DOE/CD-ETEC-023

CERTIFICATION DOCKET

FOR THE RELEASE OF BUILDING 023 AT THE ENERGY TECHNOLOGY ENGINEERING CENTER

FEBRUARY 1997

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

CERTIFICATION DOCKET

FOR THE RELEASE OF BUILDING 023 AT THE ENERGY TECHNOLOGY ENGINEERING CENTER

FEBRUARY 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 023 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 023 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 March 12, 1997. A copy of the notice, official correspondence, release criteria, project report, radiological surveys, and an independent verification report are compiled in this docket.

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EXHIBIT I

DOCUMENTS SUPPORTING THE CERTIFICATION FOR THE UNRESTRICTED USE OF BUILDING 023 AT THE ENERGY TECHNOLOGY ENGINEERING CENTER

DOE F 1325.8
(8-89)

United States Government | Department of Energy

memorandum

DATE: DEC 1 1996

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

SUBJECT: Release of Decontaminated Building 023 without radiological Restrictions at the Energy Technology Engineering Center

TO: Sally Robison, EM-443

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.

ETEC 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 023.

ETEC Building 023 was constructed in 1962 to support testing of the small sodium loop to gather data on the transport of radiological contamination. Small sections of activated stainless steel Experimental Breeder Reactor (EBR) fuel cladding was used in the sodium loop. The sodium loop testing was terminated in 1982 and the loop was dismantled in 1986. The D&D was conducted in three phases beginning in 1986, however, DOE funded the last phase of work (removal of the radioactive liquid waste holdup system) beginning in 1992. Final radiological and independent verification surveys completed in 1994 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.

The environmental survey and site assessment program of the Oak Ridge Institute for Science and Education (ORISE) has completed independent verification of the building 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 provision of the contract, and authorization to remove this facility from the DOE/OAK real property records.

Roger Liddle
Director
Environmental Restoration Division

96-ER-099/

Department of Energy
Oakland Operations Office
1301 Clay Street
Oakland, California 94612-5208

DEC 11 1996

STATEMENT OF CERTIFICATION: Energy Technology Engineering Center, Building 023

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 023. 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 023, 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

12/11/96
Date

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

United States Government **Department of Energy**

memorandum

DATE: JAN 29 1997

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

SUBJECT: Draft Certification Docket for Building 023 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 023 at the Energy Technology Engineering Center (ETEC) near Chatsworth, California.

The Office of Northwestern Area Programs has implemented a decontamination and decommissioning (D&D) 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 April 1992, Building 023 was formally designated by the Department of Energy (DOE) for cleanup.

ETEC Building 023 was constructed in 1962 to support testing of the small sodium loop to gather data on the transport of radiological contamination. Small sections of activated stainless steel Experimental Breeder Reactor fuel cladding were used in the sodium loop. The sodium loop testing was terminated in 1982 and the loop was dismantled in 1986. The D&D was conducted in three phases beginning in 1986, however, DOE funded the last phase of work (removal of the radioactive liquid waste holdup system) beginning in 1992. Final radiological and Independent Verification surveys completed in 1994 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.

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

Attachment

(8-89)
E.G. (07-90)

United States Government — Department of Energy

memorandum

DATE: FEB 14 1997

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

SUBJECT: Recommendation for Certification of Cleanup at Building 023 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 023, 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 April 1992, Building 023 was formally designated by the Department of Energy (DOE) for cleanup under Environmental Restoration.

ETEC Building 023 was constructed in 1962 to support testing of the small sodium loop to gather data on the transport of radiological contamination. Small sections of activated stainless steel Experimental Breeder Reactor fuel cladding were used in the sodium loop. The sodium loop testing was terminated in 1982 and the loop was dismantled in 1986. The project was conducted in three phases beginning in 1986, however, DOE funded the last phase of work (removal of the radioactive liquid waste holdup system) beginning in 1992. Final radiological and independent verification surveys completed in 1994 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 Buildings 028 and 029. 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 (Raymond Mosley, 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

(8-89)
E.G. (07-90)

United States Government | Department of Energy

memorandum

DATE: March 5, 1997

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

SUBJECT: Federal Register Notice for Certification of Cleanup of Building 023 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 023 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.

We have also attached a letter for your signature that transmits the disk containing the Federal Register Notice.

We are requesting that the Notice be published in the Federal Register as soon as possible.

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 023 at the Energy Technology Engineering Center located near Chatsworth, California. The disk should be used by the Government Printing Office in preparing the certification document for publication in the Federal Register.

Sincerely,

James J. Fiore
Acting Deputy Assistant Secretary
for Environmental Management

Clara Barley
DOE Federal Register Liaison
Officer

Enclosure

Printed with soy ink on recycled paper

U.S. Department of Energy

[DOCKET NO. ETEC-023]

Certification of the Radiological Condition of Building 023 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 023 located at the Energy Technology Engineering Center (ETEC) near Chatsworth, California. This property previously 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 the 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. An ETEC area that has been designated for cleanup under the DOE Environmental Restoration Program is Building 023. Other areas undergoing decontamination will be released as they are completed and verified to meet established cleanup criteria and standards for release without radiological restrictions as established in DOE Order 5400.5.

Building 023 is located within the central portion of ETEC and is situated on B Street near 12th Street among several adjacent buildings on paved ground. It is approximately 20 feet below the general grade of 12th Street. The facility consists of galvanized steel walls and roof on a concrete slab floor with various types of internal walls and partitions. It is a single floor structure which was constructed in two phases: the first section (circa 1962), "023", has been used for the storage and operation of a small sodium loop for studies of radioactive contamination transport; the second section (circa 1976), "023A", consists of a storage and setup room and a well-equipped analytical chemistry laboratory.

The first Radiological User Permit for Building 023, Authorization No. 105, was issued by the AEC in November 1976. This authorization related to the use of a small section (or sections) of activated stainless steel Experimental Boiler Reactor fuel cladding to be used in a small sodium test loop. The purpose of this test was to gather data on the transport of radiological contamination in sodium loops. The sodium loop tests were halted in 1982 and the loop was dismantled in 1986.

To allow the release of Building 023 for use without radiological restrictions, all radioactive material/contamination was removed from the facility. This decontamination and decommissioning was performed in three phases, starting in 1986 with the removal of the sodium loop and ending in 1993 after removal of the remainder of the radioactive liquid waste holdup system. After the decontamination efforts were completed, a comprehensive final survey of the building interior was performed to demonstrate compliance with 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.

Rockwell/Rocketdyne performed a final radiological survey in 1994. The Environmental Survey and Site Assessment Program of the Oak Ridge Institute for Science and Education performed independent verification of the decontamination project in 1994. Post-decontamination surveys have demonstrated that Building 023 is in compliance with DOE decontamination criteria and standards for release without radiological restrictions. DOE

intends to comply with applicable federal, state, and local requirements which relate to property transfer.

Final DOE costs for the decontamination of Building 023 were $89,000, including final survey and waste disposal. The final cost for Rockwell International was approximately $90,000.

No appreciable personnel radiation exposure was anticipated or encountered from activities associated with the decontamination of Building 023.

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, SW, Washington, D.C. Copies of the certification docket will also be available at the following locations: DOE Public Document Room, U.S. DOE, 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 023

The U.S. Department of Energy, Oakland Operations Office, Environmental Restoration Division, has reviewed and analyzed the radiological data obtained following decontamination of Building 023 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 023, at the Energy Technology Engineering Center (situated within 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 February 28, 1997 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: March 7, 1997

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

SUBJECT: Release of Decontaminated Building 023 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 023 at the Energy Technology Engineering Center (ETEC). 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 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 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

Printed on recycled paper

capacities at their home ports and sail without a full load.

Gregory D. Showalter,

Army Federal Register Liaison Officer.

[FR Doc. 97–6155 Filed 3–11–97; 8:45 am]

BILLING CODE 3710–06–M

Corps of Engineers

Availability of the Environmental Assessment for the Limited Reevaluation Study for Deepening of the Kill Van Kull and Newark Bay Navigation Channels

AGENCY: Corps of Engineers, DoD.

ACTION: Notice of availability.

SUMMARY: A Final Environmental Impact Statement (FEIS) for the Kill Van Kull and Newark Bay Channel Deepening Project was prepared and the project was authorized in the Supplemental Appropriations Act of 1985. A decision was made to deepen the channels in two phases and a Supplemental EIS was prepared to address disposal and sediment contamination issues and finalized in 1987. Phase I, the deepening to −40 feet mean low water (MLW) has been completed. The U.S. Army Corps of Engineers, New York District has prepared an Environmental Assessment (EA) for the Phase II deepening of the channels to their authorized depth of −45 feet MLW. The proposed project extends from the confluence of the Kill Van Kull and Anchorage Channels to Station 139+20N, the northern edge of the Port Elizabeth reach, approximately eight miles. The non-federal sponsor prefers to defer portions of the original project including the Port Newark Channel, and a portion of the Newark Bay Channel north of Station 139+20N. This segment was included in the economic, engineering, and environmental analyses, but is not being recommended for construction at this time. The New York District has initiated a Limited Reevaluation Study to reaffirm the recommended plan. An EA is being prepared to update the NEPA process.

FOR FURTHER INFORMATION CONTACT: For more information regarding this notice, please contact Ms. Mary M. Browning, ATTN: CENAN–PL–EA, U.S. Army Corps of Engineers, New York District, 26 Federal Plaza, New York, NY 10278–0090, or phone (212) 264–2198.

SUPPLEMENTARY INFORMATION: The Kill Van Kull and Newark Bay is a component of the Hudson-Raritan Estuarine System which lies below the confluence of the Hackensack and Passaic Rivers. The channel is situated between New Jersey and Staten Island, New York, and is northwest of the Upper Bay of New York Harbor.

Currently, navigation in the project area is severely constrained. The existing depth of the Kill Van Kull and Newark Bay Channels are not sufficient to allow the safe and efficient passage of fully loaded container and liquid bulk (tankers) vessels still willing to call on terminals in the channel. The current mode of operation calls for tankers to lighter-off in anchorages and enter the Kill Van Kull and Newark Bay Channels during high tides. Container ships calling on terminals must be loaded to less than their design capacities at their home ports and sail without a full load. This is inefficient, costly, and results in unnecessary navigational and environmental risks. Deepening the channels to their authorized depth of −45 feet MLW will provide for more economically efficient and safe utilization of these channels by vessels with drafts greater than 40 feet.

Gregory D. Showalter,

Army Federal Register Liaison Officer.

[FR Doc. 97–6156 Filed 3–11–97; 8:45 am]

BILLING CODE 3710–06–M

DEPARTMENT OF ENERGY

[Docket No. ETEC–023]

Certification of the Radiological Condition of Building 023 at the Energy Technology Engineering Center Near Chatsworth, CA

AGENCY: Office of Environmental Restoration, DOE.

ACTION: Notice of certification.

SUMMARY: The Department of Energy (DOE) has completed radiological surveys and taken remedial action to decontaminate Building 023 located at the Energy Technology Engineering Center (ETEC) near Chatsworth, California. This property previously 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. An ETEC area that has been designated for cleanup under the DOE Environmental Restoration Program is Building 023. Other areas undergoing decontamination will be released as they are completed and verified to meet established cleanup criteria and standards for release without radiological restrictions as established in DOE Order 5400.5.

Building 023 is located within the central portion of ETEC and is situated on B Street near 12th Street among several adjacent buildings on paved ground. It is approximately 20 feet below the general grade of 12th Street. The facility consists of galvanized steel walls and roof on a concrete slab floor with various types of internal walls and partitions. It is a single floor structure which was constructed in two phases: the first section (circa 1962), "023", has been used for the storage and operation of a small sodium loop for studies of radioactive contamination transport; the second section (circa 1976), "023A", consists of a storage and setup room and a well-equipped analytical chemistry laboratory.

The first Radiological User Permit for Building 023, Authorization No. 105, was issued by AEC in November 1976. This authorization related to the use of a small section (or sections) of activated stainless steel Experimental Boiler Reactor fuel cladding to be used in a small sodium test loop. The purpose of this test was to gather data on the

transport of radiological contamination in sodium loops. The sodium loop tests were halted in 1982 and the loop was dismantled in 1986.

To allow the release of Building 023 for use without radiological restrictions, all radioactive material/contamination was removed from the facility. This decontamination and decommissioning was performed in three phases, starting in 1986 with the removal of the sodium loop and ending in 1993 after removal of the remainder of the radioactive liquid waste holdup system. After the decontamination efforts were completed, a comprehensive final survey of the building interior was performed to demonstrate compliance with 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.

Rockwell/Rocketdyne performed a final radiological survey in 1994. The Environmental Survey and Site Assessment Program of the Oak Ridge Institute for Science and Education performed independent verification of the decontamination project in 1994. Post-decontamination surveys have demonstrated that Building 023 is in compliance with DOE decontamination criteria and standards for release without radiological restrictions. DOE intends to comply with applicable Federal, State, and local requirements which relate to property transfer.

Final DOE costs for the decontamination of Building 023 were $89,000, including final survey and waste disposal. The final cost for Rockwell International was approximately $90,000.

No appreciable personnel radiation exposure was anticipated or encountered from activities associated with the decontamination of Building 023.

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. DOE, 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 023

The U.S. Department of Energy, Oakland Operations Office, Environmental Restoration Division, has reviewed and analyzed the radiological data obtained following decontamination of Building 023 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 023, at the Energy Technology Engineering Center (situated within 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 February 28, 1997.

James J. Fiore,

Acting Deputy Assistant Secretary for Environmental Restoration.

[FR Doc. 97–6179 Filed 3–11–97; 8:45 am]

BILLING CODE 6450–01–P

Federal Energy Regulatory Commission

[Docket No. TM97–2–48–000]

ANR Pipeline Company; Notice of Proposed Changes in FERC Gas Tariff

March 6, 1997.

Take notice that on February 28, 1997, ANR Pipeline Company (ANR) tendered for filing as part of its FERC Gas Tariff, Second Revised Volume No. 1, the following revised tariff sheets proposed to be effective April 1, 1997:

Sixth Revised Sheet No. 19
Third Revised Sheet No. 88H

ANR states that the purpose of this filing is to comply with the annual redetermination of the levels of ANR's Transporter's Use (%) as required by ANR's currently effective tariff, to become effective April 1, 1997. This redetermination reflects an increase in certain fuel use percentages that comprise ANR's fuel matrix applicable to transportation service on its transmission facilities, storage service and gathering service.

ANR states that all of its Volume No. 1 and Volume No. 2 customers and interested State Commissions have been mailed a copy of this filing.

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, D.C. 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 as provided in 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 in the Public Reference Room.

Lois D. Cashell,

Secretary.

[FR Doc. 97–6104 Filed 3–11–97; 8:45 am]

BILLING CODE 6717–01–M

[Docket No. RP97–72–002]

ANR Pipeline Company; Notice of Compliance Filing

March 6, 1997.

Take notice that on March 3, 1997, ANR Pipeline Company (ANR) tendered for filing, as part of its FERC Gas Tariff, Second Revised Volume No. 1, the following revised tariff sheets, proposed to become effective December 1, 1996:

Substitute Second Revised Sheet No. 37
Substitute Original Sheet No. 37A
Substitute Fifth Revised Sheet No. 39
Substitute Sixth Revised Sheet No. 120

ANR states that these tariff changes are being filed pursuant to the Commission's February 14, 1997 letter order in the captioned proceeding. The revised tariff sheets address the priority of Rate Schedule FTS–2 service during the ten (10) days each month that such service will not be scheduled as firm service.

EXHIBIT II

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

XB F 1325.8
(8-89)

nited States Government **Department of Energy**

nemorandum

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

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STATE OF CALIFORNIA—HEALTH AND WELFARE AGENCY

PETE WILSON, *Governor*

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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

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

Rockwell International
Rocketdyne Division

SUPPORTING DOCUMENT

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PREPARED BY/DATE	DEPT	MAIL ADDR
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R. J. Tuttle	641	T100

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

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

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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.

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

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. F. Lee 8/14/96 C. M. Jones 8/14/96 MAG Rel: 8-22-96

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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 ≤ = 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
	Industrial	Wilderness	Residential	Default
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

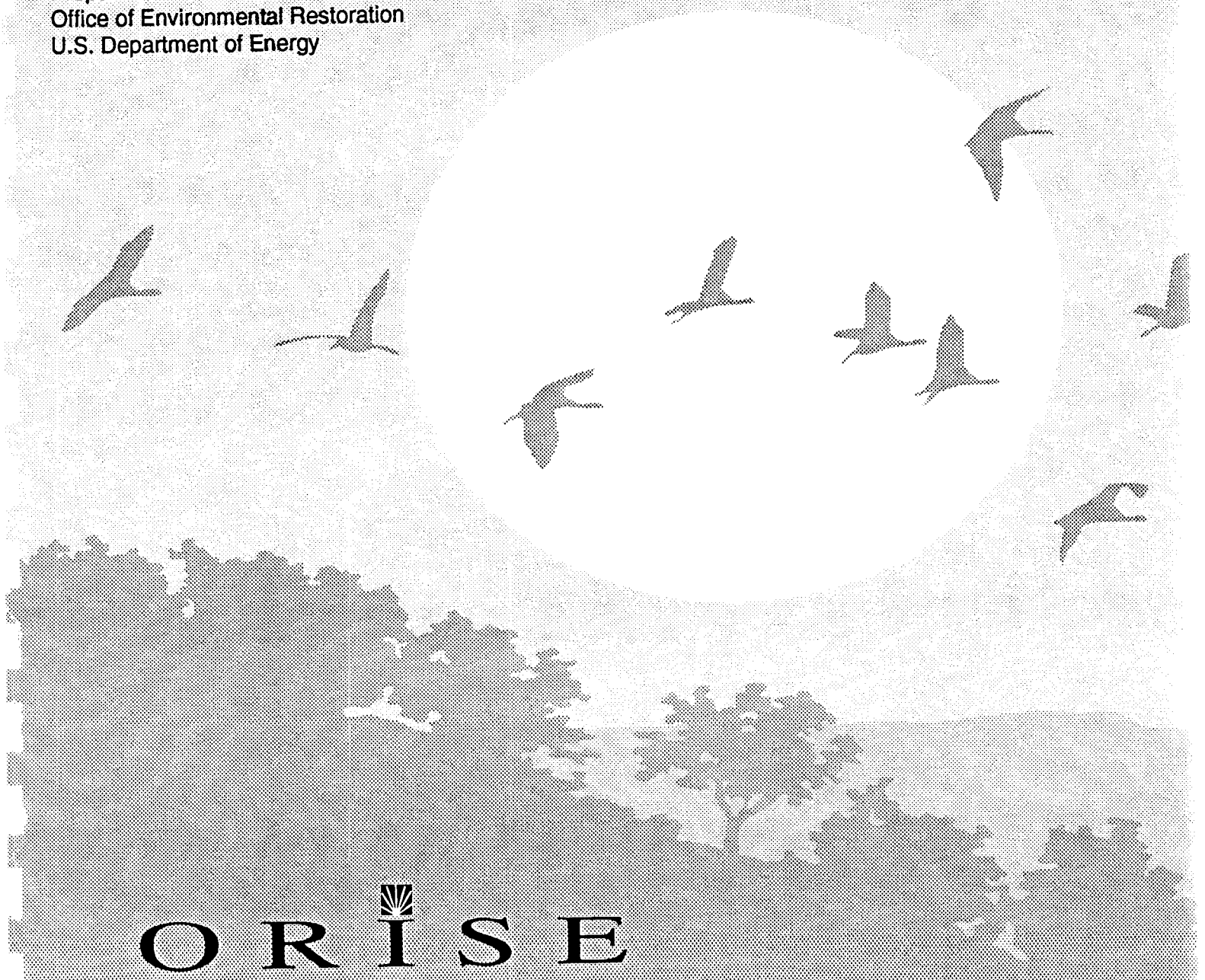
EXHIBIT III

INDEPENDENT VERIFICATION DOCUMENTATION OF THE RADIOLOGICAL CONDITION OF BUILDING 023 AT ENERGY TECHNOLOGY ENGINEERING CENTER AFTER DECONTAMINATION AND DECOMMISSIONING

VERIFICATION SURVEY OF BUILDINGS 005, 023, AND 064 SANTA SUSANA FIELD LABORATORY ROCKWELL INTERNATIONAL VENTURA COUNTY, CALIFORNIA

T.J. VITKUS

Prepared for the
Office of Environmental Restoration
U.S. Department of Energy



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VERIFICATION SURVEY OF BUILDINGS 005, 023, AND 064 SANTA SUSANA FIELD LABORATORY ROCKWELL INTERNATIONAL VENTURA COUNTY, CALIFORNIA

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OF BUILDINGS 005, 023, AND 064
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ROCKWELL INTERNATIONAL
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ABBREVIATIONS AND ACRONYMS

AEC	Atomic Energy Commission
cm^2	square centimeter
cpm	counts per minute
DOE	Department of Energy
dpm/100 cm^2	disintegrations per minute per 100 square centimeters
EML	Environmental Measurement Laboratory
EPA	Environmental Protection Agency
ERDA	Energy Research and Development Administration
ESSAP	Environmental Survey and Site Assessment Program
ETEC	Energy Technology Engineering Center
ha	hectare
GM	Geiger-Mueller
kg	kilogram
km	kilometer
m	meter
m^2	square meter
MDA	minimum detectable activity
mi	mile
mm	millimeter
NaI	sodium iodide
NIST	National Institute of Standards and Technology
ORISE	Oak Ridge Institute for Science and Education
pCi/g	picocuries per gram
PIC	pressurized ionization chamber
SSFL	Santa Susana Field Laboratory
ZnS	zinc sulfide
μR/h	microroentgens per hour

VERIFICATION SURVEY
OF BUILDINGS 005, 023, AND 064
SANTA SUSANA FIELD LABORATORY
ROCKWELL INTERNATIONAL
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INTRODUCTION AND SITE HISTORY

Rockwell International's Rocketdyne Division operates the Santa Susana Field Laboratory (SSFL). The Energy Technology Engineering Center (ETEC) is that portion of the SSFL, operated for the Department of Energy (DOE), which performs testing of equipment, materials, and components for nuclear and energy related programs. Contract work for the Atomic Energy Commission (AEC) and the Energy Research and Development Administration (ERDA), predecessor agencies to the DOE, began in the early 1950's. Specific programs conducted for AEC/ERDA/DOE involved the engineering, development, testing, and manufacturing operations of nuclear reactor systems and components. Other SSFL activities have also been conducted for the National Aeronautics and Space Administration, the Department of Defense, and other government related or affiliated organizations and agencies. Some activities have been licensed by the Nuclear Regulatory Commission.

Numerous buildings and land areas became radiologically contaminated as a result of the various operations which included ten reactors, seven criticality test facilities, fuel fabrication, reactor and fuel disassembly, laboratory work, and on-site storage of nuclear material. Potential radioactive contaminants identified at the site are uranium (in natural and enriched isotopic abundances), plutonium, americium-241, fission products (primarily cesium-137 and strontium-90), activation products (cobalt-60, europium-152, nickel-63, promethium-147, and tantalum-182), and tritium. Chemical contaminants, mainly chlorinated organic solvents, have also been identified in groundwater.

Decontamination and decommissioning of facilities began in the late 1960's and continues as other DOE sponsored projects are phased out and transitioned to EM-40. Rockwell/Rocketdyne has recently completed the decommissioning and final status radiological surveys of three SSFL facilities. These facilities are Buildings 005, 023, and 064.

Building 005 was built in the late 1950's for testing proposed coolants for the Organic Moderated Reactor Experiment and Piqua reactors. There was no radiological material use in the facility during this period; however, the facility was later converted for uranium carbide fuel fabrication. Fuel fabrication activities were performed from 1966 to 1967. At the conclusion of the fuel fabrication project, uranium contaminated equipment and surfaces were either removed or decontaminated to permit non-radiological use of the building. Additional facility decontamination was initiated during 1978 and completed in phases, ending in 1992. Decontamination activities included cleaning and/or removal of contaminated floors, equipment, duct work, drain pipes, and storage tanks. Rockwell/Rocketdyne performed the final radiological survey in 1993.

Studies of radioactive contamination transport in a sodium loop were performed in the portions of Building 023 constructed in 1962 (referred to as Old Building 023). A second section, 023A, was added on to the building in 1976. There were two fires documented within the facility that involved the sodium loop. Contaminants involved were Cs-137, Mn-54, and Co-60. In addition, the facility was also used to store a Dew-Point meter containing a Ra-226 source. Plans called for the disassembly of the meter; however, the disassembly was not attempted and the intact meter was removed from the facility. Most of the contamination identified in the building involved the radioactive liquid holdup tank and the associated drain lines and sink. Facility decontamination included the removal of the sodium loop, holdup tank, drain lines, sink, a fume hood and the ventilation exhaust system, and remediation of an area of the floor where the sodium loop was previously located. Rockwell/Rocketdyne's final radiological survey was conducted in 1993.

The third building, Building 064, was constructed in 1958 (a second bay was added on in 1963) to serve as a storage and repackaging facility for special nuclear and source radioactive material. Source and special nuclear material, including processed natural uranium, depleted uranium, enriched uranium, uranium-233, thorium, and plutonium, were stored in the building until 1980. Most recently, packaged soil contaminated with Cs-137 was stored in the facility. Exterior yard areas were occasionally used for storage of recoverable uranium scrap, irradiated fuel elements, and miscellaneous radioactive wastes. Interior surfaces were determined to be contaminated

from the uranium repackaging process. Initial facility decommissioning involved removal of equipment and fixtures, and finally, removal of the contaminated soil. Rockwell/Rocketdyne then performed the final radiological surveys of the interior and exterior grounds of the building.

DOE's Office of Environmental Restoration, Northwestern Area Programs is responsible for oversight of a number of remedial actions that have been or will be conducted at the SSFL. It is the policy of DOE to perform independent (third party) verification of remedial action activities conducted within Office of Environmental Restoration programs. The purpose of these independent verifications is to confirm that remedial actions have been effective in meeting established guidelines and that the documentation accurately and adequately describes the post-remedial action radiological conditions at the site. The Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) has been designated as the organization responsible for this task at SSFL.

SITE DESCRIPTION

The SSFL is located in the Simi Hills of southeastern Ventura County, California approximately 47 km (29 mi) northwest of downtown Los Angeles (Figure 1). The site is comprised of approximately 1090 hectares (2700 acres) and is divided into four administrative areas (Areas I through IV) and a Buffer Zone. DOE operations are conducted in Rockwell International-owned and DOE-owned facilities located within the 117 ha Area IV. The ETEC portion of Area IV consists of government-owned buildings that occupy 36 ha. The Area IV plot plan is provided in Figure 2 and indicates the locations of Buildings 005, 023, and 064.

Building 005 is located within the central portion of Area IV and is bordered on the north and northeast by B Street, to the southwest by 17th Street, and to the southeast by the Old Coal Storage Yard and G Street (Figure 3). The facility is a tilt-up concrete structure with Butler aluminum siding and has approximately 430 m^2 of floor space. A number of concrete pads are located on the east end of the building. These pads formerly held equipment used in the Molten Salt Oxidation Project and the filter plenums from the fuel fabrication project. The building interior is subdivided into an administration area, change rooms, chemistry laboratories, storage

rooms, and a high-bay area. Figure 4 shows those rooms that were included in the radiological control area.

Building 023 is located in the central section of Area IV. Facility boundaries are 12th Street to the north, B Street to the south and east and Building 032 to the west (Figure 5). Building 023 is a single story structure with galvanized steel walls and roof and a concrete slab floor. The sodium test loop was located in the western, or "old", portion of the building. The "new" building section held an analytical chemistry laboratory and a storage and set-up room. The waste holdup tank was formerly located in an exterior sub-grade vault at the east end of the building (Figure 6).

Building 064 is located in the northeast quadrant of Area IV. Facility boundaries include paved yard areas to the north, and west, "G" Street to the south, and a paved area and the Side-Yard to the east (Figure 7). This Side-Yard includes an excavated area from which the Cs-137 contaminated soil, previously stored in Building 064, originated. ESSAP performed the verification of the Side-Yard during a previous survey.[1] The 410 m^2 building is constructed of reinforced concrete with two large open bays, Rooms 110 and 114. Other rooms include a material handling area (Room 116), office and supply and storage space (Room 120), and a rest room (Figure 8).

OBJECTIVES

The objectives of the verification surveys were to provide independent document reviews and measurement and sampling data for use by the DOE in determining the radiological status of each facility and whether or not the facility meets the guideline requirements for release to unrestricted use.

DOCUMENT REVIEW

ESSAP reviewed Rockwell's radiological survey, decontamination and decommissioning, and final status survey reports for Buildings 005, 023, and 064.[2-12] Procedures and methods used by Rockwell were reviewed for adequacy and appropriateness. The post-remedial action data was reviewed for adequacy, completeness, and compliance with guidelines.

PROCEDURES

A survey team from ESSAP visited the SSFL during the period July 18 through 21, 1994 and performed visual inspections and independent measurements and sampling inside building structures as well as exterior areas. Survey activities were conducted in accordance with a site specific survey plan submitted to and approved by the DOE.[13] Additional information regarding major instrumentation and survey and analytical procedures may be found in Appendices A and B.

REFERENCE GRID

ESSAP used the 1 m × 1 m grid system established by Rockwell, where intact, for referencing measurement and sampling locations. Survey locations on upper walls, ceilings, or other ungridded surfaces were referenced to the floor or lower wall grid or to prominent building features. Survey references of exterior areas were made to either the existing grid or to prominent site features.

SURFACE SCANS

Interior surface scans for alpha, beta, and gamma activity were performed on floors, lower walls, upper walls, and ceilings of each building, and on portions of concrete exterior surfaces (ramps, walkways, and a tank vault). Exterior soil and paved areas, and the Building 005 and 064 roofs were scanned for gamma activity. Scans were performed using gas proportional, ZnS, GM, and/or NaI detectors coupled to ratemeters or ratemeter-scalers with audible indicators.

Scan coverage, with the exception of upper walls and ceilings, ranged from 25% in rooms or areas without a radiological use history, up to 100% for radiological use areas. Approximately 5% of accessible upper wall and ceiling surfaces were scanned. Locations of elevated direct radiation identified by surface scans were marked for further investigation.

SURFACE ACTIVITY MEASUREMENTS

Direct measurements to determine total alpha and total beta surface activity levels were performed in 68 floor and lower wall grid blocks. Grid blocks selected for survey were chosen either randomly or as a result of elevated direct radiation detected by surface scans. One set of five direct measurements was obtained from each grid block with measurements performed at the center and four points equidistant from the center and grid block corners. Since the time of the radioactive material use in Building 005, new tile had been placed over most of the original floor. Rather than addressing these areas with grid block measurements, tiles were removed from 10 randomly selected locations within 4 rooms (Rooms 108, 110, 113, and 114) associated with the fuel fabrication work and single-point measurements performed. An additional 165 single-point alpha and beta direct measurements were performed on floor, lower wall, upper wall and ceiling surfaces, as well as equipment, exterior paved areas around each building, the attic area in Building 005, and the tank vault outside of Building 023. All measurements were made using ZnS and GM detectors coupled to ratemeter-scalers. A smear sample for determining removable alpha and beta activity was collected from the location within each grid block that corresponded to the highest total direct measurement, and from each single-point measurement location. Figures 9 through 28 show measurement and sampling locations.

EXPOSURE RATE MEASUREMENTS

Quantitative site exposure rate measurements, at 1 m above the surface, were made at 7 locations within Building 005, 6 locations within Building 064, and at two soil sampling locations (Figures 20 and 21 and 26 through 28) using a pressurized ionization chamber (PIC). Exposure rates in all remaining areas were determined qualitatively and were based on gamma

surface scan data. Rockwell/Rocketdyne developed background exposure rate data, which was used by ESSAP for data comparisons.

SOIL SAMPLING

With the exception of the southeast side of Building 064, all exterior areas around the buildings were paved. One surface (0 to 15 cm) soil sample was collected from the southeast side of Building 064 and 2 samples were collected, through cores previously made by Rockwell, from beneath the asphalt to the northeast of Building 005. Figures 20 and 28 show sampling locations.

SAMPLE ANALYSIS AND DATA INTERPRETATION

Samples and data were returned to ESSAP's Oak Ridge, Tennessee laboratory for analysis and interpretation. Soil samples were analyzed by solid state gamma spectrometry. Spectrum were reviewed for uranium and gamma-emitting activation and fission products (primarily Cs-137). Results were reported in picocuries per gram (pCi/g). Smear samples were analyzed for gross alpha and gross beta activity using a low background proportional counter. These results were reported together with direct measurement data in units of disintegrations per minute per 100 cm^2 (dpm/100 cm^2). Exposure rates were reported in microroentgens per hour (μR/h).

Results were compared to the DOE guidelines which are provided in Appendix C.

FINDINGS AND RESULTS

DOCUMENT REVIEW

ESSAP identified a number of areas in the documentation submitted by Rockwell/Rocketdyne, principally related to guideline selection, survey methodology, and final status documentation where clarification or additional information was necessary. ESSAP provided these comments

to the DOE in March 22 and April 4, 1994 correspondences.[14,15] Rockwell/Rocketdyne subsequently issued a response to each comment in a June 2, 1994 correspondence.[16]

SURFACE SCANS

Alpha, beta, and gamma scans of the interior and exterior areas of each building identified 4 locations of elevated direct beta radiation requiring additional investigation. One location, measuring less than 15 cm^2, was in Building 064 Room 114 grid block F,8 (Figure 26). The second location was in Building 005 Room 105/112 grid block Q,19 (Figure 10). The remaining two locations were identified in the Control Room of Building 023. One area was contiguous with the area which Rockwell/Rocketdyne had previously remediated (grid blocks D,1 and D,2 Figure 22). The second location measured less than 15 cm^2 and was located in grid block B,5 (Figure 22). The location in Building 064 Room 114 and the small area of contamination in grid block B,5 of Building 023 Control Room were decontaminated by Rockwell/Rocketdyne. ESSAP personnel performed post-remedial action surface scans at each location and found the beta surface activity to be comparable to background levels. Additional investigation of the residual activity detected in Building 005 Room 105/112 grid block Q,19 and Building 023 Control Room grid blocks D,1 and D,2 determined that the activity could be averaged over 1 m^2 for guideline comparison.

SURFACE ACTIVITY LEVELS

Surface activity levels for each of the buildings surveyed are summarized in Table 1. Total activity levels for the interior of Building 005 ranged from less than 66 to 360 dpm/100 cm^2 for alpha and less than 1,500 to 7,100 dpm/100 cm^2 for beta. The average activity in 1 m^2 grid blocks was less than 66 dpm/100 cm^2 for alpha and less than 1,500 to 2,100 dpm/100 cm^2 for beta. Total activity levels for the exterior areas of Building 005 ranged from less than 66 to 360 dpm/100 cm^2 and less than 1,500 to 1,900 dpm/100 cm^2 for alpha and beta, respectively.

Final survey results for total surface activity levels inside of Building 023, listed in Table 1, were less than 66 to 400 dpm/100 cm^2 for alpha and less than 1,400 to 6,700 dpm/100 cm^2 for

beta. The average activity in 1 m^2 grid blocks was less than 66 dpm/100 cm^2 for alpha and less than 1,400 to 2,400 dpm/100 cm^2 for beta. The activity levels on exterior surfaces, including the holdup waste tank vault, were less than 66 dpm/100 cm^2 to 120 dpm/100 cm^2 for alpha and less than 1,500 to 1,600 dpm/100 cm^2 for beta. Prior to remediation, the activity level of the "hot spot" in the Control Room was 20,000 dpm/100 cm^2. Post-remedial activity was less than 1,400 dpm/100 cm^2.

Building 064 final survey results for total activity, provided in Table 1, ranged from less than 66 to 290 dpm/100 cm^2 for alpha and less than 1,500 to 2,400 dpm/100 cm^2 for beta. The 1 m^2 grid block averages were less than 66 dpm/100 cm^2 and less than 1,500 dpm/100 cm^2 for alpha and beta, respectively. Exterior surface activity levels were less than 66 dpm/100 cm^2 for alpha and ranged from less than 1,400 to 2,200 dpm/100 cm^2 for beta. The beta activity level of the "hot spot" in Room 114 was 46,000 dpm/100 cm^2 prior to additional remediation, and 1,500 dpm/100 cm^2 after decontamination.

Removable activity levels for all measurement locations, summarized in Table 1, were less than the minimum detectable activities of the procedure which were 12 dpm/100 cm^2 for gross alpha and 16 dpm/100 cm^2 for gross beta.

EXPOSURE RATES

Background exposure rates as measured by Rockwell/Rocketdyne were 8 μR/h (in Building 038 for comparison with Buildings 005 and 023), 15 μR/h (in Building 445 for comparison with Building 064), and 15 μR/h for exterior areas. Building and exterior exposure rates are summarized in Table 2. Exposure rates ranged from 10 to 11 μR/h and 14 to 17 μR/h for the interiors of Buildings 005 and 064, respectively. Exterior exposure rates ranged from 12 to 14 μR/h. Qualitative verification exposure rates in Building 023 were comparable to background levels.

RADIONUCLIDE CONCENTRATIONS IN SOIL

The radionuclide concentrations in the soil samples collected from Buildings 005 and 064 are summarized in Table 3. Concentration ranges were as follows: Cs-137, less than 0.1 to 2.7 pCi/g; U-235, 0.1 to 0.5 pCi/g; and U-238, 0.7 to 3.8 pCi/g. There were no other gamma-emitting radionuclides of significance, other than naturally occurring radionuclides.

COMPARISON OF RESULTS WITH GUIDELINES

Surface activity levels in each of the three buildings were compared to the appropriate residual radioactive material guidelines specified in DOE Order 5400.5. These guidelines are summarized in Appendix C. The applicable guidelines for Building 005 and 064 are those for uranium which are as follows:

Total Activity

5,000 α dpm/100 cm^2, average in a 1 m^2 area

15,000 α dpm/100 cm^2, maximum in a 100 cm^2 area

Removable Activity

1000 α dpm/100 cm^2

The guidelines for Building 023 are those for beta-gamma emitters which are:

Total Activity

5,000 β-γ dpm/100 cm^2, average in a 1 m^2 area

15,000 β-γ dpm/100 cm^2, maximum in a 100 cm^2 area

Removable Activity

1,000 β-γ dpm/100 cm^2

The uranium guidelines noted above specify alpha activity. However, because rough, dirty, damp, or porous materials may selectively attenuate the alpha radiation emitted by uranium, the beta radiation (emitted by the uranium daughters) was also measured, in addition to alpha activity, and used for guideline comparison. Alpha to beta decay ratios range from 1:1 for natural and low-enriched (<1%) uranium to as high as 9:1 for the reported 12.67% enriched uranium used in the fuel fabrication project. ESSAP previously requested additional information from Rockwell/Rocketdyne that would define the expected alpha-to-beta decay ratios for the various isotopic uranium compositions used in the facility.[14] Based on Rockwell/Rocketdyne's response, a 1:1 alpha to beta activity ratio was used for comparing beta surface activity levels, as well as the alpha surface activity levels, to the alpha guidelines for this survey.[16] All of the final ESSAP independent measurements were below both sets of guideline levels.

Soil concentration guidelines for uranium and Cs-137 are developed on a site-specific basis using the RESRAD computer code developed for that process. The Cs-137 guideline developed for the Building 064 Side Yard was 7.08 pCi/g average in a 100 m^2 area and a maximum "hot spot" concentration level of 70.8 pCi/g. Cesium-137 levels in verification samples were well below the average concentration guideline. Uranium levels in verification samples were comparable to expected background levels.

The DOE exposure rate guideline, identified in Appendix C, is 20 μR/h above background, at 1 m. However, Rockwell/Rocketdyne has elected to perform decommissioning work to meet a more restrictive exposure rate criteria of less than 5 μR/h above background. All exposure rates were below this guideline.

SUMMARY

The Environmental Survey and Site Assessment Program of the Oak Ridge Institute for Science and Education has conducted verification activities for Buildings 005, 023, and 064 at the Santa Susana Field Laboratory in Ventura County, California. Verification activities included document reviews and during the period July 18 through 21, 1994 ESSAP personnel visited the site and performed independent surface scans, surface activity measurements, exposure rate measurements, and soil sampling.

ESSAP identified two small areas of above guideline contamination, one each in Buildings 023 and 064, during the verification survey. Rockwell/Rocketdyne personnel subsequently decontaminated both areas to below guideline levels. All remaining ESSAP measurements and sampling support Rockwell/Rocketdyne's conclusion that Building 005, 023, and 064 meet the DOE requirements for release to unrestricted use.

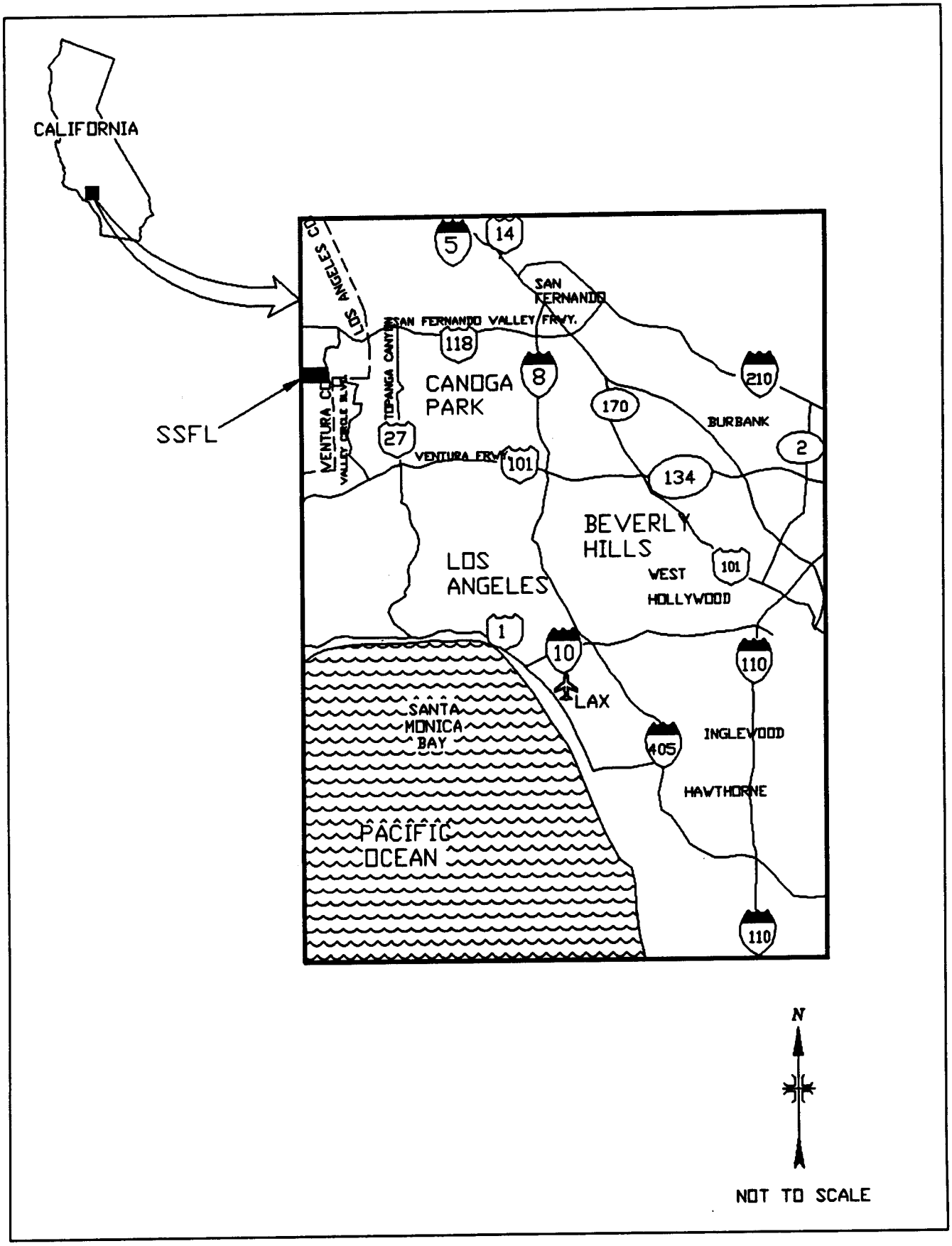


FIGURE 1: Los Angeles California Area - Location of Santa Susana Field Laboratory Site

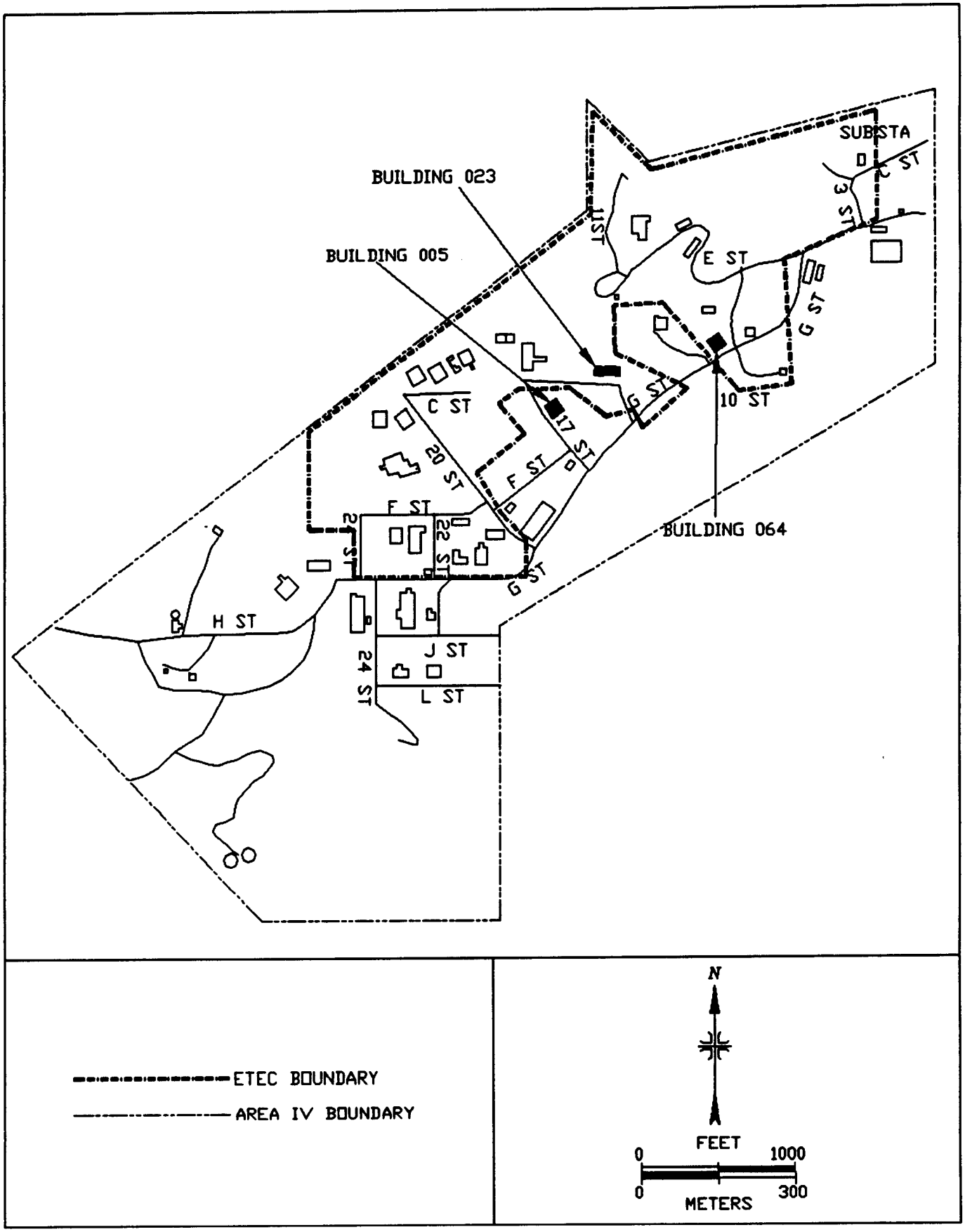


FIGURE 2: Santa Susana Field Laboratory Area IV, Plot Plan - Locations of Buildings 005, 023, and 064

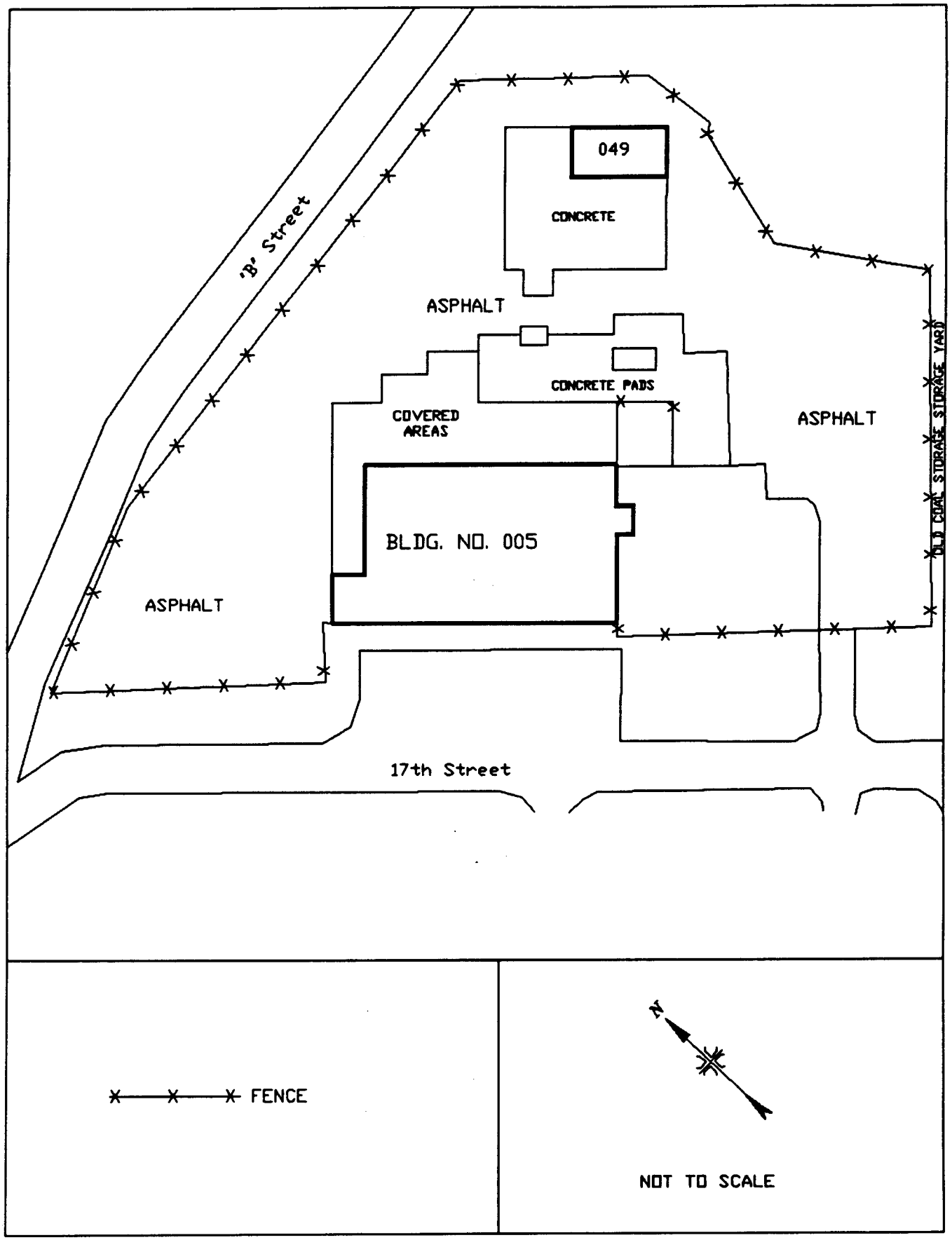


FIGURE 3: Building 005 - Plot Plan

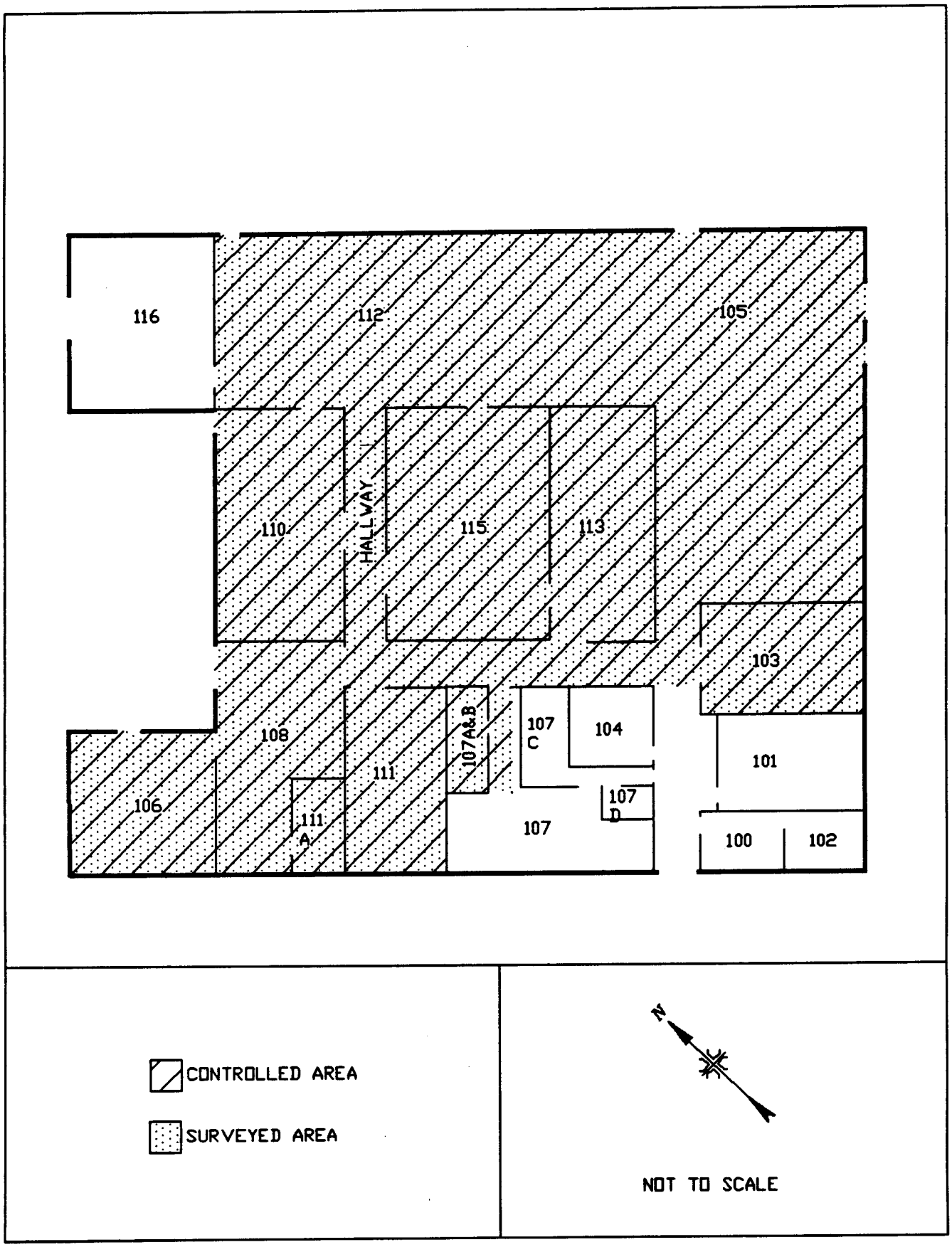


FIGURE 4: Building 005 - Floor Plan, Controlled Area, and Surveyed Areas

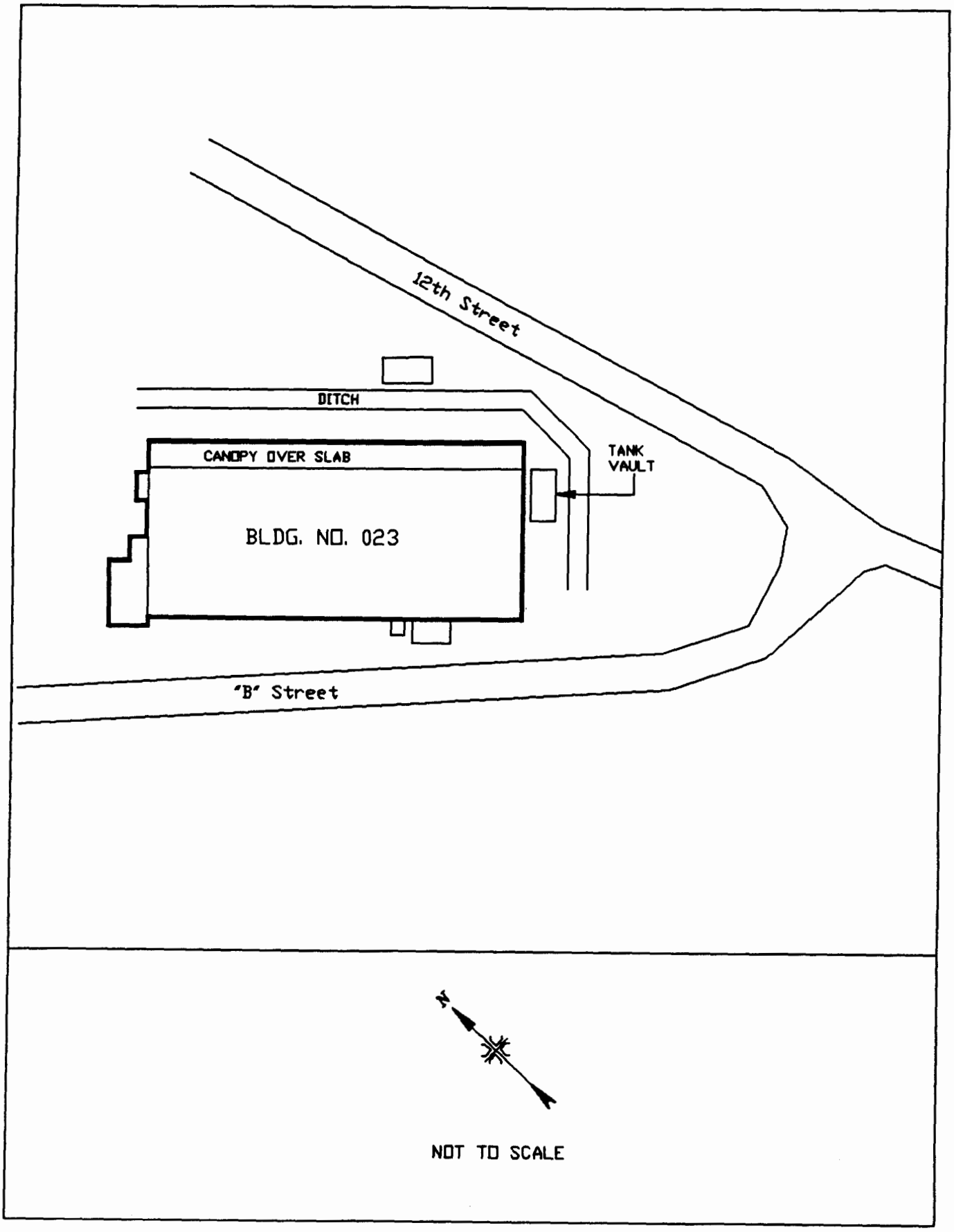


FIGURE 5: Building 023 - Plot Plan

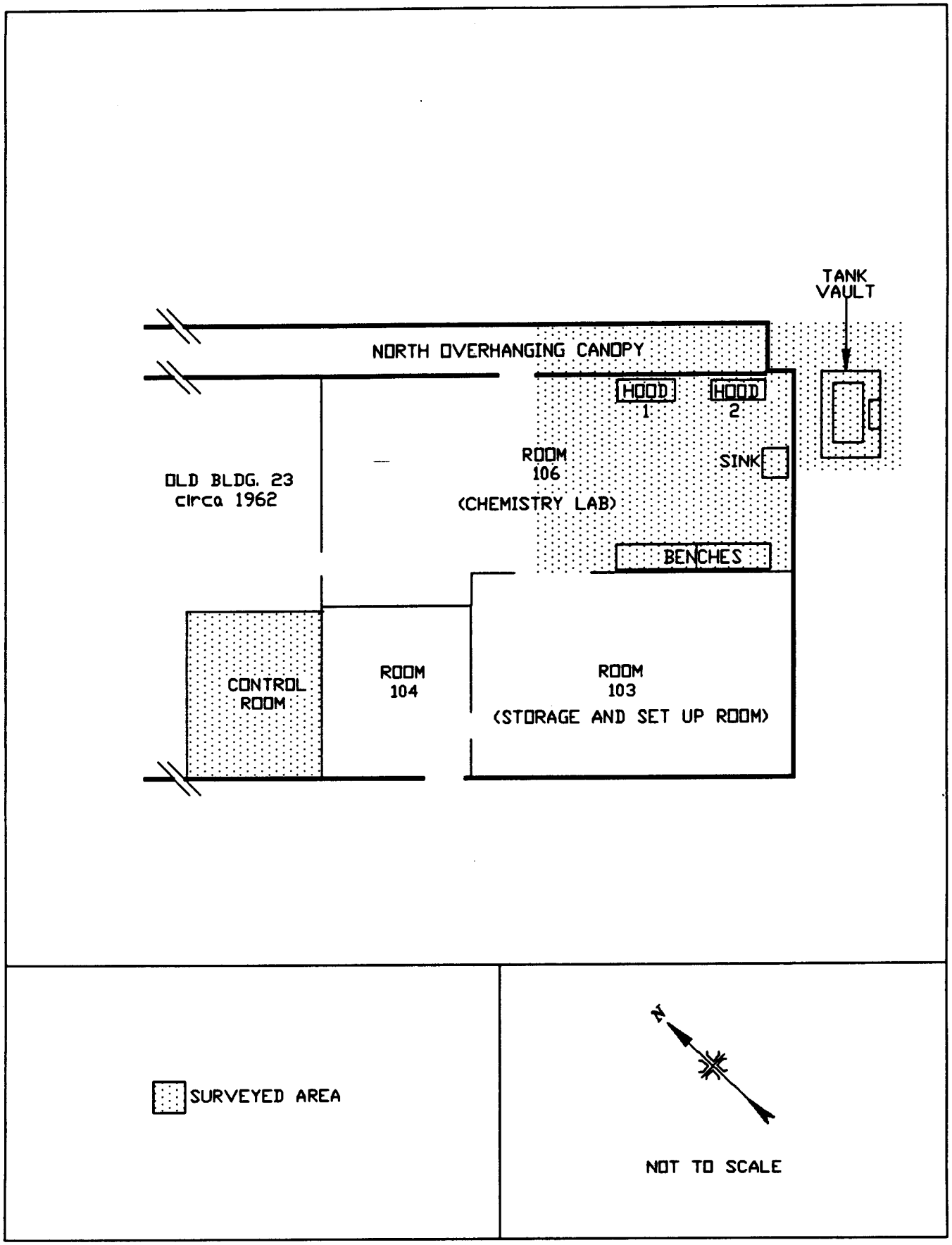


FIGURE 6: Building 023 - Floor Plan and Surveyed Areas

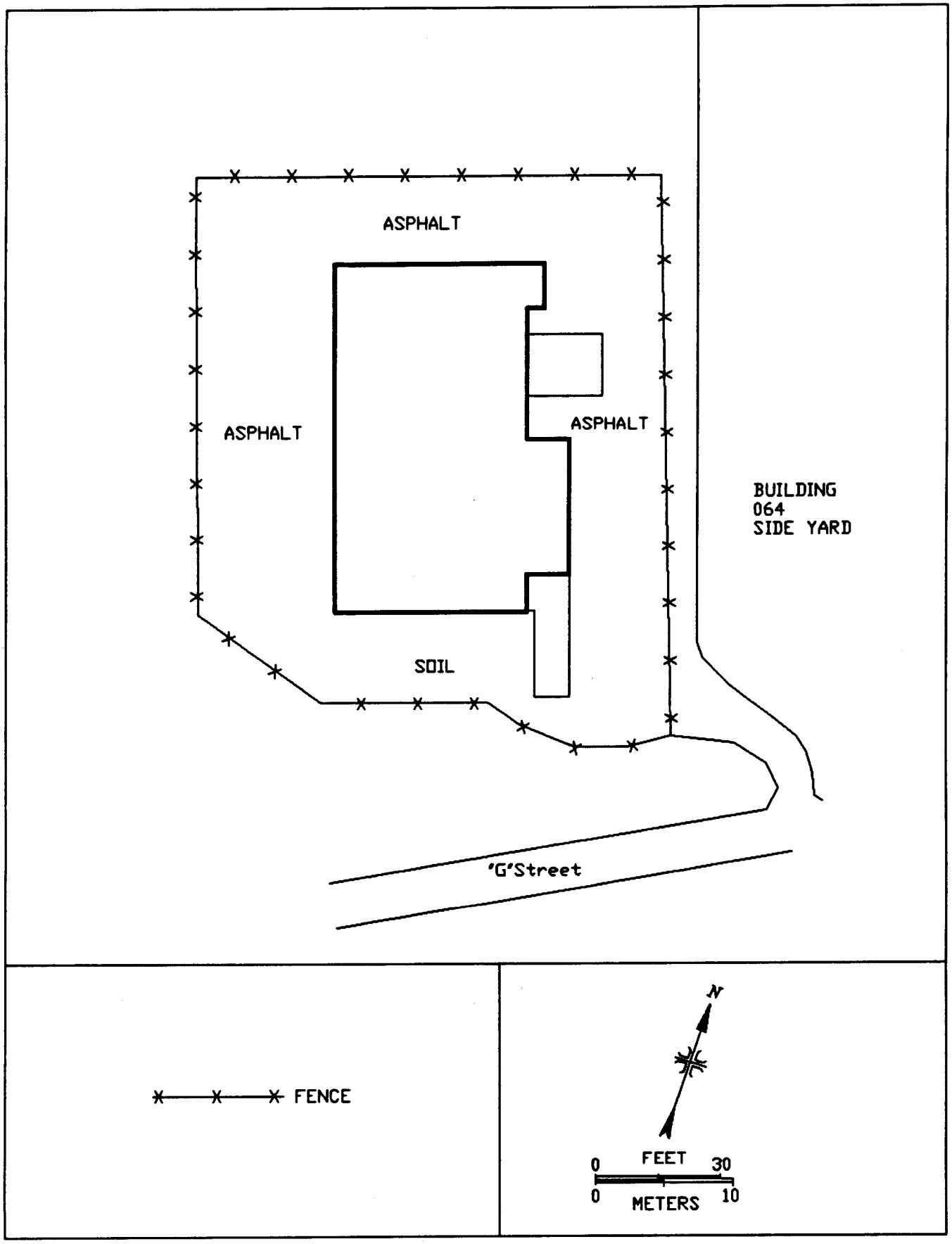


FIGURE 7: Building 064 - Plot Plan

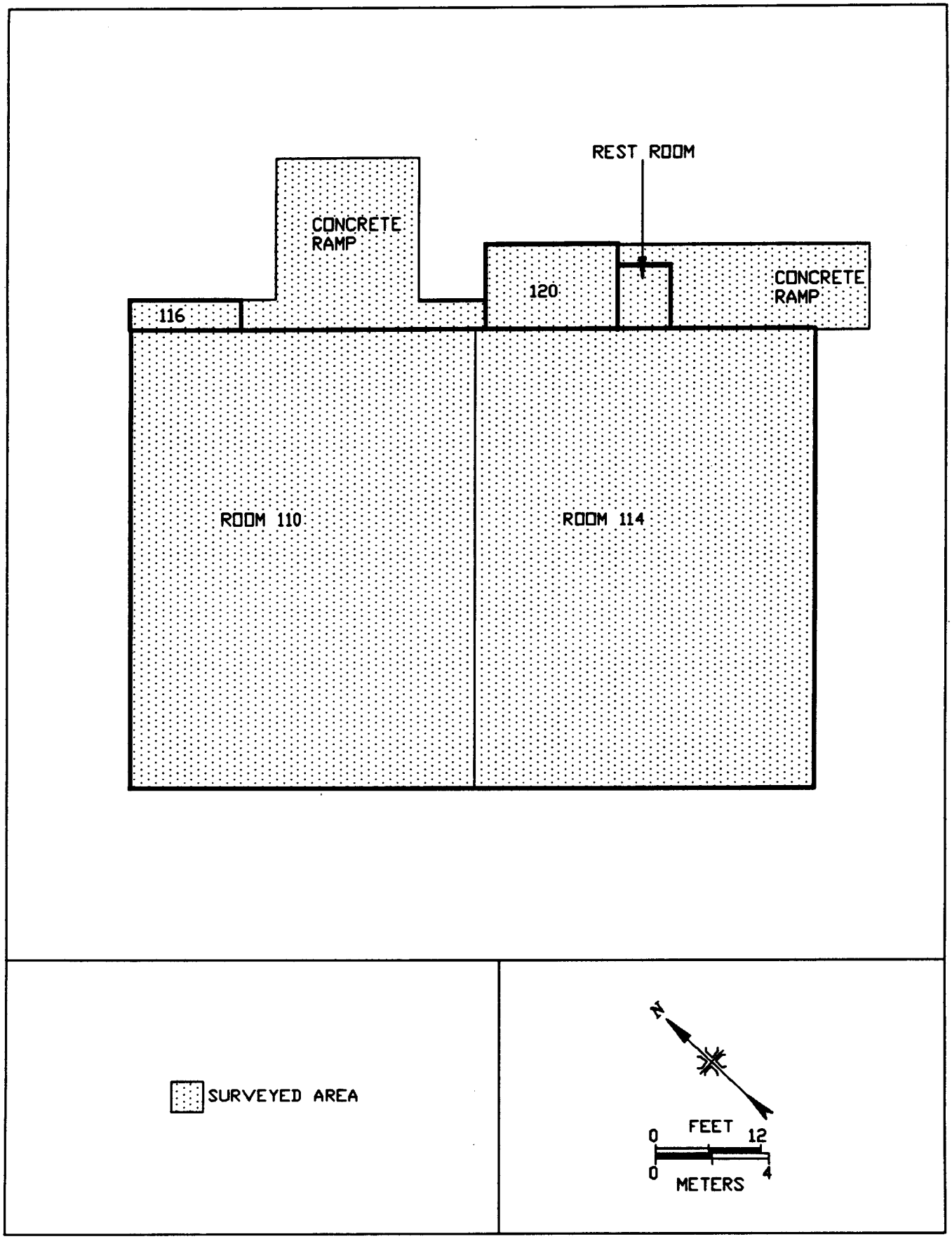


FIGURE 8: Building 064 - Floor Plan and Surveyed Areas

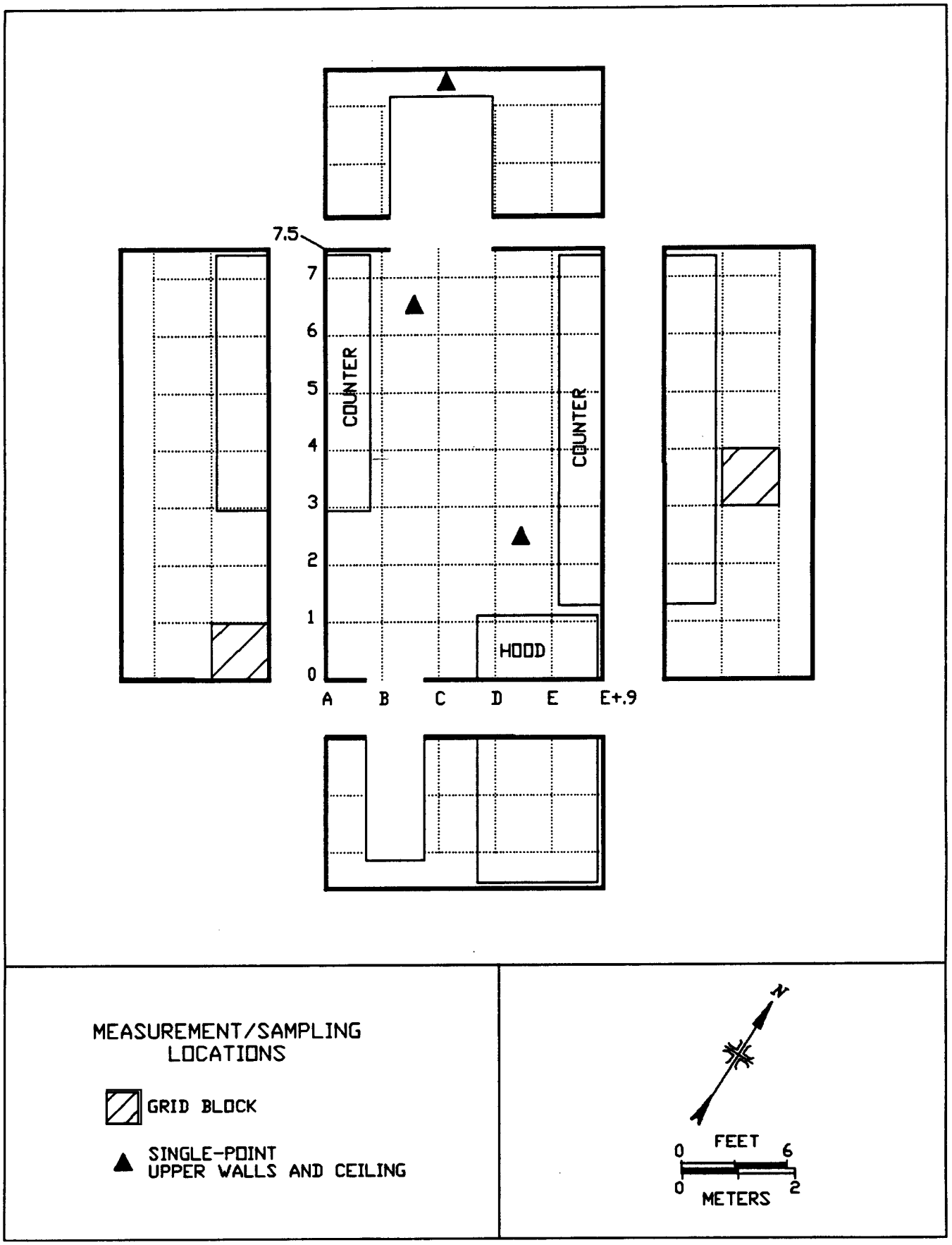


FIGURE 9: Building 005, Room 103 - Measurement and Sampling Locations

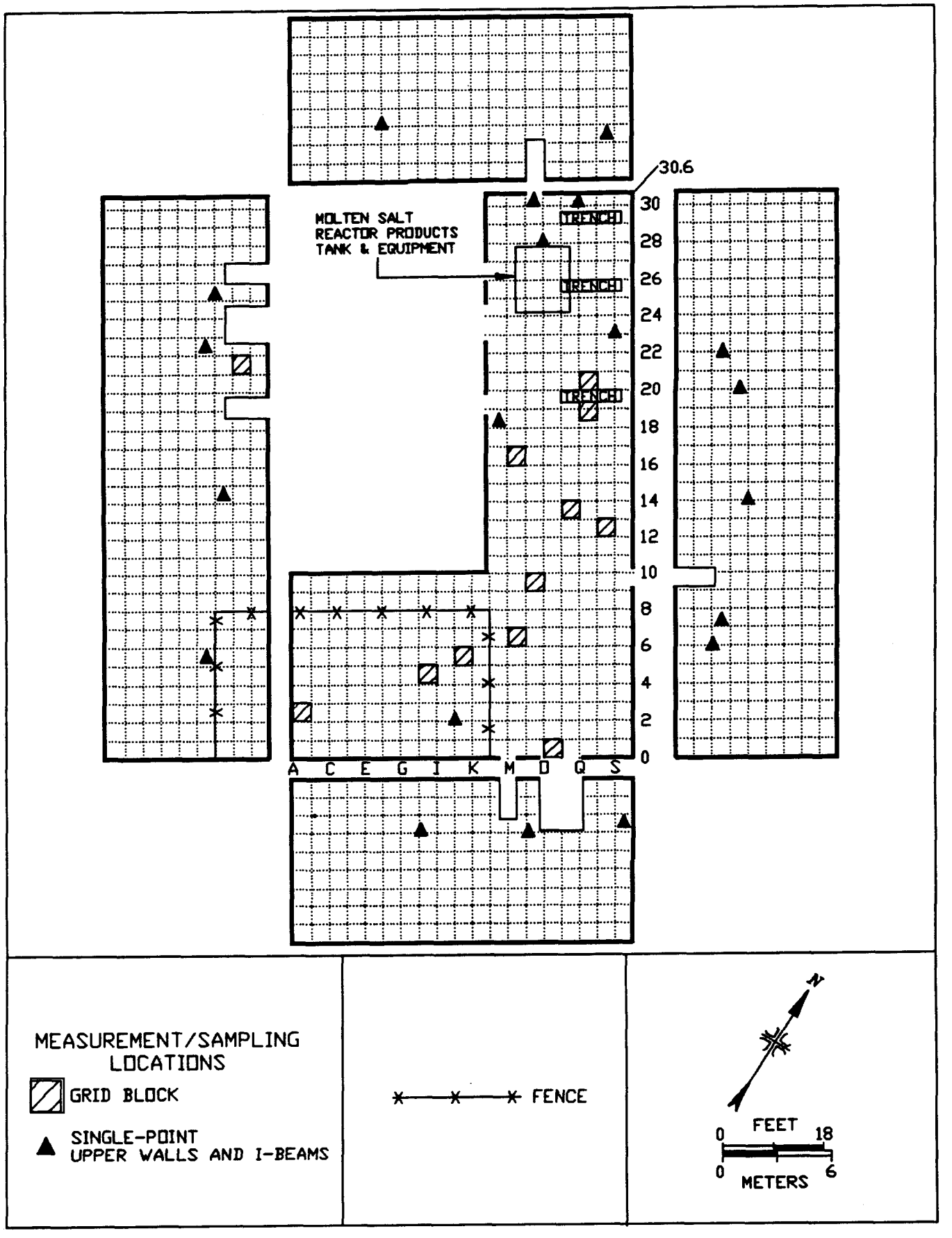


FIGURE 10: Building 005, Room 105/112 - Measurement and Sampling Locations

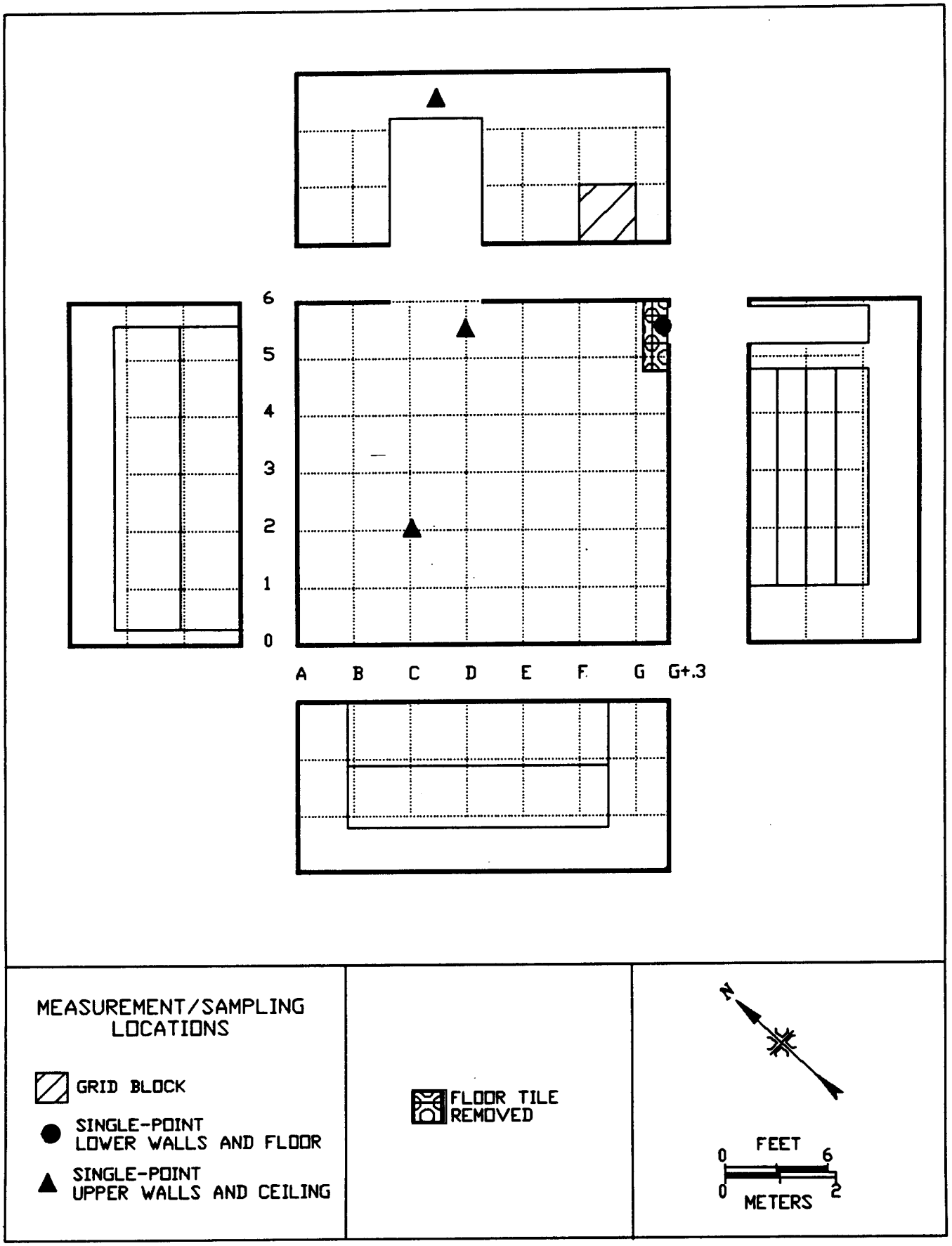


FIGURE 11: Building 005, Room 106 - Measurement and Sampling Locations

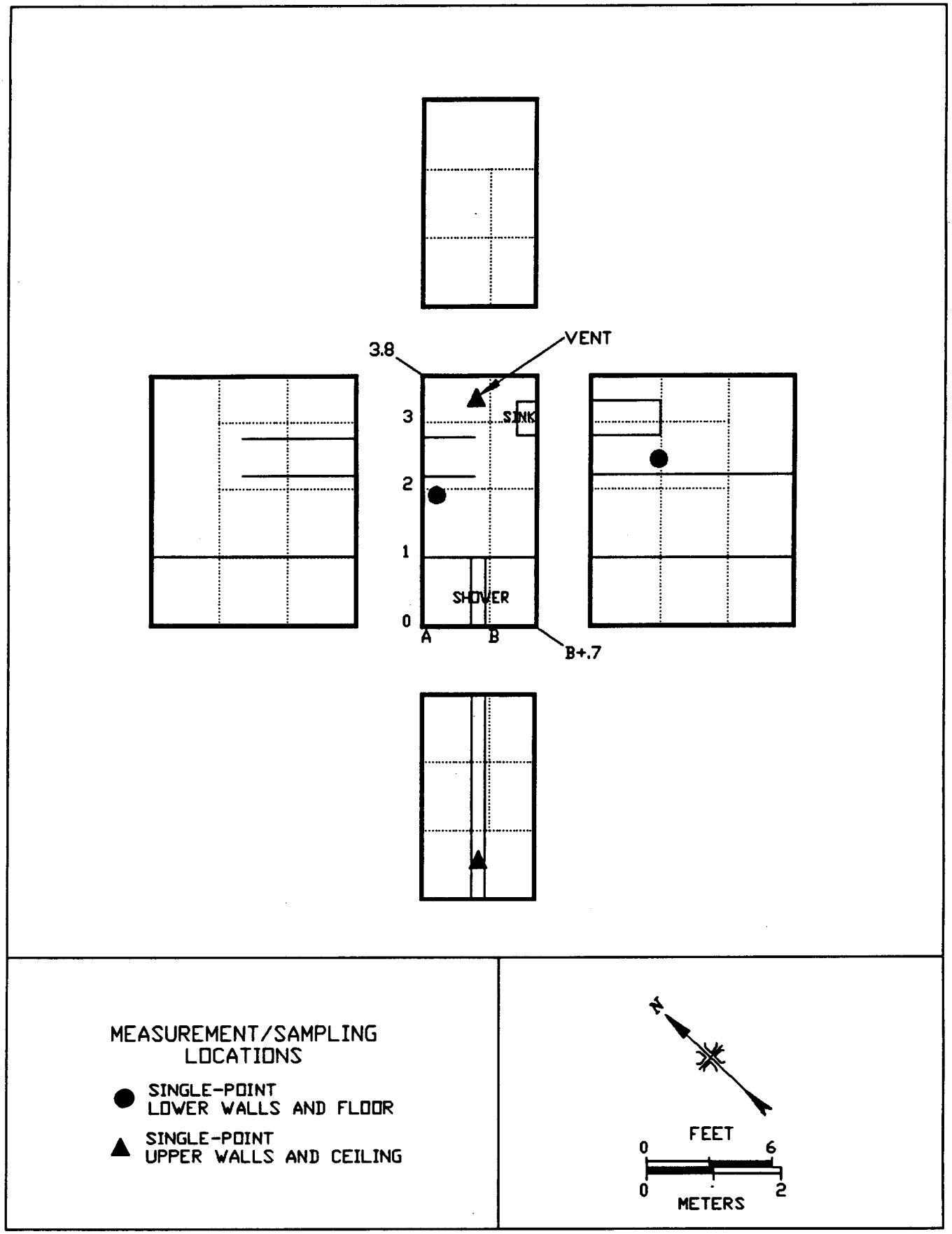


FIGURE 12: Building 005, Room 107A&B - Measurement and Sampling Locations

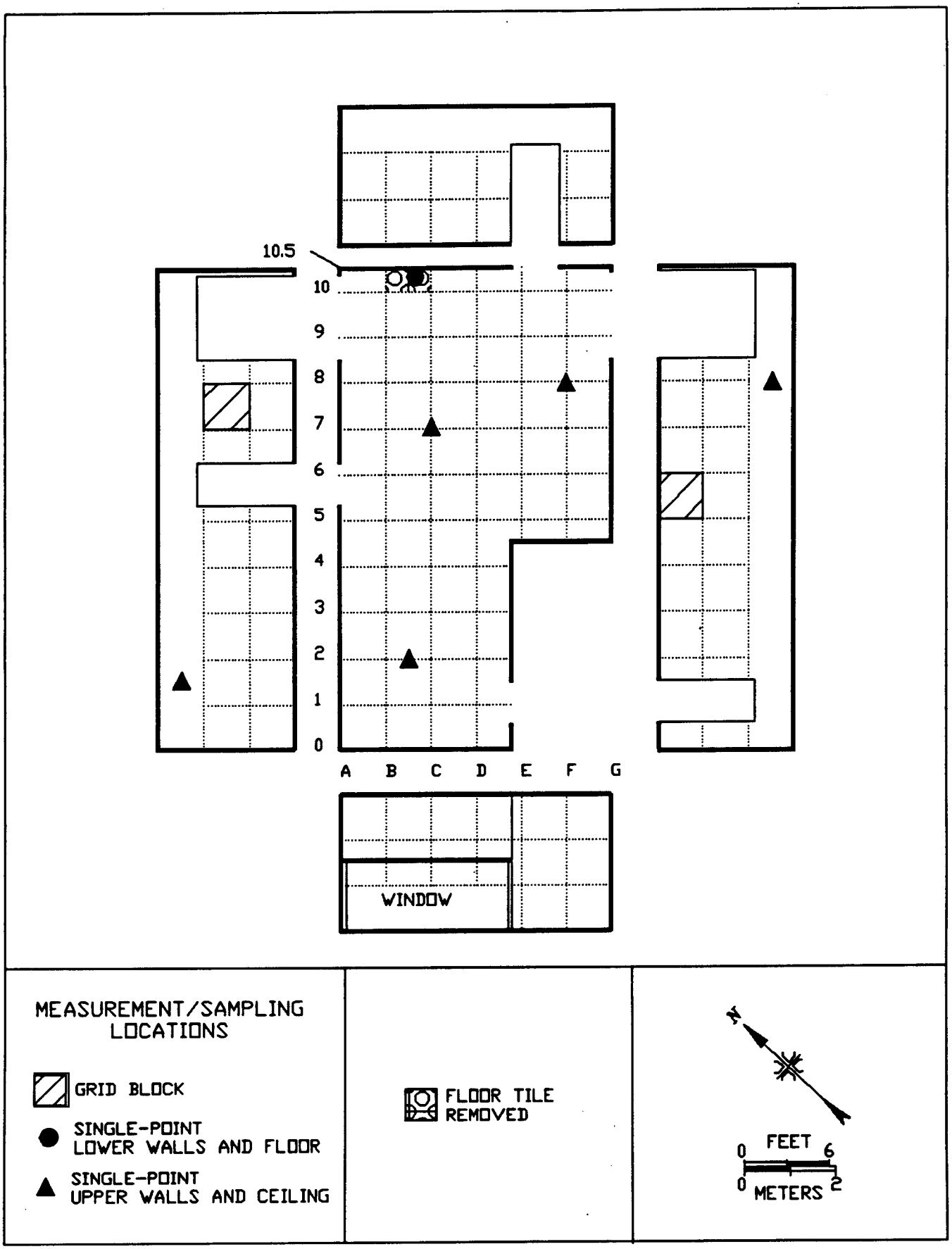


FIGURE 13: Building 005, Room 108 - Measurement and Sampling Locations

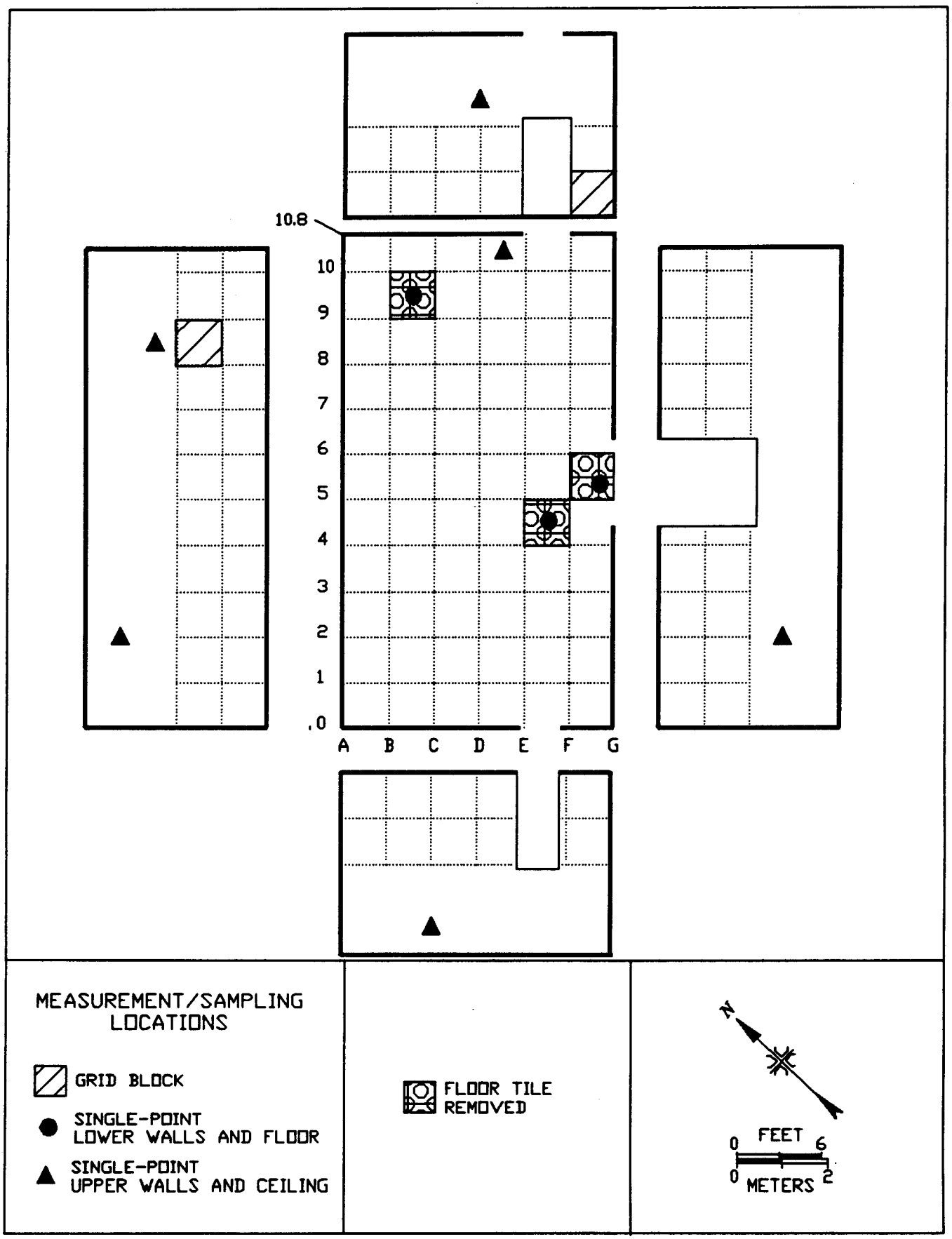


FIGURE 14: Building 005, Room 110 - Measurement and Sampling Locations

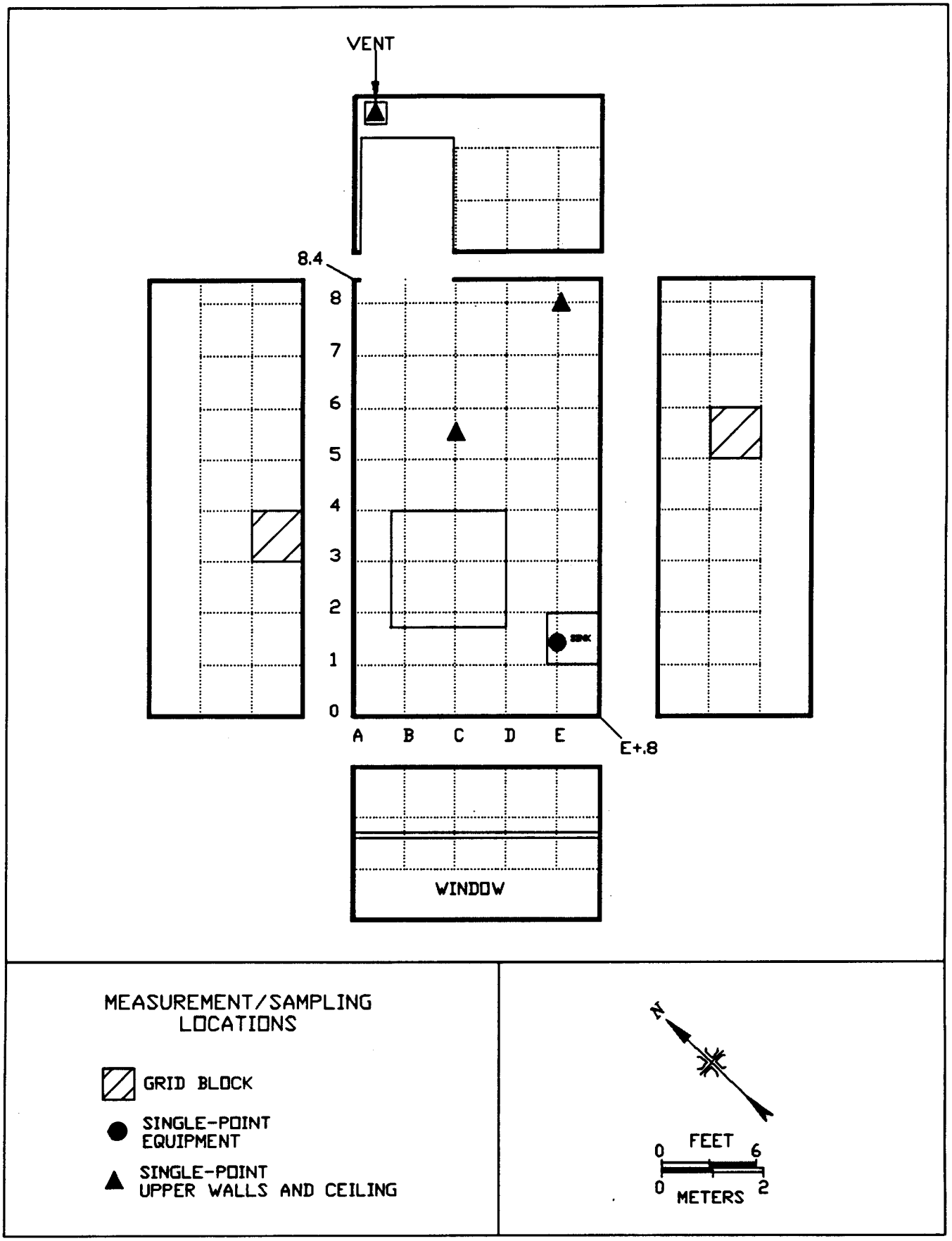


FIGURE 15: Building 005, Room 111 - Measurement and Sampling Locations

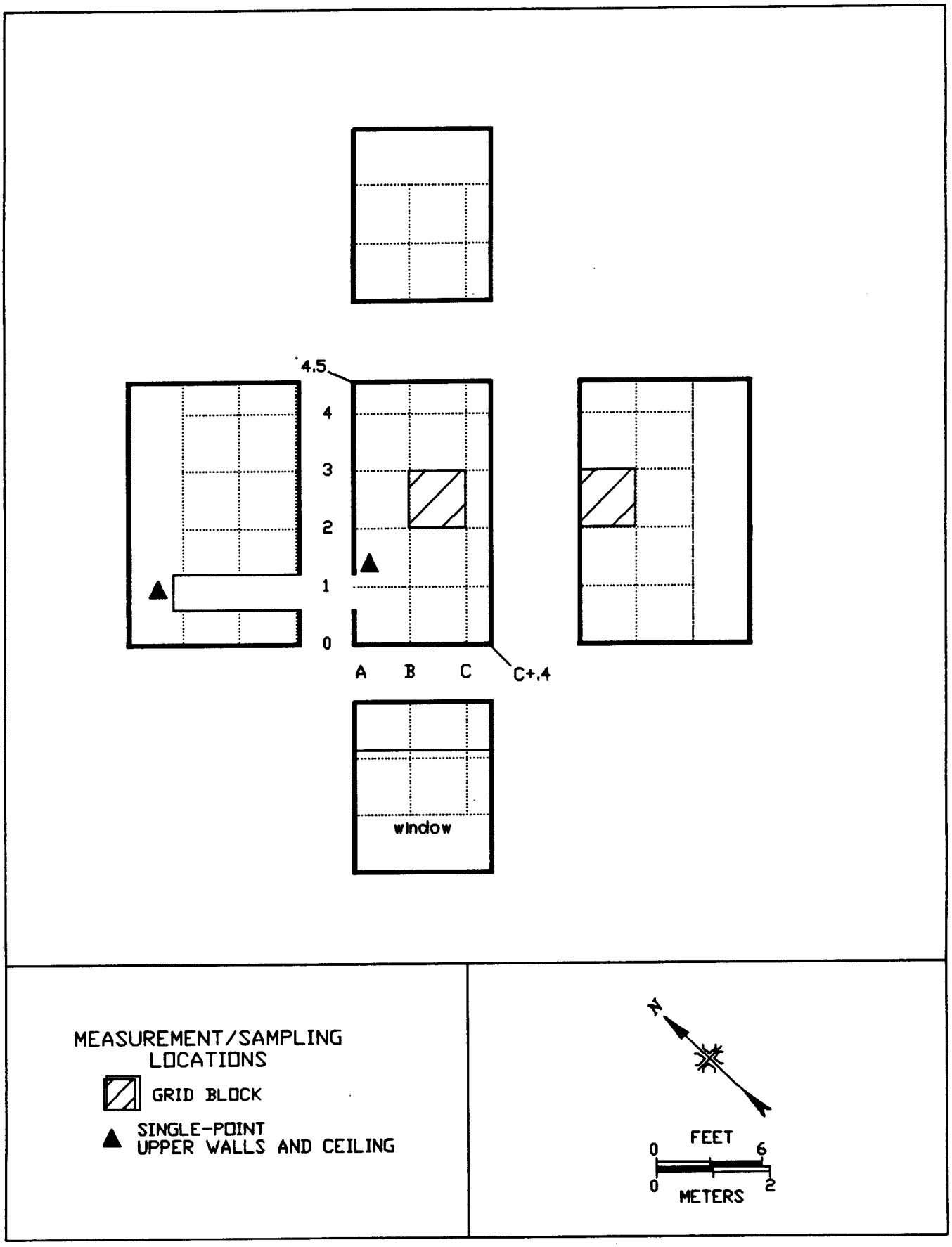


FIGURE 16: Building 005, Room 111A - Measurement and Sampling Locations

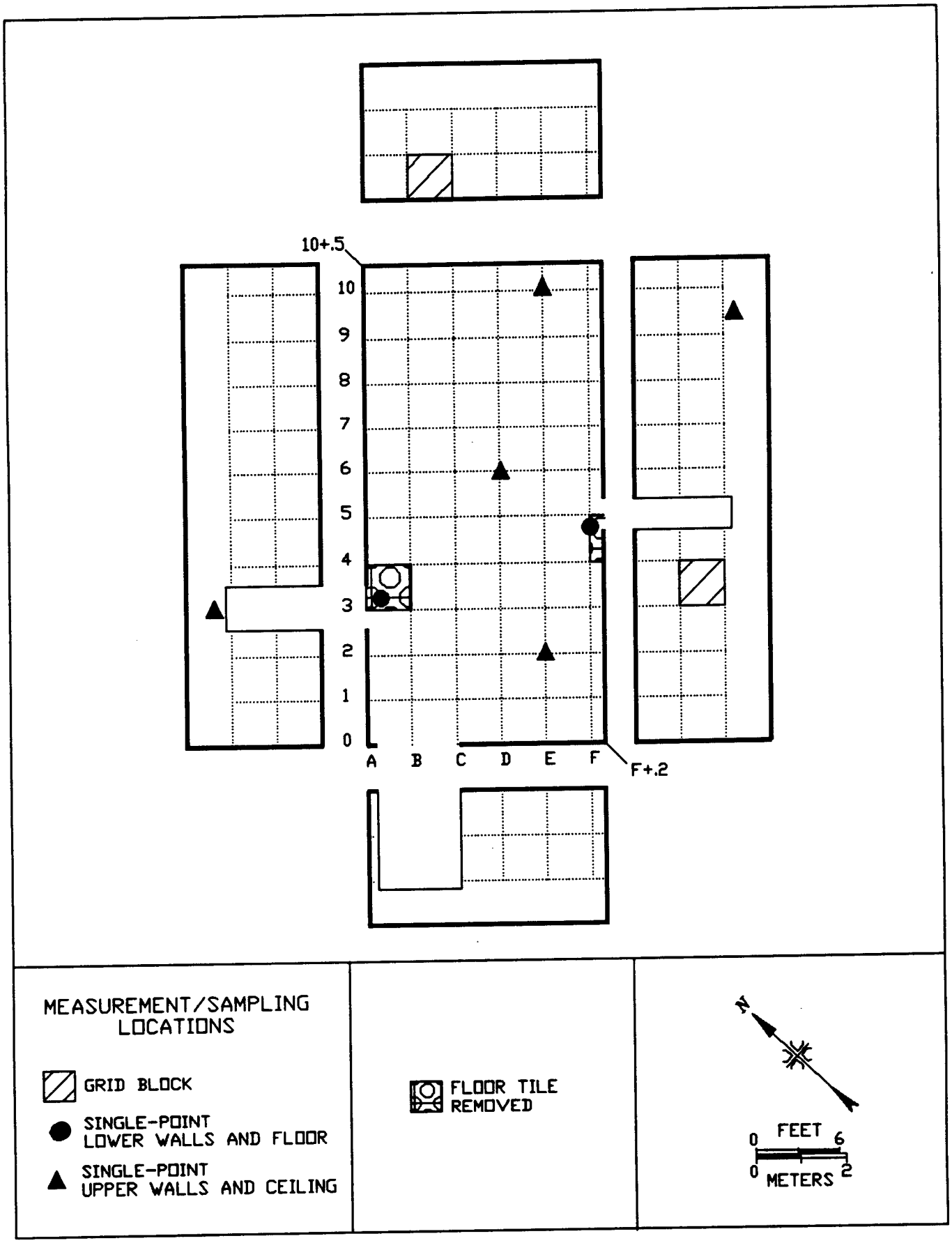


FIGURE 17: Building 005, Room 113 - Measurement and Sampling Locations

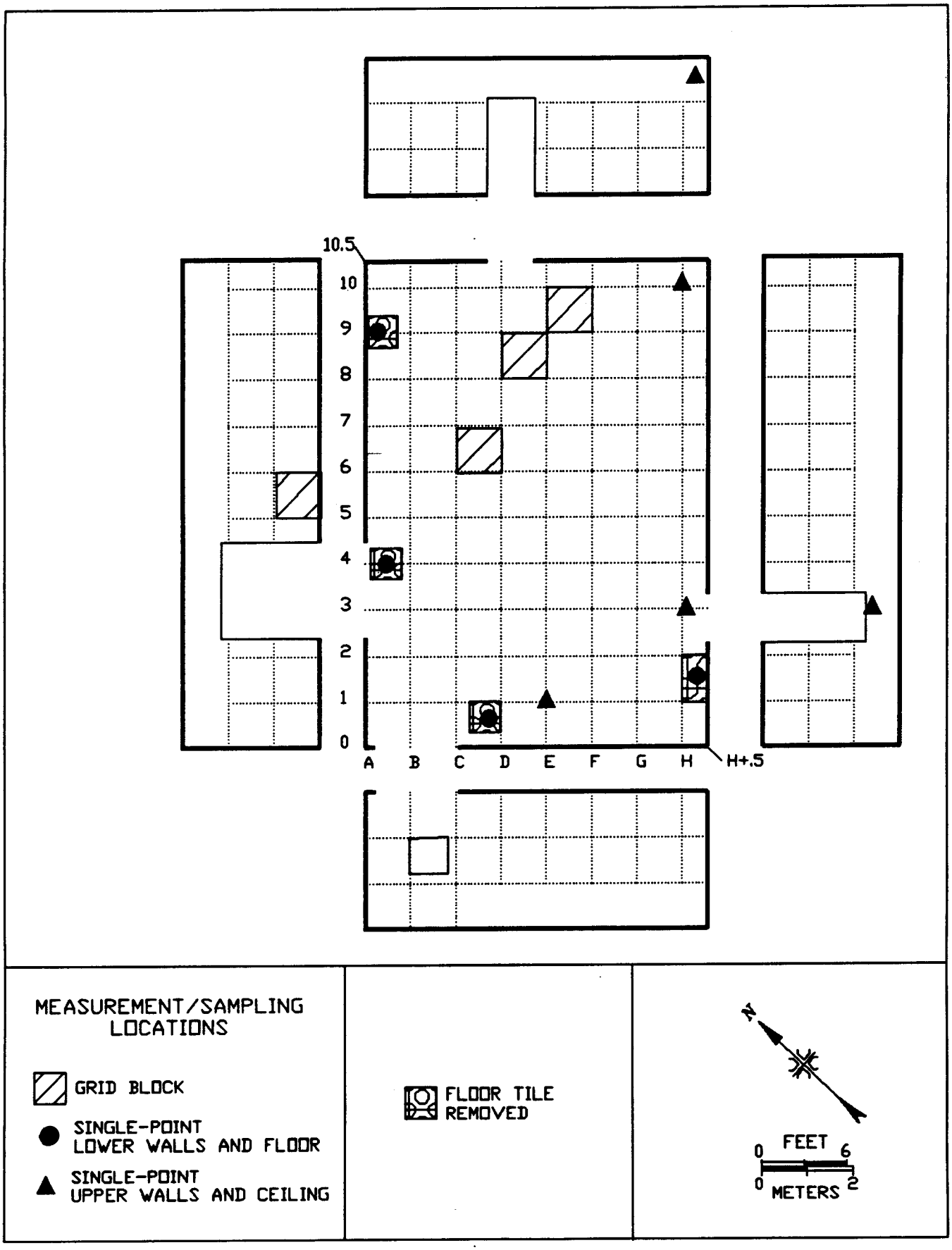


FIGURE 18: Building 005, Room 115 - Measurement and Sampling Locations

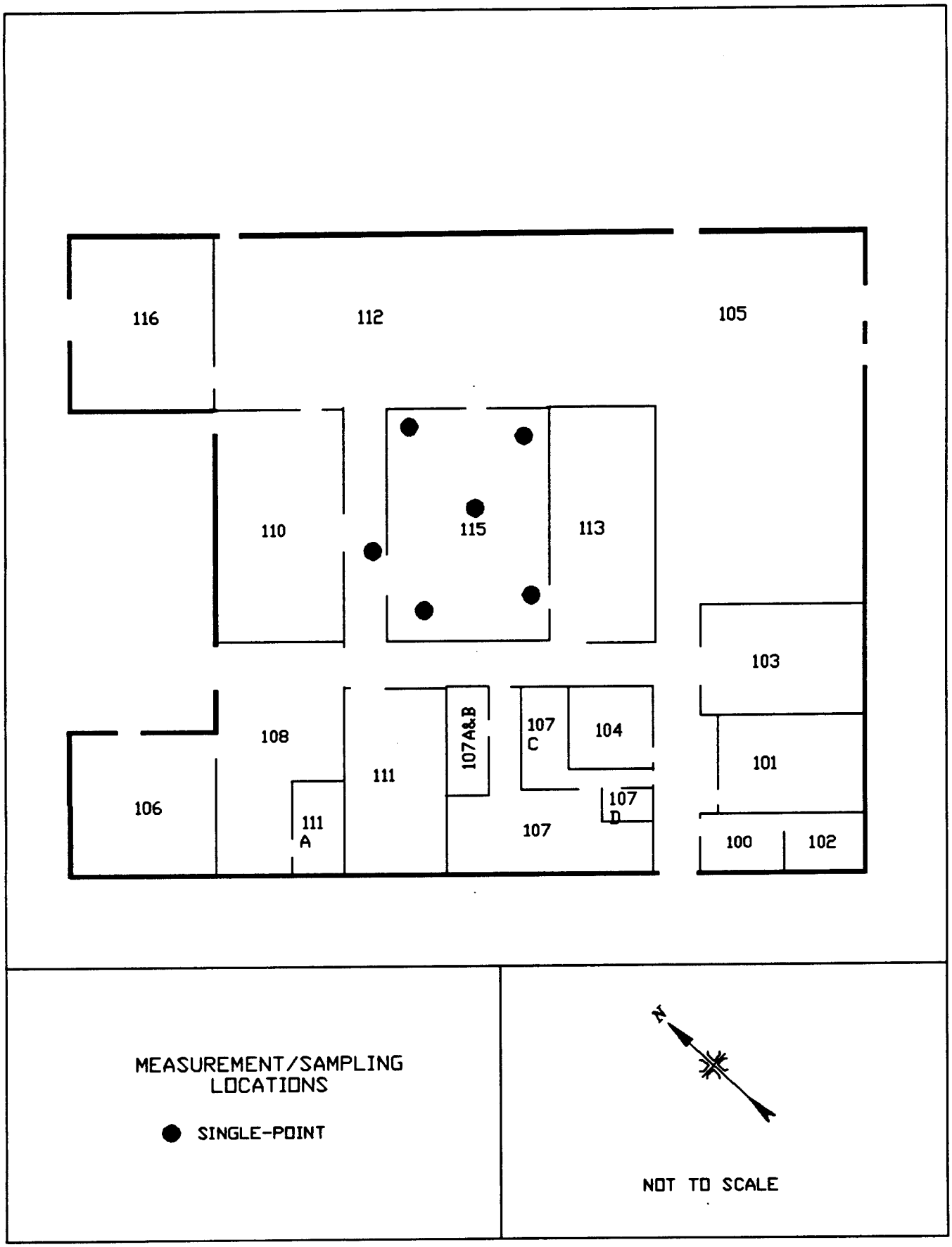


FIGURE 19: Building 005, Attic - Measurement and Sampling Locations

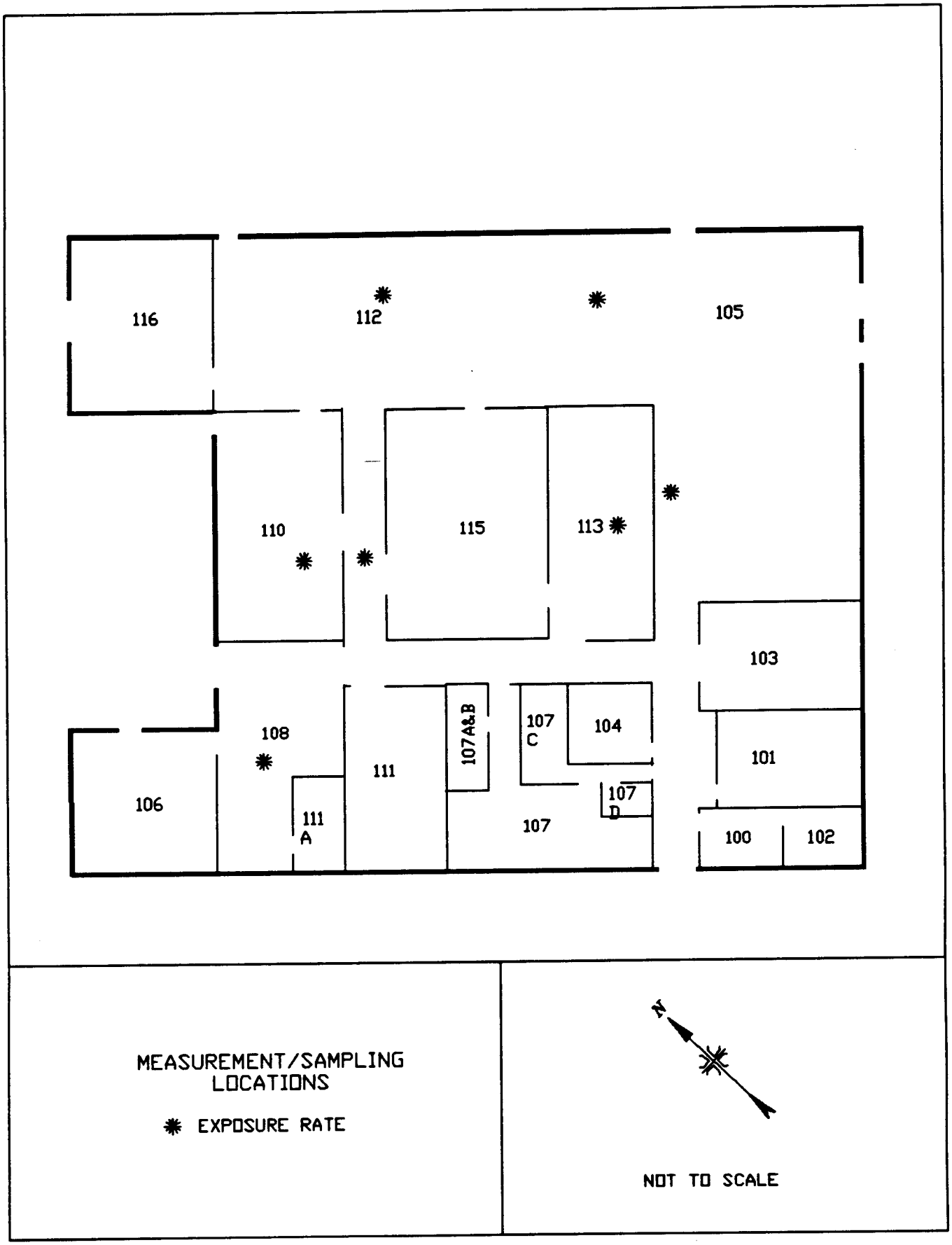


FIGURE 20: Building 005, Interior - Measurement Locations

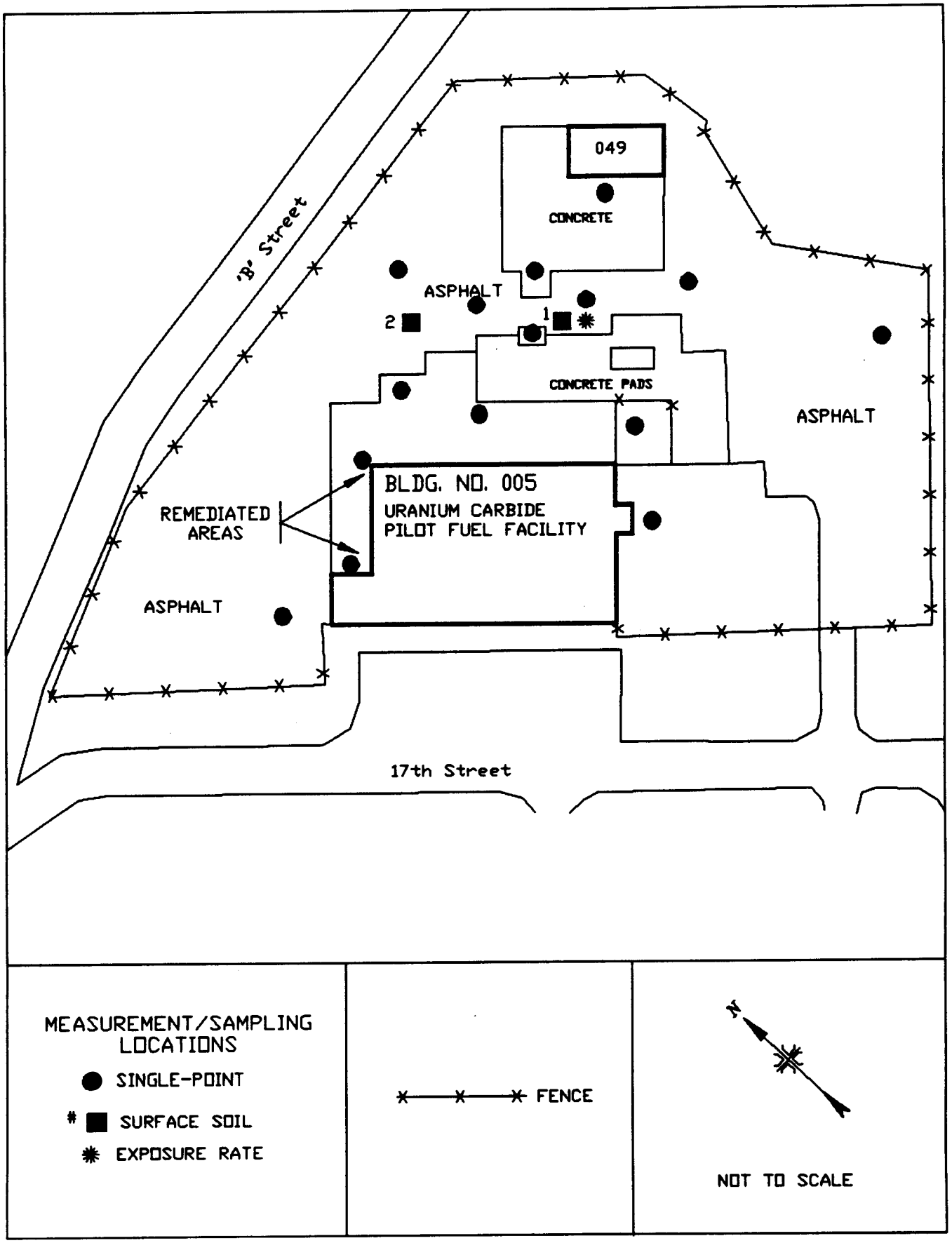


FIGURE 21: Building 005, Exterior Area - Measurement and Sampling Locations

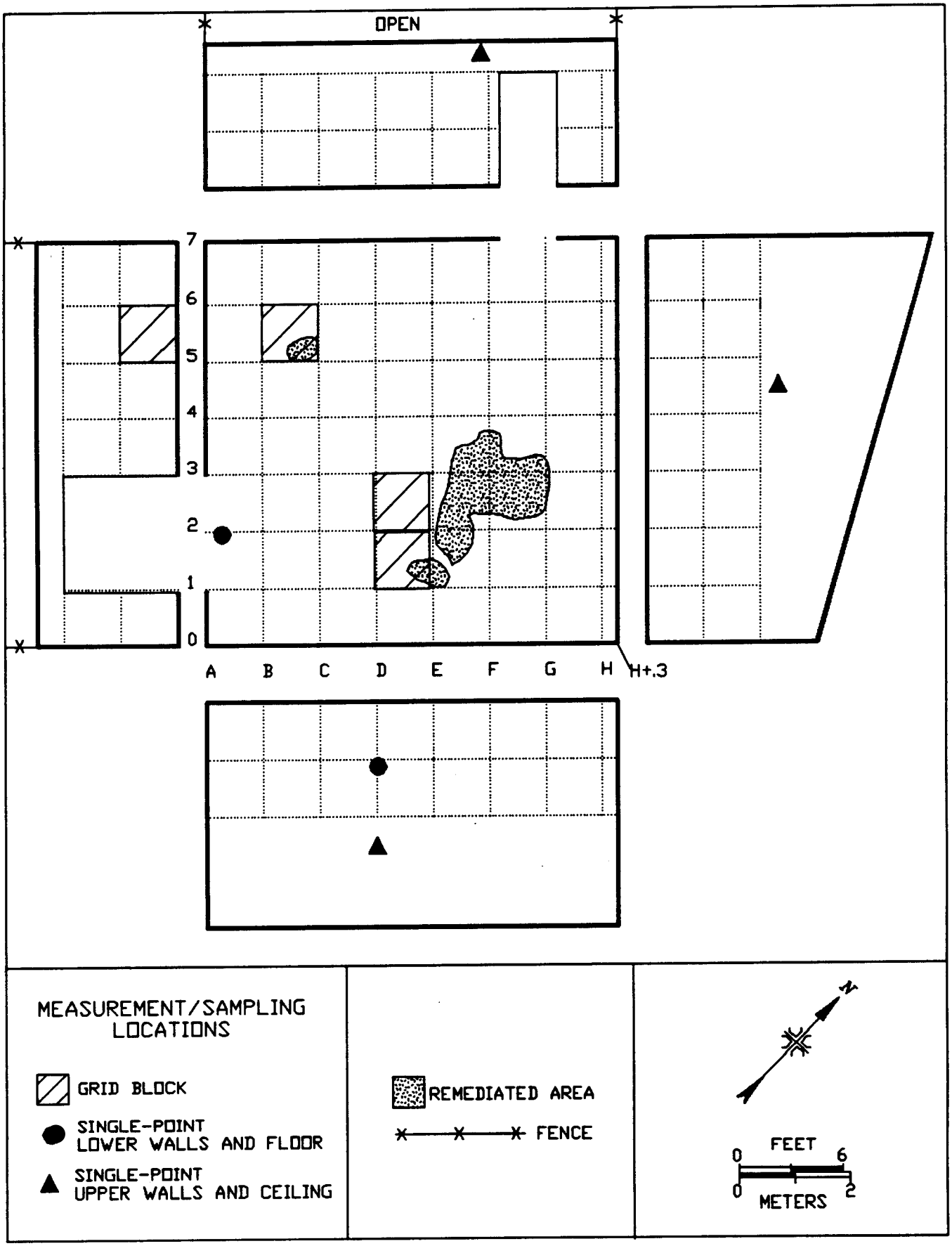


FIGURE 22: Building 023, Control Room - Measurement and Sampling Locations

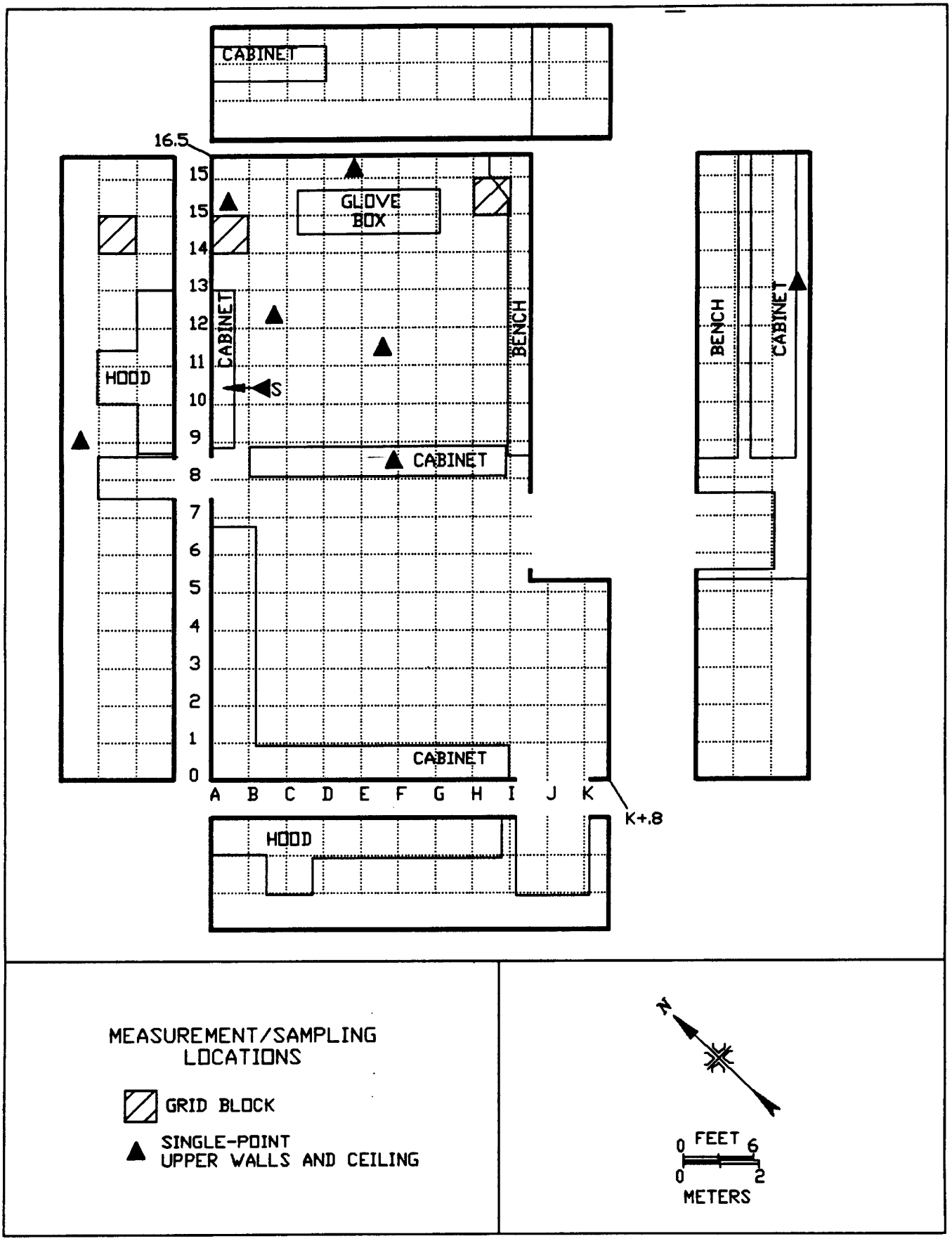


FIGURE 23: Building 023, Room 106 - Measurement and Sampling Locations

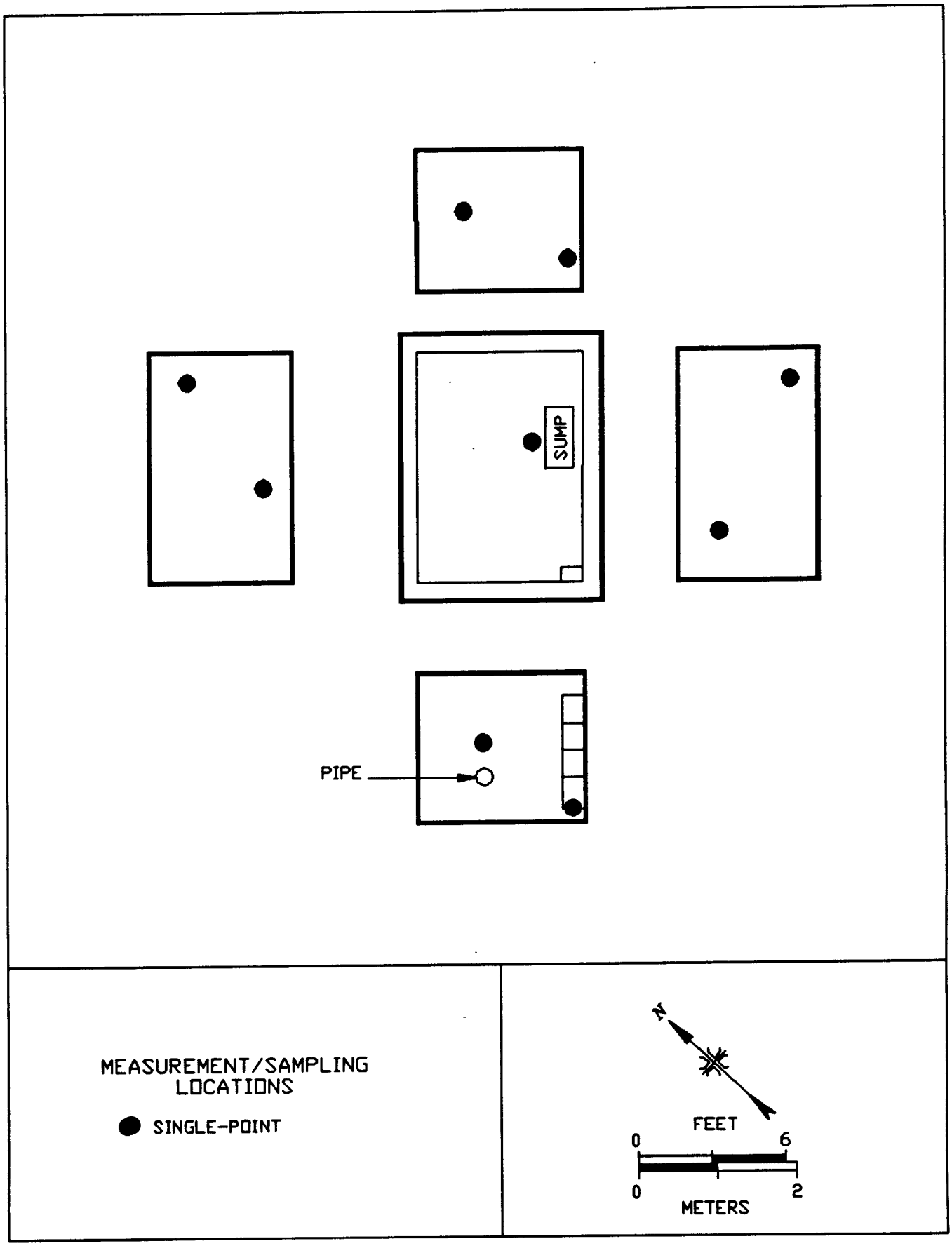


FIGURE 24: Building 023, Rad-Waste Tank Vault - Measurement and Sampling Locations

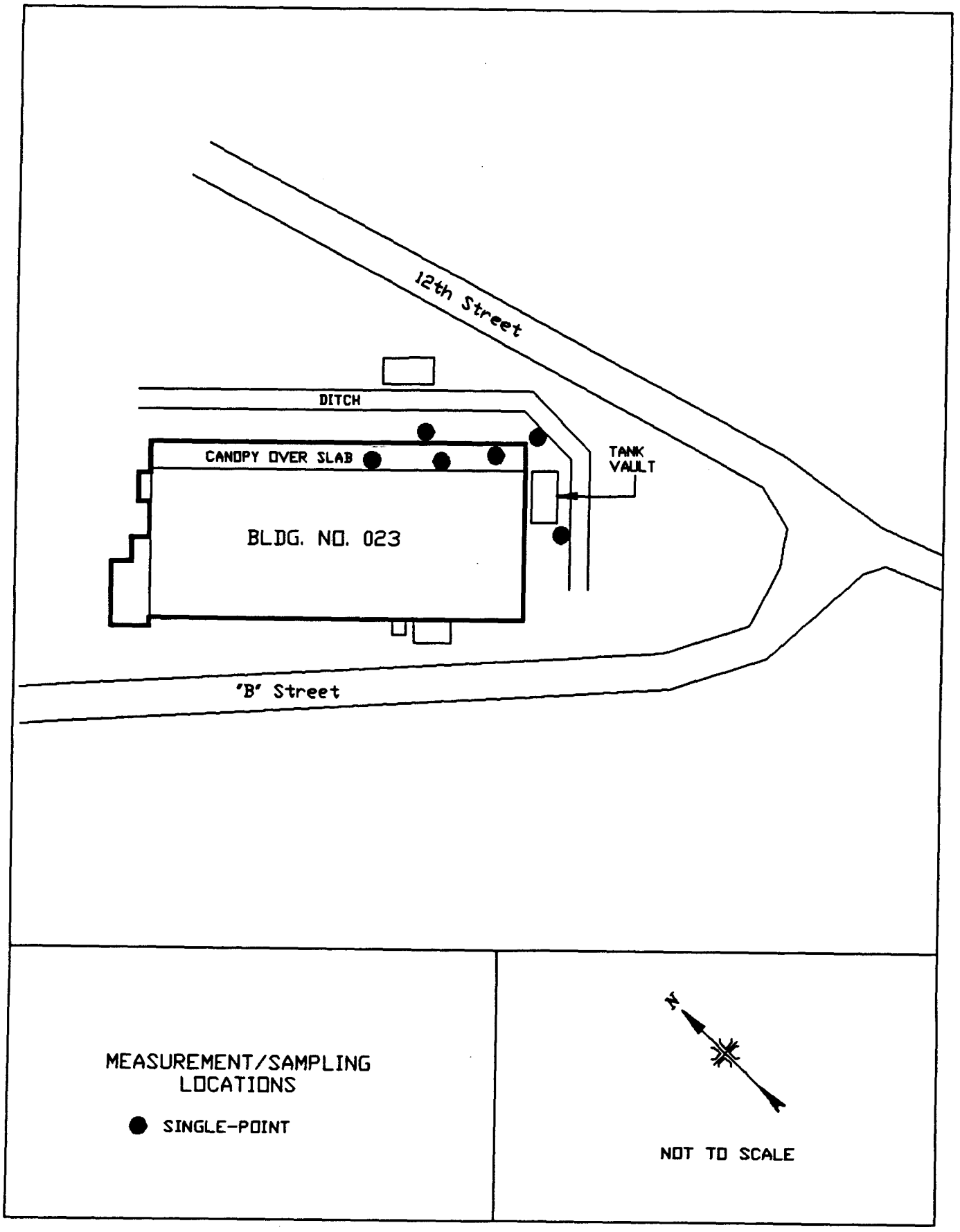
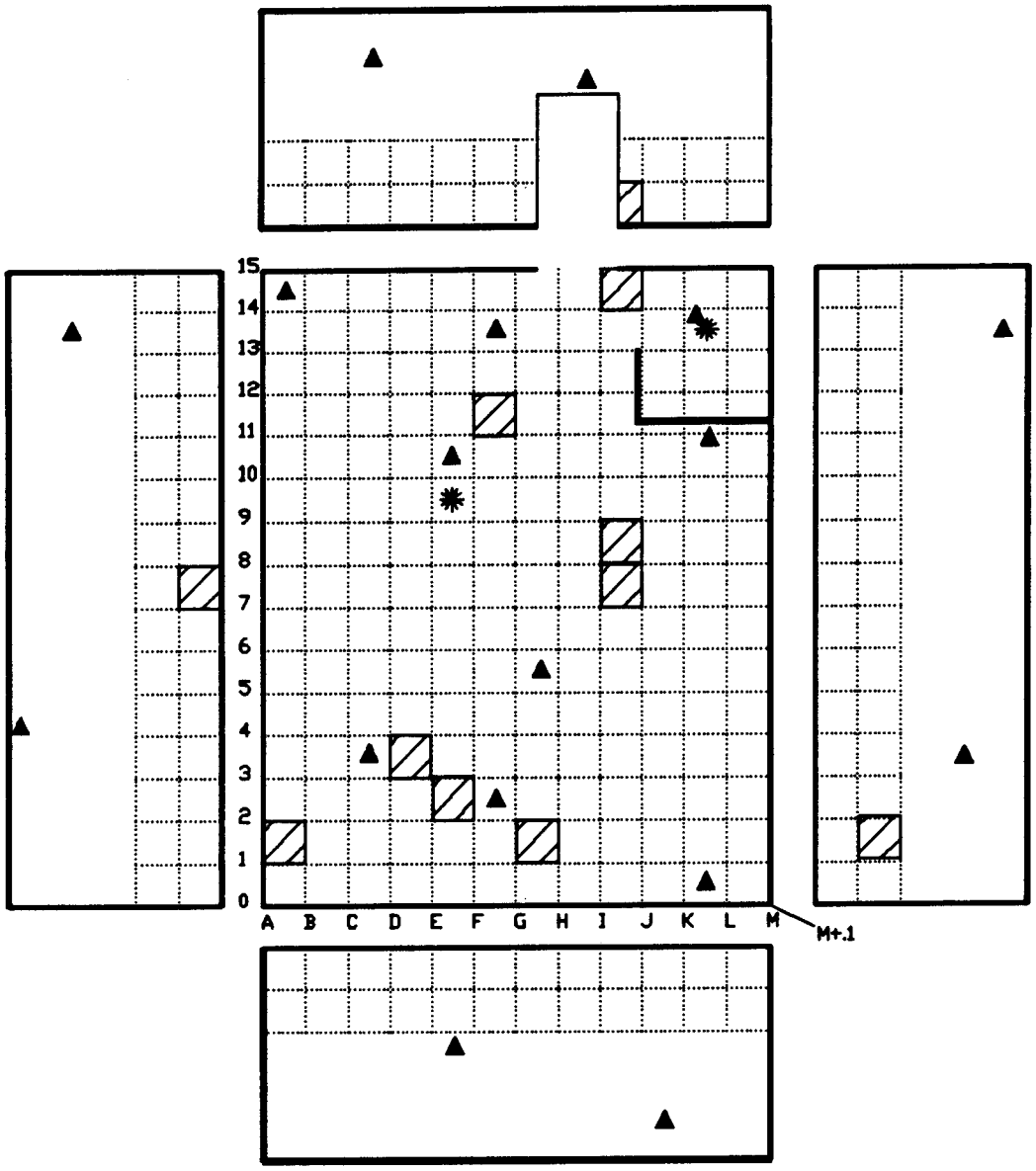


FIGURE 25: Building 023, Exterior Area - Measurement and Sampling Locations



MEASUREMENT/SAMPLING LOCATIONS

GRID BLOCK

SINGLE-POINT UPPER WALLS AND CEILING

EXPOSURE RATE

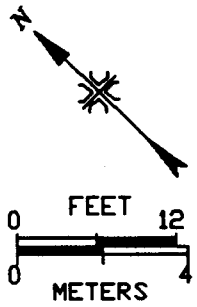


FIGURE 26: Building 064, Room 110 - Measurement and Sampling Locations

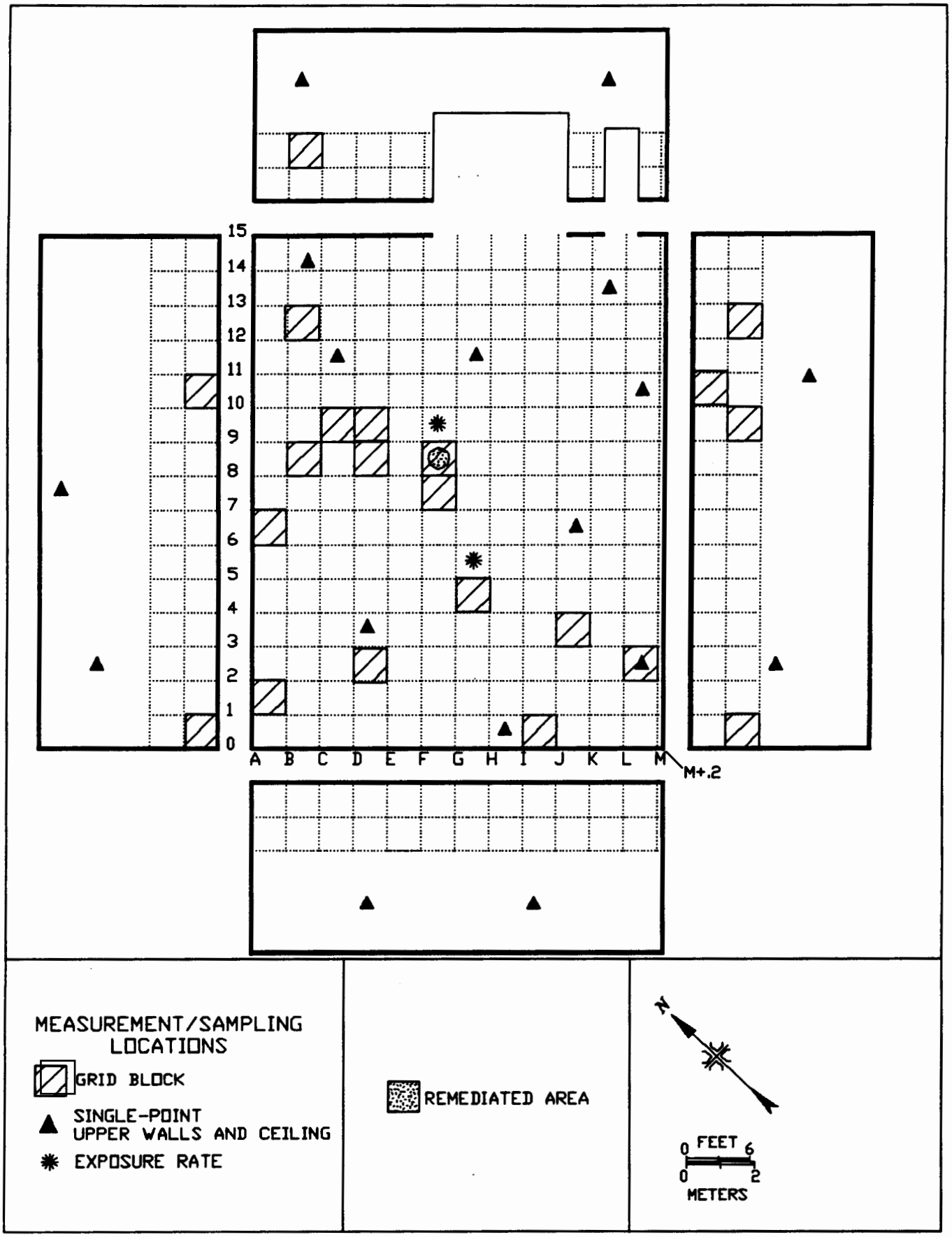


FIGURE 27: Building 064, Room 114 - Measurement and Sampling Locations

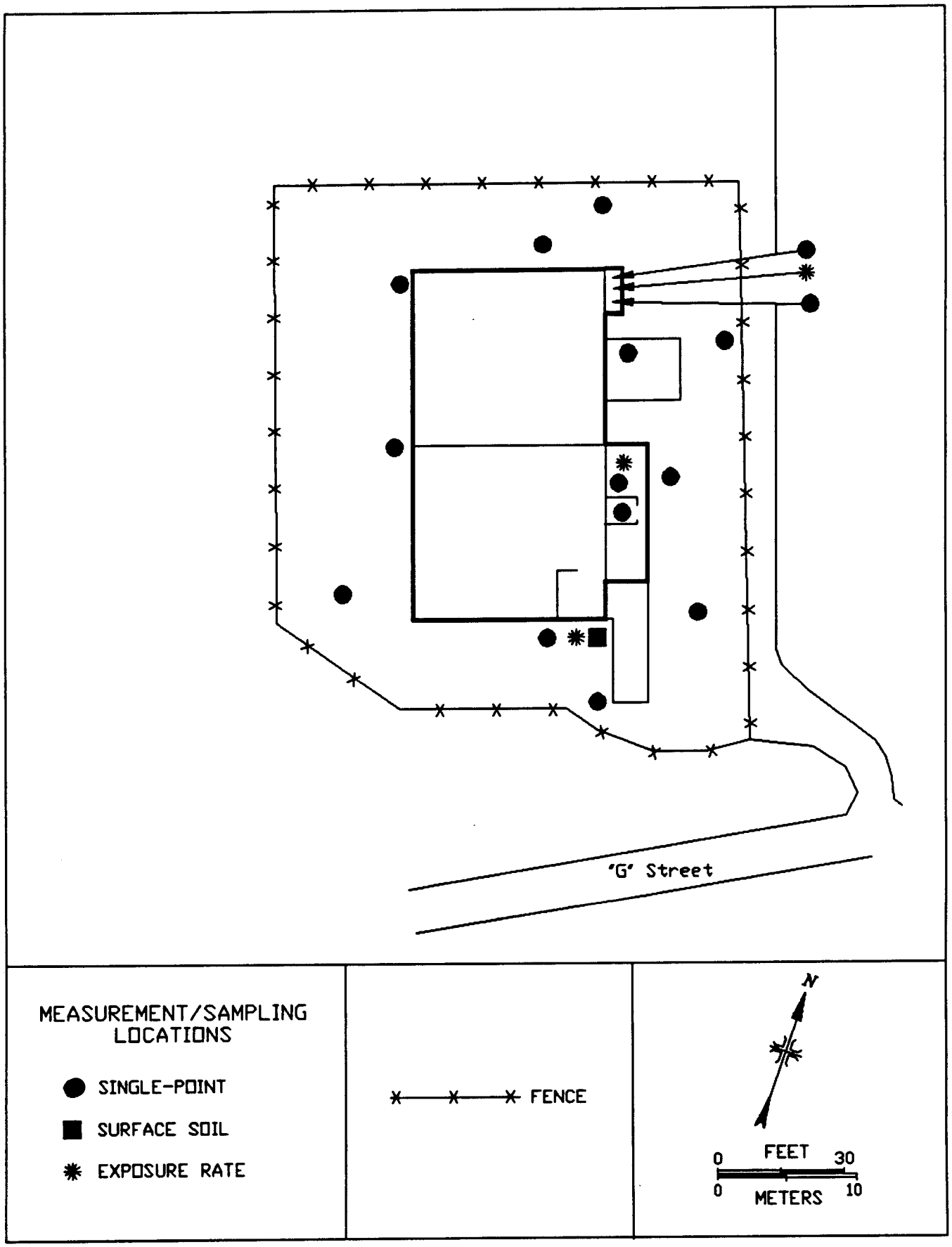


FIGURE 28: Building 064, Outer Rooms and Exterior Area - Measurement and Sampling Locations

TABLE 1

SUMMARY OF SURFACE ACTIVITY MEASUREMENTS
SANTA SUSANA FIELD LABORATORY
ROCKWELL INTERNATIONAL
VENTURA COUNTY, CALIFORNIA

Location[a]	Number of Measurement Locations		Range of Total Activity (dpm/100 cm^2)				Range of Removable Activity (dpm/100 cm^2)	
			Single Measurements		Grid Block Average			
	Single Points	Grid Blocks	Alpha	Beta	Alpha	Beta	Alpha	Beta
Building 005								
Room 103								
Lower Walls	NA[b]	2	<66	<1,500	<66	<1,500	<12	<16
Upper Walls and Ceilings	3	NA	<66	<1,500	NA	NA	<12	<16
Room 105/112								
Floor	NA	11	<66	<1,400 to 7,100	<66	<1,400 to 2,100	<12	<16
Lower Walls	NA	1	<66	<1,400	<66	<1,400	<12	<16
Upper Walls, I-Beams and Equipment[c]	27	NA	<66 to 110	<1,500	NA	NA	<12	<16
Room 106								
Floor	1	NA	<66	<1,400	NA	NA	<12	<16
Lower Wall	NA	1	<66	<1,400	<66	<1,400	<12	<16
Upper Walls and Ceiling	3	NA	<66	<1,400	NA	NA	<12	<16
Room 107A and 107B								
Floor	1	NA	<66	<1,500	NA	NA	<12	<16
Lower Wall	1	NA	<66	<1,500	NA	NA	<12	<16
Upper Walls and Ceiling	2	NA	89 to 360	<1,500 to 4,400	NA	NA	<12	<16
Room 108								
Floor	1	NA	<66	<1,500	NA	NA	<12	<16
Lower Walls	NA	2	<66	<1,400	<66	<1,400	<12	<16
Upper Walls and Ceiling	5	NA	<66	<1,400	NA	NA	<12	<16

TABLE 1 (Continued)

SUMMARY OF SURFACE ACTIVITY MEASUREMENTS
SANTA SUSANA FIELD LABORATORY
ROCKWELL INTERNATIONAL
VENTURA COUNTY, CALIFORNIA

Location[a]	Number of Measurement Locations		Range of Total Activity (dpm/100 cm^2)				Range of Removable Activity (dpm/100 cm^2)	
			Single Measurements		Grid Block Average			
	Single Points	Grid Blocks	Alpha	Beta	Alpha	Beta	Alpha	Beta
Building 005 (Continued)								
Room 110								
Floor	3	NA	<66	<1,500	NA	NA	<12	<16
Lower Walls	NA	2	<66 to 89	<1,500	<66	<1,500	<12	<16
Upper Walls and Rafter	6	NA	<66	<1,500	NA	NA	<12	<16
Room 111 and 111A								
Floor	NA	1	<66	<1,400	<66	<1,400	<12	<16
Lower Walls and Equipment	NA	3	<66 to 80	<1,500	<66	1,500	<12	<16
Upper Walls and Ceiling	6	NA	<66	1,500	NA	NA	<12	<16
Room 113								
Floor	2	NA	<66	<1,500	NA	NA	<12	<16
Lower Wall	NA	2	<66	<1,400	<66	<1,400	<12	<16
Upper Walls and Ceiling	5	NA	<66	<1,400	NA	NA	<12	<16
Room 115								
Floor	4	3	<66	<1,500	<66	<1,500	<12	<16
Lower Wall	NA	1	<66	<1,500	<66	<1,500	<12	<16
Upper Walls and Ceiling	5	NA	<66	<1,400	NA	NA	<12	<16
Attic	6	NA	<66	<1,500	NA	NA	<12	<16
Outdoor Area	15	NA	<66 to 360	<1,500 to 1,900	NA	NA	<12	<16

TABLE 1 (Continued)

SUMMARY OF SURFACE ACTIVITY MEASUREMENTS
SANTA SUSANA FIELD LABORATORY
ROCKWELL INTERNATIONAL
VENTURA COUNTY, CALIFORNIA

Location[a]	Number of Measurement Locations		Range of Total Activity (dpm/100 cm^2)				Range of Removable Activity (dpm/100 cm^2)	
			Single Measurements		Grid Block Average			
	Single Points	Grid Blocks	Alpha	Beta	Alpha	Beta	Alpha	Beta
Building 023								
Control Room								
Floor	1	3	<66	<1,400 to 6,700	<66	<1,400 to 2,400	<12	<16
Lower Walls	1	1	<66	<1,400	<66	<1,400	<12	<16
Upper Walls and Ceiling	3	NA	<66 to 110	<1,400	NA	NA	<12	<16
Room 106								
Floor	NA	2	<66	<1,400	<66	<1,400	<12	<16
Lower Walls	NA	1	<66	<1,400	<66	<1,400	<12	<16
Upper Walls, Ceiling, and Equipment	8	NA	<66 to 400	<1,400 to 3,100	NA	NA	<12	<16
Exterior								
Tank Vault	9	NA	<66 to 71	<1,500	NA	NA	<12	<16
Paved Areas and Walkways	6	NA	<66 to 120	<1,400 to 1,600	NA	NA	<12	<16
Building 064								
Room 110								
Floor	NA	8	<62 to 80	<1,400 to 2,400	<66	<1,500	<12	<16
Lower Walls	NA	3	<66 to 98	<1,500	<66	<1,500	<12	<16
Upper Walls and Ceiling	17	NA	<66 to 290	<1,500	NA	NA	<12	<16

TABLE 1 (Continued)

SUMMARY OF SURFACE ACTIVITY MEASUREMENTS
SANTA SUSANA FIELD LABORATORY
ROCKWELL INTERNATIONAL
VENTURA COUNTY, CALIFORNIA

Location[a]	Number of Measurement Locations		Range of Total Activity (dpm/100 cm^2)				Range of Removable Activity (dpm/100 cm^2)	
			Single Measurements		Grid Block Average			
	Single Points	Grid Blocks	Alpha	Beta	Alpha	Beta	Alpha	Beta
Building 064 (Continued)								
Room 114								
Floor	1	14	<66	<1,400 to 1,500	<66	<1,500	<12	<16
Lower Walls	NA	7	<66 to 89	<1,500	<66	<1,500	<12	<16
Upper Walls and Ceiling	17	NA	<66	<1,500	NA	NA	<12	<16
Room 116	2	NA	<66 to 98	<1,400 to 1,500	NA	NA	<12	<16
Room 120	1	NA	<66	<1,400	NA	NA	<12	<16
Rest Room	1	NA	<66	<1,400	NA	NA	<12	<16
Exterior								
Paved Areas and Ramps	11	NA	<66	<1,400 to 2,200	NA	NA	<12	<16

[a]Refer to Figures 9 through 18 and 20 through 28.
[b]NA = Not Applicable.
[c]All Measurements not shown on Figure 10. Seven measurements made on Molten Salt Reaction Products Tank and Equipment are not shown.

TABLE 2

EXPOSURE RATES
SANTA SUSANA FIELD LABORATORY
ROCKWELL INTERNATIONAL
VENTURA COUNTY, CALIFORNIA

Location[a]	Number of Exposure Rate Measurements	Exposure Rate Range (μR/h)[b]
Interior		
Building 005	7	10 to 11
Building 064	6	14 to 17
Exterior		
Building 005	1	12
Building 064	1	14

[a]Refer to Figures 20, 21, and 26 through 28.
[b]Reported exposure rates are inclusive of background.

TABLE 3

RADIONUCLIDE CONCENTRATIONS IN SOIL
SANTA SUSANA FIELD LABORATORY
ROCKWELL INTERNATIONAL
VENTURA COUNTY, CALIFORNIA

Location[a]	Radionuclide Concentration (pCi/g)[b]		
	Cs-137	U-235	U-238
Building 005 Loc. 1	<0.1	0.1 ± 0.1[c]	1.7 ± 1.4
Building 005 Loc. 2	<0.1	0.1 ± 0.1	0.7 ± 1.1
Building 064	2.7 ± 0.2	0.5 ± 0.1	3.8 ± 1.7

[a]Refer to Figures 21 and 28.
[b]Only radionuclides of concern reported. Gamma spectrometry results did not identify any photo peaks other than from those radionuclides occurring in nature.
[c]Uncertainties represent the 95% confidence level, based only on counting statistics.

REFERENCES

1. T. J. Vitkus, ORISE, "Verification Survey of the Old Conservation Yard, Building T064 Side Yard, and Building T028, Santa Susana Field Laboratory, Rockwell International, Ventura County, California," October 1993.

2. Energy Technology Engineering Center, "Radiological Survey of Building T005," November 16, 1987.

3. Energy Technology Engineering Center, "Building T005 Decontamination and Decommissioning Operations Plan," January 24, 1992.

4. Energy Technology Engineering Center, "Building 005 Final Survey Procedure," December 9, 1992.

5. Energy Technology Engineering Center, "Final Radiological Survey of Building 005," September 21, 1993.

6. Energy Technology Engineering Center, "Final Radiological Survey Report of Building 023," March 1, 1994.

7. Energy Technology Engineering Center, "Radiological Survey of Source and Special Nuclear Material Storage Vault Building T064," August 19, 1988.

8. Energy Technology Engineering Center, "D&D Work Plan for Building 064, Environmental Restoration," February 18, 1992.

9. Energy Technology Engineering Center, "Building T064 Interior Final Survey Procedure," November 18, 1992.

10. Energy Technology Engineering Center, "Building 064 D&D Operations Final Report," August 13, 1993.

11. Energy Technology Engineering Center, "Radiological Assessment of the Building T064 Fenced-In Yard," December 23, 1993.

12. Energy Technology Engineering Center, "Final Radiological Survey Report of Building 064 Interior," January 14, 1994.

13. Letter from T. J. Vitkus, ORISE, to A. F. Kluk, U.S. Department of Energy, "Revised Verification Survey Plan for Buildings 005, 023, and 064, Santa Susana Field Laboratory, Ventura County, California," July 11, 1994.

REFERENCES (Continued)

14. Letter from T. J. Vitkus, ORISE, to A. F. Kluk, U.S. Department of Energy, "Comments on the Radiological Survey, Decontamination and Decommissioning and Final Status Survey Documentation for Building T005 and T064, Santa Susana Field Laboratory, Ventura County, California," March 22, 1994.

15. Letter from T. J. Vitkus, ORISE, to A. F. Kluk, U.S. Department of Energy, "Comments on the Decontamination and Decommissioning and Final Status Survey Documentation for Building 023, Santa Susana Field Laboratory, Ventura County, California," April 4, 1994.

16. Letter from G. Gaylord, Rockwell International, to J. Cullen, U.S. Department of Energy, "Response to Comments by ORISE and OAK on Rocketdyne Final Survey Reports for Building T005, T023, and T064," June 2, 1994.

APPENDIX A

MAJOR INSTRUMENTATION

APPENDIX A

MAJOR INSTRUMENTATION

The display of a specific product is not to be construed as an endorsement of the product or its manufacturer by the authors or their employers.

DIRECT RADIATION MEASUREMENT

Instruments

Eberline Pulse Ratemeter
Model PRM-6
(Eberline, Santa Fe, NM)

Eberline "Rascal" Ratemeter-Scaler
Model PRS-1
(Eberline, Santa Fe, NM)

Ludlum Ratemeter-Scaler
Model 2221
(Ludlum Measurements, Inc.,
Sweetwater, TX)

Detectors

Eberline GM Detector
Model HP-260
Effective Area, 15.5 cm^2
(Eberline, Santa Fe, NM)

Eberline ZnS Scintillation Detector
Model AC-3-7
Effective Area, 59 cm^2
(Eberline, Santa Fe, NM)

Ludlum Gas Proportional Detector
Model 43-37
Effective Area, 550 cm^2
(Ludlum Measurements, Inc.,
Sweetwater, TX)

Reuter-Stokes Pressurized Ion Chamber
Model RSS-111
(Reuter-Stokes, Cleveland, OH)

Victoreen NaI Scintillation Detector
Model 489-55
3.2 cm x 3.8 cm Crystal
(Victoreen, Cleveland, OH)

LABORATORY ANALYTICAL INSTRUMENTATION

High Purity Extended Range Intrinsic Detectors
Model No: ERVDS30-25195
(Tennelec, Oak Ridge, TN)
Used in conjunction with:
Lead Shield Model G-11
(Nuclear Lead, Oak Ridge, TN) and
Multichannel Analyzer
3100 Vax Workstation
(Canberra, Meriden, CT)

Low Background Gas Proportional Counter
Model LB-5100-W
(Oxford, Oak Ridge, TN)

APPENDIX B

SURVEY AND ANALYTICAL PROCEDURES

APPENDIX B

SURVEY AND ANALYTICAL PROCEDURES

SURVEY PROCEDURES

Surface Scans

Surface scans were performed in accordance with ESSAP Surface Scanning procedures by passing the probes slowly over the surface; the distance between the probe and the surface was maintained at a minimum - nominally about 1 cm. A large surface area, gas proportional floor monitor was used to scan the floors of the surveyed areas. Other surfaces were scanned using small area (15.5 cm^2 and 59 cm^2) hand-held detectors. Identification of elevated surface activity levels was based on increases in the audible signal from the recording and/or indicating instrument. Combinations of detectors and instruments used for the scans were:

Alpha	—	gas proportional detector with ratemeter-scaler
	—	ZnS scintillation detector with ratemeter-scaler
Beta	—	gas proportional detector with ratemeter-scaler
	—	pancake GM detector with ratemeter-scaler
Gamma	—	NaI scintillation detector with ratemeter

Surface Activity Measurements

Alpha and beta activity measurements were performed in accordance with Alpha Radiation Measurement and Beta Radiation Measurement procedures on floors, walls, upper room surfaces, some equipment, and at locations of elevated direct radiation, using ZnS scintillation and GM detectors with ratemeter-scalers.

Count rates (cpm), which were integrated over 1 minute in a static position, were converted to activity levels (dpm/100 cm^2) by dividing the net rate by the 4 π efficiency and correcting for the active area of the detector. The alpha activity background countrates for the ZnS scintillation detectors averaged approximately 1 cpm for each detector. Alpha efficiency factors, based on calibration with Pu-239, ranged from 0.19 - 0.20 for the ZnS scintillation detectors. The beta activity background count rates for the GM detectors averaged approximately 55 cpm. Beta efficiency factors for Tc-99 ranged from 0.16 - 0.17 for the GM detector. The effective window for the ZnS scintillation and GM detectors were 59 cm^2 and 15.5 cm^2, respectively.

Removable Activity Measurements

Removable activity levels were determined in accordance with ESSAP Determination of Removable Activity procedures, using numbered filter paper disks, 47 mm in diameter. Moderate pressure was applied to the smear with two or three fingers, and approximately 100 cm^2 of the surface was wiped. Smears were placed in labeled envelopes with the location and other pertinent information recorded.

Exposure Rate Measurements

Quantitative measurements of gamma exposure rates, at 1 m above surfaces, were performed in accordance with ESSAP Gamma Radiation (Exposure Rate) Measurement procedures using a pressurized ionization chamber (PIC). Qualitative exposure rates were determined by comparing gamma count rates, from NaI detector ratemeter combinations, and cross calibrating to site exposure rates obtained using the PIC.

Soil Sampling

Approximately 1 kg of soil was collected at each sample location. Collected samples were placed in a plastic bag, sealed, and labeled. Sampling and labeling was in accordance with ESSAP Surface Soil Sampling and Sample Identification and Labeling procedures.

ANALYTICAL PROCEDURES

Removable Activity

Smears were counted on a low background gas proportional system for gross alpha and gross beta activity.

Gamma Spectrometry

Soil samples were dried, mixed, crushed, and/or homogenized as necessary, and a portion sealed in 0.5-liter Marinelli beaker or other appropriate container. The quantity placed in the beaker was chosen to reproduce the calibrated counting geometry and ranged from 757 to 888 g of material. Net material weights were determined and the samples counted using intrinsic germanium detectors coupled to a pulse height analyzer system. Background and Compton stripping, peak search, peak identification, and concentration calculations were performed using the computer capabilities inherent in the analyzer system. Energy peaks used for determination of radionuclides of concern were:

Cs-137	0.662 MeV
U-235	0.143 MeV (or 0.186 MeV)
U-238	0.063 MeV from Th-234*

*Secular equilibrium assumed.

Spectra were also reviewed for other identifiable photopeaks.

UNCERTAINTIES AND DETECTION LIMITS

The uncertainties associated with the analytical data presented in the tables of this report represent the 95% confidence level for that data. These uncertainties were calculated based on both the gross sample count levels and the associated background count levels. Additional

uncertainties, associated with sampling and measurement procedures, have not been propagated into the data presented in this report.

Detection limits, referred to as minimum detectable activity (MDA), were based on 2.71 plus 4.66 times the standard deviation of the background count:

$$2.71 + (4.66 \sqrt{BKG})$$

When the activity was determined to be less than the MDA of the measurement procedure, the result was reported as less than MDA. Because of variations in background levels, measurement efficiencies, the detection limits differ from sample to sample and instrument to instrument.

CALIBRATION AND QUALITY ASSURANCE

Calibration of all field and laboratory instrumentation was based on standards/sources traceable to NIST, when such standards/sources were available. In cases where they were not available, standards of an industry recognized organization were used. Calibration of pressurized ionization chambers was performed by the manufacturer.

Analytical and field survey activities were conducted in accordance with procedures from the following documents:

- Survey Procedures Manual, Revision 8 (December 1993)
- Laboratory Procedures Manual, Revision 8 (August 1993)
- Quality Assurance Manual, Revision 6 (July 1993)

The procedures contained in these manuals were developed to meet the requirements of DOE Order 5700.6C for Quality Assurance and NQA-1 and contain measures to assess processes during their performance.

Quality control procedures include:

- Daily instrument background and check-source measurements to confirm that equipment operation is within acceptable statistical fluctuations.
- Participation in EPA and EML laboratory Quality Assurance Programs.
- Training and certification of all individuals performing procedures.
- Periodic internal and external audits.

APPENDIX C

RESIDUAL RADIOACTIVE MATERIAL GUIDELINES SUMMARIZED FROM DOE ORDER 5400.5

APPENDIX C

RESIDUAL RADIOACTIVE MATERIAL GUIDELINES SUMMARIZED FROM DOE ORDER 5400.5

BASIC DOSE LIMITS

The basic limit for the annual radiation dose (excluding radon) received by an individual member of the general public is 100 mrem/yr. In implementing this limit, DOE applies as low as reasonable achievable principles to set site-specific guidelines.

STRUCTURE GUIDELINES

Indoor/Outdoor Structure Surface Contamination

Radionuclides[a]	Allowable Total Residual Surface Contamination (dpm/100 cm^2)[b] Average[c,d]	Maximum[d,e]	Removable[f]
Transuranics, Ra-226, Ra-228, Th-230 Th-228, Pa-231, Ac-227, I-125, I-129 [g]	100	300	20
Th-Natural, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	1,000	3,000	200
U-Natural, U-235, U-238, and associated decay products	5,000α	15,000α	1,000α
Beta-gamma emitters (radionuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above [h]	5,000β-γ	15,000β-γ	1,000β-γ

External Gamma Radiation

The average level of gamma radiation inside a building or habitable structure on a site that has no radiological restriction on its use shall not exceed the background level by more than 20 μR/h and will comply with the basic dose limits when an appropriate-use scenario is considered.

SOIL GUIDELINES

Radionuclides	Soil Concentration (pCi/g) Above Background[i,j,k]
Cesium-137 and Uranium	Soil guidelines are calculated on a site-specific basis, using the DOE manual developed for this use.

[a] Where surface contamination by both alpha- and beta-gamma-emitting radionuclides exists, the limits established for alpha- and beta-gamma-emitting radionuclides should apply independently.

[b] 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.

[c] Measurements of average contamination should not be averaged over an area of more than 1 m^2. For objects of less surface area, the average should be derived for each such object.

[d] The average and maximum dose rates associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mrad/h and 1.0 mrad/h, respectively, at a depth of 1 cm.

[e] The maximum contamination level applies to an area of not more than 100 cm^2.

[f] The amount of removable radioactive material per 100 cm^2 of surface area should be 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 wipe with an appropriate instrument of known efficiency. 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 total residual surface contamination levels are within the limits for removable contamination.

[g] Guidelines for these radionuclides are not given in DOE Order 5400.5; however, these guidelines are considered applicable until guidance is provided.

[h] This category of radionuclides includes mixed fission products, including the Sr-90 which is present in them. It does not apply to Sr-90, which has been separated from the other fission products, or mixtures where the Sr-90 has been enriched.

[i] These guidelines take into account ingrowth of radium-226 from thorium-230 or thorium-232 and radium-228 and assume secular equilibrium. If either Th-230 and Ra-226 or Th-232 and Ra-228 are both present, not in secular equilibrium, the guidelines apply to the higher concentration. If other mixtures of radionuclides occur, the concentrations of individual radionuclides shall be reduced so that (1) the dose for the mixtures will not exceed the basic dose limit, or (2) the sum of ratios of the soil concentration of each radionuclide to the allowable limit for that radionuclide will not exceed 1 ("unity").

[j] These guidelines represent allowable residual concentrations above background averaged across any 15-cm-thick layer to any depth and over any contiguous 100 m^2 surface area.

[k] If the average concentration in any surface or below-surface area, less than or equal to 25 m^2, exceeds the authorized limit of guideline by a factor of $(100/A)^{1/2}$, where A is the area or the elevated region in square meters, limits for "hot spots" shall also be applicable. Procedures for calculating these hot spot limits, which depend on the extent of the elevated local concentrations, are given in the DOE Manual for Implementing Residual Radioactive Materials Guidelines, DOE/CH/8901. In addition, every reasonable effort shall be made to remove any source of radionuclide that exceeds 30 times the appropriate limit for soil, irrespective of the average concentration in the soil.

REFERENCES

1. "U.S. Department of Energy Guidelines for Residual Radioactive Material at Formerly Utilized Sites Remedial Action Program and Remote Surplus Facilities Management Program Sites," Revision 2, March 1987.

2. "DOE Order 5400.5, Radiation Protection of the Public and the Environment," February 1990.

EXHIBIT IV

BUILDING 023 D&D OPERATIONS FINAL REPORT

DER 25062 DS

ENERGY TECHNOLOGY ENGINEERING CENTER

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

No. 023-AR-0002 Rev. NEW
Page 1 of 11
Orig. Date September 21, 1993
Rev. Date NEW

3180

TITLE: Building 023 D&D Operations Final Report

- APPROVALS -

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G. Gaylord

Facility Mgr: R. Meyer

RP&HPS: P. Rutherford

QA

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1.0 INTRODUCTION

This report summarizes the activities performed during the decontamination and decommissioning (D&D) of Building 023. This DOE owned facility is located in Area IV of the Santa Susana Field Laboratory and has been used in support of DOE sponsored activities. The first Radiological User Permit for B/023, #105, was issued in November of 1976. This permit authorized the use of a small section (or sections) of activated stainless steel EBR fuel cladding to be used in a small sodium test loop. The purpose of this test was to gather data on the transportation of radiological contamination in sodium loops. The sodium loop tests were halted in 1982 and the loop was dismantled in 1986. In 1982 an Alnor Dew-point Meter containing a 6.25μCi Ra^{226} source was brought to the facility to be disassembled. The disassembly of this meter was never authorized or attempted and the meter was removed intact from B/023 in 1986. A 10μCi source of Mn^{54} used to calibrate a Canberra multichannel analyzer was stored at the facility from 1983 until 1986.

Building 023 had its own radioactive liquid waste holdup system consisting of above and below grade drain lines and a below grade storage tank located in an uncovered concrete vault outside the building. This system serviced two sinks and a fume hood. The fume hood was also connected to a HEPA filtered exhaust system consisting of ducting, a plenum, blower and stack.

To allow the release of B/023 for use without radiological restrictions all radioactive materials/contamination were removed from the facility. This decontamination and decommissioning (D&D) was performed in three phases, starting in 1986 with the removal of the sodium loop and ending in 1993 after removal of the remainder of the radioactive liquid waste holdup system.

2.0 FACILITY D&D

2.1 Phase I & II

During removal of the sodium test loop in 1986 the two sinks were disconnected, their respective connections to the liquid waste holdup system were sealed and the sinks removed and dispositioned. In 1990 the HEPA filtered gas exhaust system was removed.

The fume hood was disconnected from the liquid waste holdup system and the HEPA exhaust system, and was relocated for storage within the facility. The ducting from the fume hood to the filter plenum was removed and disposed of as low level R/A waste. The remaining components of the HEPA filtered gas exhaust system, filter plenum, blower and exhaust stack were removed and shipped to the University of Missouri for use on the TRUMP-S project (ref. 6 & 7).

2.2 Phase III

The third phase of the D&D of the facility involved the decontamination of the fume hood, removal and disposal of the liquid waste holdup system, including the drain and vent lines, the liquid waste storage tank and the floor area where the sodium loop had been located.

A radiological survey of the fume hood revealed that contamination was present only in the drain basin. The basin was cut out, inspected and found to be free of hazardous material, and disposed of as low level radioactive waste. After removal of the basin an equipment release radiological survey was performed on the fume hood. No detectable activity (NDA) above natural background was found and the fume hood was released for use without radiological restrictions.

The liquid waste holdup system consisted of approximately 80 feet of three inch cast iron drain line, 40 feet of two and one half inch galvanized pipe vent lines and a 250 gal. stainless steel holdup tank. The holdup tank was located in a seven and one half foot wide by 10 foot long by six foot deep open top concrete vault outside the east end of the building. All of the drain lines ran along the outside of the building to a double fixture fitting near the holdup tank vault. The drain line then ran underground approximately six feet, through the vault wall and into the tank. The two sinks shared a common drain vent which attached to the outside of the building. The fume hood drain had an individual vent attached to the outside of the building.

The above ground drain and vent lines were disassembled at joints or connections then cut into wastebox lengths (fig 1). After the installation of the liquid waste system a concrete pad had been poured to accommodate an air conditioning unit. Therefore, a portion of the pad had to be cut and removed to gain access to the buried section of drain line (fig. 2). Once all of the drain and vent lines had been removed (fig 3). the tank was removed from the vault and transported to the RMDF for size reduction.

Prior to size reduction and disposal the tank was inspected for hazardous or potentially hazardous materials. This inspection, which was witnessed by a representative of the Rocketdyne Environmental Protection department, revealed only rust from the cast iron drain lines and slight moisture in the form of condensation on the inner tank walls. The tank was cut/size reduced into wastebox size segments using a plasma torch and packaged for disposal.

During the final survey of the facility fixed contamination was found on the concrete floor in the old control room where the sodium loop had been installed. Attempts to remove the contamination with aggressive wiping techniques were unsuccessful. Therefore, the area was decontaminated by scabbling of the concrete surface and vacuuming (Fig. 4). In accordance with the facility final survey procedure (ref. 11) the areas immediately surrounding the decontaminated area were thoroughly surveyed and the boundaries of the final survey were expanded. The survey of these areas found no surface contamination above release limits.

3.0 KNOWN OR POTENTIALLY HAZARDOUS WASTES

Because of the potential of discovering removable contamination during the D&D effort, Radioactive Materials Management Areas (RMMA's) were established for the areas of the facility undergoing D&D (ref. 10). An established procedure for defining and dispositioning hazardous wastes from a Radioactive Materials Management Area (RMMA) was implemented. This procedure, ER-SP-0001 "Management and Disposition of Known or Potentially Hazardous Wastes Originating in a RMMA," in accordance with the DOE Performance Objectives, provides step by step direction for determining if a material is; 1) a hazardous material, and 2) if so does it contain any DOE added radioactivity. All items removed during performance of the D&D of B/023 were inspected for hazardous or potentially hazardous materials, and none were found. Additionally, soil from around the below grade portion of the drain line was analyzed for radioactivity and hazardous materials (ref. 9). The results of these analyses verified "no DOE-added activity" and "non-detectable" for all hazardous constituents analyzed.

4.0 CURRENT FACILITY STATUS

Currently B/023 is being used as a laboratory to support DOE programs. All radioactively contaminated components have been removed from the facility and no radioactive material is being used in on going work. All R/A waste generated during the D&D of the facility has been packaged to disposal site requirements (ref. 8) and shipped to an approved disposal facility. The final stage of the D&D was the final radiological survey of the facility (ref. 11). Upon review and acceptance of the final survey by DOE, the facility will be released for use without radiological restrictions.

5.0 REFERENCES

1. 023-AT-0001, "Radiological Assessment of Building 023"

2. 023-DP-0001, "Building 023 Decontamination"

3. ER-SP-0001, "Management and Disposition of Known or Potentially Hazardous Wastes Originating in an RMMA"

4. 572-Z Rocketdyne Environmental Control Manual

5. ETEC Log Book, Building 023 Operations Log

6. N001DWP00014, procedure for removal of filter plenum and related components

7. Form(s) 732-A, Dated 2-10-90, 2-12-90, 2-13-90 on file with Radiation Protection and Health Physics Services (RP&HPS)

8. N00OP000002, R/A Material Packaging, Shipping and Transportation Plan

9. IL no. 93EP466, dated 13 October 1993, from A. Lenox to T. Venable, subject Building 023 Soil Sample Results, with attachments

10. N001TI000339, Definitions and Designations of Radioactive Materials Management Areas (RMMA's)

11. 023-SP-0001, "Building 023 Final Survey Procedure"

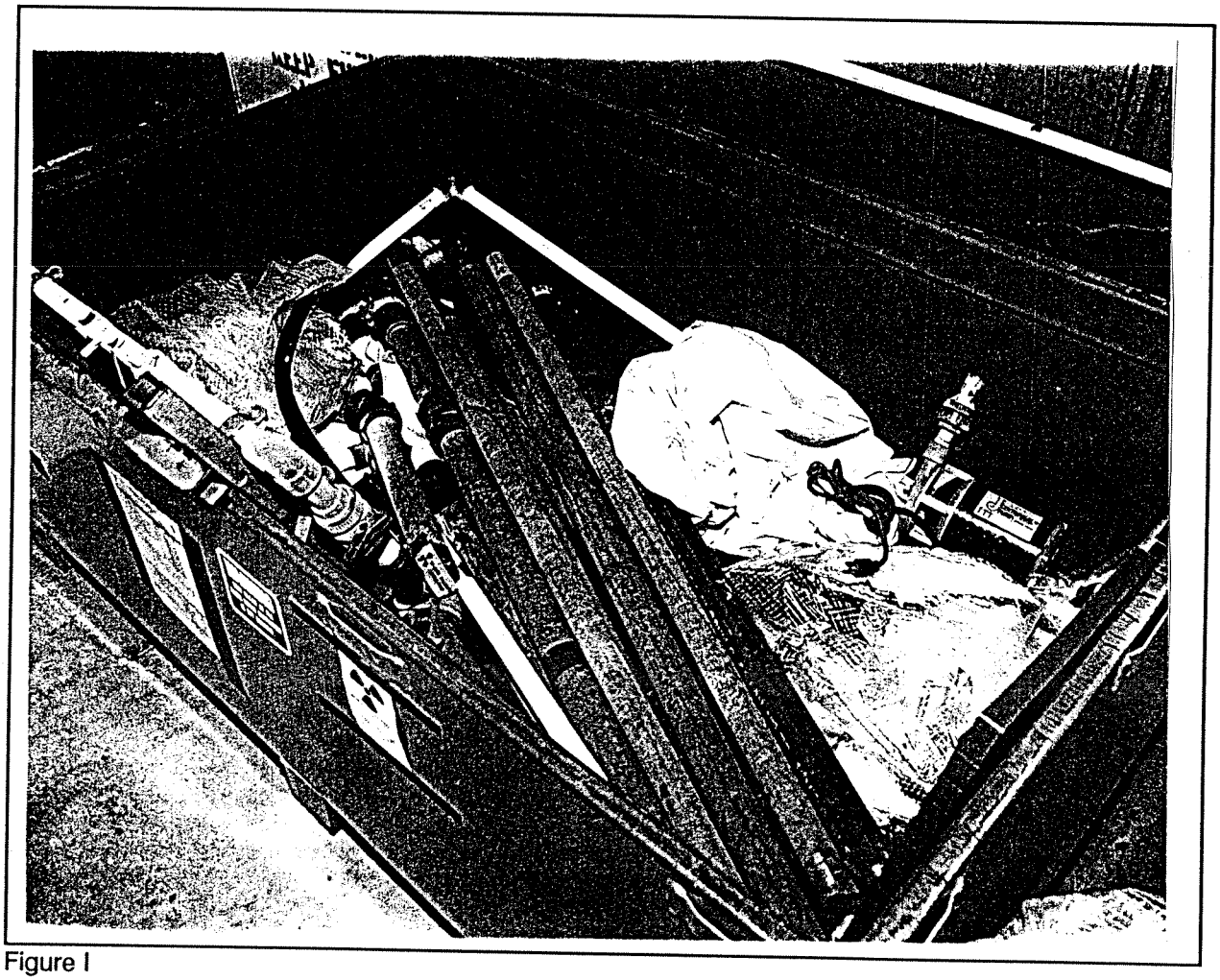
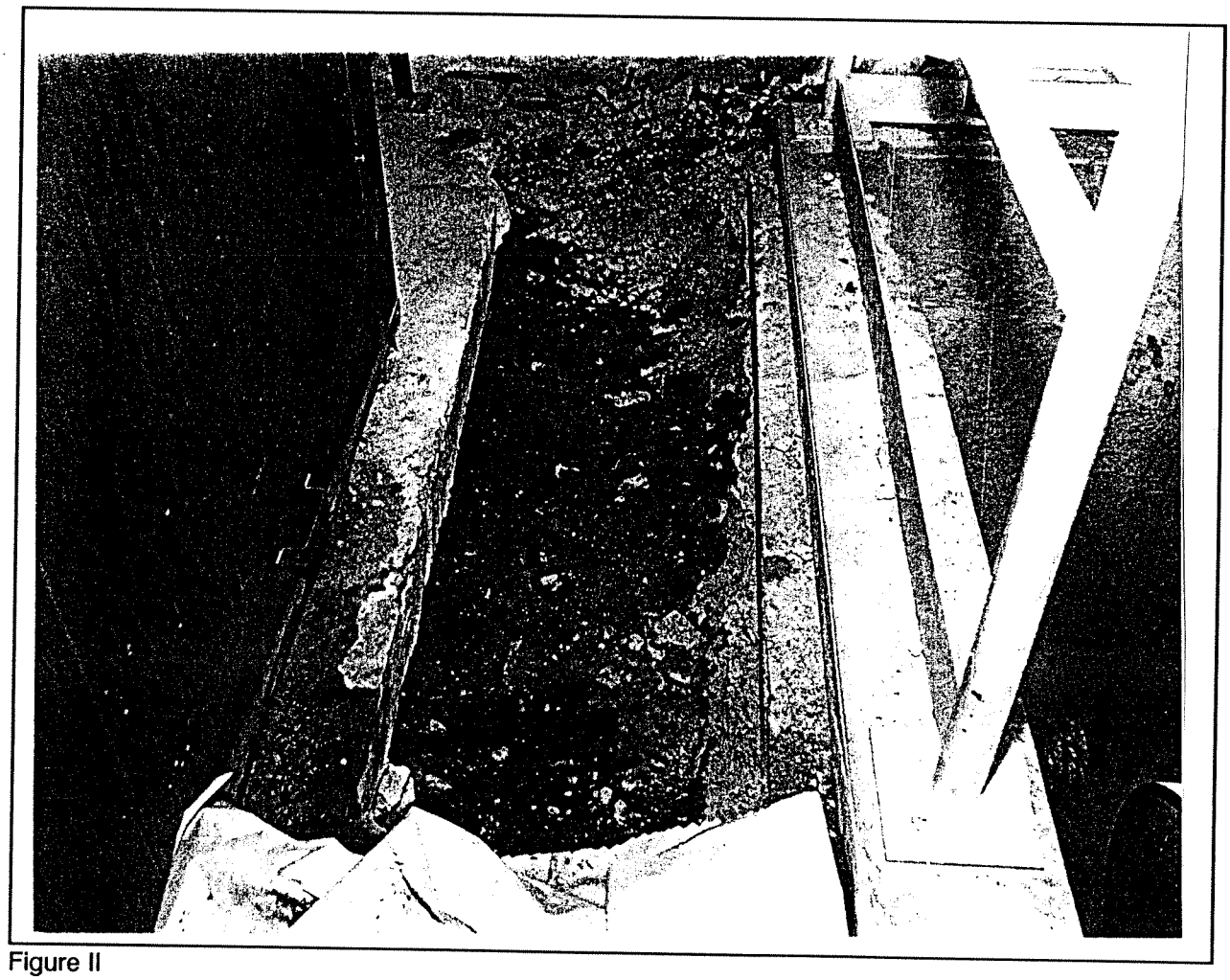


Figure I
Drain & Vent Lines, Packaged for Disposal
(ETEC P233542, 7/13/93)



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Excavation of Below Grade Drain Line
(ETEC P233541, 7/13/93)

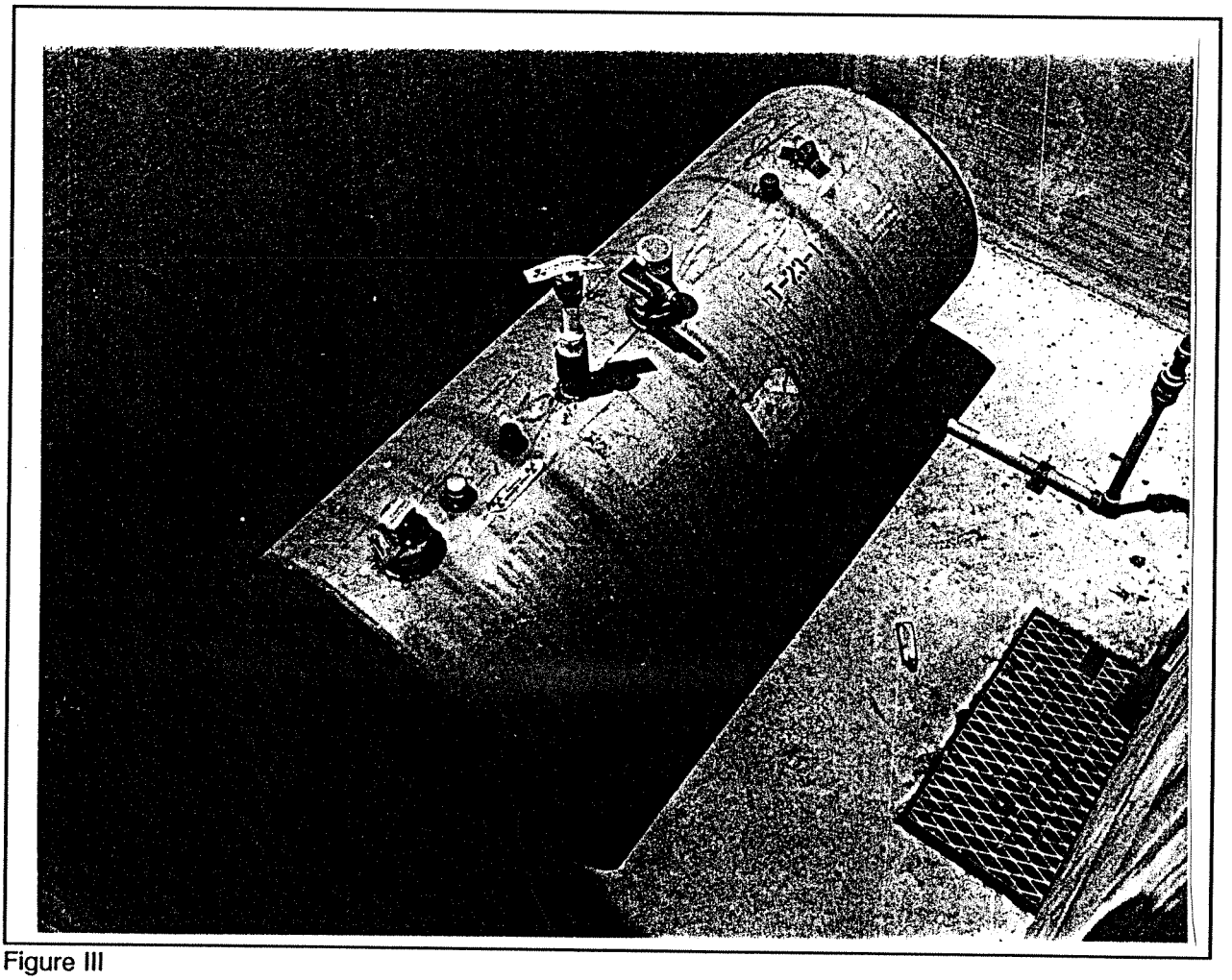
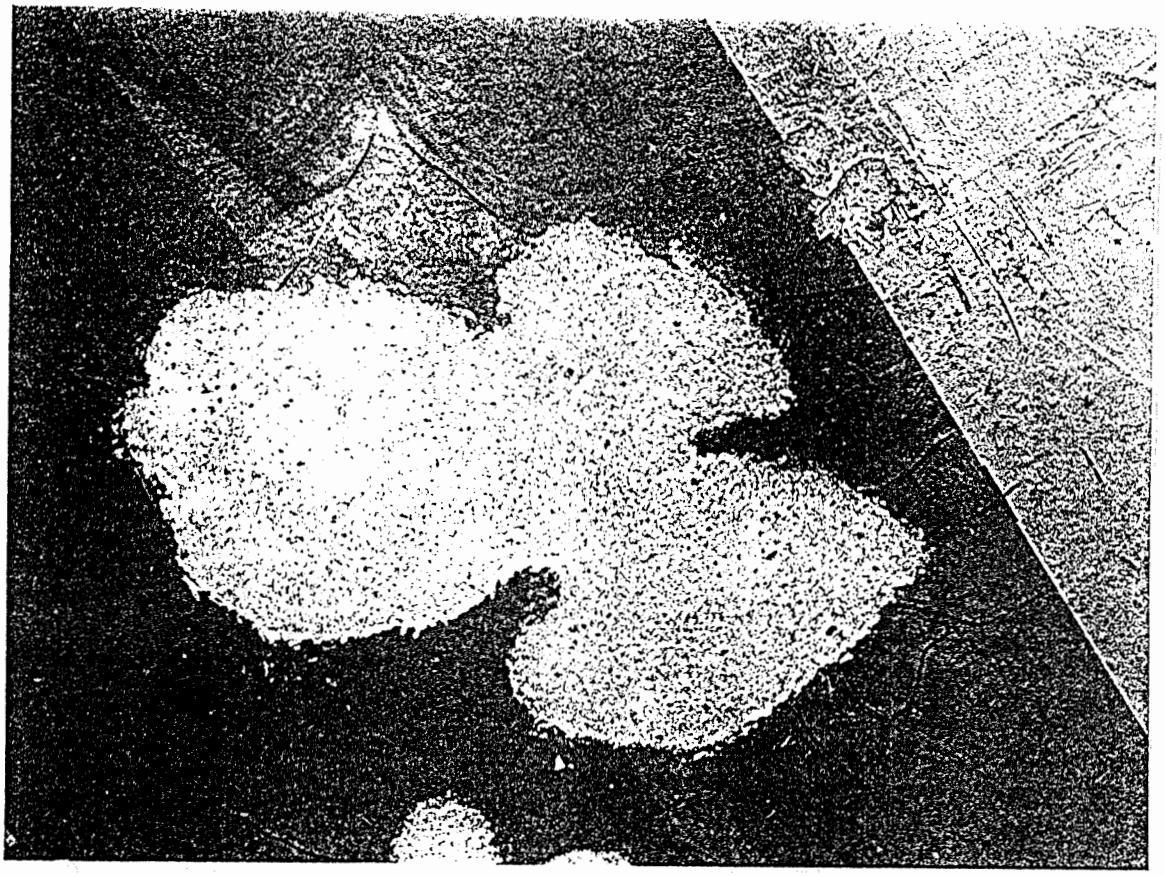


Figure III
All Lines Removed, Tank Ready to Pull
(ETEC P233543, 7/13/93)



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(ETEC 11/11/93 393973)

EXHIBIT V

FINAL RADIOLOGICAL SURVEY REPORT OF BUILDING 023

DRC 25427 DS

ENERGY TECHNOLOGY ENGINEERING CENTER

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

No. 023-ZR-0001 Rev. ___
Page 1 of 81
Orig. Date 03/01/94
Rev. Date _____

SAFETY REVIEW REPORT (SRR)

TITLE: FINAL RADIOLOGICAL SURVEY REPORT OF BUILDING 023

- APPROVALS -

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ABSTRACT

A comprehensive radiological survey of Building 023 and its surrounding area at the SSFL was performed in 1988. In accordance with that survey report's recommendation, remedial efforts were undertaken to remove residual radioactively contaminated components from the Building 023 structure and grounds. After the decontamination efforts were completed, a comprehensive final survey of the building interior was performed to demonstrate regulatory compliance for release without radiological restrictions.

Results of surveys demonstrate that Building 023 meets the requirements of DOE, NRC, and State of California for releasing Building 023 for use without radiological controls.

REFERENCES

1. 023-AT-0001, Radiological Assessment of Building 023, dated January 28, 1993, P. Waite

2. 023-DP-0001, Building 023 Decontamination, dated May 14, 1993, P. Waite

3. 023-AR-0002, Building 023 D&D Operations Final Report, dated September 21, 1993, P. Waite

4. 023-SP-0001, Building 023 Final Survey Procedure, dated 08/03/93, F. C. Dahl

5. ER-AN-0002, ETEC Environmental Restoration Program Management Plan, dated October 25, 1991

6. N001OP000033, Methods and Procedures for Radiological Monitoring

7. N001OP000028, Quality Control and General Operating Procedure for Gamma Spectroscopy Using Canberra Multichannel Analyzers

8. DOE Order 5400.5, Radiation Protection of the Public and the Environment, dated February 8, 1990

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

10. NRC Dismantling Order for the L-85 Reactor Decommissioning, NRC to M. E. Remley, dated March 1, 1983

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

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

13. GEN-ZR-0005, Radiological Survey of the Source and Special Nuclear Material Storage Vault - Building TO64, dated August 19, 1988, J. A. Chapman

1.0 INTRODUCTION

Decontamination and decommissioning (D&D) of a number of formerly used nuclear facilities and sites is underway at Rockwell International's Santa Susana Field Laboratory (SSFL). During D&D of these facilities, reasonable efforts are being made 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 under established protocols to demonstrate that any remaining radioactivity does not exceed applicable regulatory limits. Findings from the surveys are also used to perform additional D&D or radiological investigations, as needed. The scope of the surveys includes both known and suspected areas of contamination in the Building 023 interior.

Decontamination of Building 023 was performed, based on an assessment report (Ref. 1) and a decontamination plan (Ref. 2), and the work has been described, in Reference 3. The final survey was conducted according to Reference 4.

This report is organized as follows: first, the summary of the results of the survey and the conclusions and recommendations; second, the background information concerning past radiological status, D&D efforts, and current radiological status; third, the survey results and the technical approach used in the data collection, analyses, and limit criteria; and fourth, the supporting documentation and calculations for historical records and report completeness.

2.0 SUMMARY AND CONCLUSIONS

Survey measurements were made for beta surface contamination on the interior walls, floors, and ceilings in Building 023, and for ambient gamma exposure rate at 1 meter above the interior floors. These measurements were tested statistically for compliance with acceptable contamination limits for activation products and mixed fission products and for ambient exposure rate.

All tests for surface contamination showed that the facility is suitable for release without radiological restrictions. Interpretation of the interior gamma exposure rate measurements (Sample Lots 1 and 2) are based on the average interior gamma exposure rate background value for a building (Bldg 038) of similar construction that has never been used for radioactive material (8.10 μR/hr). The probability distributions of these measurements shows no local contamination. The results indicate a background distribution for the building, with an average value of 8.44 μR/hr. Interpretation of the exterior gamma exposure rate measurements are based on the average outdoor background gamma exposure rates for 90 locations in SSFL Area I (15.27 μR/hr) (Reference 13, page 83). The results for the exterior gamma measurements (Sample Lot 3) indicate a background distribution for the area with an average value of 14.97 μR/hr.

If the corresponding interior and exterior building-specific values are used as a reference, the tests for the gamma exposure rate are satisfactory, at all locations and meet the requirements for <5 μR/hr above background.

3.0 BACKGROUND

3.1 Location

Building 023 is located within Rockwell International's 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, directly south of the City of Simi Valley. Location of the 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 is a plot plan of the western portion of SSFL known as Area IV, where Building 023 is located. A drawing (plan view) of Building 023 and its adjoining areas is shown in Figure 4. Building 023 is located on government-optioned land.

3.2 Topography and Building Characteristics

Building 023 is situated on B Street near 12th Street, among several adjacent buildings on paved ground. It is approximately 20 feet below the general grade of 12th Street.

Building 023 was constructed in two phases: the first section (circa 1962), "023" has been used for the storage and for operation of the small sodium loop for studies of radioactive contamination transport. The loop was located in a small partitioned area, see Figure 6. The second section (circa 1976), "023A" consists of a storage and setup room and a well-equipped analytical chemistry laboratory. During the contamination transport studies, two fume hoods, with filtered exhaust, and a sink, connected to a radioactive liquid holdup tank (Figures 5 and 6), were used for handling the radioactive samples located on the east side of Room 106.

The building consists of galvanized steel walls and roof, on a concrete slab floor, with various types of internal walls and partitions. It is a single-floor structure.

Figure 1. Location of SSFL in relation to Los Angeles and Vicinity

Figure 2. Map of Neighboring SSFL Communities

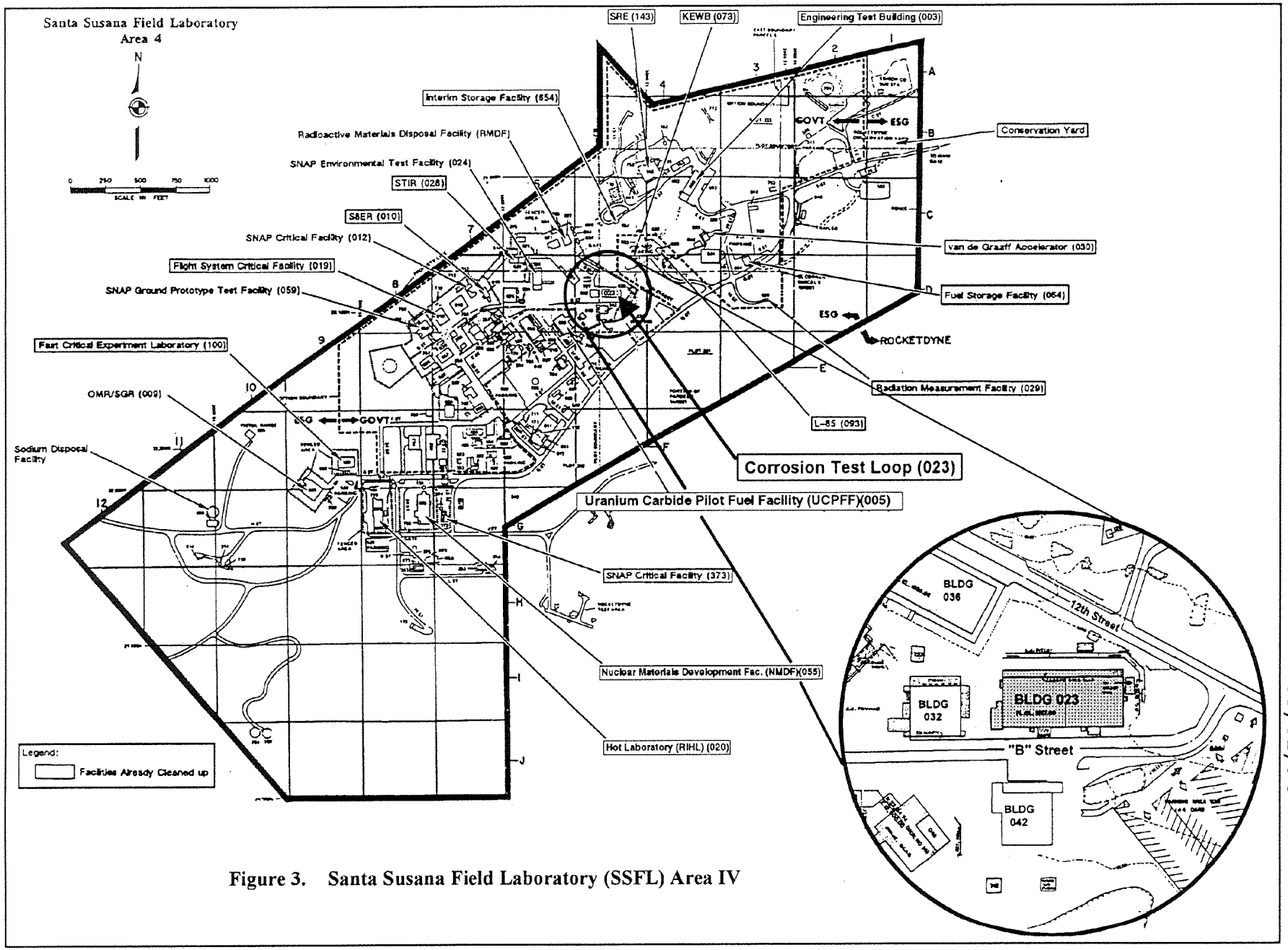


Figure 3. Santa Susana Field Laboratory (SSFL) Area IV

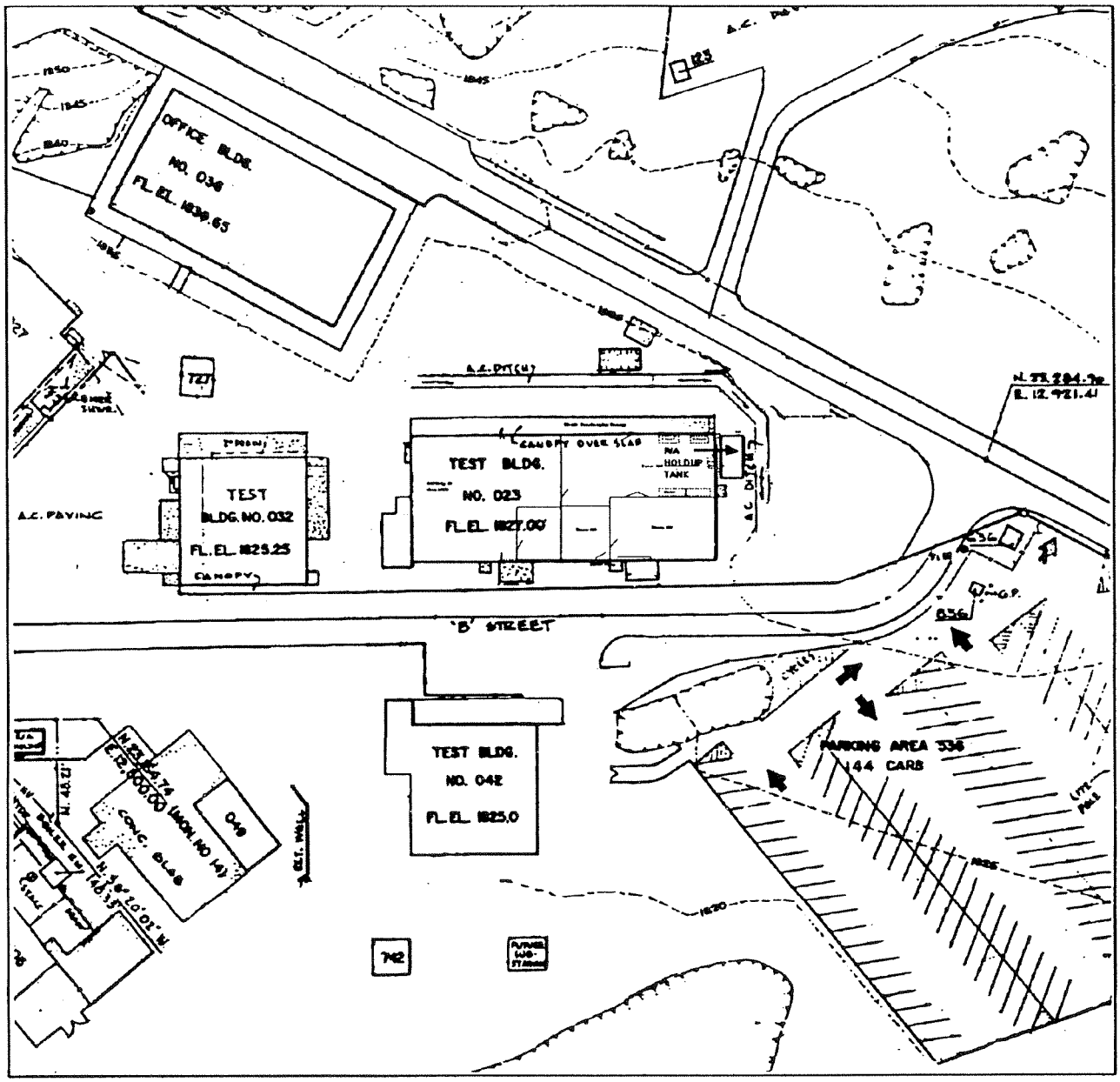
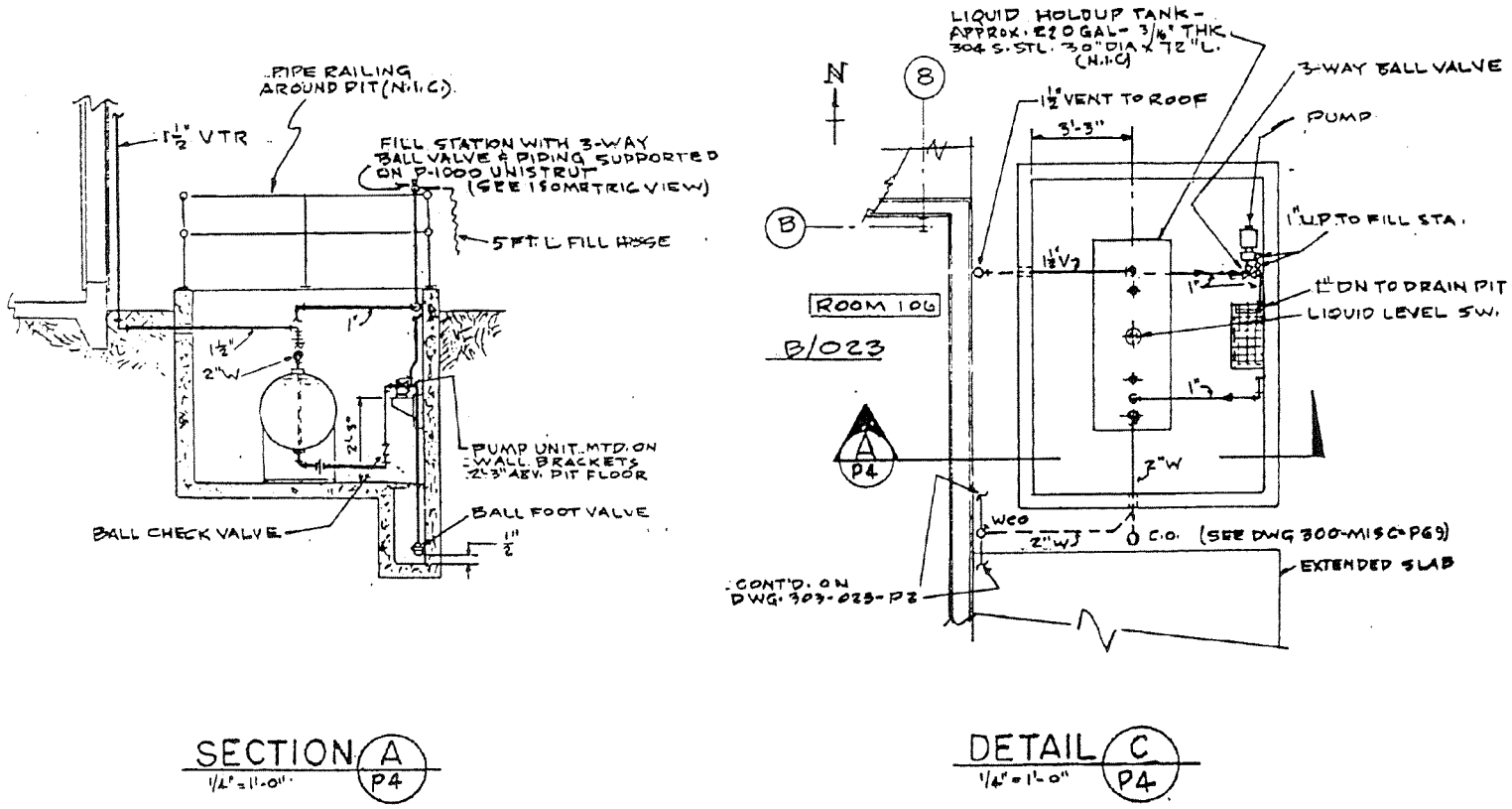


Figure 4. Building 023 Plan View



FACILITIES ENGINEERING	Rockwell International Corporation Atomics International Division		
PIPING SECTIONS & DETAILS LAB TEST AREA BLDG. 023 SANTA SUSANA FACILITY, VENTURA CTY., CA.			
APPROVED BY	DESIGNED BY L. BENEDICT	RELEASE DATE 11-15-76	REF. NO. PEWR 75194
APPROVED BY	DRAWN BY L. BENEDICT	DRAWING NO. 303-023-P4	REV. NO.
APPROVED BY	CHECKED BY		

Figure 5. Detailed Drawing of the Radioactive Liquid Hold-up Tank located on Bldg 023 Eastside

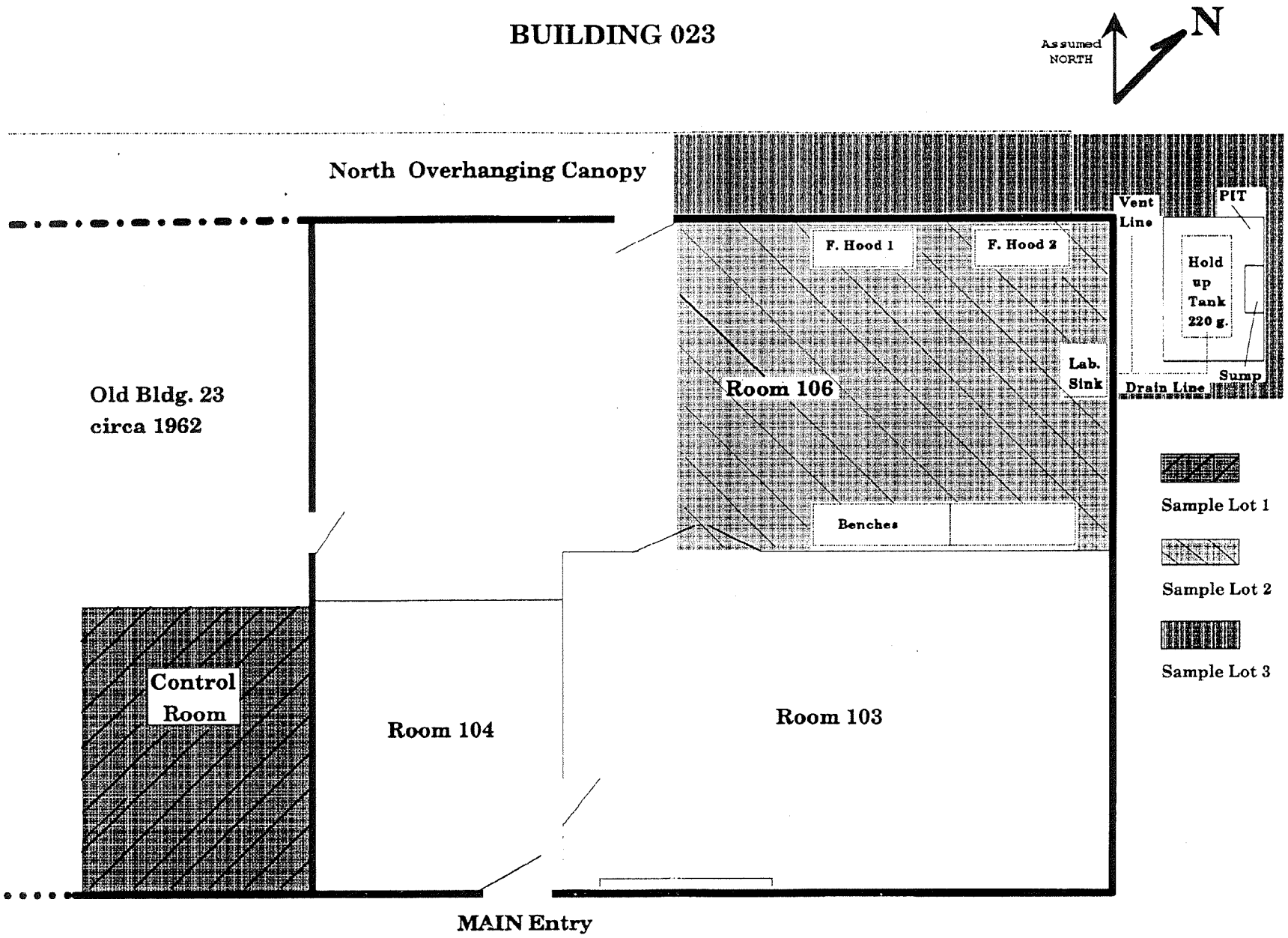


Figure 6. Building 023 Sample Lot Identification

3.3 Operating History

The first Radiological User Permit for Building 023, Authorization, No. 105, was issued in November 1976. This permit authorized the use of a small section (or sections) of activated stainless steel EBR fuel cladding to be used in a small sodium test loop. The purpose of this test was to gather data on the transport of radiological contamination in sodium loops. The sodium loop tests were halted in 1982 and the loop was dismantled in 1986. In 1982, an Alnor Dew-Point Meter containing a 6.25 μCi Ra-226 source was brought to the facility to be disassembled. The disassembly of this meter was never authorized or attempted and the meter was removed intact from Building 023 in 1986. A 10 μCi sealed source of Mn-54 used to calibrate a Canberra multichannel analyzer was stored at the facility from 1983 until 1986.

Building 023 had its own radioactive liquid waste holdup system consisting of above and below grade drain lines and a below grade storage tank located in an uncovered concrete vault outside the building. This system serviced two sinks and a fume hood. The fume hood was also connected to a HEPA filtered exhaust system consisting of ducting, a filter plenum, blower, and stack.

Two radiological incidents are on file as having occurred in Building 023. Both involved the small sodium test loop in old Building 023 (see Sample Lot 1 in Figure 6). The first incident on December 18, 1980, involved a sodium fire and Mn-54 with maximum contamination levels of 1000 dpm/100 cm^2. The second incident April 28, 1981, also involved a sodium fire with Cs-137, Mn-54, Co-60 as the principal radioactive isotopes. The sodium fire was extinguished with calcium carbonate, and smears of the loop and floor showed no contamination.

During 1992-1993, an analytical ICP (ion-coupled plasma) instrument was used to analyze small amounts of radioactively contaminated solution from the Molten Salt Oxidation (MSO) project for trace metals. This work was completed without incident just prior to performance of the final survey reported here. The remainder of the radioactive solutions and containers were transferred to the RMDF soon after completion of the survey. To provide assurance that no radioactive contamination had resulted from this final handling, a 100% survey was performed of the areas involved, with spot checks in the surrounding areas. Instrument

surveys were performed for both total alpha and beta activity, and smears were analyzed for removable alpha and beta activity. No detectable activity was found. Survey results are maintained with the Building 023 final survey file in Building 100.

3.4 Decommissioning and Demolition Efforts

1. Phase I and II

   During removal of the sodium test loop in 1986, the two sinks in Room 106 were disconnected, their respective connections to the liquid waste holdup system were sealed and the sinks removed and dispositioned. In 1990, the HEPA filtered ventilation exhaust system was removed. The fume hoods in Room 106 were disconnected from the liquid waste holdup system and the HEPA exhaust system, and was relocated for storage within the facility. The ducting from the fume hood to the filter plenum was removed and disposed of as low level RA waste. The remaining components of the HEPA filtered ventilation exhaust system, filter plenum, blower and exhaust stack were removed and shipped to the University of Missouri for use on the TRUMP-S Project (Refs. 6 and 7).

2. Phase III

   The third phase of the D&D of the facility involved the decontamination of the fume hoods, removal and disposal of the liquid waste holdup system, including the drain and vent lines, the liquid waste storage tank and the floor area where the sodium loop had been located.

   A radiological survey of the fume hood revealed that contamination was present only in the drain basin. The basin was cut out, inspected, and found to be free of hazardous material, and disposed of as low level radioactive waste. After removal of the basin, an equipment release radiological survey was performed on the fume hood. No detectable activity (NDA) above natural background was found and the fume hoods were released for use without radiological restrictions.

   The liquid waste holdup system consisted of approximately 80 feet of 3-in. cast iron drain line, 40 feet of 2 1/2-in. galvanized pipe vent lines, and a 220 gal. stainless steel holdup tank. The holdup tank was located in a 7 1/2 ft wide by 10 ft long by 6 ft deep open top concrete vault outside the east

end of the building. All of the drain lines ran along the outside of the building to a double fixture fitting near the holdup tank vault. The drain line then ran underground approximately 6 feet, through the vault wall and into the tank. The two sinks shared a common drain vent which attached to the outside of the building. The fume hood drain had an individual vent attached to the outside of the building.

The aboveground drain and vent lines were, disassembled at joints or connections, then cut into waste box lengths (Fig. 1). After the installation of the liquid waste system, a concrete pad had been poured to accommodate an air conditioning unit. Therefore, a portion of the pad had to be cut and removed to gain access to the buried section of drain line (Fig. 2). Once all of the drain and vent lines had been removed (Fig. 3), the tank was removed from the vault and transported to the RMDF for size reduction.

Prior to size reduction and disposal, the tank was inspected for hazardous or potentially hazardous materials. This inspection, which was witnessed by a representative of the Rocketdyne Environmental Protection Department, revealed only rust from the cast iron drain lines and slight moisture in the form of condensation on the inner tank walls. The tank was cut/size reduced into waste box size segments using a plasma torch and packaged for radioactive waste disposal.

During the final survey of the facility, fixed contamination (Cs-137) was found on the concrete floor in the old control room where the sodium loop had been installed. Attempts to remove the contamination with aggressive wiping techniques were unsuccessful. Therefore, the area was decontaminated by scabbling of the concrete surface and vacuuming. In accordance with the facility final survey procedure (Ref. 11) the areas immediately surrounding the decontaminated area were thoroughly surveyed and the boundaries of the final survey were expanded. The survey of these areas found no surface contamination above release limits, and the data used in this survey is after the decontamination of this area.

4.0 SURVEY RESULTS

4.1 Overview

Upon D&D of radioactive constituents, releasing a facility or area for unrestricted use requires a formal radiation survey to demonstrate that the applicable regulatory limits for such a release are met. The survey is performed under an established plan, and a statistical interpretation of the resulting data is made to determine if the regulatory release criteria have been met. This document provides the necessary framework to demonstrate that Building 023 meets DOE, NRC, and State of California criteria for release of the facility for unrestricted use. All original survey and user authorization documentation (Ref. 4) is maintained in the Building 023 final survey file in Building 100.

4.2 Scope of the Survey

For the final radiological survey of Building 023, the interior rooms were separated into sample lots. These sample lots are graphically shown in Figure 6. Sample lots were treated separately for the purposes of statistical data analyses. Distinguishable properties for selecting the sample lots were areas or rooms which contained contaminated components that were recently decontaminated. The chosen sample lots or areas are shown in Table 1 with the corresponding type of survey performed.

Table 1. Sample Lots Surveyed

Sample Lot No.	Room or Area	Type of Survey Performed[1,3]			
		Total	Removable		Ambient Gamma[2]
		Beta	Alpha[4]	Beta	
1	Rooms 110 & 104	x	x	x	x
2	Room 114	x	x	x	x
3	Rooms 116, 120, & rest rooms	x	x	x	x

(1) The type of survey performed for each sample lot was dependent on the type of surface being measured (e.g., concrete floor, walls, asphalt, gravel roof, tile floors, etc.) and the type of isotope (in this case, beta-gamma emitters)

(2) Ambient gamma readings are performed only on the horizontal walking surfaces at 1 meter.

(3) 20% of all structural surfaces were surveyed in each sample lot for total beta, removable alpha, and removable beta.

(4) Removable alpha activity measurements were also analyzed for since the NMC Tennelec counter can measure both for alpha and beta emitters simultaneously.

4.3 Survey Methods

1. Sampling Method

The method and type of survey measurements depended on the type of surfaces involved. For each sample lot, a 3-meter by 3-meter grid was superimposed on the floors, walls, and ceilings of the entire sample lot area (see Figure 7). A 100% direct frisk of each 3-m by 3-m grid was then performed using a G-M pancake probe. Due to the small size of the sample lots, each 1-meter by 1-meter area was then selected from each 3-m by 3-m area which did not contain immovable fixtures.

Each 1-m by 1-m grid location was then surveyed for contamination based on the type of surface involved. This method satisfies the State of California guidelines in DECON-1 (Ref. 8) for a minimum of 10% of an area shall be surveyed, and is shown graphically in Figure 7. Walls, floors, and ceilings were surveyed for total beta activity, removable alpha and beta activity and maximum beta activity, if a "hot spot" was detected when the total beta measurements were made. Additionally, the floors were surveyed for ambient gamma readings in μR/hr at 1 meter. Twenty percent of all structural surfaces (pipes, conduit, light fixtures, etc.) were surveyed for total and removable beta activity and removable alpha activity. Concrete slabs and pads were surveyed in the same manner as the interior floors. Asphalt paving outside the building was not surveyed since the scope of the survey was interior rooms.

2. Instrument Calibrations and Checks

Measurements of the total and maximum beta surface activities were made with a thin-window pancake Geiger-Mueller tube. The detectors were calibrated with a Tc-99 beta source standard, traceable to NIST. A 5-min integrated count time was used.

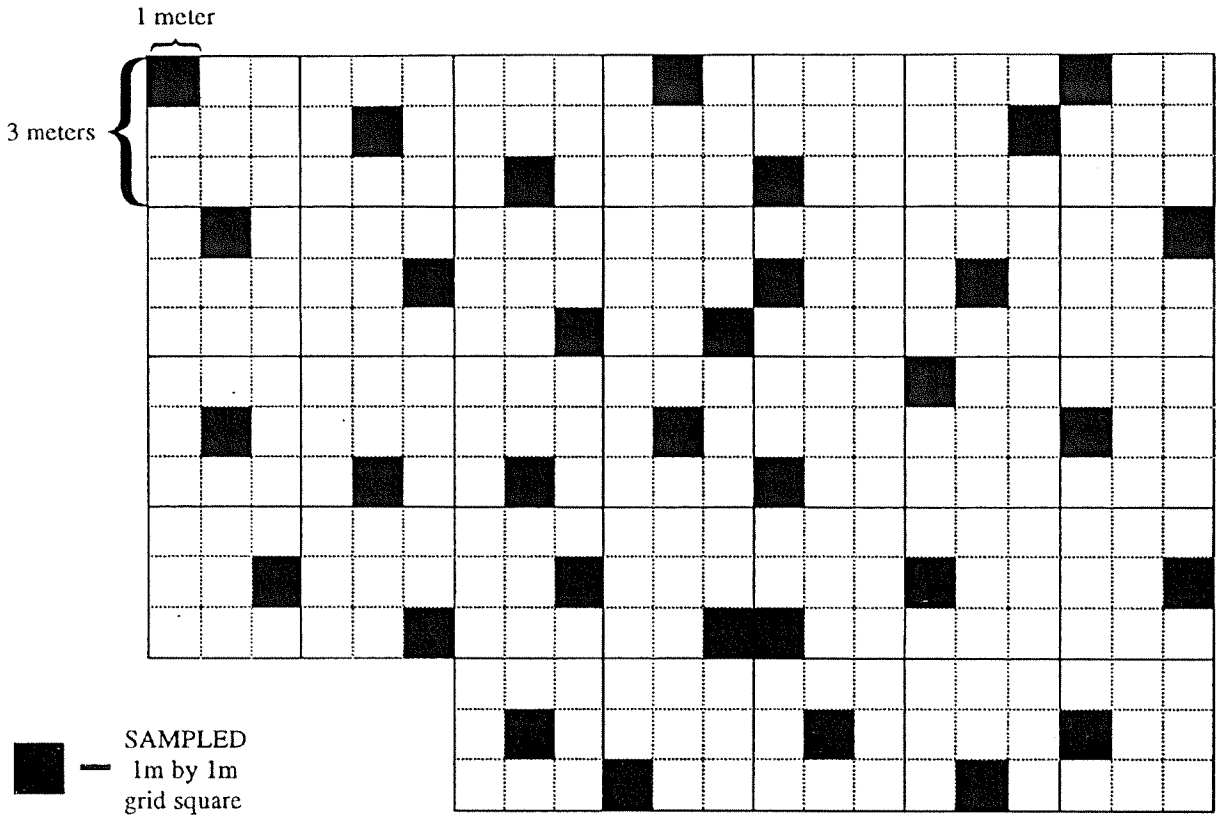


Figure 7: Typical Room or Area 3 Meter by 3 Meter Grid Markings

Measurements of removable surface activity (alpha and beta) were made by wiping approximately 100 cm^2 of surface area using standard smear disks. The activity on the disks were measured using a gas-flow proportional counter. The counters were calibrated using Th-230 and Tc-99 standard sources, traceable to NIST. A 1-min integrated count time was used.

The ambient exposure rates at 1 m from surfaces were measured using a 1-in. NaI scintillation detector. These instruments were calibrated against a Reuter-Stokes high-pressure ionization chamber, and daily checks were made using a Ra-226 source, traceable to NIST, placed 1-m from the detector. A 1-min integrated count time was used.

All portable survey instruments were serviced and calibrated with NIST traceable standards on a quarterly basis. In addition, daily (when used) checks and calibrations were performed on all instrumentation to determine acceptable performance and establish a background value for the instrument on that day. Reference 5 provides further methods and procedures for environmental surveys.

Soil analyses were performed using a high purity Ge detector gamma-spectroscopy system calibrated with a NIST traceable standard. Reference 6 contains additional information concerning the method by which soil analyses are validated.

4.4 Technical Approach

1. Criteria and Their Implementation

Acceptable contamination limits and gamma exposure rates for releasing a facility for unrestricted use are prescribed in DOE, NRC, and State of California guidelines (Ref. 8, 9, 10). The lowest (most conservative) limits were chosen from these guidelines and incorporated into the final survey criteria for Building 023. Two specific criteria were chosen from the guidelines.

a) The surface contamination limits for alpha and beta were excerpted from DOE Order 5400.5 (Ref. 8 and State of California guidelines (Ref. 9);

b) The ambient gama exposure rate limits at 1 m were excerpted from NRC Dismantling Order for the L-85 reactor decommissioning (Ref. 9) for conservatism and consistency with past decommissioning efforts. Although DOE Order 5400.5 recommends a value of 20 μR/hr above background, the value of 5 μR/hr from the NRC Dismantling Order was used for consistency, conservatism, and in keeping with ALARA principles;

Table 2 provides a summary of the contamination limit criteria. Table 3 demonstrates that the detection limits (SSAs) for the instruments and method are well below the established limit criteria (from regulatory requirements) shown in Table 2.

2. Data Analyses and Statistical Criteria

A statistical procedure was used to validate the applicability of the raw survey data for selected sample lots or areas. The statistical method known as "sampling inspection by variables" (Ref. 11) was used. This method has been widely applied in industry and the military and is essential where the lot size is impractically large. In the case of determining residual contamination in Building 023, it would be unacceptably time consuming and not cost effective to measure and document 100% of the building. However, by applying sampling inspection by variables methods, acceptable confidence in the conclusion made about the level of contamination can be achieved.

Table 2. Building 023 Contamination Limit Criteria

Parameter	Limit				Reference
Allowable Total	Radionuclides[2]	Average[3,4]	Maximum[4,5]	Removable[4,6]	
Residual surface contamination for alpha and beta (dpm/100-cm^2)[1]	U-natural, U-235, U-238, & associated decay product, alpha emitters	≤5,000	≤15,000	≤1,000	8,9
Surface contamination for gamma exposure rate	≤5 μR/hr above background at 1 m interior and exterior				10

1 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.

2 Where surface contamination by both alpha- and beta-gamma-emitting radionuclides exists, the limits established for alpha- and beta-gamma-emitting radionuclides should apply independently.

3 Measurements of average contamination should not be averaged over an area of more than 1 m^2. For objects of less surface area, the average should be derived for each such object.

4 The average and maximum dose rates associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mrad/h and 1.0 mrad/h, respectively, at 1 cm.

5 The maximum contamination level applies to an area of not more than 100 cm^2.

6 The amount of removable material per 100 cm^2 of surface area should be 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. 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 limits for removable contamination.

Table 3. Observed Detection Limits versus Established Limit Criteria

	Removable Alpha (dpm/100 cm^2)	Total Beta (dpm/100 cm^2)	Removable Beta (dpm/100 cm^2)	Ambient Gamma Exposure Rate (μR/hr)
Limit criteria	1000	5000	1000	<5.0 above background
Average obs. detection limit (SSA*)	4	316	12	0.60
Obs. detection limit range	2-9	252-373	6-23	0.49-0.66
Ave-obs. detection limit to established limit criteria	0.39%	6.32%	1.17%	12.02%

*SSA = 1.645 x [SQRT (2 x counts)] x area factor x efficiency factor/minutes = dpm/100 cm^2

background

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

U = acceptance limit

TS and $\bar{x}$ are then compared with an acceptance limit, U (such as those shown in Table 2), to determine acceptance or other plans of action, including rejection of the area as contaminated and requiring further remediation.

The sample mean, standard deviation, and acceptance limit 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 the LTPD. USNRC Regulatory Guide 6.6 ("Acceptance Sampling Procedures for Exempted and Generally Licensed Items Containing By-Product Material") 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 has stated that the consumer's risk of acceptance (β) at 10% defective (LTPD) must be 0.1. 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:

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

where k = tolerance factor

K_2 = the normal deviate exceeded with probability of β, 0.10 (from tables, K = 1.282)

K_β = the normal deviate exceeded with probability equal to the LTPD, 10% (from tables, K = 1.282)[1]

n = number of samples

The statistical criteria for acceptance of the Building 023 interior final survey are presented below.

a) Acceptance: If the test statistic ($\bar{x}$ + ks) is less than or equal to the limit (U), accept the region 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.) See Figure 8 for an example of the sample lot acceptance by the test.

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 region as clean. If not, the region is contaminated and must be remediated. See Figure 9 for an example of additional measurements that must be taken in the sample lot to accept or reject it.

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

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[1]The values chosen for these coefficients for the survey correspond to assuring, with 90% confidence, that 90% of the area has residual contamination below 100% of the applicable limit (a 90/90/100 test). The choice of values for the two coefficients is consistent with industrial sampling practices and State of California guidelines (Ref. 9).

Figure 10 for an example of sample lot rejection by the test.

Thus, based on sampling inspection, we are willing to accept the hypothesis that the probability of accepting a lot as not being contaminated which is, in fact, 10% defective is 0.10. Or in other words, the Building 023 final survey corresponds to assuring with 90% confidence that 90% of the area has residual contamination below 100% (a 90/90/100 test) of the applicable limits described in Table 2.

4.5 Sample Lot Analyses and Results

1. Sample Lot 1

a) Description

Sample Lot 1, located in the southeast room of old building 023, contained the small sodium loop used for testing. The floor of the room (designated as the control room in Figure 6) contain fixed CS-137 contamination and was decontaminated. Every 1 m^2 area was surveyed after the decontamination efforts and the analyses below use this post-decontamination data.

b) Analyses of Sample Lot 1 Data

Raw data measurements for Sample Lot 1 were taken, subtracted for daily instrument background (except for ambient gamma exposure rates) and plotted on a cumulative probability graph as explained previously. For statistical comparisons (using the "sampling inspection by variables" method), similar areas within Sample Lot 1 were combined together and then analyzed for the specific type of radiation measurement made on the surface. Individual raw measurement data and instrument backgrounds are provided in Appendix A.

Sample lot 1 results are tabulated in Table 4 for comparing the test statistic ($TS = \overline{x} + ks$) with applicable, established contamination criteria or acceptance limit (U) from Table 2. The corresponding figures for the graphs of each calculated cumulative probability plot are also provided. Individual calculated sample results used as graph data for Sample Lot 1 are provided in Appendix B.

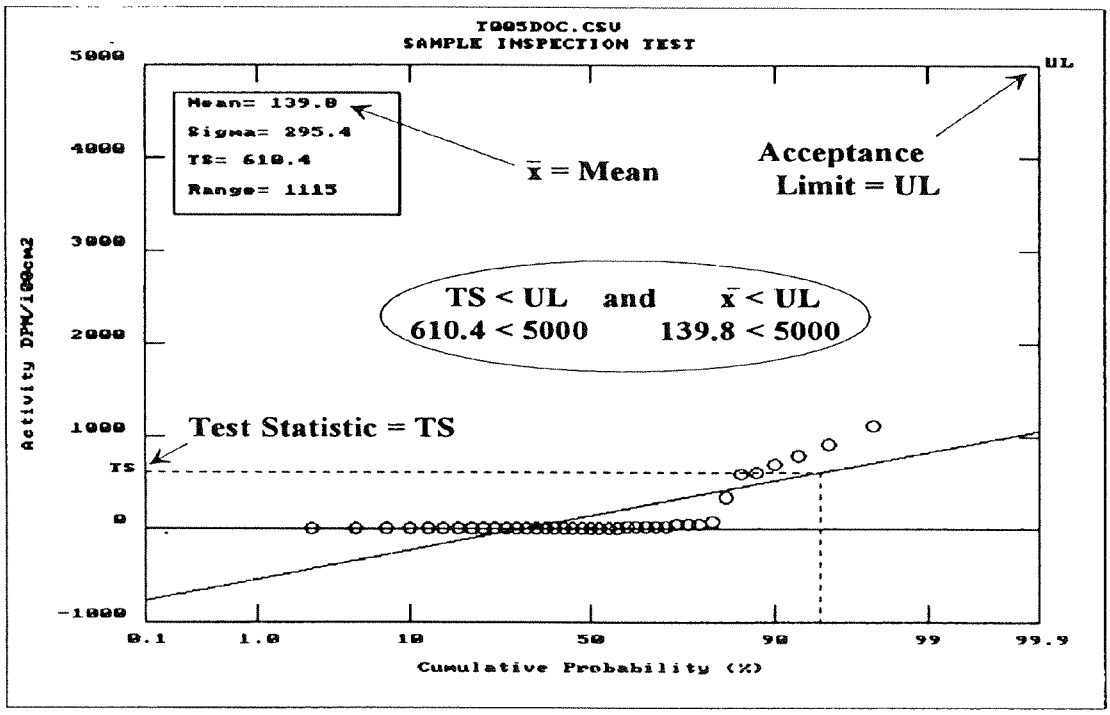


Figure 8. Example of Sample Lot Acceptance, where TS(=$\bar{x}$+ks) ≤ UL and $\bar{x}$ ≤ UL

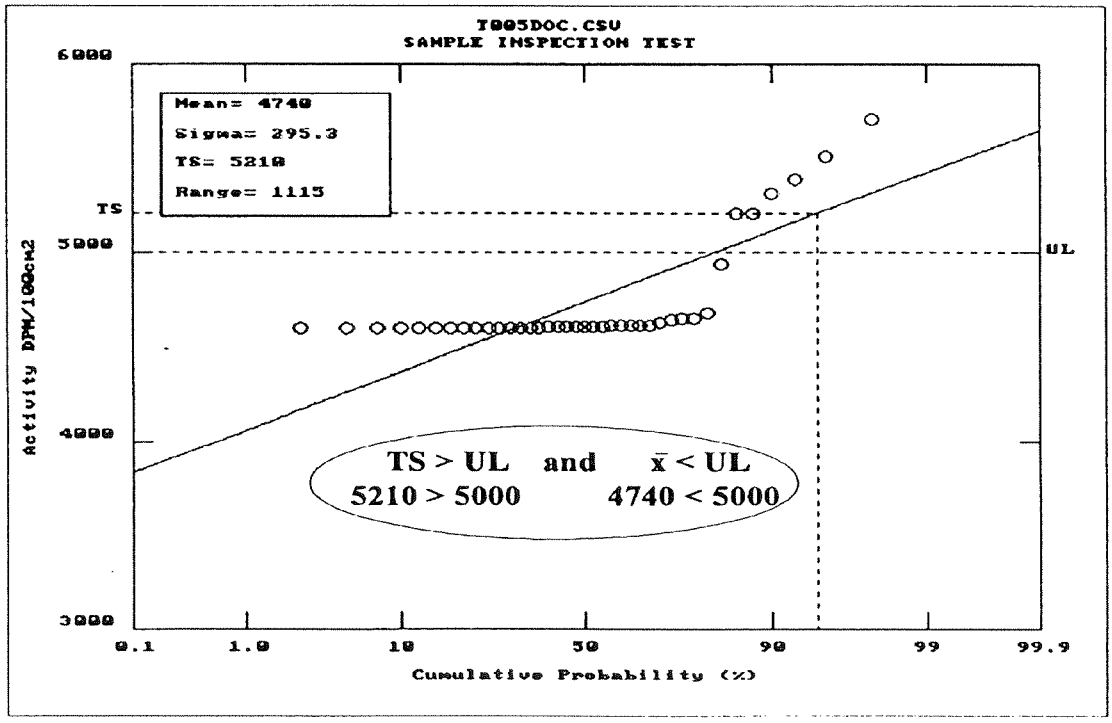


Figure 9. Example of Sample Lot Requiring Additional Measurements, where TS(=$\bar{x}$+ks) > UL and $\bar{x}$ < UL

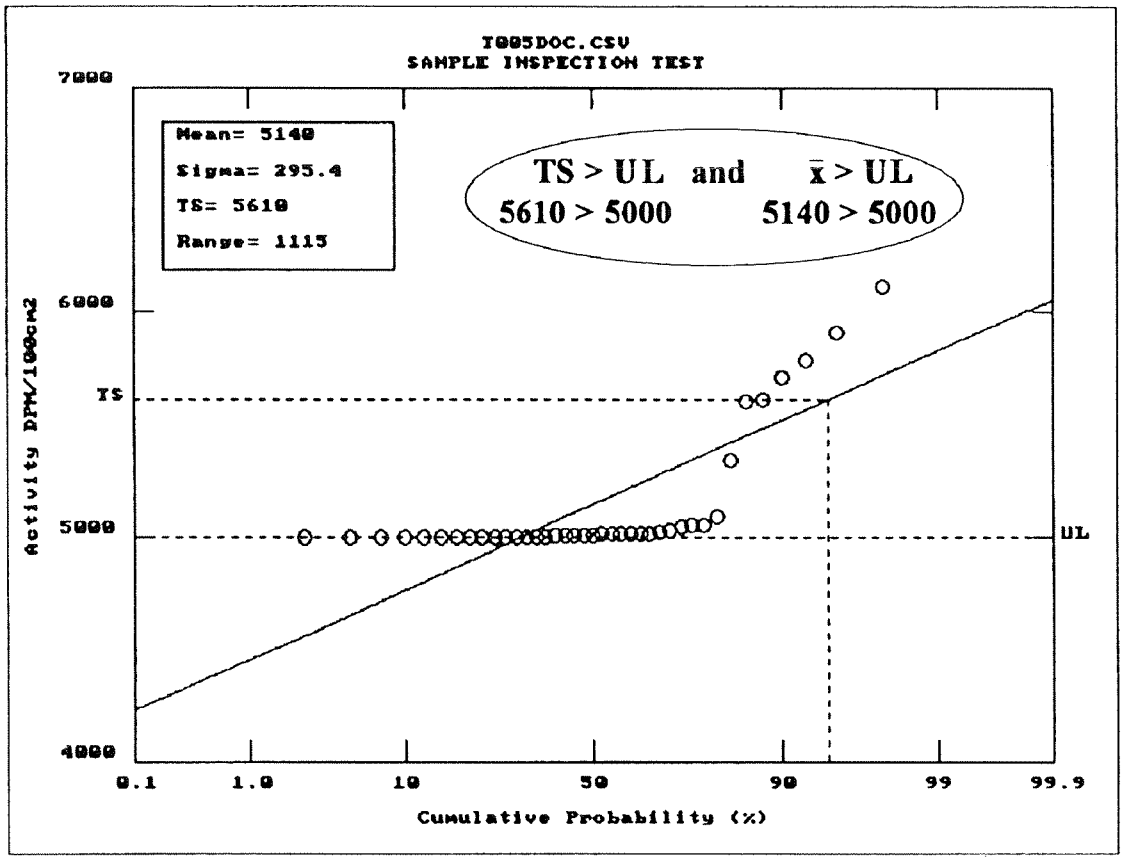


Figure 10. Example of Sample Lot Rejection, where TS(=$\bar{x}$+ks) > UL and $\bar{x}$ > UL

Table 4. Sample Lot 1 Results

	Calculated Test Statistic (TS = $\bar{x}$ + ks)			
	Total	Removable		Ambient Gamma Exposure Rate
	Beta (dpm/100 cm^2)	Alpha (dpm/100 cm^2)	Beta (dpm/100 cm^2)	
Acceptance Limit (UL)	5000	1000	1000	13.10**
Floors only				9.25 (15)*
Entire area - floors, walls, ceiling, & structure	1244.0 (12)*	2.74 (14)*	28.06 (13)*	

* Numbers in parenthesis refer to figure numbers.

** The acceptance limit for ambient gamma exposure rate in μR/hr was determined by calculating the average ambient indoor background (8.10 μR/hr, see Figure 11 for the normal distribution.) from 30 locations inside a known uncontaminated building (Bldg. 038) and adding the acceptance criteria from Table 2 (<5 μR/hr above background) to achieve a final indoor ambient gamma exposure rate limit of 13.10 μR/hr. All values, excluding the ambient gamma exposure rate, in this table are subtracted for daily instrument background.

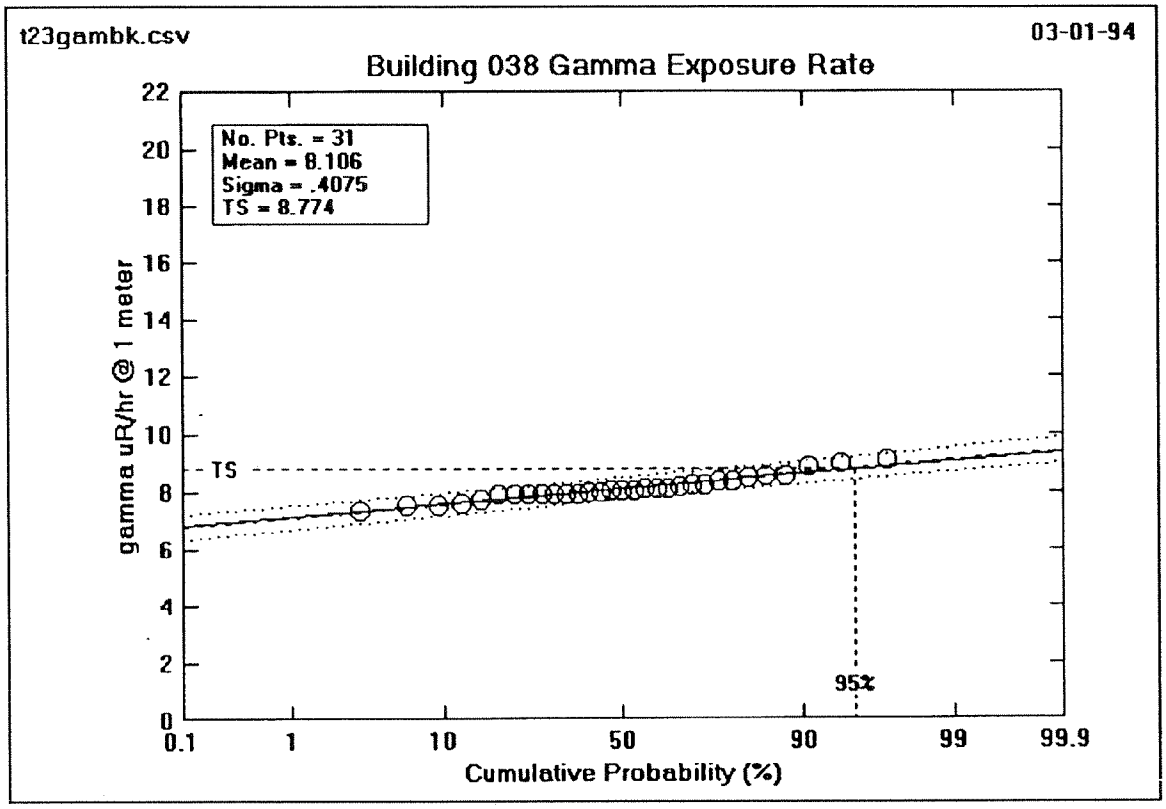
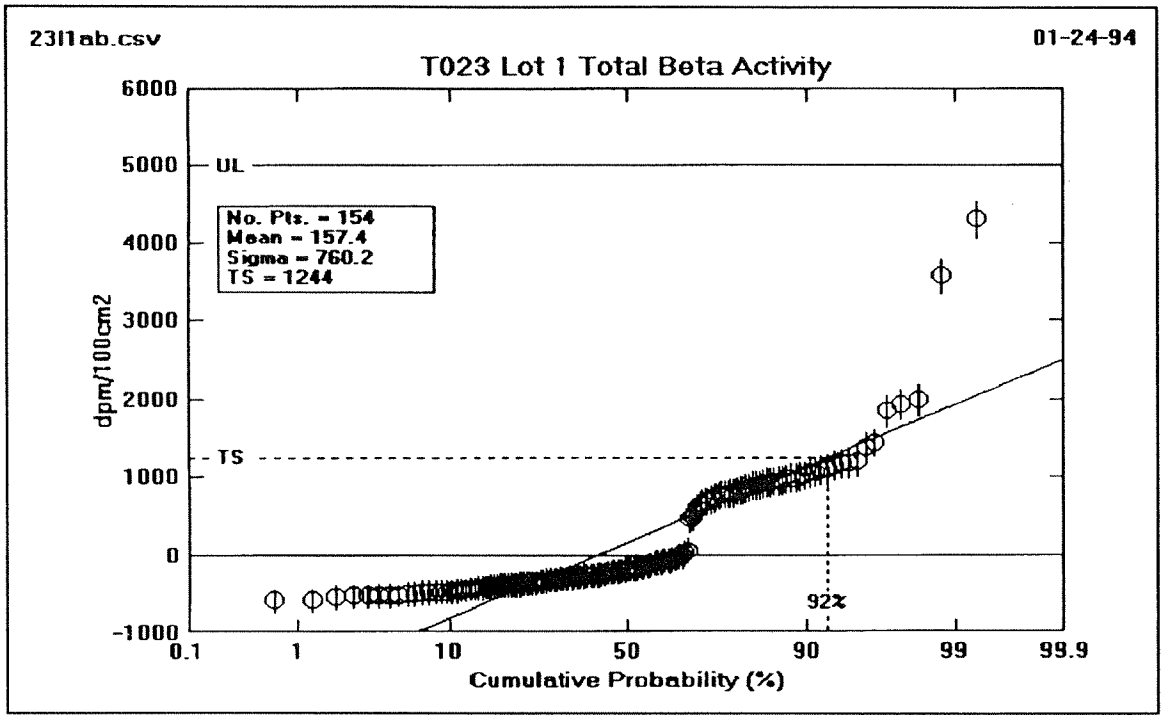
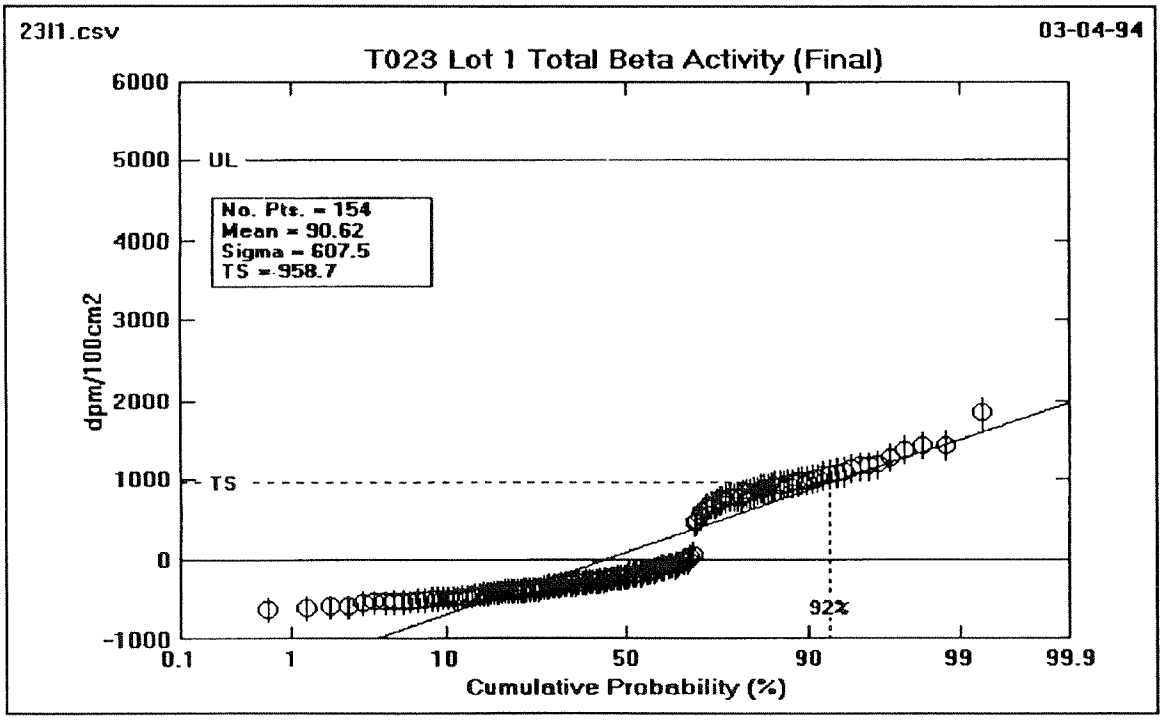


Figure 11. Gamma exposure rate measured in Bldg. 038. Tilt-up wall aluminum-siding building (Bldg. 038) has construction similiar to that of T023 and no radiological history. Confidence bounds (95%) on least-squares fit of data are close to the derived Gaussian line. See Appendix B for data measurements.

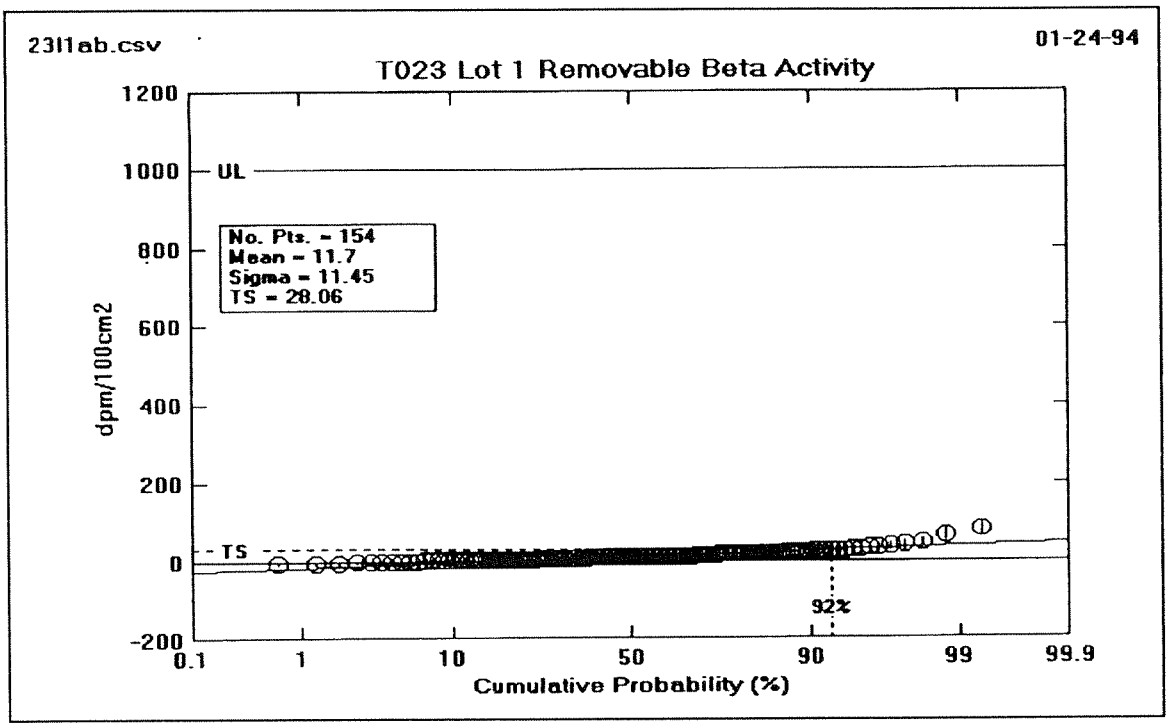


12a.) Pre-Decon with scale including Acceptance Limit (UL)

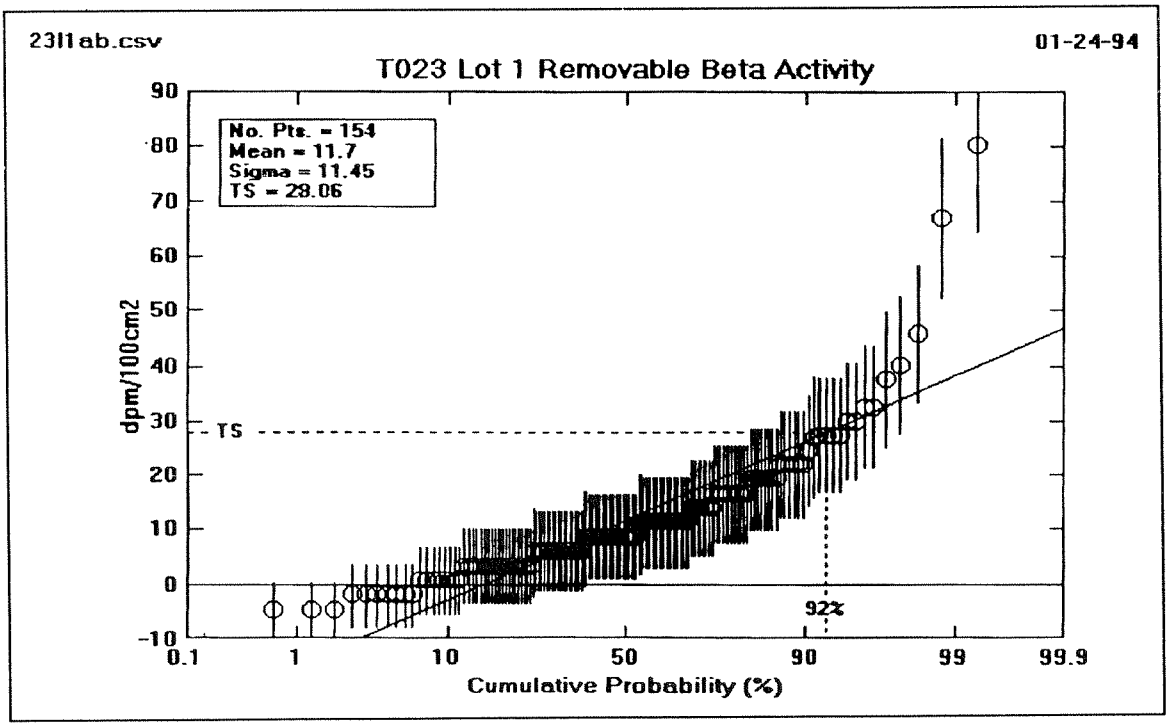


12b.) Post-Decon with scale including Acceptance Limit (UL)
100% of the Area was surveyed for Total Beta Activity

Figure 12: T023 - LOT 1 Total Beta Activity

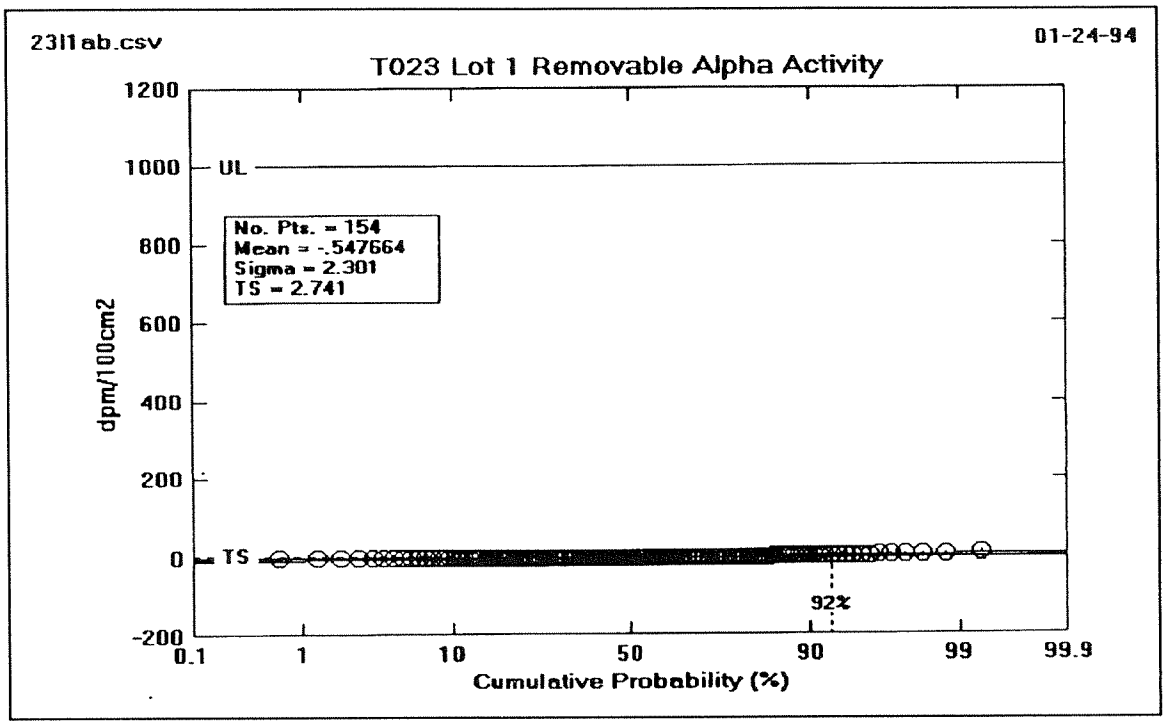


13a.) Scale including Acceptance Limit (UL)

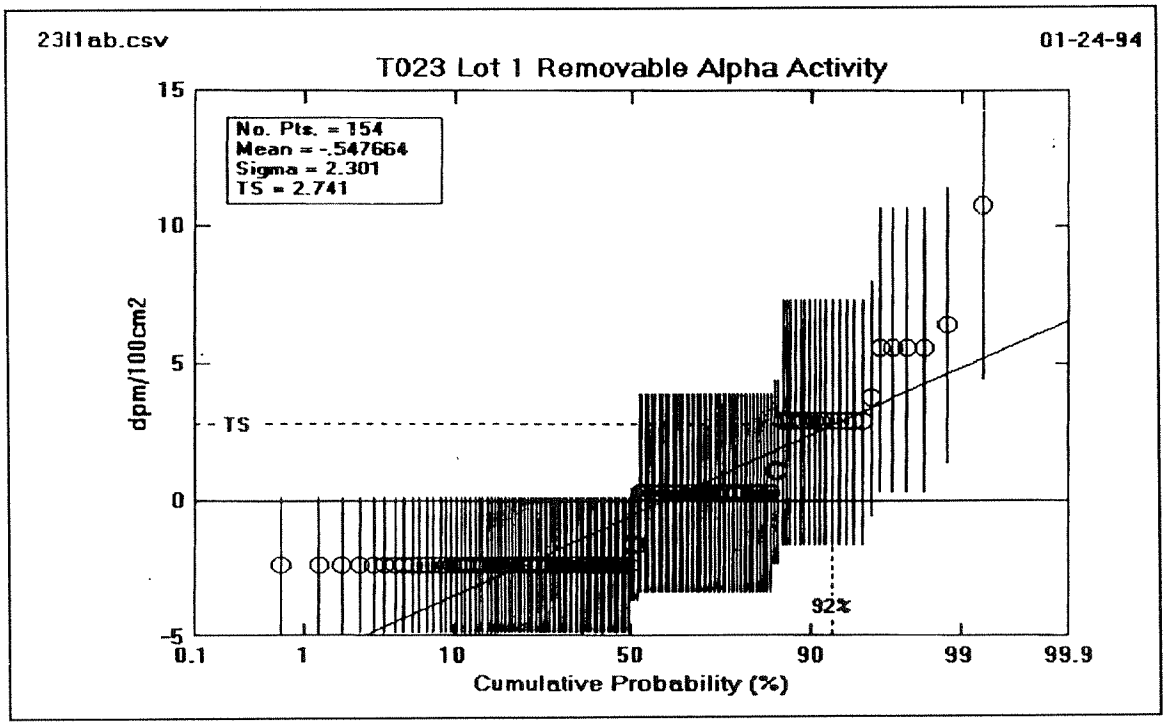


13b.) Expanded Scale

Figure 13: T023 - LOT 1 Removable Beta Activity

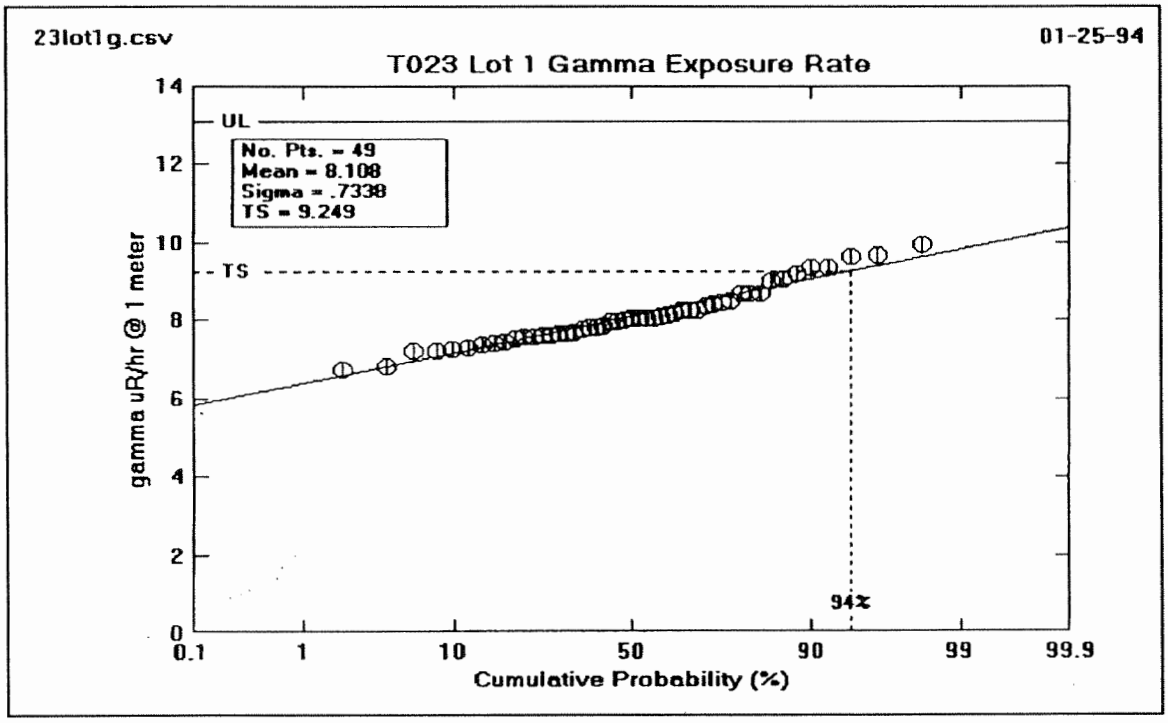


14a.) Scale including Acceptance Limit (UL)



14b.) Expanded Scale

Figure 14: T023 - LOT 1 Removable Alpha Activity



15) Scale including Acceptance Limit (UL)

Figure 15: T023 - LOT 1 Floors Ambient Gamma Exposure Rate

c) Interpretation of Results for Sample Lot 1

Figures 12 through 15 and Table 4 demonstrate that for each applicable acceptance limit (U) from Table 2, the corresponding test statistic (TS) value is less than the U or TS <U. Therefore, the four figures for Sample Lot 1 pass the "sampling inspection by variables" test and are "Accepted" as radiologically clean. Or in other words, the Building 023 Sample Lot 1 survey corresponds to assuring with a 90% confidence that 90% of Sample Lot 1 has residual contamination below 100% (a 90/90/100 test) of the applicable NRC, DOE, and State of California limits described in Table 2.

2. Sample Lot 2

a) Description

Sample Lot 2, located in the newer building 023A (Room 106) contained two fume hoods, the radioactive sink drain to the radioactive liquid holdup tank, and various analytical chemistry equipment (see Figure 6). All of the 1 m^2 areas except those with immovable furniture were surveyed.

b) Analyses of Sample Lot 2 Data

Raw data measurements for Sample Lot 2 were taken, subtracted for daily instrument background (except for ambient gamma exposure rates) and plotted on a cumulative probability graph as explained previously. For statistical comparisons (using the "sampling inspection by variables" method), similar areas within Sample Lot 2 were combined together and then analyzed for the specific type of radiation measurement made on the surface. Individual raw measurement data and instrument backgrounds are provided in Appendix A.

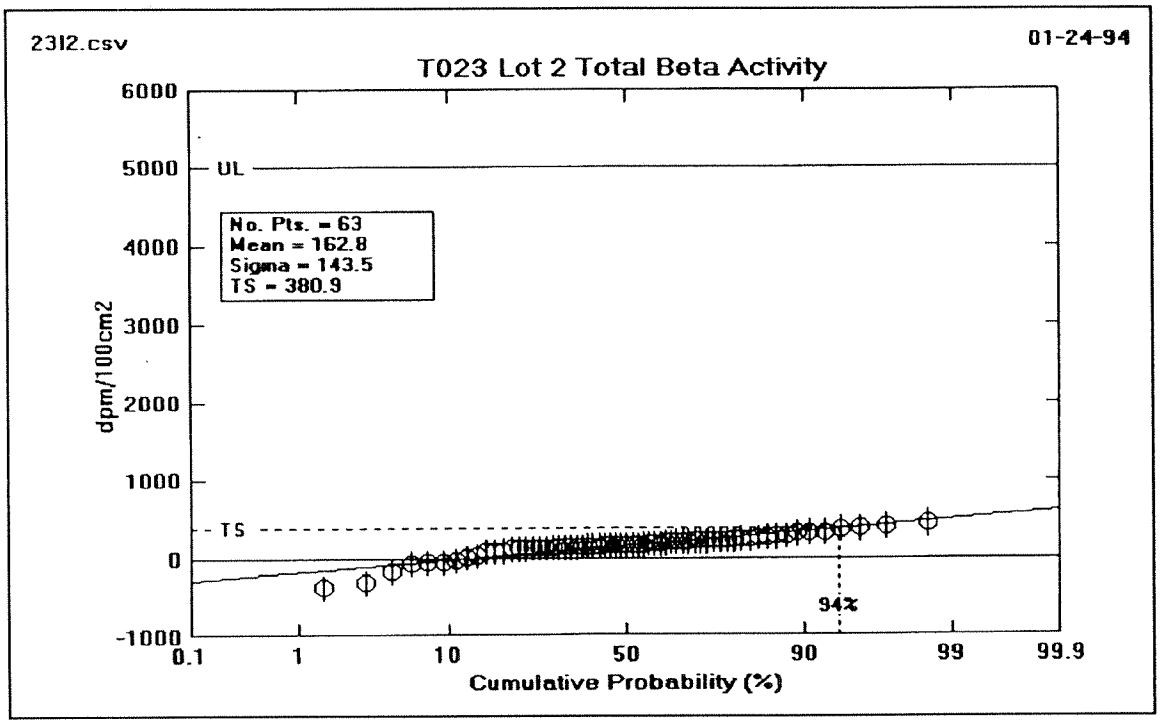
Sample lot 2 results are tabulated in Table 5 for comparing the test statistic ($TS = \overline{x} + ks$) with applicable, established contamination criteria or acceptance limit (U) from Table 2. The corresponding figures for the graphs of each calculated cumulative probability plot are also provided. Individual calculated sample results used as graph data for Sample Lot 2 are provided in Appendix B.

Table 5. Sample Lot 2 Results

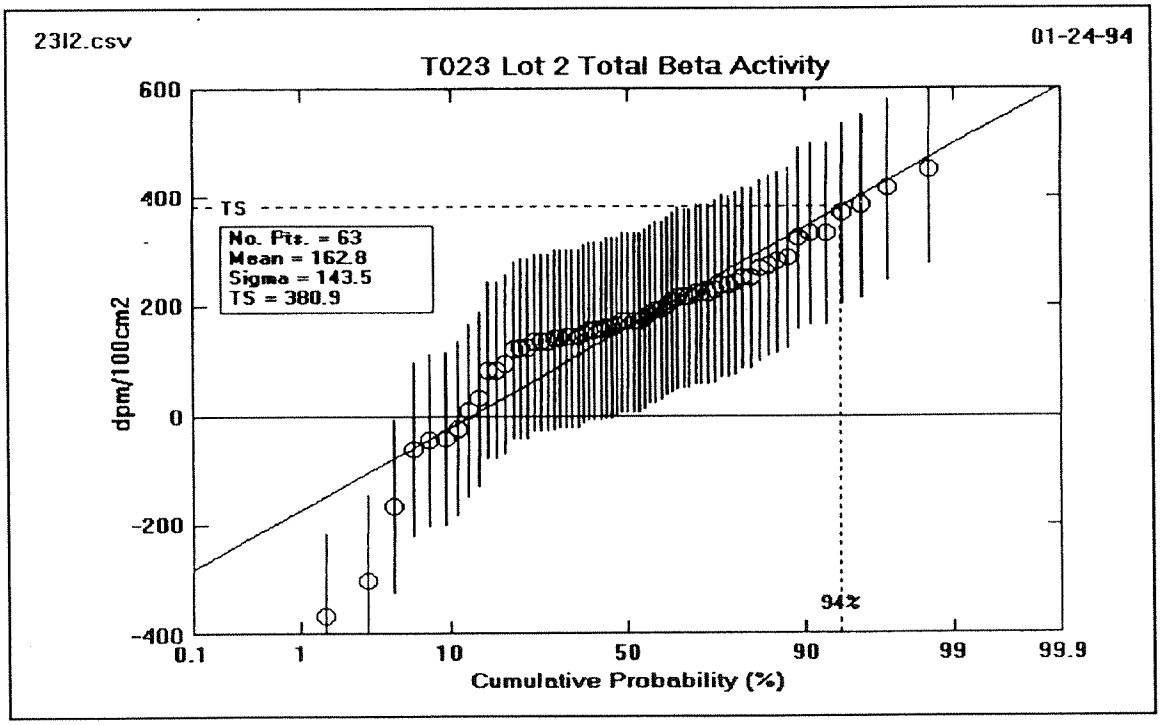
	Calculated Test Statistic (TS = $\bar{x}$ + ks)			
	Total	Removable		Ambient Gamma Exposure Rate
	Beta (dpm/100 cm^2)	Alpha (dpm/100 cm^2)	Beta (dpm/100 cm^2)	
Acceptance Limit (UL)	5000	1000	1000	13.10**
Floors only				9.35 (19)*
Entire area - floors, walls, ceiling, & structure	380.9 (16)*	3.07 (18)*	19.17 (17)*	

* Numbers in parenthesis refer to figure numbers.

** The acceptance limit for ambient gamma exposure rate in μR/hr was determined by calculating the average ambient indoor background (8.10 μR/hr, see Figure 11 for the normal distribution) from 30 locations inside a known uncontaminated building (Bldg. 038) and adding the acceptance criteria from Table 2 (<5 μR/hr above background) to achieve a final indoor ambient gamma exposure rate limit of 13.10 μR/hr. All values, excluding the ambient gamma exposure rate, in this table are subtracted for daily instrument background.

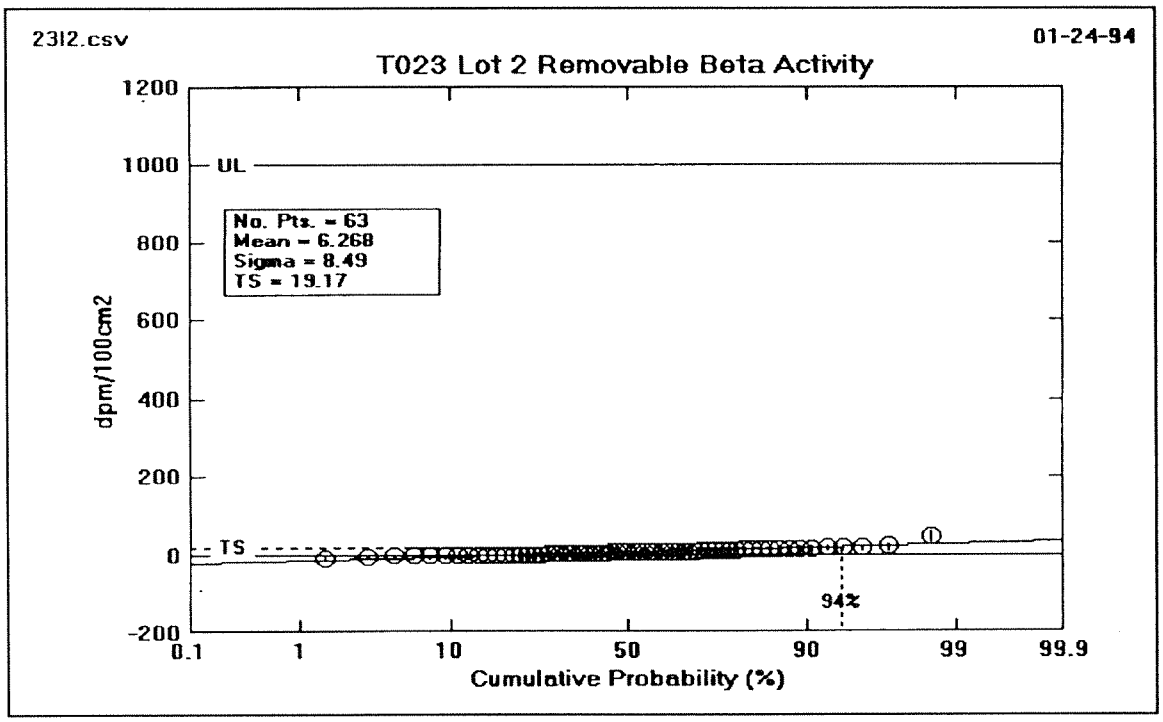


16a.) Scale including Acceptance Limit (UL)

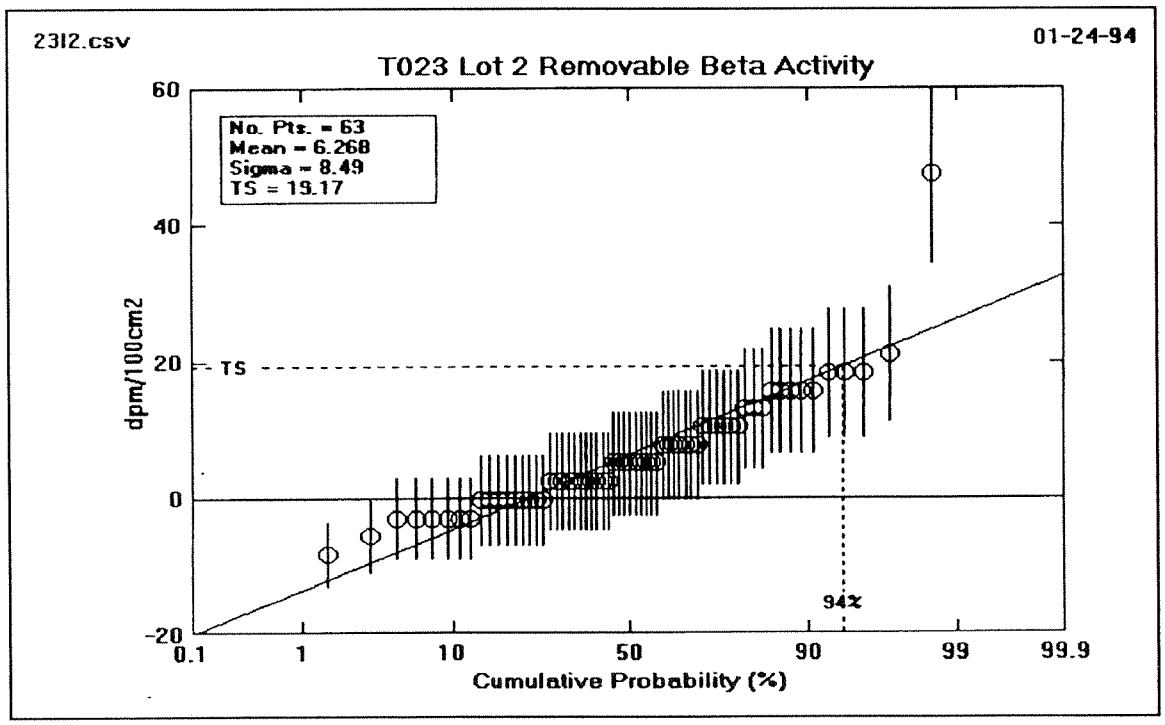


16b.) Expanded Scale

Figure 16: T023 - LOT 2 Total Beta Activity

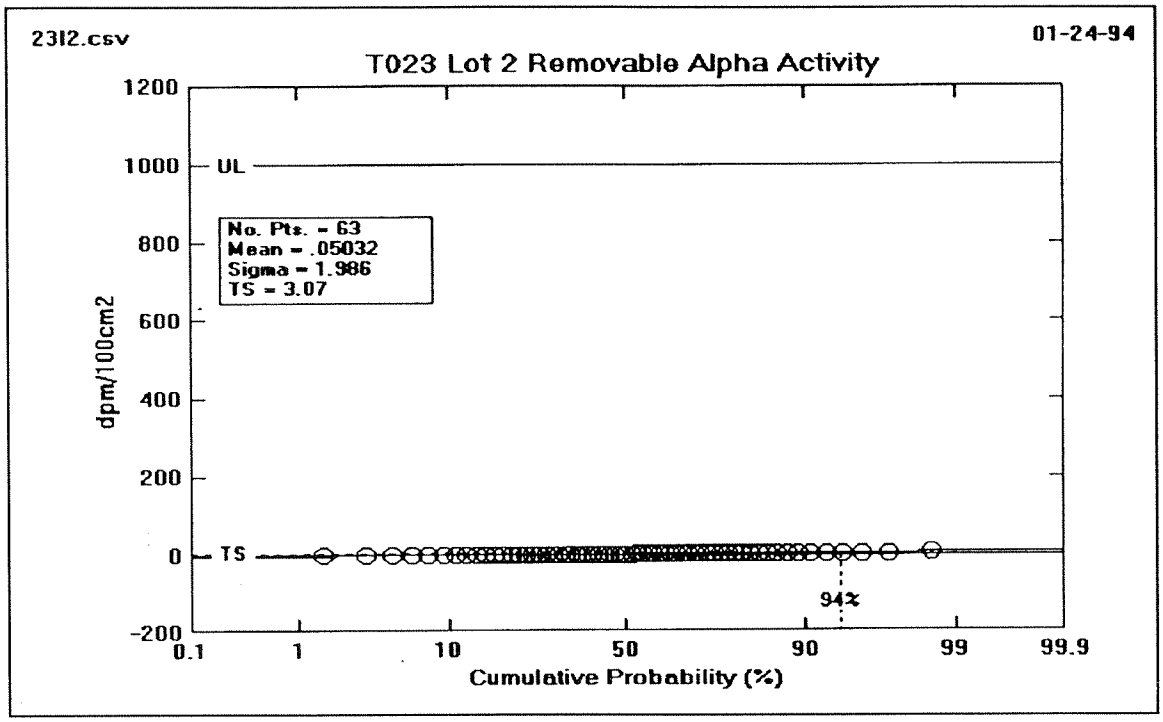


17a.) Scale including Acceptance Limit (UL)

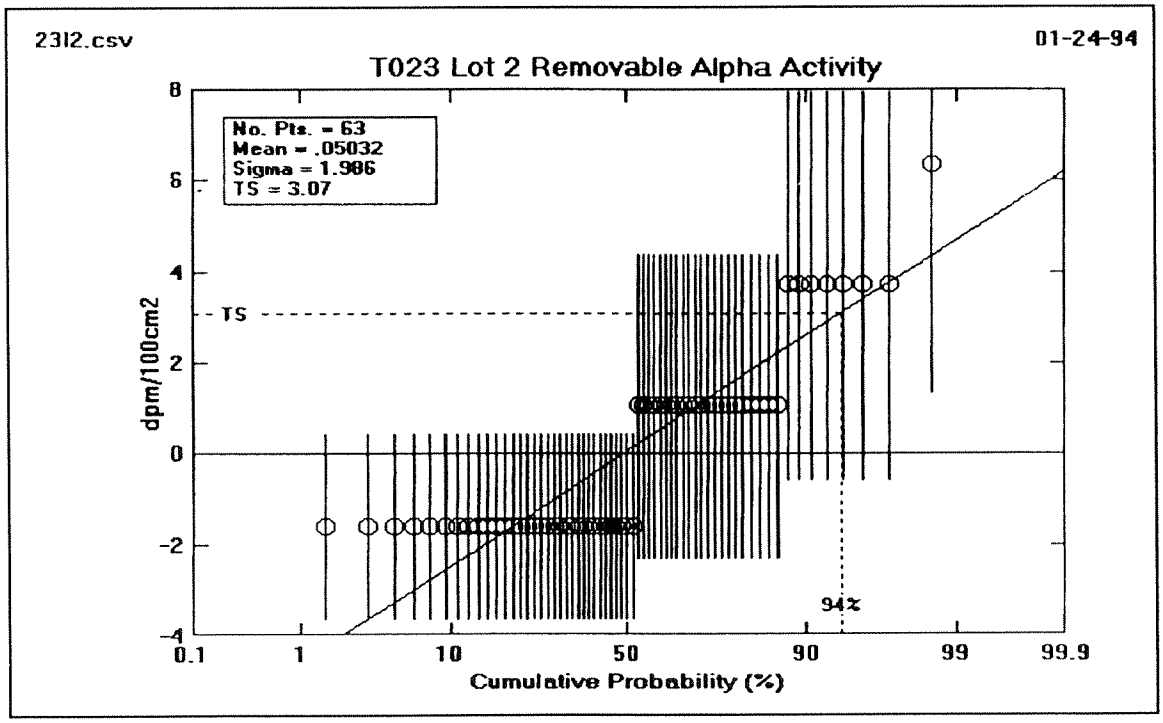


17b.) Expanded Scale

Figure 17: T023 - LOT 2 Removable Beta Activity

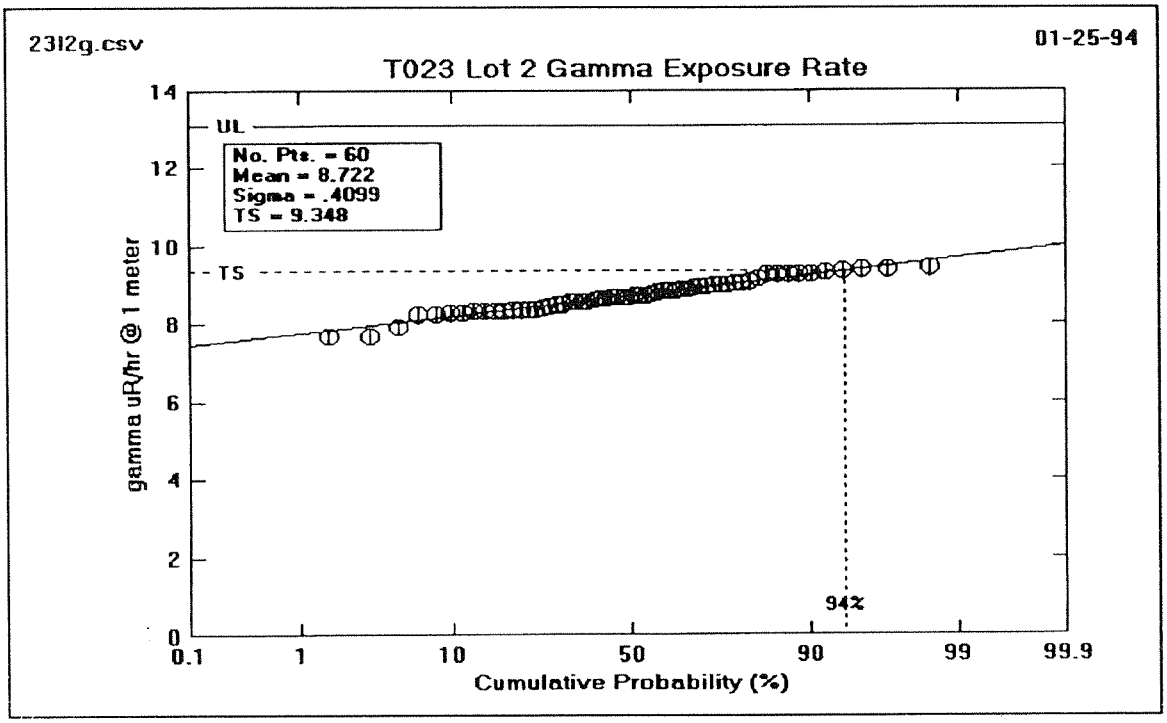


18a.) Scale including Acceptance Limit (UL)



18b.) Expanded Scale

Figure 18: T023 - LOT 2 Removable Alpha Activity



19) Scale including Acceptance Limit (UL)

Figure 19: T023 - LOT 2 Floors Ambient Gamma Exposure Rate

c) Interpretation of Results for Sample Lot 2

Figures 16 through 19 and Table 5 demonstrate that for each applicable acceptance limit (U) from Table 2, the corresponding test statistic (TS) value is less than the U or TS <U. Therefore, the four figures for Sample Lot 2 pass the "sampling inspection by variables" test and are "Accepted" as radiologically clean. Or in other words, the Building 023 Sample Lot 2 survey corresponds to assuring with a 90% confidence that 90% of Sample Lot 2 has residual contamination below 100% (a 90/90/100 test) of the applicable NRC, DOE, and State of California limits described in Table 2.

3. Sample Lot 3

a) Description

Sample Lot 3, located outside Building 023 in the northeast corner, contains the north overhang asphalt area where the fume hood exhausted and the radioactive liquid holdup tank pit and drain pipe excavations on the east side of the building (see Figure 6).

b) Analyses of Sample Lot 3 Data

Raw data measurements for Sample Lot 3 were taken, subtracted for daily instrument background (except for ambient gamma exposure rates) and plotted on a cumulative probability graph as explained previously. For statistical comparisons (using the "sampling inspection by variables" method), similar areas within Sample Lot 3 were combined together and then analyzed for the specific type of radiation measurement made on the surface. Individual raw measurement data and instrument backgrounds are provided in Appendix A.

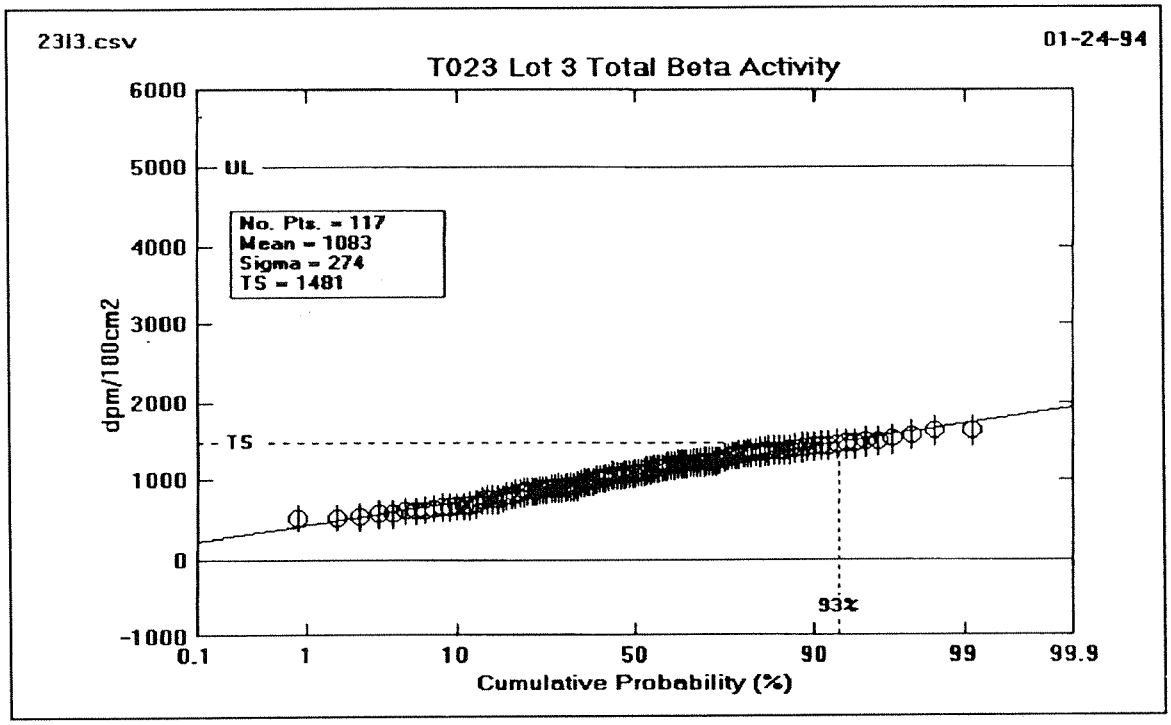
Sample lot 3 results are tabulated in Table 6 for comparing the test statistic ($TS = \bar{x} + ks$) with applicable, established contamination criteria or acceptance limit (U) from Table 2. The corresponding figures for the graphs of each calculated cumulative probability plot are also provided. Individual calculated sample results used as graph data for Sample Lot 3 are provided in Appendix B.

Table 6. Sample Lot 3 Results

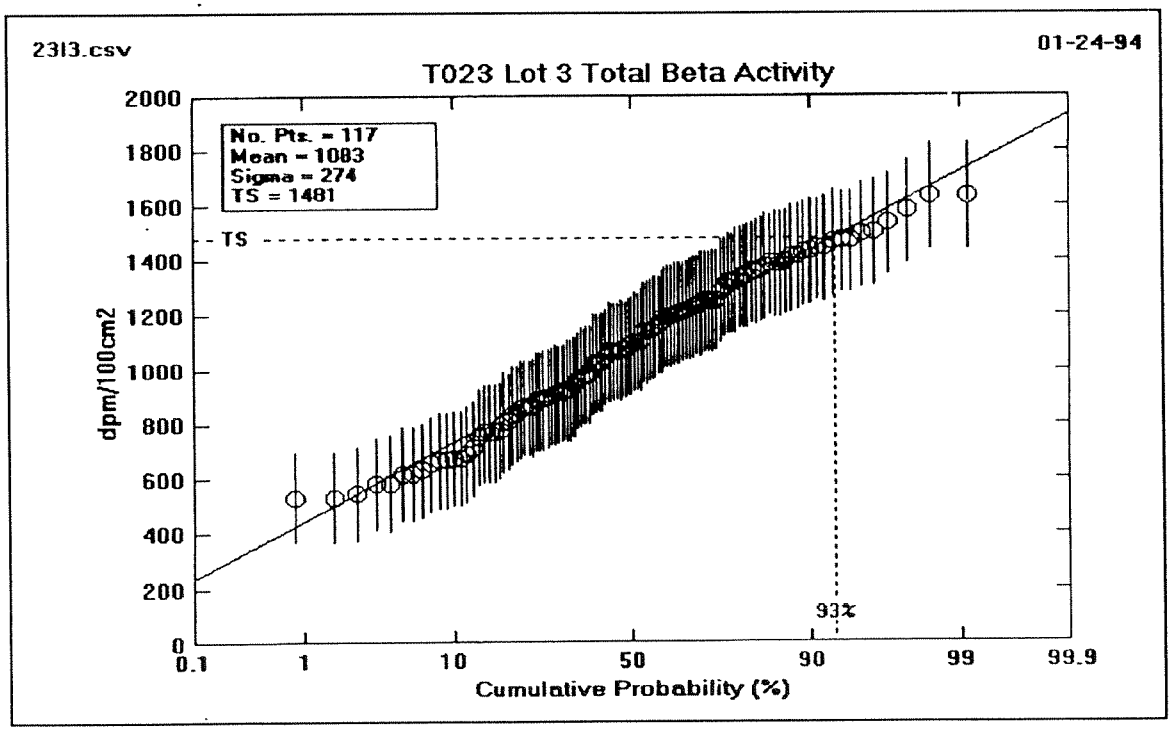
	Calculated Test Statistic (TS = $\overline{x}$ + ks)			
	Total	Removable		Ambient Gamma Exposure Rate
	Beta (dpm/100 cm^2)	Alpha (dpm/100 cm^2)	Beta (dpm/100 cm^2)	
Acceptance Limit (UL)	5000	1000	1000	20.27**
Floors only				14.97 (23)*
Entire area - floors, walls, ceiling, & structure	1481 (20)*	4.57 (22)*	12.68 (21)*	

* Numbers in parenthesis refer to figure numbers.

** The acceptance limit for exterior ambient gamma exposure rate in μR/hr was determined by using the average ambient outdoor background exposure rate for 90 locations in SSFL Area I (15.27 μR/hr) from Reference 14 (page 83) and then adding the acceptance criteria from Table 3 (<5.27 μR/hr above background) to achieve a final exterior ambient gamma exposure rate, in this table are subtracted for daily instrument backgrcund.

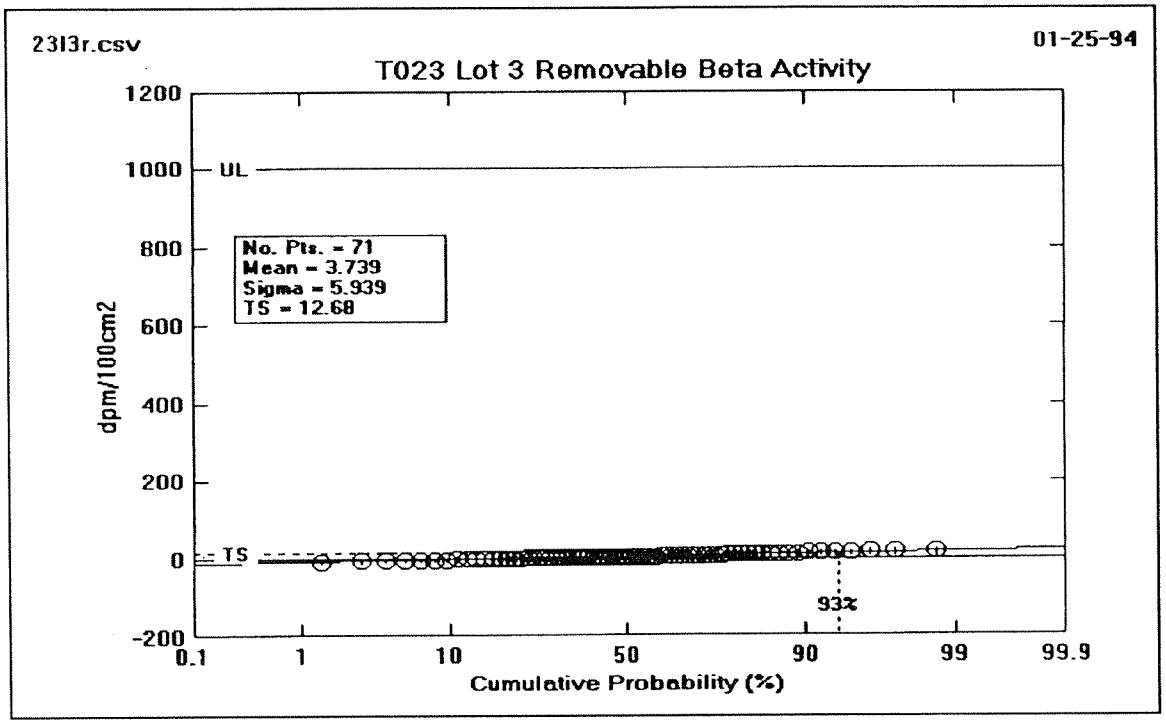


20a.) Scale including Acceptance Limit (UL)

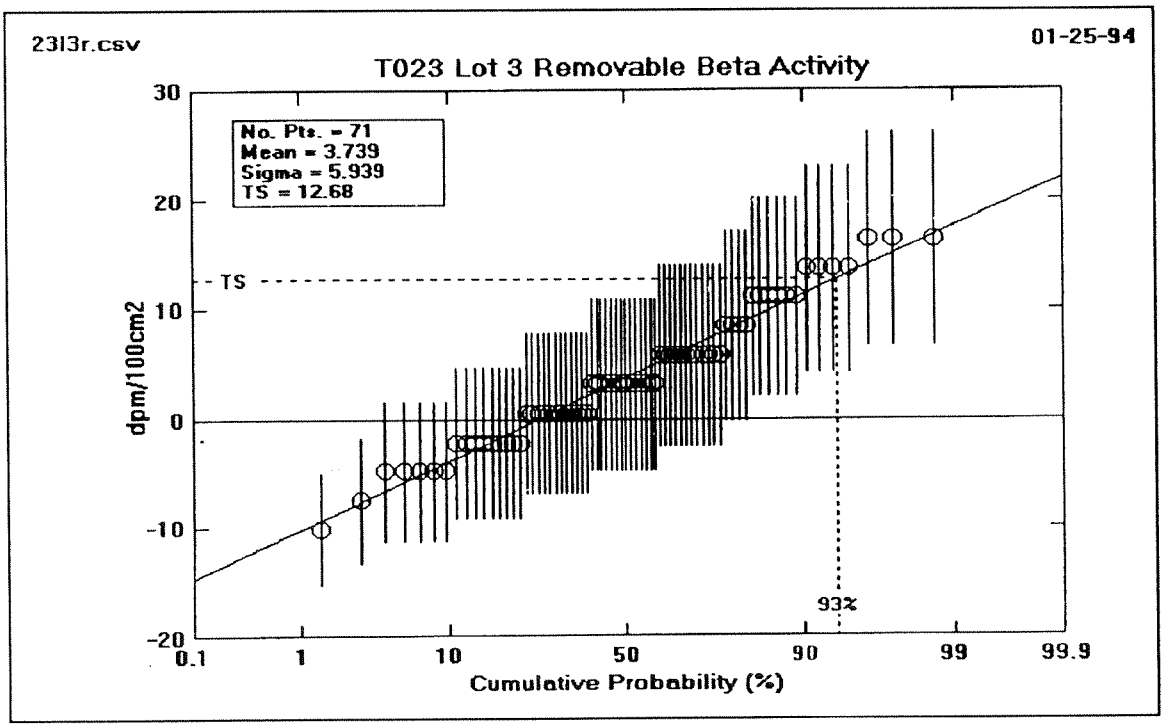


20b.) Expanded Scale

Figure 20: T023 - LOT 3 Total Beta Activity

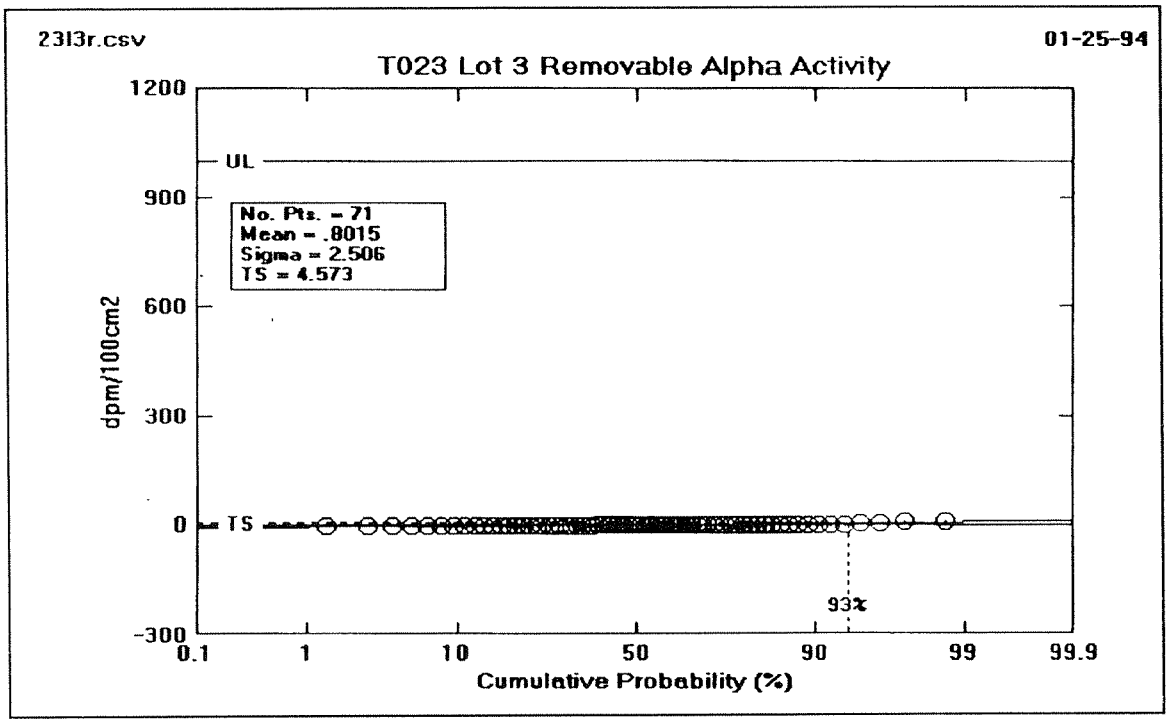


21a.) Scale including Acceptance Limit (UL)

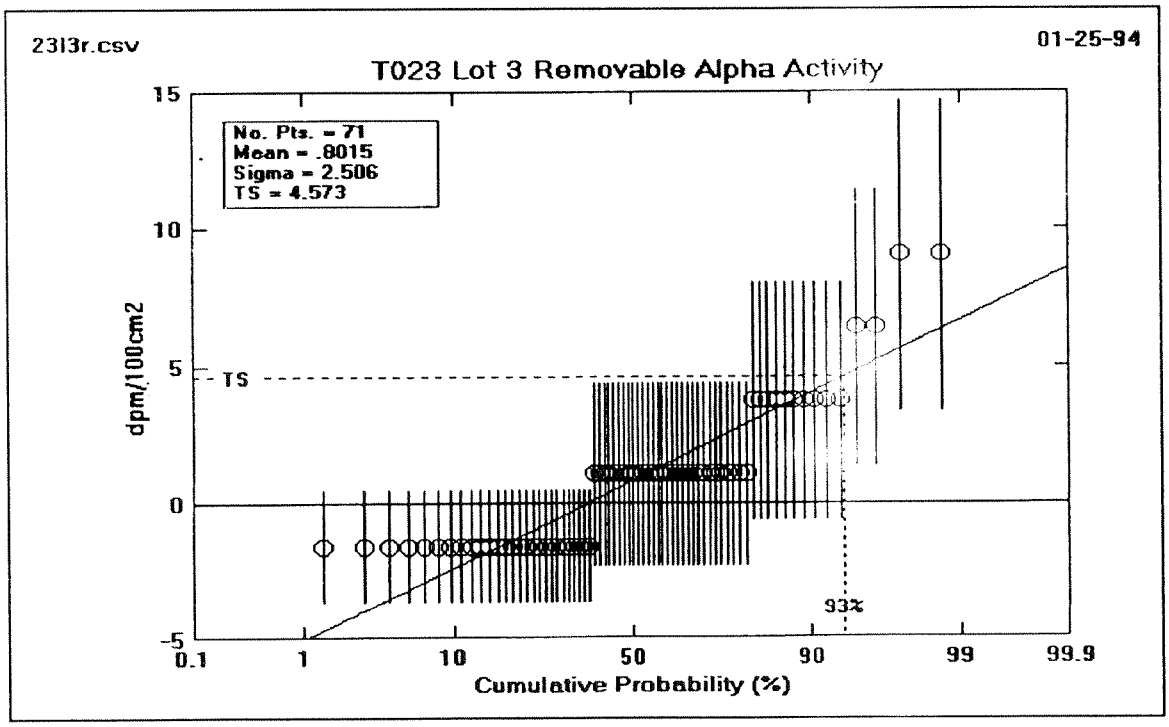


21b.) Expanded Scale

Figure 21: T023 - LOT 3 Removable Beta Activity

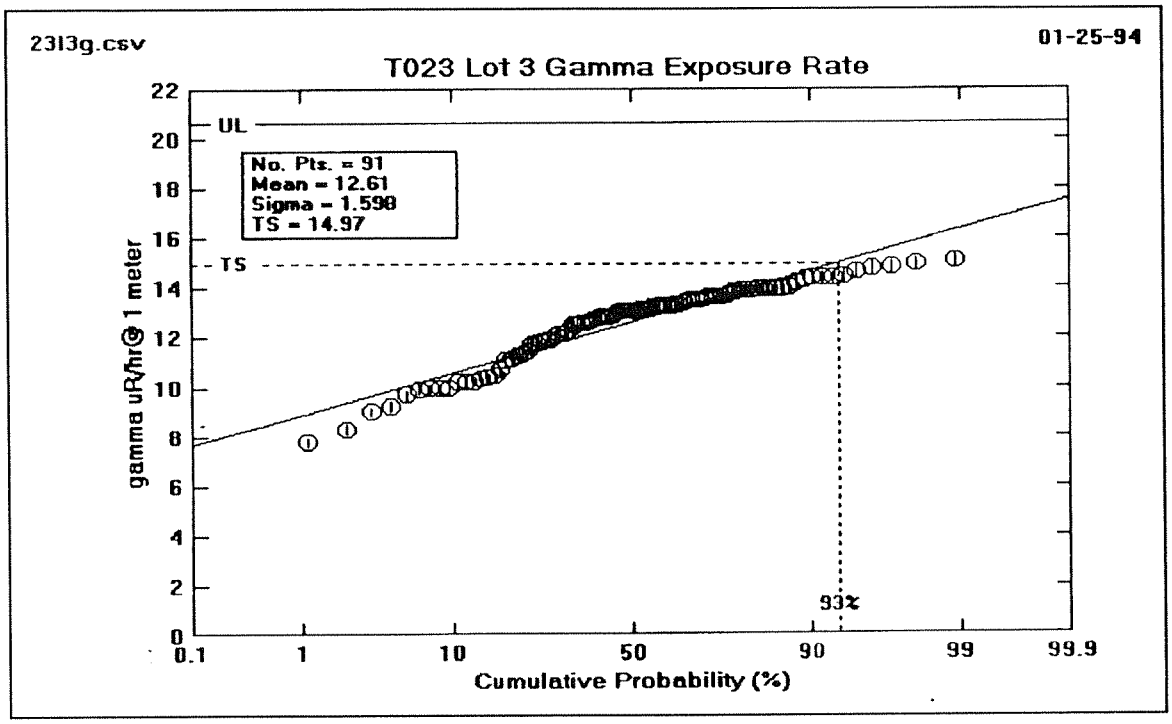


22a.) Scale including Acceptance Limit (UL)



22b.) Expanded Scale

Figure 22: T023 - LOT 3 Removable Alpha Activity



23) Scale including Acceptance Limit (UL)

Figure 23: T023 - LOT 3 Floors Ambient Gamma Exposure Rate

c) Interpretation of Results for Sample Lot 3

Figures 20 through 23 and Table 4 demonstrate that for each applicable acceptance limit (U) from Table 2, the corresponding test statistic (TS) value is less than the U or TS <U. Therefore, the four figures for Sample Lot 3 pass the "sampling inspection by variables" test and are "Accepted" as radiologically clean. Or in other words, the Building 023 Sample Lot 3 survey corresponds to assuring with a 90% confidence that 90% of Sample Lot 3 has residual contamination below 100% (a 90/90/100 test) of the applicable NRC, DOE, and State of California limits described in Table 2.

APPENDIX A

Building 023

Sample Lots 1 through 3

Final Survey Data

BUILDING 023 FINAL SURVEY DATA FOR LOT 1

SAMPLE NAME	GRID NAME	GROSS COUNTS IN 5 MINUTES ALPHA TOTAL	ALPHA MAX	ALPHA REM	BETA TOTAL	BETA MAX	BETA REM	IN 1 MIN GAMMA TOTAL	ALPHA INSTRUMENT BACKG	ALPHA INSTRUMENT EFACT	ALPHA INSTRUMENT AFACT	ALPHA SMEAR BACKG	ALPHA SMEAR EFACT	BETA INSTRUMENT BACKG	BETA INSTRUMENT EFACT	BETA INSTRUMENT AFACT	BETA SMEAR BACKG	BETA SMEAR EFACT	GAMMA BACKG	GAMMA EFACT
Floors - Rm 103	1,1			2	333		4	2079			1.41	0.9	2.6261	233.444	7.652	5	2.7	2.6518		0.00465
Floors - Rm 103	1,2			0	323		9	2138			1.41	0.9	2.6261	233.444	7.652	5	2.7	2.6518		0.00465
Floors - Rm 103	1,3			0	350		7	2008			1.41	0.9	2.6261	233.444	7.652	5	2.7	2.6518		0.00465
Floors - Rm 103	1,4			0	361		5	2009			1.41	0.9	2.6261	233.444	7.652	5	2.7	2.6518		0.00465
Floors - Rm 103	1,5			1	387		4	1948			1.41	0.9	2.6261	233.444	7.652	5	2.7	2.6518		0.00465
Floors - Rm 103	1,6			0	390		3	1866			1.41	0.9	2.6261	233.444	7.652	5	2.7	2.6518		0.00465
Floors - Rm 103	1,7			1	383		11	1678			1.41	0.9	2.6261	233.444	7.652	5	2.7	2.6518		0.00465
Floors - Rm 103	2,1			0	359		13	1934			1.41	0.9	2.6261	233.444	7.652	5	2.7	2.6518		0.00465
Floors - Rm 103	2,2			1	357		8	1981			1.41	0.9	2.6261	233.444	7.652	5	2.7	2.6518		0.00465
Floors - Rm 103	2,3			3	367		10	2075			1.41	0.9	2.6261	233.444	7.652	5	2.7	2.6518		0.00465
Floors - Rm 103 (Pre- Decon)	2,4			1	493	2919	7	1823			1.41	0.9	2.6261	233.444	7.652	5	2.7	2.6518		0.00465
Floors - Rm 103 (Pre- Decon)	2,5			2	486	849	14	1866			1.41	0.9	2.6261	233.444	7.652	5	2.7	2.6518		0.00465
Floors - Rm 103 (Post Decon)	2,4				446						1.41			241.833	7.035	5				0.00465
Floors - Rm 103 (Post Decon)	2,5				439						1.41			241.833	7.035	5				0.00465
Floors - Rm 103	2,6			1	372		13	1760			1.41	0.9	2.6261	233.444	7.652	5	2.7	2.6518		0.00465
Floors - Rm 103	2,7			0	363		10	1718			1.41	0.9	2.6261	233.444	7.652	5	2.7	2.6518		0.00465
Floors - Rm 103	3,1			1	321		6	1809			1.41	0.9	2.6261	238.111	7.711	5	2.7	2.6518		0.00465
Floors - Rm 103	3,2			0	359		4	1775			1.41	0.9	2.6261	238.111	7.711	5	2.7	2.6518		0.00465
Floors - Rm 103	3,3			1	357		8	1773			1.41	0.9	2.6261	238.111	7.711	5	2.7	2.6518		0.00465
Floors - Rm 103	4,2			0	355		4	1743			1.41	0.9	2.6261	238.111	7.711	5	2.7	2.6518		0.00465
Floors - Rm 103	4,3			1	340		5	1592			1.41	0.9	2.6261	238.111	7.711	5	2.7	2.6518		0.00465
Floors - Rm 103	4,4			0	346		7	1563			1.41	0.9	2.6261	238.111	7.711	5	2.7	2.6518		0.00465
Floors - Rm 103	4,5			1	348		2	1628			1.41	0.9	2.6261	238.111	7.711	5	2.7	2.6518		0.00465
Floors - Rm 103	4,6			0	340		6	1549			1.41	0.9	2.6261	238.111	7.711	5	2.7	2.6518		0.00465
Floors - Rm 103	4,7			0	354		12	1628			1.41	0.9	2.6261	238.111	7.711	5	2.7	2.6518		0.00465
Floors - Rm 103	5,1			1	345		10	1736			1.41	0.9	2.6261	238.111	7.711	5	2.7	2.6518		0.00465
Floors - Rm 103	5,2			0	331		4	1771			1.41	0.9	2.6261	238.111	7.711	5	2.7	2.6518		0.00465
Floors - Rm 103	5,3			1	347		7	1678			1.41	0.9	2.6261	238.111	7.711	5	2.7	2.6518		0.00465
Floors - Rm 103	5,4			0	324		33	1689			1.41	0.9	2.6261	238.111	7.711	5	2.7	2.6518		0.00465
Floors - Rm 103	5,5			2	379		2	1728			1.41	0.9	2.6261	238.111	7.711	5	2.7	2.6518		0.00465
Floors - Rm 103	5,6			0	335		4	1589			1.41	0.9	2.6261	238.111	7.711	5	2.7	2.6518		0.00465
Floors - Rm 103	5,7			0	309		5	1566			1.41	0.9	2.6261	238.111	7.711	5	2.7	2.6518		0.00465
Floors - Rm 103	6,1			0	340		5	1673			1.41	0.9	2.6261	238.111	7.711	5	2.7	2.6518		0.00465
Floors - Rm 103	6,2			1	366		6	1711			1.41	0.9	2.6261	238.111	7.711	5	2.7	2.6518		0.00465
Floors - Rm 103	6,3			0	341		5	1642			1.41	0.9	2.6261	238.111	7.711	5	2.7	2.6518		0.00465
Floors - Rm 103	6,4			1	361		11	1602			1.41	0.9	2.6261	238.111	7.711	5	2.7	2.6518		0.00465
Floors - Rm 103	6,5			0	377		9	1623			1.41	0.9	2.6261	238.111	7.711	5	2.7	2.6518		0.00465
Floors - Rm 103	6,6			1	381		8	1647			1.41	0.9	2.6261	238.111	7.711	5	2.7	2.6518		0.00465
Floors - Rm 103	4,1			0	323		6	1720			1.41	0.6	2.6575	255.667	7.232	5	3.8	2.6490		0.00465
Floors - Rm 103	6,7			2	341		6	1657			1.41	0.9	2.6261	238.111	7.711	5	2.7	2.6518		0.00465
Floors - Rm 103	7,1			0	333		5	1471			1.41	0.9	2.6261	238.111	7.711	5	2.7	2.6518		0.00465
Floors - Rm 103	7,2			1	317		6	1449			1.41	0.9	2.6261	238.111	7.711	5	2.7	2.6518		0.00465

SAMPLE NAME	GRID NAME	GROSS COUNTS IN 5 MINUTES ALPHA TOTAL	ALPHA MAX	ALPHA REM	BETA TOTAL	BETA MAX	BETA REM	IN 1 MIN GAMMA TOTAL	ALPHA INSTRUMENT BACKG	ALPHA INSTRUMENT EFACT	ALPHA INSTRUMENT AFACT	ALPHA SMEAR BACKG	ALPHA SMEAR EFACT	BETA INSTRUMENT BACKG	BETA INSTRUMENT EFACT	BETA INSTRUMENT AFACT	BETA SMEAR BACKG	BETA SMEAR EFACT	GAMMA BACKG	GAMMA EFACT
Floors - Rm 103	7,6			1	358		9	1639			1.41	0.9	2.6261	238.111	7.711	5	2.7	2.6518		0.00465
Floors - Rm 103	7,7			0	327		6	1554			1.41	0.9	2.6261	238.111	7.711	5	2.7	2.6518		0.00465
Floors - Rm 103	3,4			1	375		7	1872			1.41	0.6	2.6575	255.667	7.232	5	3.8	2.6490		0.00465
Floors - Rm 103 (Pre- Decon)	3,5			0	750	1301	19	1816			1.41	0.6	2.6575	255.667	7.232	5	3.8	2.6490		0.00465
Floors - Rm 103 (Pre- Decon)	3,6			1	851	2157	18	1736			1.41	0.6	2.6575	255.667	7.232	5	3.8	2.6490		0.00465
Floors - Rm 103 (Post Decon)	3,5				455						1.41			255.667	7.232	5				0.00465
Floors - Rm 103 (Post Decon)	3,6				434						1.41			255.667	7.232	5				0.00465
Floors - Rm 103	3,7			2	395		7	1798			1.41	0.6	2.6575	255.667	7.232	5	3.8	2.6490		0.00465
Floors - Rm 103	7,3			0	320		8	1640			1.41	0.6	2.6575	255.667	7.232	5	3.8	2.6490		0.00465
Floors - Rm 103	7,4			0	418		8	1731			1.41	0.6	2.6575	255.667	7.232	5	3.8	2.6490		0.00465
Floors - Rm 103	7,5			3	511		14	1753			1.41	0.6	2.6575	255.667	7.232	5	3.8	2.6490		0.00465
Wall West - Rm 103	1,1			0	206		5				1.41	0.9	2.6261	239.333	7.760	5	2.7	2.6518		0.00465
Wall West - Rm 103	2,1			1	196		4				1.41	0.9	2.6261	239.333	7.760	5	2.7	2.6518		0.00465
Wall West - Rm 103	3,1			1	193		7				1.41	0.9	2.6261	239.333	7.760	5	2.7	2.6518		0.00465
Wall West - Rm 103	4,1			0	213		5				1.41	0.9	2.6261	255.667	7.232	5	2.7	2.6518		0.00465
Wall West - Rm 103	5,1			0	195		6				1.41	0.9	2.6261	239.333	7.760	5	2.7	2.6518		0.00465
Wall West - Rm 103	6,1			0	190		4				1.41	0.9	2.6261	239.333	7.760	5	2.7	2.6518		0.00465
Wall West - Rm 103	7,1			1	175		5				1.41	0.9	2.6261	239.333	7.760	5	2.7	2.6518		0.00465
Wall West - Rm 103	1,2			1	206		4				1.41	0.9	2.6261	239.333	7.760	5	2.7	2.6518		0.00465
Wall West - Rm 103	2,2			0	191		4				1.41	0.9	2.6261	239.333	7.760	5	2.7	2.6518		0.00465
Wall West - Rm 103	3,2			0	193		6				1.41	0.9	2.6261	239.333	7.760	5	2.7	2.6518		0.00465
Wall West - Rm 103	4,2			0	183		6				1.41	0.9	2.6261	255.667	7.232	5	2.7	2.6518		0.00465
Wall West - Rm 103	5,2			2	172		9				1.41	0.9	2.6261	239.333	7.760	5	2.7	2.6518		0.00465
Wall West - Rm 103	6,2			2	189		6				1.41	0.9	2.6261	239.333	7.760	5	2.7	2.6518		0.00465
Wall West - Rm 103	7,2			0	162		9				1.41	0.9	2.6261	239.333	7.760	5	2.7	2.6518		0.00465
Wall West - Rm 103	1,3			1	170		10				1.41	0.9	2.6261	234.111	7.337	5	2.7	2.6518		0.00465
Wall West - Rm 103	2,3			1	178		7				1.41	0.9	2.6261	234.111	7.337	5	2.7	2.6518		0.00465
Wall West - Rm 103	3,3			2	192		6				1.41	0.9	2.6261	234.111	7.337	5	2.7	2.6518		0.00465
Wall West - Rm 103	4,3			1	186		3				1.41	0.9	2.6261	234.111	7.337	5	2.7	2.6518		0.00465
Wall West - Rm 103	5,3			0	174		4				1.41	0.9	2.6261	234.111	7.337	5	2.7	2.6518		0.00465
Wall West - Rm 103	6,3			2	169		7				1.41	0.9	2.6261	234.111	7.337	5	2.7	2.6518		0.00465
Wall West - Rm 103	7,3			0	162		4				1.41	0.9	2.6261	234.111	7.337	5	2.7	2.6518		0.00465
Wall North - Rm 103	8,1			0	197		2				1.41	0.9	2.6261	244.667	7.524	5	2.7	2.6518		0.00465
Wall North - Rm 103	9,1			0	194		11				1.41	0.9	2.6261	244.667	7.524	5	2.7	2.6518		0.00465
Wall North - Rm 103	10,1			1	190		4				1.41	0.9	2.6261	244.667	7.524	5	2.7	2.6518		0.00465
Wall North - Rm 103	11,1			2	186		9				1.41	0.9	2.6261	255.667	7.232	5	2.7	2.6518		0.00465
Wall North - Rm 103	12,1			0	264		20				1.41	0.9	2.6261	255.667	7.232	5	2.7	2.6518		0.00465
Wall North - Rm 103	13,1			1	184		8				1.41	0.9	2.6261	244.667	7.524	5	2.7	2.6518		0.00465
Wall North - Rm 103	14,1			0	193		2				1.41	0.9	2.6261	244.667	7.524	5	2.7	2.6518		0.00465
Wall North - Rm 103	8,2			0	166		4				1.41	0.9	2.6261	244.667	7.524	5	2.7	2.6518		0.00465
Wall North - Rm 103	9,2			0	172		11				1.41	0.9	2.6261	244.667	7.524	5	2.7	2.6518		0.00465
Wall North - Rm 103	10,2			0	174		6				1.41	0.9	2.6261	244.667	7.524	5	2.7	2.6518		0.00465

SAMPLE NAME	GRID NAME	GROSS COUNTS IN 5 MINUTES ALPHA TOTAL	ALPHA MAX	ALPHA REM	BETA TOTAL	BETA MAX	BETA REM	IN 1 MIN GAMMA TOTAL	ALPHA INSTRUMENT BACKG	ALPHA INSTRUMENT EFACT	ALPHA INSTRUMENT AFACT	ALPHA SMEAR BACKG	ALPHA SMEAR EFACT	BETA INSTRUMENT BACKG	BETA INSTRUMENT EFACT	BETA INSTRUMENT AFACT	BETA SMEAR BACKG	BETA SMEAR EFACT	GAMMA BACKG	GAMMA EFACT
Wall North - Rm 103	11,2			1	192		7				1.41	0.9	2.6261	255.667	7.232	5	2.7	2.6518		0.00465
Wall North - Rm 103	12,2			1	222		15				1.41	0.9	2.6261	255.667	7.232	5	2.7	2.6518		0.00465
Wall North - Rm 103	13,2			2	166		6				1.41	0.9	2.6261	244.667	7.524	5	2.7	2.6518		0.00465
Wall North - Rm 103	14,2			2	180		7				1.41	0.9	2.6261	244.667	7.524	5	2.7	2.6518		0.00465
Wall North - Rm 103	8,3			0	189		3				1.41	0.9	2.6261	234.111	7.337	5	2.7	2.6518		0.00465
Wall North - Rm 103	9,3			0	202		4				1.41	0.9	2.6261	234.111	7.337	5	2.7	2.6518		0.00465
Wall North - Rm 103	10,3			1	190		3				1.41	0.9	2.6261	234.111	7.337	5	2.7	2.6518		0.00465
Wall North - Rm 103	11,3			0	173		4				1.41	0.9	2.6261	234.111	7.337	5	2.7	2.6518		0.00465
Wall North - Rm 103	12,3			0	180		9				1.41	0.9	2.6261	234.111	7.337	5	2.7	2.6518		0.00465
Wall North - Rm 103	13,3			1	169		28				1.41	0.9	2.6261	234.111	7.337	5	2.7	2.6518		0.00465
Wall North - Rm 103	14,3			2	163		6				1.41	0.9	2.6261	234.111	7.337	5	2.7	2.6518		0.00465
Wall South - Rm 103	8,1			1	216		9				1.41	0.9	2.6261	239.333	7.760	5	2.7	2.6518		0.00465
Wall South - Rm 103	9,1			1	204		6				1.41	0.9	2.6261	239.333	7.760	5	2.7	2.6518		0.00465
Wall South - Rm 103	10,1			1	202		5				1.41	0.9	2.6261	239.333	7.760	5	2.7	2.6518		0.00465
Wall South - Rm 103	11,1			1	226		13				1.41	0.9	2.6261	239.333	7.760	5	2.7	2.6518		0.00465
Wall South - Rm 103	12,1			1	238		1				1.41	0.9	2.6261	239.333	7.760	5	2.7	2.6518		0.00465
Wall South - Rm 103	13,1			0	230		6				1.41	0.9	2.6261	239.333	7.760	5	2.7	2.6518		0.00465
Wall South - Rm 103	14,1			2	227		2				1.41	0.9	2.6261	239.333	7.760	5	2.7	2.6518		0.00465
Wall South - Rm 103	15,1+2			1	243		4				1.41	0.9	2.6261	239.333	7.760	5	2.7	2.6518		0.00465
Wall South - Rm 103	8,2			0	192		5				1.41	0.9	2.6261	239.333	7.760	5	2.7	2.6518		0.00465
Wall South - Rm 103	9,2			0	202		7				1.41	0.9	2.6261	239.333	7.760	5	2.7	2.6518		0.00465
Wall South - Rm 103	10,2			1	215		3				1.41	0.9	2.6261	239.333	7.760	5	2.7	2.6518		0.00465
Wall South - Rm 103	11,2			0	212		5				1.41	0.9	2.6261	239.333	7.760	5	2.7	2.6518		0.00465
Wall South - Rm 103	12,2			1	215		7				1.41	0.9	2.6261	239.333	7.760	5	2.7	2.6518		0.00465
Wall South - Rm 103	13,2			0	217		11				1.41	0.9	2.6261	239.333	7.760	5	2.7	2.6518		0.00465
Wall South - Rm 103	14,2			0	214		5				1.41	0.9	2.6261	239.333	7.760	5	2.7	2.6518		0.00465
Wall South - Rm 103	8,3			0	200		8				1.41	0.9	2.6261	234.111	7.337	5	2.7	2.6518		0.00465
Wall South - Rm 103	9,3			1	197		1				1.41	0.9	2.6261	234.111	7.337	5	2.7	2.6518		0.00465
Wall South - Rm 103	10,3			0	205		6				1.41	0.9	2.6261	234.111	7.337	5	2.7	2.6518		0.00465
Wall South - Rm 103	11,3			0	203		4				1.41	0.9	2.6261	234.111	7.337	5	2.7	2.6518		0.00465
Wall South - Rm 103	12,3			1	224		7				1.41	0.9	2.6261	234.111	7.337	5	2.7	2.6518		0.00465
Wall South - Rm 103	13,3			1	231		5				1.41	0.9	2.6261	234.111	7.337	5	2.7	2.6518		0.00465
Wall South - Rm 103	14,3			0	220		10				1.41	0.9	2.6261	234.111	7.337	5	2.7	2.6518		0.00465
Wall South - Rm 103	15,3+4			0	216		5				1.41	0.9	2.6261	234.111	7.337	5	2.7	2.6518		0.00465
Wall South - Rm 103	8,4			0	218		6				1.41	0.9	2.6261	241.889	7.432	5	2.7	2.6518		0.00465
Wall South - Rm 103	9,4			5	211		7				1.41	0.9	2.6261	241.889	7.432	5	2.7	2.6518		0.00465
Wall South - Rm 103	10,4			0	200		6				1.41	0.9	2.6261	241.889	7.432	5	2.7	2.6518		0.00465
Wall South - Rm 103	11,4			1	205		7				1.41	0.9	2.6261	241.889	7.432	5	2.7	2.6518		0.00465
Wall South - Rm 103	12,4			0	201		1				1.41	0.9	2.6261	241.889	7.432	5	2.7	2.6518		0.00465
Wall South - Rm 103	13,4			0	193		7				1.41	0.9	2.6261	241.889	7.432	5	2.7	2.6518		0.00465
Wall South - Rm 103	14,4			3	235		3				1.41	0.9	2.6261	241.889	7.432	5	2.7	2.6518		0.00465
Wall East - Rm 103	1,1			0	222		9				1.41	0.9	2.6261	239.333	7.760	5	2.7	2.6518		0.00465

BUILDING 023 FINAL SURVEY DATA FOR LOT 1

SAMPLE NAME	GRID NAME	GROSS COUNTS IN 5 MINUTES ALPHA TOTAL	ALPHA MAX	ALPHA REM	BETA TOTAL	BETA MAX	BETA REM	IN 1 MIN GAMMA TOTAL	ALPHA INSTRUMENT BACKG	ALPHA INSTRUMENT EFACT	ALPHA INSTRUMENT AFACT	ALPHA SMEAR BACKG	ALPHA SMEAR EFACT	BETA INSTRUMENT BACKG	BETA INSTRUMENT EFACT	BETA INSTRUMENT AFACT	BETA SMEAR BACKG	BETA SMEAR EFACT	GAMMA BACKG	GAMMA EFACT
Wall East - Rm 103	2,1			0	211		10				1.41	0.9	2.6261	239.333	7.760	5	2.7	2.6518		0.00465
Wall East - Rm 103	3,1			0	229		7				1.41	0.9	2.6261	239.333	7.760	5	2.7	2.6518		0.00465
Wall East - Rm 103	4,1			0	220		5				1.41	0.9	2.6261	239.333	7.760	5	2.7	2.6518		0.00465
Wall East - Rm 103	5,1			1	231		6				1.41	0.9	2.6261	239.333	7.760	5	2.7	2.6518		0.00465
Wall East - Rm 103	6,1			0	227		6				1.41	0.9	2.6261	239.333	7.760	5	2.7	2.6518		0.00465
Wall East - Rm 103	7,1			0	237		3				1.41	0.9	2.6261	239.333	7.760	5	2.7	2.6518		0.00465
Wall East - Rm 103	1,2			3	162		8				1.41	0.9	2.6261	244.667	7.524	5	2.7	2.6518		0.00465
Wall East - Rm 103	2,2			2	194		2				1.41	0.9	2.6261	244.667	7.524	5	2.7	2.6518		0.00465
Wall East - Rm 103	3,2			1	209		5				1.41	0.9	2.6261	244.667	7.524	5	2.7	2.6518		0.00465
Wall East - Rm 103	4,2			1	202		10				1.41	0.9	2.6261	244.667	7.524	5	2.7	2.6518		0.00465
Wall East - Rm 103	5,2			1	189		7				1.41	0.9	2.6261	244.667	7.524	5	2.7	2.6518		0.00465
Wall East - Rm 103	6,2			0	193		6				1.41	0.9	2.6261	244.667	7.524	5	2.7	2.6518		0.00465
Wall East - Rm 103	7,2			0	188		14				1.41	0.9	2.6261	244.667	7.524	5	2.7	2.6518		0.00465
Wall East - Rm 103	1,3			0	188		7				1.41	0.9	2.6261	241.889	7.432	5	2.7	2.6518		0.00465
Wall East - Rm 103	2,3			0	177		3				1.41	0.9	2.6261	241.889	7.432	5	2.7	2.6518		0.00465
Wall East - Rm 103	3,3			1	222		7				1.41	0.9	2.6261	241.889	7.432	5	2.7	2.6518		0.00465
Wall East - Rm 103	4,3			0	198		13				1.41	0.9	2.6261	241.889	7.432	5	2.7	2.6518		0.00465
Wall East - Rm 103	5,3			1	203		8				1.41	0.9	2.6261	241.889	7.432	5	2.7	2.6518		0.00465
Wall East - Rm 103	6,3			0	232		10				1.41	0.9	2.6261	241.889	7.432	5	2.7	2.6518		0.00465
Wall East - Rm 103	7,3			0	215		8				1.41	0.9	2.6261	241.889	7.432	5	2.7	2.6518		0.00465
Wall East - Rm 103	1,4			3	215		4				1.41	0.9	2.6261	241.889	7.432	5	2.7	2.6518		0.00465
Wall East - Rm 103	2,4			2	206		7				1.41	0.9	2.6261	241.889	7.432	5	2.7	2.6518		0.00465
Wall East - Rm 103	3,4			0	183		9				1.41	0.9	2.6261	241.889	7.432	5	2.7	2.6518		0.00465
Wall East - Rm 103	4,4			0	204		5				1.41	0.9	2.6261	241.889	7.432	5	2.7	2.6518		0.00465
Wall East - Rm 103	5,4			1	206		15				1.41	0.9	2.6261	241.889	7.432	5	2.7	2.6518		0.00465
Wall East - Rm 103	6,4			0	218		4				1.41	0.9	2.6261	241.889	7.432	5	2.7	2.6518		0.00465
Wall East - Rm 103	7,4			1	201		5				1.41	0.9	2.6261	241.889	7.432	5	2.7	2.6518		0.00465
Wall East - Rm 103	1,5			0	178		8				1.41	0.9	2.6261	241.889	7.432	5	2.7	2.6518		0.00465
Wall East - Rm 103	2,5			0	195		2				1.41	0.9	2.6261	241.889	7.432	5	2.7	2.6518		0.00465
Wall East - Rm 103	3,5			0	200		9				1.41	0.9	2.6261	241.889	7.432	5	2.7	2.6518		0.00465
Wall East - Rm 103	4,5			0	223		11				1.41	0.9	2.6261	241.889	7.432	5	2.7	2.6518		0.00465
Wall East - Rm 103	5,5			1	221		9				1.41	0.9	2.6261	241.889	7.432	5	2.7	2.6518		0.00465

SAMPLE NAME	GRID NAME	GROSS COUNTS IN 5 MINUTES ALPHA TOTAL	ALPHA MAX	ALPHA REM	BETA TOTAL	BETA MAX	BETA REM	GAMMA TOTAL	IN 1 MIN ALPHA INSTRUMENT BACKG	ALPHA INSTRUMENT EFACT	ALPHA INSTRUMENT AFACT	ALPHA SMEAR BACKG	ALPHA SMEAR EFACT	BETA INSTRUMENT BACKG	BETA INSTRUMENT EFACT	BETA INSTRUMENT AFACT	BETA SMEAR BACKG	BETA SMEAR EFACT	GAMMA BACKG	GAMMA EFACT
Floors - Rm 106	1,1			3	301		3	1839			1.41	0.6	2.648	240.00	7.375	5	3.1	2.6553		0.00465
Floors - Rm 106	2,1			0	237		2	1826			1.41	0.6	2.648	240.00	7.375	5	3.1	2.6553		0.00465
Floors - Rm 106	3,1			1	262		6	1795			1.41	0.6	2.648	240.00	7.375	5	3.1	2.6553		0.00465
Floors - Rm 106	4,1			0	271		4	1818			1.41	0.6	2.648	240.00	7.375	5	3.1	2.6553		0.00465
Floors - Rm 106	5,1			2	257		0	1793			1.41	0.6	2.648	240.00	7.375	5	3.1	2.6553		0.00465
Floors - Rm 106	6,1			1	259		3	1789			1.41	0.6	2.648	240.00	7.375	5	3.1	2.6553		0.00465
Floors - Rm 106	7,1			0	253		7	1796			1.41	0.6	2.648	240.00	7.375	5	3.1	2.6553		0.00465
Floors - Rm 106	8,1			1	273		10	1850			1.41	0.6	2.648	240.00	7.375	5	3.1	2.6553		0.00465
Floors - Rm 106	9,1			1	232		5	1708			1.41	0.6	2.648	240.00	7.375	5	3.1	2.6553		0.00465
Floors - Rm 106	1,2			1	292		11	1829			1.41	0.6	2.648	240.00	7.375	5	3.1	2.6553		0.00465
Floors - Rm 106	2,2			1	266		9	1928			1.41	0.6	2.648	240.00	7.375	5	3.1	2.6553		0.00465
Floors - Rm 106	3,2			0	264		6	1947			1.41	0.6	2.648	234.56	7.344	5	3.1	2.6553		0.00465
Floors - Rm 106	4,2			1	255		5	1947			1.41	0.6	2.648	234.56	7.344	5	3.1	2.6553		0.00465
Floors - Rm 106	5,2			0	291		6	1864			1.41	0.6	2.648	234.56	7.344	5	3.1	2.6553		0.00465
Floors - Rm 106	6,2			0	267		4	1868			1.41	0.6	2.648	234.56	7.344	5	3.1	2.6553		0.00465
Floors - Rm 106	7,2			0	253		5	1877			1.41	0.6	2.648	234.56	7.344	5	3.1	2.6553		0.00465
Floors - Rm 106	8,2			0	262		3	1778			1.41	0.6	2.648	240.00	7.375	5	3.1	2.6553		0.00465
Floors - Rm 106	9,2			0	257		3	1783			1.41	0.6	2.648	240.00	7.375	5	3.1	2.6553		0.00465
Floors - Rm 106	1,3			1	263		4	1800			1.41	0.6	2.648	234.56	7.344	5	3.1	2.6553		0.00465
Floors - Rm 106	2,3			0	256		7	2004			1.41	0.6	2.648	234.56	7.344	5	3.1	2.6553		0.00465
Floors - Rm 106	3,3			0	236		7	1993			1.41	0.6	2.648	234.56	7.344	5	3.1	2.6553		0.00465
Floors - Rm 106	4,3			1	254		2	2019			1.41	0.6	2.648	234.56	7.344	5	3.1	2.6553		0.00465
Floors - Rm 106	5,3			0	229		10	2000			1.41	0.6	2.648	234.56	7.344	5	3.1	2.6553		0.00465
Floors - Rm 106	6,3			0	271		2	2017			1.41	0.6	2.648	234.56	7.344	5	3.1	2.6553		0.00465
Floors - Rm 106	7,3			0	253		4	1790			1.41	0.6	2.648	234.56	7.344	5	3.1	2.6553		0.00465
Floors - Rm 106	1,4			0	273		4	1775			1.41	0.6	2.648	234.56	7.344	5	3.1	2.6553		0.00465
Floors - Rm 106	2,4			1	280		21	1938			1.41	0.6	2.648	234.56	7.344	5	3.1	2.6553		0.00465
Floors - Rm 106	3,4			0	246		9	1994			1.41	0.6	2.648	234.56	7.344	5	3.1	2.6553		0.00465
Floors - Rm 106	4,4			1	262		4	1950			1.41	0.6	2.648	234.56	7.344	5	3.1	2.6553		0.00465
Floors - Rm 106	5,4			0	272		5	1933			1.41	0.6	2.648	234.56	7.344	5	3.1	2.6553		0.00465
Floors - Rm 106	6,4			0	246		5	1939			1.41	0.6	2.648	234.56	7.344	5	3.1	2.6553		0.00465
Floors - Rm 106	7,4			0	285		5	1791			1.41	0.6	2.648	234.56	7.344	5	3.1	2.6553		0.00465
Floors - Rm 106	9,4			0	258		5	1652			1.41	0.6	2.648	234.56	7.344	5	3.1	2.6553		0.00465
Floors - Rm 106	1-2,5			1	274		7	1651			1.41	0.6	2.648	234.56	7.344	5	3.1	2.6553		0.00465
Floors - Rm 106	3,5			1	260		4	1993			1.41	0.6	2.648	234.56	7.344	5	3.1	2.6553		0.00465
Floors - Rm 106	4,5			0	257		8	2010			1.41	0.6	2.648	234.56	7.344	5	3.1	2.6553		0.00465
Floors - Rm 106	6,5			2	253		10	1865			1.41	0.6	2.648	234.56	7.344	5	3.1	2.6553		0.00465
Floors - Rm 106	7,5			0	254		9	1808			1.41	0.6	2.648	234.56	7.344	5	3.1	2.6553		0.00465
Floors - Rm 106	9,5			0	254		3	1770			1.41	0.6	2.648	234.56	7.344	5	3.1	2.6553		0.00465

SAMPLE NAME	GRID NAME	GROSS COUNTS IN 5 MINUTES ALPHA TOTAL	ALPHA MAX	ALPHA REM	BETA TOTAL	BETA MAX	BETA REM	IN 1 MIN GAMMA TOTAL	ALPHA INSTRUMENT BACKG	ALPHA INSTRUMENT EFACT	ALPHA INSTRUMENT AFACT	ALPHA SMEAR BACKG	ALPHA SMEAR EFACT	BETA INSTRUMENT BACKG	BETA INSTRUMENT EFACT	BETA INSTRUMENT AFACT	BETA SMEAR BACKG	BETA SMEAR EFACT	GAMMA BACKG	GAMMA EFACT
Floors - Rm 106	1,6			0	239		7	1800			1.41	0.6	2.648	234.56	7.344	5	3.1	2.6553		0.00465
Floors - Rm 106	2,6			0	264		7	1918			1.41	0.6	2.648	234.56	7.344	5	3.1	2.6553		0.00465
Floors - Rm 106	3,6			2	251		2	1907			1.41	0.6	2.648	234.56	7.344	5	3.1	2.6553		0.00465
Floors - Rm 106	4,6			1	261		4	1904			1.41	0.6	2.648	234.56	7.344	5	3.1	2.6553		0.00465
Floors - Rm 106	5,6			2	265		4	1876			1.41	0.6	2.648	234.56	7.344	5	3.1	2.6553		0.00465
Floors - Rm 106	6,6			1	258		4	1886			1.41	0.6	2.648	234.56	7.344	5	3.1	2.6553		0.00465
Floors - Rm 106	7,6			0	265		6	1875			1.41	0.6	2.648	234.56	7.344	5	3.1	2.6553		0.00465
Floors - Rm 106	9,6			2	269		5	1838			1.41	0.6	2.648	234.56	7.344	5	3.1	2.6553		0.00465
Floors - Rm 106	1,7			1	255		6	1908			1.41	0.6	2.648	235.78	7.375	5	3.1	2.6553		0.00465
Floors - Rm 106	2,7			1	230		2	1859			1.41	0.6	2.648	235.78	7.375	5	3.1	2.6553		0.00465
Floors - Rm 106	3,7			2	257		3	1905			1.41	0.6	2.648	235.78	7.375	5	3.1	2.6553		0.00465
Floors - Rm 106	4,7			0	270		8	1929			1.41	0.6	2.648	235.78	7.375	5	3.1	2.6553		0.00465
Floors - Rm 106	5,7			2	280		8	1971			1.41	0.6	2.648	235.78	7.375	5	3.1	2.6553		0.00465
Floors - Rm 106	6,7			1	259		3	1844			1.41	0.6	2.648	235.78	7.375	5	3.1	2.6553		0.00465
Floors - Rm 106	9,7			1	265		6	1903			1.41	0.6	2.648	235.78	7.375	5	3.1	2.6553		0.00465
Floors - Rm 106	F-1			0	266		9	1871			1.41	0.6	2.648	235.78	7.375	5	3.1	2.6553		0.00465
Floors - Rm 106	F-2			0	257		4	2029			1.41	0.6	2.648	235.78	7.375	5	3.1	2.6553		0.00465
Floors - Rm 106	F-3			1	268		2	1993			1.41	0.6	2.648	235.78	7.375	5	3.1	2.6553		0.00465
Floors - Rm 106	1-5,8			0	259		6	1858			1.41	0.6	2.648	235.78	7.375	5	3.1	2.6553		0.00465
Floors - Rm 106	6-7,8			0	260		3	1895			1.41	0.6	2.648	235.78	7.375	5	3.1	2.6553		0.00465
Floors - Rm 106	8-9,8			0	281		3	1845			1.41	0.6	2.648	235.78	7.375	5	3.1	2.6553		0.00465
Wall North - Rm 106	1,1			1	188		9				1.41	0.6	2.648	236.89	7.510	5	3.1	2.6553		0.00465
Wall North - Rm 106	1,2			1	215		1				1.41	0.6	2.648	236.89	7.510	5	3.1	2.6553		0.00465
Wall North - Rm 106	1,3			0	197		5				1.41	0.6	2.648	236.89	7.510	5	3.1	2.6553		0.00465
Wall North - Rm 106	2,3			3	213		2				1.41	0.6	2.648	236.89	7.510	5	3.1	2.6553		0.00465
Wall North - Rm 106	3,3			0	238		4				1.41	0.6	2.648	236.89	7.510	5	3.1	2.6553		0.00465
Wall North - Rm 106	4,2			0	223		8				1.41	0.6	2.648	236.89	7.510	5	3.1	2.6553		0.00465
Wall North - Rm 106	4,3			2	228		6				1.41	0.6	2.648	236.89	7.510	5	3.1	2.6553		0.00465
Wall North - Rm 106	5,2			2	221		6				1.41	0.6	2.648	236.89	7.510	5	3.1	2.6553		0.00465
Wall North - Rm 106	5,3			1	220		4				1.41	0.6	2.648	236.89	7.510	5	3.1	2.6553		0.00465
Wall North - Rm 106	6,1			0	245		3				1.41	0.6	2.648	236.89	7.510	5	3.1	2.6553		0.00465
Wall North - Rm 106	6,2			0	226		7				1.41	0.6	2.648	236.89	7.510	5	3.1	2.6553		0.00465
Wall North - Rm 106	6,3			0	187		8				1.41	0.6	2.648	241.00	7.413	5	3.1	2.6553		0.00465
Wall North - Rm 106	7,1			0	209		5				1.41	0.6	2.648	241.00	7.413	5	3.1	2.6553		0.00465
Wall North - Rm 106	7,2			1	162		11				1.41	0.6	2.648	241.00	7.413	5	3.1	2.6553		0.00465
Wall North - Rm 106	7,3			1	213		4				1.41	0.6	2.648	241.00	7.413	5	3.1	2.6553		0.00465
Wall North - Rm 106	8,1			0	245		4				1.41	0.6	2.648	241.00	7.413	5	3.1	2.6553		0.00465
Wall North - Rm 106	8,2			1	227		2				1.41	0.6	2.648	241.00	7.413	5	3.1	2.6553		0.00465
Wall North - Rm 106	8,3			0	197		5				1.41	0.6	2.648	241.00	7.413	5	3.1	2.6553		0.00465

SAMPLE NAME	GRID NAME	GROSS COUNTS IN 5 MINUTES ALPHA TOTAL	ALPHA MAX	ALPHA REM	BETA TOTAL	BETA MAX	BETA REM	IN 1 MIN GAMMA TOTAL	ALPHA INSTRUMENT BACKG	ALPHA INSTRUMENT EFACT	ALPHA INSTRUMENT AFACT	ALPHA SMEAR BACKG	ALPHA SMEAR EFACT	BETA INSTRUMENT BACKG	BETA INSTRUMENT EFACT	BETA INSTRUMENT AFACT	BETA SMEAR BACKG	BETA SMEAR EFACT	GAMMA BACKG	GAMMA EFACT
Wall North - Rm 106	9,1			0	223		8				1.41	0.6	2.648	241.00	7.413	5	3.1	2.6553		0.00465
Wall North - Rm 106	9,2			0	241		5				1.41	0.6	2.648	241.00	7.413	5	3.1	2.6553		0.00465
Wall North - Rm 106	9,3			1	201		0				1.41	0.6	2.648	241.00	7.413	5	3.1	2.6553		0.00465
Wall East - Rm 106	10,1			0	196		20				1.41	0.6	2.648	241.00	7.413	5	3.1	2.6553		0.00465
Wall East - Rm 106	10,2			0	261		5				1.41	0.6	2.648	241.00	7.413	5	3.1	2.6553		0.00465
Wall East - Rm 106	10,3			0	193		1				1.41	0.6	2.648	241.00	7.413	5	3.1	2.6553		0.00465
Wall East - Rm 106	11,1			0	218		2				1.41	0.6	2.648	241.00	7.413	5	3.1	2.6553		0.00465
Wall East - Rm 106	11,2			0	212		3				1.41	0.6	2.648	241.00	7.413	5	3.1	2.6553		0.00465
Wall East - Rm 106	11,3			1	202		5				1.41	0.6	2.648	241.00	7.413	5	3.1	2.6553		0.00465
Wall East - Rm 106	12,1			1	194		10				1.41	0.6	2.648	244.67	7.196	5	3.1	2.6553		0.00465
Wall East - Rm 106	12,2			1	220		5				1.41	0.6	2.648	244.67	7.196	5	3.1	2.6553		0.00465
Wall East - Rm 106	12,3			0	243		3				1.41	0.6	2.648	244.67	7.196	5	3.1	2.6553		0.00465
Wall East - Rm 106	13,1			2	202		5				1.41	0.6	2.648	244.67	7.196	5	3.1	2.6553		0.00465
Wall East - Rm 106	13,2			1	194		2				1.41	0.6	2.648	244.67	7.196	5	3.1	2.6553		0.00465
Wall East - Rm 106	13,3			0	210		8				1.41	0.6	2.648	244.67	7.196	5	3.1	2.6553		0.00465
Wall East - Rm 106	14,1			0	217		26				1.41	0.6	2.648	244.67	7.196	5	3.1	2.6553		0.00465
Wall East - Rm 106	14,2			0	198		5				1.41	0.6	2.648	244.67	7.196	5	3.1	2.6553		0.00465
Wall East - Rm 106	14,3			0	200		4				1.41	0.6	2.648	244.67	7.196	5	3.1	2.6553		0.00465
Wall East - Rm 106	15,1			1	187		1				1.41	0.6	2.648	244.67	7.196	5	3.1	2.6553		0.00465
Wall East - Rm 106	15,2			0	192		5				1.41	0.6	2.648	244.67	7.196	5	3.1	2.6553		0.00465
Wall East - Rm 106	15,3			0	210		7				1.41	0.6	2.648	244.67	7.196	5	3.1	2.6553		0.00465
Wall East - Rm 106	16,1			3	217		4				1.41	0.6	2.648	244.67	7.196	5	3.1	2.6553		0.00465
Wall East - Rm 106	16,2			0	215		4				1.41	0.6	2.648	244.67	7.196	5	3.1	2.6553		0.00465
Wall East - Rm 106	16,3			1	206		2				1.41	0.6	2.648	244.67	7.196	5	3.1	2.6553		0.00465
Wall East - Rm 106	17,1			2	163		5				1.41	0.6	2.648	244.67	7.196	5	3.1	2.6553		0.00465
Wall East - Rm 106	17,2			1	200		12				1.41	0.6	2.648	244.67	7.196	5	3.1	2.6553		0.00465
Wall East - Rm 106	17,3			1	174		3				1.41	0.6	2.648	244.67	7.196	5	3.1	2.6553		0.00465
Wall South - Rm 106	18,1			3	185		7				1.41	0.6	2.648	244.67	7.196	5	3.1	2.6553		0.00465
Wall South - Rm 106	18,2			0	217		9				1.41	0.6	2.648	244.67	7.196	5	3.1	2.6553		0.00465
Wall South - Rm 106	18,3			1	189		5				1.41	0.6	2.648	244.67	7.196	5	3.1	2.6553		0.00465
Wall South - Rm 106	19,1			0	211		2				1.41	0.6	2.648	244.67	7.196	5	3.1	2.6553		0.00465
Wall South - Rm 106	19,2			0	207		8				1.41	0.6	2.648	244.67	7.196	5	3.1	2.6553		0.00465
Wall South - Rm 106	19,3			0	207		8				1.41	0.6	2.648	244.67	7.196	5	3.1	2.6553		0.00465
Wall South - Rm 106	20,1			1	257		6				1.41	0.6	2.648	244.67	7.196	5	3.1	2.6553		0.00465
Wall South - Rm 106	20,2			1	243		2				1.41	0.6	2.648	244.67	7.196	5	3.1	2.6553		0.00465
Wall South - Rm 106	20,3			0	193		6				1.41	0.6	2.648	244.67	7.196	5	3.1	2.6553		0.00465
Wall South - Rm 106	21,1			0	178		2				1.41	0.6	2.648	244.67	7.196	5	3.1	2.6553		0.00465
Wall South - Rm 106	21,2			0	240		4				1.41	0.6	2.648	244.67	7.196	5	3.1	2.6553		0.00465
Wall South - Rm 106	21,3			0	222		5				1.41	0.6	2.648	244.67	7.196	5	3.1	2.6553		0.00465

SAMPLE NAME	GRID NAME	GROSS COUNTS IN 5 MINUTES ALPHA TOTAL	ALPHA MAX	ALPHA REM	BETA TOTAL	BETA MAX	BETA REM	IN 1 MIN GAMMA TOTAL	ALPHA INSTRUMENT BACKG	ALPHA INSTRUMENT EFACT	ALPHA INSTRUMENT AFACT	ALPHA SMEAR BACKG	ALPHA SMEAR EFACT	BETA INSTRUMENT BACKG	BETA INSTRUMENT EFACT	BETA INSTRUMENT AFACT	BETA SMEAR BACKG	BETA SMEAR EFACT	GAMMA BACKG	GAMMA EFACT
Wall South - Rm 106	22,1			1	223		2				1.41	0.6	2.648	244.67	7.196	5	3.1	2.6553		0.00465
Wall South - Rm 106	22,2			1	241		3				1.41	0.6	2.648	244.67	7.196	5	3.1	2.6553		0.00465
Wall South - Rm 106	22,3			4	203		1				1.41	0.6	2.648	244.67	7.196	5	3.1	2.6553		0.00465
Wall South - Rm 106	23,1			0	212		3				1.41	0.6	2.648	244.67	7.196	5	3.1	2.6553		0.00465
Wall South - Rm 106	23,2			0	196		3				1.41	0.6	2.648	244.67	7.196	5	3.1	2.6553		0.00465
Wall South - Rm 106	23,3			0	178		2				1.41	0.6	2.648	244.67	7.196	5	3.1	2.6553		0.00465
Wall South - Rm 106	24,1			1	234		3				1.41	0.6	2.648	244.67	7.196	5	3.1	2.6553		0.00465
Wall South - Rm 106	24,2			0	232		3				1.41	0.6	2.648	244.67	7.196	5	3.1	2.6553		0.00465
Wall South - Rm 106	24,3			0	247		6				1.41	0.6	2.648	244.67	7.196	5	3.1	2.6553		0.00465
Wall South - Rm 106	25,1			3	247		17				1.41	0.6	2.648	244.67	7.196	5	3.1	2.6553		0.00465
Wall South - Rm 106	25,2			1	211		10				1.41	0.6	2.648	244.67	7.196	5	3.1	2.6553		0.00465
Wall South - Rm 106	25,3			0	197		3				1.41	0.6	2.648	244.67	7.196	5	3.1	2.6553		0.00465
Wall South - Rm 106	26,1			0	221		5				1.41	0.6	2.648	244.67	7.196	5	3.1	2.6553		0.00465
Wall South - Rm 106	26,2			2	232		7				1.41	0.6	2.648	244.67	7.196	5	3.1	2.6553		0.00465
Wall South - Rm 106	26,3			0	214		8				1.41	0.6	2.648	244.67	7.196	5	3.1	2.6553		0.00465
Ceiling - Rm 106	1,1			3	237		4				1.41	0.6	2.657	241.22	7.000	5	3.8	2.6490		0.00465
Ceiling - Rm 106	1,2			0	237		8				1.41	0.6	2.657	241.22	7.000	5	3.8	2.6490		0.00465
Ceiling - Rm 106	1,3			0	287		5				1.41	0.6	2.657	241.22	7.000	5	3.8	2.6490		0.00465
Ceiling - Rm 106	1,4			1	268		6				1.41	0.6	2.657	241.22	7.000	5	3.8	2.6490		0.00465
Ceiling - Rm 106	1,5			0	272		0				1.41	0.6	2.657	241.22	7.000	5	3.8	2.6490		0.00465
Ceiling - Rm 106	1,6			0	264		10				1.41	0.6	2.657	241.22	7.000	5	3.8	2.6490		0.00465
Ceiling - Rm 106	1,7			1	216		5				1.41	0.6	2.657	241.22	7.000	5	3.8	2.6490		0.00465
Ceiling - Rm 106	1,8			1	218		7				1.41	0.6	2.657	241.22	7.000	5	3.8	2.6490		0.00465
Ceiling - Rm 106	1,9			1	238		2				1.41	0.6	2.657	241.22	7.000	5	3.8	2.6490		0.00465
Ceiling - Rm 106	2,1			0	242		9				1.41	0.6	2.657	241.22	7.000	5	3.8	2.6490		0.00465
Ceiling - Rm 106	2,2			3	275		2				1.41	0.6	2.657	241.22	7.000	5	3.8	2.6490		0.00465
Ceiling - Rm 106	2,3			0	258		6				1.41	0.6	2.657	241.22	7.000	5	3.8	2.6490		0.00465
Ceiling - Rm 106	2,4			1	232		2				1.41	0.6	2.657	241.22	7.000	5	3.8	2.6490		0.00465
Ceiling - Rm 106	2,5			0	260		5				1.41	0.6	2.657	241.22	7.000	5	3.8	2.6490		0.00465
Ceiling - Rm 106	2,6			1	265		3				1.41	0.6	2.657	241.22	7.000	5	3.8	2.6490		0.00465
Ceiling - Rm 106	2,7			1	248		2				1.41	0.6	2.657	241.22	7.000	5	3.8	2.6490		0.00465
Ceiling - Rm 106	2,8			1	264		5				1.41	0.6	2.657	241.22	7.000	5	3.8	2.6490		0.00465
Ceiling - Rm 106	2,9			0	271		3				1.41	0.6	2.657	241.22	7.000	5	3.8	2.6490		0.00465
Ceiling - Rm 106	3,1			0	277		6				1.41	0.6	2.657	241.22	7.000	5	3.8	2.6490		0.00465
Ceiling - Rm 106	3,2			1	260		3				1.41	0.6	2.657	241.22	7.000	5	3.8	2.6490		0.00465
Ceiling - Rm 106	3,3			1	286		6				1.41	0.6	2.657	241.22	7.000	5	3.8	2.6490		0.00465
Ceiling - Rm 106	3,4			0	284		3				1.41	0.6	2.657	246.44	7.135	5	3.8	2.6490		0.00465
Ceiling - Rm 106	3,5			0	287		8				1.41	0.6	2.657	246.44	7.135	5	3.8	2.6490		0.00465
Ceiling - Rm 106	3,6			0	283		4				1.41	0.6	2.657	246.44	7.135	5	3.8	2.6490		0.00465

SAMPLE NAME	GRID NAME	GROSS COUNTS IN 5 MINUTES ALPHA TOTAL	ALPHA MAX	ALPHA REM	BETA TOTAL	BETA MAX	BETA REM	IN 1 MIN GAMMA TOTAL	ALPHA INSTRUMENT BACKG	ALPHA INSTRUMENT EFACT	ALPHA INSTRUMENT AFACT	ALPHA SMEAR BACKG	ALPHA SMEAR EFACT	BETA INSTRUMENT BACKG	BETA INSTRUMENT EFACT	BETA INSTRUMENT AFACT	BETA SMEAR BACKG	BETA SMEAR EFACT	GAMMA BACKG	GAMMA EFACT
Ceiling - Rm 106	3,7			0	285		9				1.41	0.6	2.657	246.44	7.135	5	3.8	2.6490		0.00465
Ceiling - Rm 106	3,8			1	276		7				1.41	0.6	2.657	246.44	7.135	5	3.8	2.6490		0.00465
Ceiling - Rm 106	3,9			0	301		4				1.41	0.6	2.657	246.44	7.135	5	3.8	2.6490		0.00465
Ceiling - Rm 106	4,1			1	260		2				1.41	0.6	2.657	246.44	7.135	5	3.8	2.6490		0.00465
Ceiling - Rm 106	4,2			0	262		8				1.41	0.6	2.657	246.44	7.135	5	3.8	2.6490		0.00465
Ceiling - Rm 106	4,3			1	243		3				1.41	0.6	2.657	246.44	7.135	5	3.8	2.6490		0.00465
Ceiling - Rm 106	4,4			0	259		6				1.41	0.6	2.657	246.44	7.135	5	3.8	2.6490		0.00465
Ceiling - Rm 106	4,5			1	261		7				1.41	0.6	2.657	246.44	7.135	5	3.8	2.6490		0.00465
Ceiling - Rm 106	4,6			0	236		2				1.41	0.6	2.657	246.44	7.135	5	3.8	2.6490		0.00465
Ceiling - Rm 106	4,7			3	278		8				1.41	0.6	2.657	246.44	7.135	5	3.8	2.6490		0.00465
Ceiling - Rm 106	4,8			0	268		3				1.41	0.6	2.657	246.44	7.135	5	3.8	2.6490		0.00465
Ceiling - Rm 106	4,9			0	298		10				1.41	0.6	2.657	246.44	7.135	5	3.8	2.6490		0.00465
Ceiling - Rm 106	5,1			0	305		6				1.41	0.6	2.657	246.44	7.135	5	3.8	2.6490		0.00465
Ceiling - Rm 106	5,2			2	276		4				1.41	0.6	2.657	246.44	7.135	5	3.8	2.6490		0.00465
Ceiling - Rm 106	5,3			0	259		3				1.41	0.6	2.657	246.44	7.135	5	3.8	2.6490		0.00465
Ceiling - Rm 106	5,4			0	272		11				1.41	0.6	2.657	246.44	7.135	5	3.8	2.6490		0.00465
Ceiling - Rm 106	5,5			0	252		5				1.41	0.6	2.657	246.44	7.135	5	3.8	2.6490		0.00465
Ceiling - Rm 106	5,6			2	264		8				1.41	0.6	2.657	246.44	7.135	5	3.8	2.6490		0.00465
Ceiling - Rm 106	5,7			0	255		7				1.41	0.6	2.657	246.44	7.135	5	3.8	2.6490		0.00465
Ceiling - Rm 106	5,8			1	260		2				1.41	0.6	2.657	246.44	7.135	5	3.8	2.6490		0.00465
Ceiling - Rm 106	5,9			0	259		4				1.41	0.6	2.657	246.44	7.135	5	3.8	2.6490		0.00465
Ceiling - Rm 106	6,1			1	290		2				1.41	0.6	2.657	246.44	7.135	5	3.8	2.6490		0.00465
Ceiling - Rm 106	6,2			0	237		4				1.41	0.6	2.657	246.44	7.135	5	3.8	2.6490		0.00465
Ceiling - Rm 106	6,3			1	284		8				1.41	0.6	2.657	246.44	7.135	5	3.8	2.6490		0.00465
Ceiling - Rm 106	6,4			0	260		4				1.41	0.6	2.657	246.44	7.135	5	3.8	2.6490		0.00465
Ceiling - Rm 106	6,5			2	278		30				1.41	0.6	2.657	246.44	7.135	5	3.8	2.6490		0.00465
Ceiling - Rm 106	6,6			3	275		9				1.41	0.6	2.657	246.44	7.135	5	3.8	2.6490		0.00465
Ceiling - Rm 106	6,7			1	272		7				1.41	0.6	2.657	246.44	7.135	5	3.8	2.6490		0.00465
Ceiling - Rm 106	6,8			0	231		6				1.41	0.6	2.657	246.44	7.135	5	3.8	2.6490		0.00465
Ceiling - Rm 106	6,9			1	249		4				1.41	0.6	2.657	246.44	7.135	5	3.8	2.6490		0.00465
Ceiling - Rm 106	7,1			2	254		3				1.41	0.6	2.657	246.44	7.135	5	3.8	2.6490		0.00465
Ceiling - Rm 106	7,2			0	238		3				1.41	0.6	2.657	237.89	7.324	5	3.8	2.6490		0.00465
Ceiling - Rm 106	7,3			0	260		4				1.41	0.6	2.657	237.89	7.324	5	3.8	2.6490		0.00465
Ceiling - Rm 106	7,4			0	229		3				1.41	0.6	2.657	237.89	7.324	5	3.8	2.6490		0.00465
Ceiling - Rm 106	7,5			1	283		7				1.41	0.6	2.657	237.89	7.324	5	3.8	2.6490		0.00465
Ceiling - Rm 106	7,6			1	267		4				1.41	0.6	2.657	237.89	7.324	5	3.8	2.6490		0.00465
Ceiling - Rm 106	7,7			0	269		6				1.41	0.6	2.657	237.89	7.324	5	3.8	2.6490		0.00465
Ceiling - Rm 106	7,8			0	273		3				1.41	0.6	2.657	237.89	7.324	5	3.8	2.6490		0.00465
Ceiling - Rm 106	7,9			0	264		5				1.41	0.6	2.657	237.89	7.324	5	3.8	2.6490		0.00465

		GROSS COUNTS IN 5 MINUTES						IN 1 MIN	ALPHA					BETA					GAMMA	
SAMPLE	GRID	ALPHA			BETA			GAMMA	INSTRUMENT			SMEAR		INSTRUMENT			SMEAR			
NAME	NAME	TOTAL	MAX	REM	TOTAL	MAX	REM	TOTAL	BACKG	EFACT	AFACT	BACKG	EFACT	BACKG	EFACT	AFACT	BACKG	EFACT	BACKG	EFACT
Ceiling - Rm 106	8,1			0	277		1				1.41	0.6	2.657	237.89	7.324	5	3.8	2.6490		0.00465
Ceiling - Rm 106	8,2			0	245		4				1.41	0.6	2.657	237.89	7.324	5	3.8	2.6490		0.00465
Ceiling - Rm 106	8,3			0	278		3				1.41	0.6	2.657	237.89	7.324	5	3.8	2.6490		0.00465
Ceiling - Rm 106	8,4			1	284		6				1.41	0.6	2.657	237.89	7.324	5	3.8	2.6490		0.00465
Ceiling - Rm 106	8,5			1	290		3				1.41	0.6	2.657	237.89	7.324	5	3.8	2.6490		0.00465
Ceiling - Rm 106	8,6			1	221		3				1.41	0.6	2.657	237.89	7.324	5	3.8	2.6490		0.00465
Ceiling - Rm 106	8,7			3	291		5				1.41	0.6	2.657	237.89	7.324	5	3.8	2.6490		0.00465
Ceiling - Rm 106	8,8			1	238		3				1.41	0.6	2.657	237.89	7.324	5	3.8	2.6490		0.00465
Ceiling - Rm 106	8,9			1	231		3				1.41	0.6	2.657	237.89	7.324	5	3.8	2.6490		0.00465
Ceiling - Rm 106	Cn-1			1	259		5				1.41	0.6	2.657	237.89	7.324	5	3.8	2.6490		0.00465
Ceiling - Rm 106	Cn-2			0	283		6				1.41	0.6	2.657	237.89	7.324	5	3.8	2.6490		0.00465
Ceiling - Rm 106	Cn-3			1	250		11				1.41	0.6	2.657	237.89	7.324	5	3.8	2.6490		0.00465
Ceiling - Rm 106	Cn-4			2	256		2				1.41	0.6	2.657	237.89	7.324	5	3.8	2.6490		0.00465
Ceiling - Rm 106	Cn-5			1	283		3				1.41	0.6	2.657	237.89	7.324	5	3.8	2.6490		0.00465
Ceiling - Rm 106	Ce-1			1	255		9				1.41	0.6	2.657	237.89	7.324	5	3.8	2.6490		0.00465
Ceiling - Rm 106	Ce-2			0	253		7				1.41	0.6	2.657	237.89	7.324	5	3.8	2.6490		0.00465

BUILDING 023 - FINAL SURVEY DATA FOR LOT3

SAMPLE NAME	GRID NAME	GROSS COUNTS IN 5 MINUTES ALPHA TOTAL	ALPHA MAX	ALPHA REM	BETA TOTAL	BETA MAX	BETA REM	IN 1 MIN GAMMA TOTAL	ALPHA INSTRUMENT BACKG	ALPHA INSTRUMENT EFACT	ALPHA INSTRUMENT AFACT	ALPHA SMEAR BACKG	ALPHA SMEAR EFACT	BETA INSTRUMENT BACKG	BETA INSTRUMENT EFACT	BETA INSTRUMENT AFACT	BETA SMEAR BACKG	BETA SMEAR EFACT	GAMMA BACKG	GAMMA EFACT
Outside - Ground (North)	1,1			1	379		6	2145			1.41	0.6	2.6575	253.333	7.351	5	3.8	2.6490		0.00465
Outside - Ground (North)	1,2			0	417		5	2404			1.41	0.6	2.6575	253.333	7.351	5	3.8	2.6490		0.00465
Outside - Ground (North)	1,3			1	379		3	2566			1.41	0.6	2.6575	253.333	7.351	5	3.8	2.6490		0.00465
Outside - Ground (North)	1,4				404			2694			1.41			253.333	7.351	5				0.00465
Outside - Ground (North)	1,5				441			2973			1.41			253.333	7.351	5				0.00465
Outside - Ground (North)	2,1			0	392		5	2192			1.41	0.6	2.6575	253.333	7.351	5	3.8	2.6490		0.00465
Outside - Ground (North)	2,2			0	381		0	2470			1.41	0.6	2.6575	253.333	7.351	5	3.8	2.6490		0.00465
Outside - Ground (North)	2,3			3	377		4	2719			1.41	0.6	2.6575	253.333	7.351	5	3.8	2.6490		0.00465
Outside - Ground (North)	2,4				398			2810			1.41			253.333	7.351	5				0.00465
Outside - Ground (North)	2,5				413			2768			1.41			253.333	7.351	5				0.00465
Outside - Ground (North)	3,1			0	333		5	1939			1.41	0.6	2.6575	253.333	7.351	5	3.8	2.6490		0.00465
Outside - Ground (North)	3,2			1	410		2	2443			1.41	0.6	2.6575	253.333	7.351	5	3.8	2.6490		0.00465
Outside - Ground (North)	3,3			0	434		1	2617			1.41	0.6	2.6575	253.333	7.351	5	3.8	2.6490		0.00465
Outside - Ground (North)	3,4				445			2763			1.41			253.333	7.351	5				0.00465
Outside - Ground (North)	3,5				422			2849			1.41			253.333	7.351	5				0.00465
Outside - Ground (North)	4,1			0	374		9	2204			1.41	0.6	2.6575	253.333	7.351	5	3.8	2.6490		0.00465
Outside - Ground (North)	4,2			0	363		9	2545			1.41	0.6	2.6575	253.333	7.351	5	3.8	2.6490		0.00465
Outside - Ground (North)	4,3			3	408		6	2765			1.41	0.6	2.6575	253.333	7.351	5	3.8	2.6490		0.00465
Outside - Ground (North)	4,4				454			2803			1.41			255.556	7.216	5				0.00465
Outside - Ground (North)	4,5				434			2910			1.41			255.556	7.216	5				0.00465
Outside - Ground (North)	5,1			0	378		5	2247			1.41	0.6	2.6575	255.556	7.216	5	3.8	2.6490		0.00465
Outside - Ground (North)	5,2			0	390		3	2382			1.41	0.6	2.6575	255.556	7.216	5	3.8	2.6490		0.00465
Outside - Ground (North)	5,3			0	425		3	2816			1.41	0.6	2.6575	255.556	7.216	5	3.8	2.6490		0.00465
Outside - Ground (North)	5,4				452			2898			1.41			255.556	7.216	5				0.00465
Outside - Ground (North)	5,5				449			2986			1.41			255.556	7.216	5				0.00465
Outside - Ground (North)	6,1			1	371		5	2220			1.41	0.6	2.6575	255.556	7.216	5	3.8	2.6490		0.00465
Outside - Ground (North)	6,2			1	448		4	2539			1.41	0.6	2.6575	255.556	7.216	5	3.8	2.6490		0.00465
Outside - Ground (North)	6,3			0	378		10	2813			1.41	0.6	2.6575	255.556	7.216	5	3.8	2.6490		0.00465
Outside - Ground (North)	6,4				442			2818			1.41			255.556	7.216	5				0.00465
Outside - Ground (North)	6,5				456			2948			1.41			255.556	7.216	5				0.00465
Outside - Ground (North)	7,1			2	375		4	2085			1.41	0.6	2.6575	255.556	7.216	5	3.8	2.6490		0.00465
Outside - Ground (North)	7,2			1	413		6	2430			1.41	0.6	2.6575	255.556	7.216	5	3.8	2.6490		0.00465
Outside - Ground (North)	7,3			0	421		6	2845			1.41	0.6	2.6575	255.556	7.216	5	3.8	2.6490		0.00465
Outside - Ground (North)	7,4				426			2821			1.41			255.556	7.216	5				0.00465
Outside - Ground (North)	7,5				423			2907			1.41			255.556	7.216	5				0.00465
Outside - Ground (North)	8,1			1	414		5	1789			1.41	0.6	2.6575	255.556	7.216	5	3.8	2.6490		0.00465
Outside - Ground (North)	8,2			0	374		9	2136			1.41	0.6	2.6575	255.556	7.216	5	3.8	2.6490		0.00465
Outside - Ground (North)	8,3			2	428		7	2616			1.41	0.6	2.6575	255.556	7.216	5	3.8	2.6490		0.00465
Outside - Ground (North)	8,4				444			2854			1.41			255.556	7.216	5				0.00465
Outside - Ground (North)	8,5				448			3008			1.41			255.556	7.216	5				0.00465
Outside - Ground (North)	9,1			1	403		2	1670			1.41	0.6	2.6575	255.556	7.216	5	3.8	2.6490		0.00465

BUILDING 023 - FINAL SURVEY DATA FOR LOT3

SAMPLE NAME	GRID NAME	GROSS COUNTS IN 5 MINUTES ALPHA TOTAL	ALPHA MAX	ALPHA REM	BETA TOTAL	BETA MAX	BETA REM	GAMMA TOTAL	IN 1 MIN ALPHA INSTRUMENT BACKG	ALPHA INSTRUMENT EFACT	ALPHA INSTRUMENT AFACT	ALPHA SMEAR BACKG	ALPHA SMEAR EFACT	BETA INSTRUMENT BACKG	BETA INSTRUMENT EFACT	BETA INSTRUMENT AFACT	BETA SMEAR BACKG	BETA SMEAR EFACT	GAMMA BACKG	GAMMA EFACT
Outside - Ground (North)	9,2			2	421		8	2204			1.41	0.6	2.6575	255.556	7.216	5	3.8	2.6490		0.00465
Outside - Ground (North)	9,3			1	416		10	2713			1.41	0.6	2.6575	255.556	7.216	5	3.8	2.6490		0.00465
Outside - Ground (North)	9,4				397			2868			1.41			255.556	7.216	5				0.00465
Outside - Ground (North)	9,5				463			2928			1.41			255.556	7.216	5				0.00465
Outside - Ground (North)	10,1			0	398		2	2298			1.41	0.6	2.6575	255.556	7.216	5	3.8	2.6490		0.00465
Outside - Ground (North)	10,2			0	404		5	2523			1.41	0.6	2.6575	255.556	7.216	5	3.8	2.6490		0.00465
Outside - Ground (North)	10,3			1	429		2	2867			1.41	0.6	2.6575	255.556	7.216	5	3.8	2.6490		0.00465
Outside - Ground (North)	10,4				459			2917			1.41			255.556	7.216	5				0.00465
Outside - Ground (North)	10,5				445			3116			1.41			255.556	7.216	5				0.00465
Outside - Ground (North)	11,1				381			2597			1.41			250.222	6.979	5				0.00465
Outside - Ground (North)	11,2				400			2749			1.41			250.222	6.979	5				0.00465
Outside - Ground (North)	11,3				482			2826			1.41			255.556	7.216	5				0.00465
Outside - Ground (North)	11,4				423			2972			1.41			255.556	7.216	5				0.00465
Outside - Ground (North)	11,5				464			2993			1.41			255.556	7.216	5				0.00465
Outside - Ground (North)	12,1				403			2689			1.41			250.222	6.979	5				0.00465
Outside - Ground (North)	12,2				406			2760			1.41			250.222	6.979	5				0.00465
Outside - Ground (North)	12,3				408			2937			1.41			250.222	6.979	5				0.00465
Outside - Ground (North)	12,4				470			2937			1.41			250.222	6.979	5				0.00465
Outside - Ground (North)	12,5				442			2999			1.41			250.222	6.979	5				0.00465
Outside - Ground (North)	13,1				461			2825			1.41			250.222	6.979	5				0.00465
Outside - Ground (North)	13,2				461			2842			1.41			250.222	6.979	5				0.00465
Outside - Ground (North)	13,3				437			2997			1.41			250.222	6.979	5				0.00465
Outside - Ground (North)	13,4				439			3193			1.41			250.222	6.979	5				0.00465
Outside - Ground (North)	14,1				425			2887			1.41			250.222	6.979	5				0.00465
Outside - Ground (North)	14,2				397			3080			1.41			250.222	6.979	5				0.00465
Outside - Ground (North)	14,3				457			3052			1.41			250.222	6.979	5				0.00465
Outside - Ground (North)	15,1				449			2995			1.41			250.222	6.979	5				0.00465
Outside - Ground (North)	15,2				427			3011			1.41			250.222	6.979	5				0.00465
Outside - Ground (East)	1,1			1	404		8	2556			1.41	0.6	2.6575	250.222	6.979	5	3.8	2.6490		0.00465
Outside - Ground (East)	1,2			4	404		3	2643			1.41	0.6	2.6575	250.222	6.979	5	3.8	2.6490		0.00465
Outside - Ground (East)	1,3			0	417		4	2728			1.41	0.6	2.6575	250.222	6.979	5	3.8	2.6490		0.00465
Outside - Ground (East)	1,4			0	439		7	2856			1.41	0.6	2.6575	250.222	6.979	5	3.8	2.6490		0.00465
Outside - Ground (East)	2,1			0	424		5	2713			1.41	0.6	2.6575	250.222	6.979	5	3.8	2.6490		0.00465
Outside - Ground (East)	2,2			2	384		6	2933			1.41	0.6	2.6575	255.556	7.081	5	3.8	2.6490		0.00465
Outside - Ground (East)	2,3			0	457		4	2852			1.41	0.6	2.6575	255.556	7.081	5	3.8	2.6490		0.00465
Outside - Ground (East)	2,4			0	479		3	2904			1.41	0.6	2.6575	255.556	7.081	5	3.8	2.6490		0.00465
Outside - Ground (East)	3,1			0	411		7	2998			1.41	0.6	2.6575	255.556	7.081	5	3.8	2.6490		0.00465
Outside - Ground (East)	3,2			0	424		5	2820			1.41	0.6	2.6575	255.556	7.081	5	3.8	2.6490		0.00465
Outside - Ground (East)	3,3			4	406		5	2988			1.41	0.6	2.6575	255.556	7.081	5	3.8	2.6490		0.00465
Outside - Ground (East)	3,4			1	364		6	3090			1.41	0.6	2.6575	255.556	7.081	5	3.8	2.6490		0.00465
Outside - Pit Floor	1,1			1	432		4	3240			1.41	0.6	2.6575	255.556	7.081	5	3.8	2.6490		0.00465

SAMPLE NAME	GRID NAME	GROSS COUNTS IN 5 MINUTES ALPHA TOTAL	ALPHA MAX	ALPHA REM	BETA TOTAL	BETA MAX	BETA REM	IN 1 MIN GAMMA TOTAL	ALPHA INSTRUMENT BACKG	ALPHA INSTRUMENT EFACT	ALPHA INSTRUMENT AFACT	ALPHA SMEAR BACKG	ALPHA SMEAR EFACT	BETA INSTRUMENT BACKG	BETA INSTRUMENT EFACT	BETA INSTRUMENT AFACT	BETA SMEAR BACKG	BETA SMEAR EFACT	GAMMA BACKG	GAMMA EFACT
Outside - Pit Floor	1,2			2	394		10	3096			1.41	0.6	2.6575	255.556	7.081	5	3.8	2.6490		0.00465
Outside - Pit Floor	1,3			2	432		7	3182			1.41	0.6	2.6575	255.556	7.081	5	3.8	2.6490		0.00465
Outside - Pit Floor	2,1			1	391		8	3220			1.41	0.6	2.6575	255.556	7.081	5	3.8	2.6490		0.00465
Outside - Pit Floor	2,2			1	445		4	3090			1.41	0.6	2.6575	255.556	7.081	5	3.8	2.6490		0.00465
Outside - Pit Floor	2,3			1	394		5	3151			1.41	0.6	2.6575	255.556	7.081	5	3.8	2.6490		0.00465
Outside - Ground (Near Pit)	G-1				445			2141			1.41			250.222	6.979	5				0.00465
Outside - Ground (Near Pit)	G-2				430			1989			1.41			250.222	6.979	5				0.00465
Outside - Ground (Near Pit)	G-3				382			2143			1.41			250.222	6.979	5				0.00465
Outside - Ground (Near Pit)	G-4				390			2233			1.41			250.222	6.979	5				0.00465
Outside - Pit Wall West	1,1			1	383		6				1.41	0.6	2.6575	255.556	7.081	5	3.8	2.6490		0.00465
Outside - Pit Wall West	1,2			1	356		6				1.41	0.6	2.6575	255.556	7.081	5	3.8	2.6490		0.00465
Outside - Pit Wall West	2,1			1	353		6				1.41	0.6	2.6575	255.556	7.081	5	3.8	2.6490		0.00465
Outside - Pit Wall West	2,2			2	350		5				1.41	0.6	2.6575	255.556	7.081	5	3.8	2.6490		0.00465
Outside - Pit Wall West	3,1			0	351		3				1.41	0.6	2.6575	255.556	7.081	5	3.8	2.6490		0.00465
Outside - Pit Wall West	3,2			0	343		4				1.41	0.6	2.6575	255.556	7.081	5	3.8	2.6490		0.00465
Outside - Pit Wall North	4,1			2	364		6				1.41	0.6	2.6575	255.556	7.081	5	3.8	2.6490		0.00465
Outside - Pit Wall North	4,2			0	351		4				1.41	0.6	2.6575	255.556	7.081	5	3.8	2.6490		0.00465
Outside - Pit Wall North	5,1			0	382		5				1.41	0.6	2.6575	255.556	7.081	5	3.8	2.6490		0.00465
Outside - Pit Wall North	5,2			1	333		8				1.41	0.6	2.6575	255.556	7.081	5	3.8	2.6490		0.00465
Outside - Pit Wall East	6,1			1	350		4				1.41	0.6	2.6575	255.556	7.081	5	3.8	2.6490		0.00465
Outside - Pit Wall East	6,2			1	348		9				1.41	0.6	2.6575	255.556	7.081	5	3.8	2.6490		0.00465
Outside - Pit Wall East	7,1			1	362		6				1.41	0.6	2.6575	255.556	7.081	5	3.8	2.6490		0.00465
Outside - Pit Wall East	7,2			1	345		4				1.41	0.6	2.6575	255.556	7.081	5	3.8	2.6490		0.00465
Outside - Pit Wall East	8,1			1	365		3				1.41	0.6	2.6575	255.556	7.081	5	3.8	2.6490		0.00465
Outside - Pit Wall East	8,2			2	343		5				1.41	0.6	2.6575	255.556	7.081	5	3.8	2.6490		0.00465
Outside - Pit Wall South	9,1			1	338		3				1.41	0.6	2.6575	255.556	7.081	5	3.8	2.6490		0.00465
Outside - Pit Wall South	9,2			1	364		8				1.41	0.6	2.6575	255.556	7.081	5	3.8	2.6490		0.00465
Outside - Pit Wall South	10,1			1	365		8				1.41	0.6	2.6575	243.667	7.096	5	3.8	2.6490		0.00465
Outside - Pit Wall South	10,2			1	319		2				1.41	0.6	2.6575	243.667	7.096	5	3.8	2.6490		0.00465
Outside - Pit Wall South	11,1			0	365		4				1.41	0.6	2.6575	243.667	7.096	5	3.8	2.6490		0.00465
Outside - Pit Wall South	11,2			2	358		3				1.41	0.6	2.6575	243.667	7.096	5	3.8	2.6490		0.00465
Outside - Pit Wall South	12,1-2			1	362		6				1.41	0.6	2.6575	243.667	7.096	5	3.8	2.6490		0.00465

APPENDIX B

Building 023

Sample Lots 1 through 3

Final Survey Results

BUILDING 023 FINAL SURVEY RESULTS FOR LOT 1

SAMPLE NAME	GRID NAME	ALPHA (DPM/100CM2)						BETA (DPM/100CM2)						GAMMA (uR/hr)	
		TOTAL	STD DEV	MAX	STD DEV	REM	STD DEV	TOTAL	STD DEV	MAX	STD DEV	REM	STD DEV	TOTAL	STD DEV
Floors - Rm 103	1,1	0.00	0.00			2.89	4.47	761.85	182.13			3.45	6.86	9.67	0.21
Floors - Rm 103	1,2	0.00	0.00			-2.36	2.49	685.32	180.52			16.71	9.07	9.94	0.22
Floors - Rm 103	1,3	0.00	0.00			-2.36	2.49	891.94	184.84			11.40	8.26	9.34	0.21
Floors - Rm 103	1,4	0.00	0.00			-2.36	2.49	976.12	186.58			6.10	7.36	9.34	0.21
Floors - Rm 103	1,5	0.00	0.00			0.26	3.62	1175.08	190.61			3.45	6.86	9.06	0.21
Floors - Rm 103	1,6	0.00	0.00			-2.36	2.49	1198.04	191.07			0.80	6.33	8.68	0.20
Floors - Rm 103	1,7	0.00	0.00			0.26	3.62	1144.47	190.00			22.01	9.82	7.80	0.19
Floors - Rm 103	2,1	0.00	0.00			-2.36	2.49	960.81	186.26			27.31	10.51	8.99	0.20
Floors - Rm 103	2,2	0.00	0.00			0.26	3.62	945.51	185.95			14.05	8.67	9.21	0.21
Floors - Rm 103	2,3	0.00	0.00			5.51	5.19	1022.03	187.52			19.36	9.45	9.65	0.21
Floors - Rm 103 (Pre- Decon)	2,4	0.00	0.00			0.26	3.62	1986.25	206.25	20551.21	429.66	11.40	8.26	8.48	0.20
Floors - Rm 103 (Pre- Decon)	2,5	0.00	0.00			2.89	4.47	1932.68	205.26	4710.54	251.77	29.97	10.84	8.68	0.20
Floors - Rm 103 (Post Decon)	2,4							1436.36	184.51						
Floors - Rm 103 (Post Decon)	2,5							1387.12	183.57						
Floors - Rm 103	2,6	0.00	0.00			0.26	3.62	1060.30	188.30			27.31	10.51	8.18	0.20
Floors - Rm 103	2,7	0.00	0.00			-2.36	2.49	991.42	186.89			19.36	9.45	7.99	0.19
Floors - Rm 103	3,1	0.00	0.00			0.26	3.62	639.12	182.32			8.75	7.82	8.41	0.20
Floors - Rm 103	3,2	0.00	0.00			-2.36	2.49	932.12	188.41			3.45	6.86	8.25	0.20
Floors - Rm 103	3,3	0.00	0.00			0.26	3.62	916.70	188.10			14.05	8.67	8.24	0.20
Floors - Rm 103	4,2	0.00	0.00			-2.36	2.49	901.27	187.78			3.45	6.86	8.10	0.19
Floors - Rm 103	4,3	0.00	0.00			0.26	3.62	785.62	185.39			6.10	7.36	7.40	0.19
Floors - Rm 103	4,4	0.00	0.00			-2.36	2.49	831.88	186.35			11.40	8.26	7.27	0.18
Floors - Rm 103	4,5	0.00	0.00			0.26	3.62	847.30	186.67			-1.86	5.75	7.57	0.19
Floors - Rm 103	4,6	0.00	0.00			-2.36	2.49	785.62	185.39			8.75	7.82	7.20	0.18
Floors - Rm 103	4,7	0.00	0.00			-2.36	2.49	893.56	187.62			24.66	10.17	7.57	0.19
Floors - Rm 103	5,1	0.00	0.00			0.26	3.62	824.17	186.19			19.36	9.45	8.07	0.19
Floors - Rm 103	5,2	0.00	0.00			-2.36	2.49	716.22	183.94			3.45	6.86	8.24	0.20
Floors - Rm 103	5,3	0.00	0.00			0.26	3.62	839.59	186.51			11.40	8.26	7.80	0.19
Floors - Rm 103	5,4	0.00	0.00			-2.36	2.49	662.25	182.81			80.35	15.84	7.85	0.19
Floors - Rm 103	5,5	0.00	0.00			2.89	4.47	1086.33	191.54			-1.86	5.75	8.04	0.19
Floors - Rm 103	5,6	0.00	0.00			-2.36	2.49	747.06	184.59			3.45	6.86	7.39	0.19
Floors - Rm 103	5,7	0.00	0.00			-2.36	2.49	546.59	180.35			6.10	7.36	7.28	0.18
Floors - Rm 103	6,1	0.00	0.00			-2.36	2.49	785.62	185.39			6.10	7.36	7.78	0.19
Floors - Rm 103	6,2	0.00	0.00			0.26	3.62	986.09	189.51			8.75	7.82	7.96	0.19
Floors - Rm 103	6,3	0.00	0.00			-2.36	2.49	793.33	185.55			6.10	7.36	7.64	0.19
Floors - Rm 103	6,4	0.00	0.00			0.26	3.62	947.54	188.73			22.01	9.82	7.45	0.19
Floors - Rm 103	6,5	0.00	0.00			-2.36	2.49	1070.91	191.23			16.71	9.07	7.55	0.19

SAMPLE NAME	GRID NAME	ALPHA (DPM/100CM2)						BETA (DPM/100CM2)						GAMMA (uR/hr)	
		TOTAL	STD DEV	MAX	STD DEV	REM	STD DEV	TOTAL	STD DEV	MAX	STD DEV	REM	STD DEV	TOTAL	STD DEV
Floors - Rm 103	6,6	0.00	0.00			0.26	3.62	1101.75	191.85			14.05	8.67	7.66	0.19
Floors - Rm 103	4,1	0.00	0.00			-1.59	2.06	486.93	173.96			5.83	8.29	8.00	0.19
Floors - Rm 103	6,7	0.00	0.00			2.89	4.47	793.33	185.55			8.75	7.82	7.71	0.19
Floors - Rm 103	7,1	0.00	0.00			-2.36	2.49	731.64	184.27			6.10	7.36	6.84	0.18
Floors - Rm 103	7,2	0.00	0.00			0.26	3.62	608.27	181.67			8.75	7.82	6.74	0.18
Floors - Rm 103	7,6	0.00	0.00			0.26	3.62	924.41	188.26			16.71	9.07	7.62	0.19
Floors - Rm 103	7,7	0.00	0.00			-2.36	2.49	685.38	183.29			8.75	7.82	7.23	0.18
Floors - Rm 103	3,4	0.00	0.00			1.06	3.36	862.97	181.61			8.48	8.71	8.70	0.20
Floors - Rm 103 (Pre- Decon)	3,5	0.00	0.00			-1.59	2.06	3574.80	229.33	7559.39	285.32	40.26	12.65	8.44	0.20
Floors - Rm 103 (Pre- Decon)	3,6	0.00	0.00			1.06	3.36	4305.19	240.57	13749.61	355.21	37.62	12.37	8.07	0.19
Floors - Rm 103 (Post Decon)	3,5							1441.49	192.78						
Floors - Rm 103 (Post Decon)	3,6							1289.63	189.91						
Floors - Rm 103	3,7	0.00	0.00			3.72	4.29	1007.60	184.46			8.48	8.71	8.36	0.20
Floors - Rm 103	7,3	0.00	0.00			-1.59	2.06	465.23	173.51			11.13	9.10	7.63	0.19
Floors - Rm 103	7,4	0.00	0.00			-1.59	2.06	1173.92	187.70			11.13	9.10	8.05	0.19
Floors - Rm 103	7,5	0.00	0.00			6.38	5.04	1846.46	200.23			27.02	11.18	8.15	0.19
Wall West - Rm 103	1,1	0.00	0.00			-2.36	2.49	-258.68	163.77			6.10	7.36		
Wall West - Rm 103	2,1	0.00	0.00			0.26	3.62	-336.28	161.92			3.45	6.86		
Wall West - Rm 103	3,1	0.00	0.00			0.26	3.62	-359.57	161.36			11.40	8.26		
Wall West - Rm 103	4,1	0.00	0.00			-2.36	2.49	-308.55	156.55			6.10	7.36		
Wall West - Rm 103	5,1	0.00	0.00			-2.36	2.49	-344.04	161.73			8.75	7.82		
Wall West - Rm 103	6,1	0.00	0.00			-2.36	2.49	-382.85	160.80			3.45	6.86		
Wall West - Rm 103	7,1	0.00	0.00			0.26	3.62	-499.25	157.96			6.10	7.36		
Wall West - Rm 103	1,2	0.00	0.00			0.26	3.62	-258.68	163.77			3.45	6.86		
Wall West - Rm 103	2,2	0.00	0.00			-2.36	2.49	-375.09	160.99			3.45	6.86		
Wall West - Rm 103	3,2	0.00	0.00			-2.36	2.49	-359.57	161.36			8.75	7.82		
Wall West - Rm 103	4,2	0.00	0.00			-2.36	2.49	-525.49	151.46			8.75	7.82		
Wall West - Rm 103	5,2	0.00	0.00			2.89	4.47	-522.53	157.39			16.71	9.07		
Wall West - Rm 103	6,2	0.00	0.00			2.89	4.47	-390.61	160.61			8.75	7.82		
Wall West - Rm 103	7,2	0.00	0.00			-2.36	2.49	-600.14	155.47			16.71	9.07		
Wall West - Rm 103	1,3	0.00	0.00			0.26	3.62	-470.40	147.50			19.36	9.45		
Wall West - Rm 103	2,3	0.00	0.00			0.26	3.62	-411.70	148.95			11.40	8.26		
Wall West - Rm 103	3,3	0.00	0.00			2.89	4.47	-308.98	151.46			8.75	7.82		
Wall West - Rm 103	4,3	0.00	0.00			0.26	3.62	-353.01	150.39			0.80	6.33		
Wall West - Rm 103	5,3	0.00	0.00			-2.36	2.49	-441.05	148.23			3.45	6.86		
Wall West - Rm 103	6,3	0.00	0.00			2.89	4.47	-477.74	147.32			11.40	8.26		
Wall West - Rm 103	7,3	0.00	0.00			-2.36	2.49	-529.10	146.03			3.45	6.86		

BUILDING 023 FINAL SURVEY RESULTS FOR LOT 1

SAMPLE NAME	GRID NAME	ALPHA (DPM/100CM2)						BETA (DPM/100CM2)						GAMMA (uR/hr)	
		TOTAL	STD DEV	MAX	STD DEV	REM	STD DEV	TOTAL	STD DEV	MAX	STD DEV	REM	STD DEV	TOTAL	STD DEV
Wall North - Rm 103	8,1	0.00	0.00			-2.36	2.49	-358.66	158.13			-1.86	5.75		
Wall North - Rm 103	9,1	0.00	0.00			-2.36	2.49	-381.24	157.59			22.01	9.82		
Wall North - Rm 103	10,1	0.00	0.00			0.26	3.62	-411.34	156.87			3.45	6.86		
Wall North - Rm 103	11,1	0.00	0.00			2.89	4.47	-503.80	151.98			16.71	9.07		
Wall North - Rm 103	12,1	0.00	0.00			-2.36	2.49	60.26	164.85			45.88	12.63		
Wall North - Rm 103	13,1	0.00	0.00			0.26	3.62	-456.48	155.79			14.05	8.67		
Wall North - Rm 103	14,1	0.00	0.00			-2.36	2.49	-388.76	157.41			-1.86	5.75		
Wall North - Rm 103	8,2	0.00	0.00			-2.36	2.49	-591.92	152.48			3.45	6.86		
Wall North - Rm 103	9,2	0.00	0.00			-2.36	2.49	-546.78	153.59			22.01	9.82		
Wall North - Rm 103	10,2	0.00	0.00			-2.36	2.49	-531.73	153.96			8.75	7.82		
Wall North - Rm 103	11,2	0.00	0.00			0.26	3.62	-460.41	153.01			11.40	8.26		
Wall North - Rm 103	12,2	0.00	0.00			0.26	3.62	-243.46	158.05			32.62	11.16		
Wall North - Rm 103	13,2	0.00	0.00			2.89	4.47	-591.92	152.48			8.75	7.82		
Wall North - Rm 103	14,2	0.00	0.00			2.89	4.47	-486.58	155.06			11.40	8.26		
Wall North - Rm 103	8,3	0.00	0.00			-2.36	2.49	-330.99	150.93			0.80	6.33		
Wall North - Rm 103	9,3	0.00	0.00			-2.36	2.49	-235.61	153.23			3.45	6.86		
Wall North - Rm 103	10,3	0.00	0.00			0.26	3.62	-323.66	151.10			0.80	6.33		
Wall North - Rm 103	11,3	0.00	0.00			-2.36	2.49	-448.39	148.04			3.45	6.86		
Wall North - Rm 103	12,3	0.00	0.00			-2.36	2.49	-397.03	149.31			16.71	9.07		
Wall North - Rm 103	13,3	0.00	0.00			0.26	3.62	-477.74	147.32			67.09	14.69		
Wall North - Rm 103	14,3	0.00	0.00			2.89	4.47	-521.76	146.22			8.75	7.82		
Wall South - Rm 103	8,1	0.00	0.00			0.26	3.62	-181.08	165.60			16.71	9.07		
Wall South - Rm 103	9,1	0.00	0.00			0.26	3.62	-274.20	163.40			8.75	7.82		
Wall South - Rm 103	10,1	0.00	0.00			0.26	3.62	-289.72	163.03			6.10	7.36		
Wall South - Rm 103	11,1	0.00	0.00			0.26	3.62	-103.47	167.40			27.31	10.51		
Wall South - Rm 103	12,1	0.00	0.00			0.26	3.62	-10.35	169.55			-4.51	5.10		
Wall South - Rm 103	13,1	0.00	0.00			-2.36	2.49	-72.43	168.12			8.75	7.82		
Wall South - Rm 103	14,1	0.00	0.00			2.89	4.47	-95.71	167.58			-1.86	5.75		
Wall South - Rm 103	15,1+2	0.00	0.00			0.26	3.62	28.45	170.43			3.45	6.86		
Wall South - Rm 103	8,2	0.00	0.00			-2.36	2.49	-367.33	161.17			6.10	7.36		
Wall South - Rm 103	9,2	0.00	0.00			-2.36	2.49	-289.72	163.03			11.40	8.26		
Wall South - Rm 103	10,2	0.00	0.00			0.26	3.62	-188.84	165.41			0.80	6.33		
Wall South - Rm 103	11,2	0.00	0.00			-2.36	2.49	-212.12	164.87			6.10	7.36		
Wall South - Rm 103	12,2	0.00	0.00			0.26	3.62	-188.84	165.41			11.40	8.26		
Wall South - Rm 103	13,2	0.00	0.00			-2.36	2.49	-173.32	165.78			22.01	9.82		
Wall South - Rm 103	14,2	0.00	0.00			-2.36	2.49	-196.60	165.23			6.10	7.36		
Wall South - Rm 103	8,3	0.00	0.00			-2.36	2.49	-250.28	152.88			14.05	8.67		

SAMPLE NAME	GRID NAME	ALPHA (DPM/100CM2)						BETA (DPM/100CM2)						GAMMA (uR/hr)	
		TOTAL	STD DEV	MAX	STD DEV	REM	STD DEV	TOTAL	STD DEV	MAX	STD DEV	REM	STD DEV	TOTAL	STD DEV
Wall South - Rm 103	9,3	0.00	0.00			0.26	3.62	-272.30	152.35			-4.51	5.10		
Wall South - Rm 103	10,3	0.00	0.00			-2.36	2.49	-213.60	153.75			8.75	7.82		
Wall South - Rm 103	11,3	0.00	0.00			-2.36	2.49	-228.27	153.40			3.45	6.86		
Wall South - Rm 103	12,3	0.00	0.00			0.26	3.62	-74.19	157.04			11.40	8.26		
Wall South - Rm 103	13,3	0.00	0.00			0.26	3.62	-22.83	158.24			6.10	7.36		
Wall South - Rm 103	14,3	0.00	0.00			-2.36	2.49	-103.54	156.36			19.36	9.45		
Wall South - Rm 103	15,3+4	0.00	0.00			-2.36	2.49	-132.89	155.67			6.10	7.36		
Wall South - Rm 103	8,4	0.00	0.00			-2.36	2.49	-177.55	159.39			8.75	7.82		
Wall South - Rm 103	9,4	0.00	0.00			10.77	6.38	-229.58	158.17			11.40	8.26		
Wall South - Rm 103	10,4	0.00	0.00			-2.36	2.49	-311.34	156.24			8.75	7.82		
Wall South - Rm 103	11,4	0.00	0.00			0.26	3.62	-274.18	157.12			11.40	8.26		
Wall South - Rm 103	12,4	0.00	0.00			-2.36	2.49	-303.91	156.42			-4.51	5.10		
Wall South - Rm 103	13,4	0.00	0.00			-2.36	2.49	-363.37	155.00			11.40	8.26		
Wall South - Rm 103	14,4	0.00	0.00			5.51	5.19	-51.20	162.31			0.80	6.33		
Wall East - Rm 103	1,1	0.00	0.00			-2.36	2.49	-134.51	166.68			16.71	9.07		
Wall East - Rm 103	2,1	0.00	0.00			-2.36	2.49	-219.88	164.68			19.36	9.45		
Wall East - Rm 103	3,1	0.00	0.00			-2.36	2.49	-80.19	167.94			11.40	8.26		
Wall East - Rm 103	4,1	0.00	0.00			-2.36	2.49	-150.03	166.32			6.10	7.36		
Wall East - Rm 103	5,1	0.00	0.00			0.26	3.62	-64.67	168.30			8.75	7.82		
Wall East - Rm 103	6,1	0.00	0.00			-2.36	2.49	-95.71	167.58			8.75	7.82		
Wall East - Rm 103	7,1	0.00	0.00			-2.36	2.49	-18.11	169.37			0.80	6.33		
Wall East - Rm 103	1,2	0.00	0.00			5.51	5.19	-622.02	151.74			14.05	8.67		
Wall East - Rm 103	2,2	0.00	0.00			2.89	4.47	-381.24	157.59			-1.86	5.75		
Wall East - Rm 103	3,2	0.00	0.00			0.26	3.62	-268.37	160.27			6.10	7.36		
Wall East - Rm 103	4,2	0.00	0.00			0.26	3.62	-321.04	159.03			19.36	9.45		
Wall East - Rm 103	5,2	0.00	0.00			0.26	3.62	-418.86	156.69			11.40	8.26		
Wall East - Rm 103	6,2	0.00	0.00			-2.36	2.49	-388.76	157.41			8.75	7.82		
Wall East - Rm 103	7,2	0.00	0.00			-2.36	2.49	-426.38	156.51			29.97	10.84		
Wall East - Rm 103	1,3	0.00	0.00			-2.36	2.49	-400.53	154.10			11.40	8.26		
Wall East - Rm 103	2,3	0.00	0.00			-2.36	2.49	-482.29	152.12			0.80	6.33		
Wall East - Rm 103	3,3	0.00	0.00			0.26	3.62	-147.82	160.08			11.40	8.26		
Wall East - Rm 103	4,3	0.00	0.00			-2.36	2.49	-326.20	155.89			27.31	10.51		
Wall East - Rm 103	5,3	0.00	0.00			0.26	3.62	-289.04	156.77			14.05	8.67		
Wall East - Rm 103	6,3	0.00	0.00			-2.36	2.49	-73.50	161.80			19.36	9.45		
Wall East - Rm 103	7,3	0.00	0.00			-2.36	2.49	-199.85	158.87			14.05	8.67		
Wall East - Rm 103	1,4	0.00	0.00			5.51	5.19	-199.85	158.87			3.45	6.86		
Wall East - Rm 103	2,4	0.00	0.00			2.89	4.47	-266.74	157.30			11.40	8.26		

BUILDING 023 FINAL SURVEY RESULTS FOR LOT 1

SAMPLE NAME	GRID NAME	ALPHA (DPM/100CM2)						BETA (DPM/100CM2)						GAMMA (uR/hr)	
		TOTAL	STD DEV	MAX	STD DEV	REM	STD DEV	TOTAL	STD DEV	MAX	STD DEV	REM	STD DEV	TOTAL	STD DEV
Wall East - Rm 103	3,4	0.00	0.00			-2.36	2.49	-437.69	153.20			16.71	9.07		
Wall East - Rm 103	4,4	0.00	0.00			-2.36	2.49	-281.61	156.94			6.10	7.36		
Wall East - Rm 103	5,4	0.00	0.00			0.26	3.62	-266.74	157.30			32.62	11.16		
Wall East - Rm 103	6,4	0.00	0.00			-2.36	2.49	-177.55	159.39			3.45	6.86		
Wall East - Rm 103	7,4	0.00	0.00			0.26	3.62	-303.91	156.42			6.10	7.36		
Wall East - Rm 103	1,5	0.00	0.00			-2.36	2.49	-474.85	152.30			14.05	8.67		
Wall East - Rm 103	2,5	0.00	0.00			-2.36	2.49	-348.50	155.35			-1.86	5.75		
Wall East - Rm 103	3,5	0.00	0.00			-2.36	2.49	-311.34	156.24			16.71	9.07		
Wall East - Rm 103	4,5	0.00	0.00			-2.36	2.49	-140.39	160.25			22.01	9.82		
Wall East - Rm 103	5,5	0.00	0.00			0.26	3.62	-155.26	159.91			16.71	9.07		
Maximum:		0.00	0.00	0.00	0.00	10.77	6.38	4305.19	240.57	20551.21	429.66	80.35	15.84	9.94	0.22
Minimum:		0.00	0.00	0.00	0.00	-2.36	0.00	-622.02	0.00	1289.63	183.57	-4.51	5.10	6.74	0.18
Average:		0.00	0.00	0.00	0.00	-0.53	3.09	127.85	163.54	6515.67	259.09	11.70	8.19	8.11	0.19

SAMPLE NAME	GRID NAME	ALPHA (DPM/100CM2)						BETA (DPM/100CM2)						GAMMA (uR/hr)	
		TOTAL	STD DEV	MAX	STD DEV	REM	STD DEV	TOTAL	STD DEV	MAX	STD DEV	REM	STD DEV	TOTAL	STD DEV
Floors - Rm 106	1,1					6.35	5.02	449.90	171.55			-0.27	6.56	8.55	0.20
Floors - Rm 106	2,1					-1.59	2.05	-22.13	161.08			-2.92	6.00	8.49	0.20
Floors - Rm 106	3,1					1.06	3.35	162.26	165.25			7.70	8.01	8.35	0.20
Floors - Rm 106	4,1					-1.59	2.05	228.64	166.72			2.39	7.08	8.45	0.20
Floors - Rm 106	5,1					3.71	4.27	125.38	164.42			-8.23	4.68	8.34	0.20
Floors - Rm 106	6,1					1.06	3.35	140.13	164.75			-0.27	6.56	8.32	0.20
Floors - Rm 106	7,1					-1.59	2.05	95.88	163.76			10.36	8.44	8.35	0.20
Floors - Rm 106	8,1					1.06	3.35	243.39	167.05			18.32	9.61	8.60	0.20
Floors - Rm 106	9,1					1.06	3.35	-59.00	160.23			5.05	7.56	7.94	0.19
Floors - Rm 106	1,2					1.06	3.35	383.52	170.11			20.98	9.97	8.50	0.20
Floors - Rm 106	2,2					1.06	3.35	191.76	165.90			15.67	9.24	8.97	0.20
Floors - Rm 106	3,2					-1.59	2.05	216.24	163.98			7.70	8.01	9.05	0.21
Floors - Rm 106	4,2					1.06	3.35	150.14	162.49			5.05	7.56	9.05	0.21
Floors - Rm 106	5,2					-1.59	2.05	414.53	168.36			7.70	8.01	8.67	0.20
Floors - Rm 106	6,2					-1.59	2.05	238.27	164.47			2.39	7.08	8.69	0.20
Floors - Rm 106	7,2					-1.59	2.05	135.46	162.16			5.05	7.56	8.73	0.20
Floors - Rm 106	8,2					-1.59	2.05	162.26	165.25			-0.27	6.56	8.27	0.20
Floors - Rm 106	9,2					-1.59	2.05	125.38	164.42			-0.27	6.56	8.29	0.20
Floors - Rm 106	1,3					1.06	3.35	208.90	163.81			2.39	7.08	8.37	0.20
Floors - Rm 106	2,3					-1.59	2.05	157.49	162.66			10.36	8.44	9.32	0.21
Floors - Rm 106	3,3					-1.59	2.05	10.61	159.31			10.36	8.44	9.27	0.21
Floors - Rm 106	4,3					1.06	3.35	142.80	162.33			-2.92	6.00	9.39	0.21
Floors - Rm 106	5,3					-1.59	2.05	-40.80	158.12			18.32	9.61	9.30	0.21
Floors - Rm 106	6,3					-1.59	2.05	267.65	165.13			-2.92	6.00	9.38	0.21
Floors - Rm 106	7,3					-1.59	2.05	135.46	162.16			2.39	7.08	8.32	0.20
Floors - Rm 106	1,4					-1.59	2.05	282.33	165.45			2.39	7.08	8.25	0.20
Floors - Rm 106	2,4					1.06	3.35	333.74	166.59			47.53	13.04	9.01	0.20
Floors - Rm 106	3,4					-1.59	2.05	84.05	160.99			15.67	9.24	9.27	0.21
Floors - Rm 106	4,4					1.06	3.35	201.55	163.65			2.39	7.08	9.07	0.21
Floors - Rm 106	5,4					-1.59	2.05	274.99	165.29			5.05	7.56	8.99	0.20
Floors - Rm 106	6,4					-1.59	2.05	84.05	160.99			5.05	7.56	9.02	0.20
Floors - Rm 106	7,4					-1.59	2.05	370.46	167.40			5.05	7.56	8.33	0.20
Floors - Rm 106	9,4					-1.59	2.05	172.18	162.99			5.05	7.56	7.68	0.19
Floors - Rm 106	1-2,5					1.06	3.35	289.68	165.62			10.36	8.44	7.68	0.19
Floors - Rm 106	3,5					1.06	3.35	186.86	163.32			2.39	7.08	9.27	0.21

SAMPLE NAME	GRID NAME	ALPHA (DPM/100CM2)						BETA (DPM/100CM2)						GAMMA (uR/hr)	
		TOTAL	STD DEV	MAX	STD DEV	REM	STD DEV	TOTAL	STD DEV	MAX	STD DEV	REM	STD DEV	TOTAL	STD DEV
Floors - Rm 106	4,5					-1.59	2.05	164.83	162.82			13.01	8.85	9.35	0.21
Floors - Rm 106	6,5					3.71	4.27	135.46	162.16			18.32	9.61	8.67	0.20
Floors - Rm 106	7,5					-1.59	2.05	142.80	162.33			15.67	9.24	8.41	0.20
Floors - Rm 106	9,5					-1.59	2.05	142.80	162.33			-0.27	6.56	8.23	0.20
Floors - Rm 106	1,6					-1.59	2.05	32.64	159.81			10.36	8.44	8.37	0.20
Floors - Rm 106	2,6					-1.59	2.05	216.24	163.98			10.36	8.44	8.92	0.20
Floors - Rm 106	3,6					3.71	4.27	120.77	161.83			-2.92	6.00	8.87	0.20
Floors - Rm 106	4,6					1.06	3.35	194.21	163.48			2.39	7.08	8.85	0.20
Floors - Rm 106	5,6					3.71	4.27	223.58	164.14			2.39	7.08	8.72	0.20
Floors - Rm 106	6,6					1.06	3.35	172.18	162.99			2.39	7.08	8.77	0.20
Floors - Rm 106	7,6					-1.59	2.05	223.58	164.14			7.70	8.01	8.72	0.20
Floors - Rm 106	9,6					3.71	4.27	252.96	164.80			5.05	7.56	8.55	0.20
Floors - Rm 106	1,7					1.06	3.35	141.77	163.39			7.70	8.01	8.87	0.20
Floors - Rm 106	2,7					1.06	3.35	-42.61	159.17			-2.92	6.00	8.64	0.20
Floors - Rm 106	3,7					3.71	4.27	156.52	163.72			-0.27	6.56	8.86	0.20
Floors - Rm 106	4,7					-1.59	2.05	252.40	165.87			13.01	8.85	8.97	0.20
Floors - Rm 106	5,7					3.71	4.27	326.15	167.50			13.01	8.85	9.17	0.21
Floors - Rm 106	6,7					1.06	3.35	171.27	164.05			-0.27	6.56	8.57	0.20
Floors - Rm 106	9,7					1.06	3.35	215.52	165.05			7.70	8.01	8.85	0.20
Floors - Rm 106	F-1					-1.59	2.05	222.90	165.21			15.67	9.24	8.70	0.20
Floors - Rm 106	F-2					-1.59	2.05	156.52	163.72			2.39	7.08	9.43	0.21
Floors - Rm 106	F-3					1.06	3.35	237.65	165.54			-2.92	6.00	9.27	0.21
Floors - Rm 106	1-5,8					-1.59	2.05	171.27	164.05			7.70	8.01	8.64	0.20
Floors - Rm 106	6-7,8					-1.59	2.05	178.65	164.22			-0.27	6.56	8.81	0.20
Floors - Rm 106	8-9,8					-1.59	2.05	333.53	167.66			-0.27	6.56	8.58	0.20
Wall North - Rm 106	1,1					1.06	3.35	-367.17	154.81			15.67	9.24		
Wall North - Rm 106	1,2					1.06	3.35	-164.39	159.65			-5.58	5.38		
Wall North - Rm 106	1,3					-1.59	2.05	-299.58	156.44			5.05	7.56		
Wall North - Rm 106	2,3					6.35	5.02	-179.41	159.30			-2.92	6.00		
Wall North - Rm 106	3,3					-1.59	2.05	8.34	163.66			2.39	7.08		
Wall North - Rm 106	4,2					-1.59	2.05	-104.31	161.06			13.01	8.85		
Wall North - Rm 106	4,3					3.71	4.27	-66.76	161.93			7.70	8.01		
Wall North - Rm 106	5,2					3.71	4.27	-119.33	160.71			7.70	8.01		
Wall North - Rm 106	5,3					1.06	3.35	-126.84	160.53			2.39	7.08		
Wall North - Rm 106	6,1					-1.59	2.05	60.92	164.87			-0.27	6.56		

SAMPLE NAME	GRID NAME	ALPHA (DPM/100CM2)						BETA (DPM/100CM2)						GAMMA (uR/hr)	
		TOTAL	STD DEV	MAX	STD DEV	REM	STD DEV	TOTAL	STD DEV	MAX	STD DEV	REM	STD DEV	TOTAL	STD DEV
Wall North - Rm 106	6,2					-1.59	2.05	-81.78	161.58			10.36	8.44		
Wall North - Rm 106	6,3					-1.59	2.05	-400.33	153.37			13.01	8.85		
Wall North - Rm 106	7,1					-1.59	2.05	-237.23	157.26			5.05	7.56		
Wall North - Rm 106	7,2					1.06	3.35	-585.66	148.82			20.98	9.97		
Wall North - Rm 106	7,3					1.06	3.35	-207.58	157.96			2.39	7.08		
Wall North - Rm 106	8,1					-1.59	2.05	29.65	163.43			2.39	7.08		
Wall North - Rm 106	8,2					1.06	3.35	-103.79	160.38			-2.92	6.00		
Wall North - Rm 106	8,3					-1.59	2.05	-326.19	155.15			5.05	7.56		
Wall North - Rm 106	9,1					-1.59	2.05	-133.44	159.69			13.01	8.85		
Wall North - Rm 106	9,2					-1.59	2.05	0.00	162.76			5.05	7.56		
Wall North - Rm 106	9,3					1.06	3.35	-296.54	155.86			-8.23	4.68		
Wall East - Rm 106	10,1					-1.59	2.05	-333.61	154.98			44.88	12.76		
Wall East - Rm 106	10,2					-1.59	2.05	148.27	166.10			5.05	7.56		
Wall East - Rm 106	10,3					-1.59	2.05	-355.85	154.44			-5.58	5.38		
Wall East - Rm 106	11,1					-1.59	2.05	-170.51	158.83			-2.92	6.00		
Wall East - Rm 106	11,2					1.06	3.35	-214.99	157.79			-0.27	6.56		
Wall East - Rm 106	11,3					1.06	3.35	-289.12	156.04			5.05	7.56		
Wall East - Rm 106	12,1					1.06	3.35	-364.60	150.72			18.32	9.61		
Wall East - Rm 106	12,2					-1.59	2.05	-177.50	155.12			5.05	7.56		
Wall East - Rm 106	12,3					3.71	4.27	-11.99	158.91			-0.27	6.56		
Wall East - Rm 106	13,1					1.06	3.35	-307.03	152.08			5.05	7.56		
Wall East - Rm 106	13,2					-1.59	2.05	-364.60	150.72			-2.92	6.00		
Wall East - Rm 106	13,3					-1.59	2.05	-249.46	153.44			13.01	8.85		
Wall East - Rm 106	14,1					-1.59	2.05	-199.09	154.62			60.81	14.32		
Wall East - Rm 106	14,2					-1.59	2.05	-335.81	151.40			5.05	7.56		
Wall East - Rm 106	14,3					1.06	3.35	-321.42	151.74			2.39	7.08		
Wall East - Rm 106	15,1					-1.59	2.05	-414.97	149.51			-5.58	5.38		
Wall East - Rm 106	15,2					-1.59	2.05	-378.99	150.37			5.05	7.56		
Wall East - Rm 106	15,3					6.35	5.02	-249.46	153.44			10.36	8.44		
Wall East - Rm 106	16,1					-1.59	2.05	-199.09	154.62			2.39	7.08		
Wall East - Rm 106	16,2					-1.59	2.05	-213.48	154.28			2.39	7.08		
Wall East - Rm 106	16,3					1.06	3.35	-278.24	152.76			-2.92	6.00		
Wall East - Rm 106	17,1					3.71	4.27	-587.67	145 29			5.05	7.56		
Wall East - Rm 106	17,2					1.06	3.35	-321.42	151.74			23.63	10.32		
Wall East - Rm 106	17,3					1.06	3.35	-508.52	147.24			-0.27	6.56		

SAMPLE NAME	GRID NAME	ALPHA (DPM/100CM2)						BETA (DPM/100CM2)						GAMMA (uR/hr)	
		TOTAL	STD DEV	MAX	STD DEV	REM	STD DEV	TOTAL	STD DEV	MAX	STD DEV	REM	STD DEV	TOTAL	STD DEV
Wall South - Rm 106	18,1					6.35	5.02	-429.36	149.16			10.36	8.44		
Wall South - Rm 106	18,2					-1.59	2.05	-199.09	154.62			15.67	9.24		
Wall South - Rm 106	18,3					1.06	3.35	-400.58	149.85			5.05	7.56		
Wall South - Rm 106	19,1					-1.59	2.05	-242.26	153.61			-2.92	6.00		
Wall South - Rm 106	19,2					-1.59	2.05	-271.05	152.93			13.01	8.85		
Wall South - Rm 106	19,3					-1.59	2.05	-271.05	152.93			13.01	8.85		
Wall South - Rm 106	20,1					1.06	3.35	88.75	161.17			7.70	8.01		
Wall South - Rm 106	20,2					1.06	3.35	-11.99	158.91			-2.92	6.00		
Wall South - Rm 106	20,3					-1.59	2.05	-371.79	150.54			7.70	8.01		
Wall South - Rm 106	21,1					-1.59	2.05	-479.73	147.94			-2.92	6.00		
Wall South - Rm 106	21,2					-1.59	2.05	-33.58	158.42			2.39	7.08		
Wall South - Rm 106	21,3					-1.59	2.05	-163.11	155.45			5.05	7.56		
Wall South - Rm 106	22,1					1.06	3.35	-155.91	155.62			-2.92	6.00		
Wall South - Rm 106	22,2					1.06	3.35	-26.39	158.58			-0.27	6.56		
Wall South - Rm 106	22,3					9.00	5.68	-299.83	152.25			-5.58	5.38		
Wall South - Rm 106	23,1					-1.59	2.05	-235.07	153.78			-0.27	6.56		
Wall South - Rm 106	23,2					-1.59	2.05	-350.20	151.06			-0.27	6.56		
Wall South - Rm 106	23,3					-1.59	2.05	-479.73	147.94			-2.92	6.00		
Wall South - Rm 106	24,1					1.06	3.35	-76.76	157.44			-0.27	6.56		
Wall South - Rm 106	24,2					-1.59	2.05	-91.15	157.11			-0.27	6.56		
Wall South - Rm 106	24,3					-1.59	2.05	16.79	159.56			7.70	8.01		
Wall South - Rm 106	25,1					6.35	5.02	16.79	159.56			36.91	11.90		
Wall South - Rm 106	25,2					1.06	3.35	-242.26	153.61			18.32	9.61		
Wall South - Rm 106	25,3					-1.59	2.05	-343.01	151.23			-0.27	6.56		
Wall South - Rm 106	26,1					-1.59	2.05	-170.30	155.28			5.05	7.56		
Wall South - Rm 106	26,2					3.71	4.27	-91.15	157.11			10.36	8.44		
Wall South - Rm 106	26,3					-1.59	2.05	-220.68	154.11			13.01	8.85		
Ceiling - Rm 106	1,1					6.38	5.04	-29.55	153.07			0.53	7.40		
Ceiling - Rm 106	1,2					-1.59	2.06	-29.55	153.07			11.13	9.10		
Ceiling - Rm 106	1,3					-1.59	2.06	320.44	160.88			3.18	7.86		
Ceiling - Rm 106	1,4					1.06	3.36	187.44	157.96			5.83	8.29		
Ceiling - Rm 106	1,5					-1.59	2.06	215.44	158.58			-10.07	5.16		
Ceiling - Rm 106	1,6					-1.59	2.06	159.44	157.34			16.42	9.84		
Ceiling - Rm 106	1,7					1.06	3.36	-176.55	149.68			3.18	7.86		
Ceiling - Rm 106	1,8					1.06	3.36	-162.55	150.00			8.48	8.71		

SAMPLE NAME	GRID NAME	ALPHA (DPM/100CM2)						BETA (DPM/100CM2)						GAMMA (uR/hr)	
		TOTAL	STD DEV	MAX	STD DEV	REM	STD DEV	TOTAL	STD DEV	MAX	STD DEV	REM	STD DEV	TOTAL	STD DEV
Ceiling - Rm 106	1,9					1.06	3.36	-22.55	153.23			-4.77	6.38		
Ceiling - Rm 106	2,1					-1.59	2.06	5.44	153.87			13.77	9.48		
Ceiling - Rm 106	2,2					6.38	5.04	236.44	159.04			-4.77	6.38		
Ceiling - Rm 106	2,3					-1.59	2.06	117.44	156.40			5.83	8.29		
Ceiling - Rm 106	2,4					1.06	3.36	-64.55	152.27			-4.77	6.38		
Ceiling - Rm 106	2,5					-1.59	2.06	131.44	156.71			3.18	7.86		
Ceiling - Rm 106	2,6					1.06	3.36	166.44	157.49			-2.12	6.91		
Ceiling - Rm 106	2,7					1.06	3.36	47.44	154.82			-4.77	6.38		
Ceiling - Rm 106	2,8					1.06	3.36	159.44	157.34			3.18	7.86		
Ceiling - Rm 106	2,9					-1.59	2.06	208.44	158.42			-2.12	6.91		
Ceiling - Rm 106	3,1					-1.59	2.06	250.44	159.35			5.83	8.29		
Ceiling - Rm 106	3,2					1.06	3.36	131.44	156.71			-2.12	6.91		
Ceiling - Rm 106	3,3					1.06	3.36	313.44	160.73			5.83	8.29		
Ceiling - Rm 106	3,4					-1.59	2.06	267.98	164.34			-2.12	6.91		
Ceiling - Rm 106	3,5					-1.59	2.06	289.38	164.80			11.13	9.10		
Ceiling - Rm 106	3,6					-1.59	2.06	260.84	164.18			0.53	7.40		
Ceiling - Rm 106	3,7					-1.59	2.06	275.11	164.49			13.77	9.48		
Ceiling - Rm 106	3,8					1.06	3.36	210.89	163.10			8.48	8.71		
Ceiling - Rm 106	3,9					-1.59	2.06	389.28	166.95			0.53	7.40		
Ceiling - Rm 106	4,1					1.06	3.36	96.73	160.58			-4.77	6.38		
Ceiling - Rm 106	4,2					-1.59	2.06	111.00	160.90			11.13	9.10		
Ceiling - Rm 106	4,3					1.06	3.36	-24.58	157.86			-2.12	6.91		
Ceiling - Rm 106	4,4					-1.59	2.06	89.59	160.42			5.83	8.29		
Ceiling - Rm 106	4,5					1.06	3.36	103.86	160.74			8.48	8.71		
Ceiling - Rm 106	4,6					-1.59	2.06	-74.53	156.73			-4.77	6.38		
Ceiling - Rm 106	4,7					6.38	5.04	225.16	163.41			11.13	9.10		
Ceiling - Rm 106	4,8					-1.59	2.06	153.81	161.84			-2.12	6.91		
Ceiling - Rm 106	4,9					-1.59	2.06	367.87	166.49			16.42	9.84		
Ceiling - Rm 106	5,1					-1.59	2.06	417.82	167.56			5.83	8.29		
Ceiling - Rm 106	5,2					3.72	4.29	210.89	163.10			0.53	7.40		
Ceiling - Rm 106	5,3					-1.59	2.06	89.59	160.42			-2.12	6.91		
Ceiling - Rm 106	5,4					-1.59	2.06	182.35	162.47			19.07	10.19		
Ceiling - Rm 106	5,5					-1.59	2.06	39.64	159.31			3.18	7.86		
Ceiling - Rm 106	5,6					3.72	4.29	125.27	161.21			11.13	9.10		
Ceiling - Rm 106	5,7					-1.59	2.06	61.05	159.78			8.48	8.71		

SAMPLE NAME	GRID NAME	ALPHA (DPM/100CM2)						BETA (DPM/100CM2)						GAMMA (uR/hr)	
		TOTAL	STD DEV	MAX	STD DEV	REM	STD DEV	TOTAL	STD DEV	MAX	STD DEV	REM	STD DEV	TOTAL	STD DEV
Ceiling - Rm 106	5,8					1.06	3.36	96.73	160.58			-4.77	6.38		
Ceiling - Rm 106	5,9					-1.59	2.06	89.59	160.42			0.53	7.40		
Ceiling - Rm 106	6,1					1.06	3.36	310.79	165.27			-4.77	6.38		
Ceiling - Rm 106	6,2					-1.59	2.06	-67.39	156.89			0.53	7.40		
Ceiling - Rm 106	6,3					1.06	3.36	267.98	164.34			11.13	9.10		
Ceiling - Rm 106	6,4					-1.59	2.06	96.73	160.58			0.53	7.40		
Ceiling - Rm 106	6,5					3.72	4.29	225.16	163.41			69.40	15.40		
Ceiling - Rm 106	6,6					6.38	5.04	203.76	162.94			13.77	9.48		
Ceiling - Rm 106	6,7					1.06	3.36	182.35	162.47			8.48	8.71		
Ceiling - Rm 106	6,8					-1.59	2.06	-110.20	155.91			5.83	8.29		
Ceiling - Rm 106	6,9					1.06	3.36	18.24	158.83			0.53	7.40		
Ceiling - Rm 106	7,1					3.72	4.29	53.91	159.62			-2.12	6.91		
Ceiling - Rm 106	7,2					-1.59	2.06	0.81	159.77			-2.12	6.91		
Ceiling - Rm 106	7,3					-1.59	2.06	161.94	163.42			0.53	7.40		
Ceiling - Rm 106	7,4					-1.59	2.06	-65.10	158.25			-2.12	6.91		
Ceiling - Rm 106	7,5					1.06	3.36	330.39	167.16			8.48	8.71		
Ceiling - Rm 106	7,6					1.06	3.36	213.21	164.57			0.53	7.40		
Ceiling - Rm 106	7,7					-1.59	2.06	227.86	164.89			5.83	8.29		
Ceiling - Rm 106	7,8					-1.59	2.06	257.15	165.54			-2.12	6.91		
Ceiling - Rm 106	7,9					-1.59	2.06	191.24	164.08			3.18	7.86		
Ceiling - Rm 106	8,1					-1.59	2.06	286.45	166.19			-7.42	5.80		
Ceiling - Rm 106	8,2					-1.59	2.06	52.08	160.94			0.53	7.40		
Ceiling - Rm 106	8,3					-1.59	2.06	293.77	166.35			-2.12	6.91		
Ceiling - Rm 106	8,4					1.06	3.36	337.72	167.32			5.83	8.29		
Ceiling - Rm 106	8,5					1.06	3.36	381.66	168.28			-2.12	6.91		
Ceiling - Rm 106	8,6					1.06	3.36	-123.69	156.89			-2.12	6.91		
Ceiling - Rm 106	8,7					6.38	5.04	388.99	168.43			3.18	7.86		
Ceiling - Rm 106	8,8					1.06	3.36	0.81	159.77			-2.12	6.91		
Ceiling - Rm 106	8,9					1.06	3.36	-50.45	158.59			-2.12	6.91		
Ceiling - Rm 106	Cn-1					1.06	3.36	154.62	163.26			3.18	7.86		
Ceiling - Rm 106	Cn-2					-1.59	2.06	330.39	167.16			5.83	8.29		
Ceiling - Rm 106	Cn-3					1.06	3.36	88.70	161.77			19.07	10.19		
Ceiling - Rm 106	Cn-4					3.72	4.29	132.65	162.77			-4.77	6.38		
Ceiling - Rm 106	Cn-5					1.06	3.36	330.39	167.16			-2.12	6.91		
Ceiling - Rm 106	Ce-1					1.06	3.36	125.32	162.60			13.77	9.48		

BUILDING 023 - FINAL SURVEY RESULTS FOR LOT 2

SAMPLE NAME	GRID NAME	ALPHA (DPM/100CM2)						BETA (DPM/100CM2)						GAMMA (uR/hr)	
		TOTAL	STD DEV	MAX	STD DEV	REM	STD DEV	TOTAL	STD DEV	MAX	STD DEV	REM	STD DEV	TOTAL	STD DEV
Ceiling - Rm 106	Ce-2					-1.59	2.06	110.67	162.27			8.48	8.71		
Maximum:		0.00	0.00	0.00	0.00	9.00	5.68	449.90	171.55	0.00	0.00	69.40	15.40	9.43	0.21
Minimum:		0.00	0.00	0.00	0.00	-1.59	2.05	-587.67	145.29	0.00	0.00	-10.07	4.68	7.68	0.19
Average:		0.00	0.00	0.00	0.00	0.17	2.83	31.81	159.92	0.00	0.00	5.44	7.72	8.72	0.20

BUILDING 023 - FINAL SURVEY DATA FOR LOT3

SAMPLE NAME	GRID NAME	ALPHA (DPM/100CM2)						BETA (DPM/100CM2)						GAMMA (uR/hr)	
		TOTAL	STD DEV	MAX	STD DEV	REM	STD DEV	TOTAL	STD DEV	MAX	STD DEV	REM	STD DEV	TOTAL	STD DEV
Outside - Ground (North)	1,1					1.06	3.36	923.82	184.86			5.83	8.29	9.97	0.22
Outside - Ground (North)	1,2					-1.59	2.06	1203.17	190.33			3.18	7.86	11.18	0.23
Outside - Ground (North)	1,3					1.06	3.36	923.82	184.86			-2.12	6.91	11.93	0.24
Outside - Ground (North)	1,4							1107.60	188.48					12.53	0.24
Outside - Ground (North)	1,5							1379.60	193.71					13.82	0.25
Outside - Ground (North)	2,1					-1.59	2.06	1019.39	186.75			3.18	7.86	10.19	0.22
Outside - Ground (North)	2,2					-1.59	2.06	938.52	185.15			-10.07	5.16	11.49	0.23
Outside - Ground (North)	2,3					6.38	5.04	909.12	184.57			0.53	7.40	12.64	0.24
Outside - Ground (North)	2,4							1063.50	187.62					13.07	0.25
Outside - Ground (North)	2,5							1173.77	189.76					12.87	0.24
Outside - Ground (North)	3,1					-1.59	2.06	585.66	178.01			3.18	7.86	9.02	0.20
Outside - Ground (North)	3,2					1.06	3.36	1151.71	189.34			-4.77	6.38	11.36	0.23
Outside - Ground (North)	3,3					-1.59	2.06	1328.14	192.73			-7.42	5.80	12.17	0.24
Outside - Ground (North)	3,4							1409.01	194.27					12.85	0.24
Outside - Ground (North)	3,5							1239.93	191.04					13.25	0.25
Outside - Ground (North)	4,1					-1.59	2.06	887.06	184.13			13.77	9.48	10.25	0.22
Outside - Ground (North)	4,2					-1.59	2.06	806.20	182.51			13.77	9.48	11.83	0.23
Outside - Ground (North)	4,3					6.38	5.04	1137.01	189.05			5.83	8.29	12.86	0.24
Outside - Ground (North)	4,4							1432.03	192.22					13.03	0.25
Outside - Ground (North)	4,5							1287.70	189.49					13.53	0.25
Outside - Ground (North)	5,1					-1.59	2.06	883.59	181.64			3.18	7.86	10.45	0.22
Outside - Ground (North)	5,2					-1.59	2.06	970.19	183.35			-2.12	6.91	11.08	0.23
Outside - Ground (North)	5,3					-1.59	2.06	1222.76	188.25			-2.12	6.91	13.09	0.25
Outside - Ground (North)	5,4							1417.60	191.95					13.48	0.25
Outside - Ground (North)	5,5							1395.95	191.54					13.88	0.25
Outside - Ground (North)	6,1					1.06	3.36	833.08	180.63			3.18	7.86	10.32	0.22
Outside - Ground (North)	6,2					1.06	3.36	1388.73	191.41			0.53	7.40	11.81	0.23
Outside - Ground (North)	6,3					-1.59	2.06	883.59	181.64			16.42	9.84	13.08	0.25
Outside - Ground (North)	6,4							1345.43	190.59					13.10	0.25
Outside - Ground (North)	6,5							1446.46	192.49					13.71	0.25
Outside - Ground (North)	7,1					3.72	4.29	861.94	181.21			0.53	7.40	9.70	0.21
Outside - Ground (North)	7,2					1.06	3.36	1136.16	186.59			5.83	8.29	11.30	0.23
Outside - Ground (North)	7,3					-1.59	2.06	1193.89	187.70			5.83	8.29	13.23	0.25
Outside - Ground (North)	7,4							1229.97	188.39					13.12	0.25
Outside - Ground (North)	7,5							1208.32	187.98					13.52	0.25

SAMPLE NAME	GRID NAME	ALPHA (DPM/100CM2)						BETA (DPM/100CM2)						GAMMA (uR/hr)	
		TOTAL	STD DEV	MAX	STD DEV	REM	STD DEV	TOTAL	STD DEV	MAX	STD DEV	REM	STD DEV	TOTAL	STD DEV
Outside - Ground (North)	8,1					1.06	3.36	1143.38	186.73			3.18	7.86	8.32	0.20
Outside - Ground (North)	8,2					-1.59	2.06	854.73	181.06			13.77	9.48	9.93	0.21
Outside - Ground (North)	8,3					3.72	4.29	1244.41	188.67			8.48	8.71	12.16	0.24
Outside - Ground (North)	8,4							1359.87	190.86					13.27	0.25
Outside - Ground (North)	8,5							1388.73	191.41					13.99	0.26
Outside - Ground (North)	9,1					1.06	3.36	1064.00	185.19			-4.77	6.38	7.77	0.19
Outside - Ground (North)	9,2					3.72	4.29	1193.89	187.70			11.13	9.10	10.25	0.22
Outside - Ground (North)	9,3					1.06	3.36	1157.81	187.01			16.42	9.84	12.62	0.24
Outside - Ground (North)	9,4							1020.70	184.34					13.34	0.25
Outside - Ground (North)	9,5							1496.98	193.44					13.62	0.25
Outside - Ground (North)	10,1					-1.59	2.06	1027.92	184.48			-4.77	6.38	10.69	0.22
Outside - Ground (North)	10,2					-1.59	2.06	1071.22	185.33			3.18	7.86	11.73	0.23
Outside - Ground (North)	10,3					1.06	3.36	1251.62	188.81			-4.77	6.38	13.33	0.25
Outside - Ground (North)	10,4							1468.11	192.90					13.56	0.25
Outside - Ground (North)	10,5							1367.08	191.00					14.49	0.26
Outside - Ground (North)	11,1							912.72	175.34					12.08	0.24
Outside - Ground (North)	11,2							1045.32	177.96					12.78	0.24
Outside - Ground (North)	11,3							1634.08	195.98					13.14	0.25
Outside - Ground (North)	11,4							1208.32	187.98					13.82	0.25
Outside - Ground (North)	11,5							1504.19	193.57					13.92	0.25
Outside - Ground (North)	12,1							1066.26	178.37					12.50	0.24
Outside - Ground (North)	12,2							1087.19	178.78					12.83	0.24
Outside - Ground (North)	12,3							1101.15	179.06					13.66	0.25
Outside - Ground (North)	12,4							1533.86	187.30					13.66	0.25
Outside - Ground (North)	12,5							1338.44	183.62					13.95	0.25
Outside - Ground (North)	13,1							1471.05	186.12					13.14	0.25
Outside - Ground (North)	13,2							1471.05	186.12					13.22	0.25
Outside - Ground (North)	13,3							1303.55	182.96					13.94	0.25
Outside - Ground (North)	13,4							1317.51	183.22					14.85	0.26
Outside - Ground (North)	14,1							1219.80	181.35					13.42	0.25
Outside - Ground (North)	14,2							1024.38	177.55					14.32	0.26
Outside - Ground (North)	14,3							1443.13	185.60					14.19	0.26
Outside - Ground (North)	15,1							1387.30	184.55					13.93	0.25
Outside - Ground (North)	15,2							1233.76	181.62					14.00	0.26
Outside - Ground (East)	1,1					1.06	3.36	1073.24	178.51			11.13	9.10	11.89	0.24

SAMPLE NAME	GRID NAME	ALPHA (DPM/100CM2)						BETA (DPM/100CM2)						GAMMA (uR/hr)	
		TOTAL	STD DEV	MAX	STD DEV	REM	STD DEV	TOTAL	STD DEV	MAX	STD DEV	REM	STD DEV	TOTAL	STD DEV
Outside - Ground (East)	1,2					9.04	5.70	1073.24	178.51			-2.12	6.91	12.29	0.24
Outside - Ground (East)	1,3					-1.59	2.06	1163.97	180.28			0.53	7.40	12.69	0.24
Outside - Ground (East)	1,4					-1.59	2.06	1317.51	183.22			8.48	8.71	13.28	0.25
Outside - Ground (East)	2,1					-1.59	2.06	1212.82	181.22			3.18	7.86	12.62	0.24
Outside - Ground (East)	2,2					3.72	4.29	909.58	179.09			5.83	8.29	13.64	0.25
Outside - Ground (East)	2,3					-1.59	2.06	1426.53	189.03			0.53	7.40	13.26	0.25
Outside - Ground (East)	2,4					-1.59	2.06	1582.32	191.93			-2.12	6.91	13.50	0.25
Outside - Ground (East)	3,1					-1.59	2.06	1100.78	182.83			8.48	8.71	13.94	0.25
Outside - Ground (East)	3,2					-1.59	2.06	1192.84	184.60			3.18	7.86	13.11	0.25
Outside - Ground (East)	3,3					9.04	5.70	1065.37	182.14			3.18	7.86	13.89	0.25
Outside - Ground (East)	3,4					1.06	3.36	767.95	176.26			5.83	8.29	14.37	0.26
Outside - Pit Floor	1,1					1.06	3.36	1249.49	185.69			0.53	7.40	15.07	0.26
Outside - Pit Floor	1,2					3.72	4.29	980.39	180.48			16.42	9.84	14.40	0.26
Outside - Pit Floor	1,3					3.72	4.29	1249.49	185.69			8.48	8.71	14.80	0.26
Outside - Pit Floor	2,1					1.06	3.36	959.15	180.06			11.13	9.10	14.97	0.26
Outside - Pit Floor	2,2					1.06	3.36	1341.55	187.43			0.53	7.40	14.37	0.26
Outside - Pit Floor	2,3					1.06	3.36	980.39	180.48			3.18	7.86	14.65	0.26
Outside - Ground (Near Pit)	G-1							1359.38	184.02					9.96	0.22
Outside - Ground (Near Pit)	G-2							1254.69	182.02					9.25	0.21
Outside - Ground (Near Pit)	G-3							919.70	175.48					9.96	0.22
Outside - Ground (Near Pit)	G-4							975.53	176.59					10.38	0.22
Outside - Pit Wall West	1,1					1.06	3.36	902.50	178.95			5.83	8.29		
Outside - Pit Wall West	1,2					1.06	3.36	711.30	175.12			5.83	8.29		
Outside - Pit Wall West	2,1					1.06	3.36	690.05	174.69			5.83	8.29		
Outside - Pit Wall West	2,2					3.72	4.29	668.81	174.26			3.18	7.86		
Outside - Pit Wall West	3,1					-1.59	2.06	675.89	174.41			-2.12	6.91		
Outside - Pit Wall West	3,2					-1.59	2.06	619.24	173.25			0.53	7.40		
Outside - Pit Wall North	4,1					3.72	4.29	767.95	176.26			5.83	8.29		
Outside - Pit Wall North	4,2					-1.59	2.06	675.89	174.41			0.53	7.40		
Outside - Pit Wall North	5,1					-1.59	2.06	895.41	178.81			3.18	7.86		
Outside - Pit Wall North	5,2					1.06	3.36	548.42	171.80			11.13	9.10		
Outside - Pit Wall East	6,1					1.06	3.36	668.81	174.26			0.53	7.40		
Outside - Pit Wall East	6,2					1.06	3.36	654.64	173.97			13.77	9.48		
Outside - Pit Wall East	7,1					1.06	3.36	753.79	175.98			5.83	8.29		
Outside - Pit Wall East	7,2					1.06	3.36	633.40	173.54			0.53	7.40		

SAMPLE NAME	GRID NAME	ALPHA (DPM/100CM2)						BETA (DPM/100CM2)						GAMMA (uR/hr)	
		TOTAL	STD DEV	MAX	STD DEV	REM	STD DEV	TOTAL	STD DEV	MAX	STD DEV	REM	STD DEV	TOTAL	STD DEV
Outside - Pit Wall East	8,1					1.06	3.36	775.03	176.41			-2.12	6.91		
Outside - Pit Wall East	8,2					3.72	4.29	619.24	173.25			3.18	7.86		
Outside - Pit Wall South	9,1					1.06	3.36	583.83	172.53			-2.12	6.91		
Outside - Pit Wall South	9,2					1.06	3.36	767.95	176.26			11.13	9.10		
Outside - Pit Wall South	10,1					1.06	3.36	860.95	175.06			11.13	9.10		
Outside - Pit Wall South	10,2					1.06	3.36	534.54	168.31			-4.77	6.38		
Outside - Pit Wall South	11,1					-1.59	2.06	860.95	175.06			0.53	7.40		
Outside - Pit Wall South	11,2					3.72	4.29	811.28	174.05			-2.12	6.91		
Outside - Pit Wall South	12,1-2					1.06	3.36	839.66	174.63			5.83	8.29		
Maximum:						9.04	5.70	1634.08	195.98			16.42	9.84	15.07	0.26
Minimum:						-1.59	2.06	534.54	168.31			-10.07	5.16	7.77	0.19
Average:						0.95	3.16	1087.79	183.29			3.90	7.91	12.68	0.24

01-Mar-94 Bldg 038 Interior Ambient Gamma Background Measurements Page 1 of 1

Data Description
Building 038 GAMMA
Background Survey
for T023 DATA

SAMPLE NAME	GRID NAME	GAMMA TOTAL	GAMMA (uR/h) TOTAL	GAMMA (uR/h) STD DEV
Front Door (Main Entrance)	1	1706	7.93	0.19
Women's Restroom	2	1719	7.99	0.19
Inside Large Conference Roor	3	1904	8.85	0.20
Inside Large Conference Roor	4	1953	9.08	0.21
Outside Office Rm 156/133	5	1723	8.01	0.19
Inside Exec. Conference Roor	6	1822	8.47	0.20
Inside Exec. Conference Roor	7	1769	8.23	0.20
Hallway	8	1584	7.37	0.19
Outside Rm 146a/143a	9	1803	8.38	0.20
Inside Rm 136	10	1767	8.22	0.20
Inside Rm 120	11	1632	7.59	0.19
Inside Rm 120	12	1616	7.51	0.19
Inside Rm 117	13	1748	8.13	0.19
Inside North Exit	14	1704	7.92	0.19
Inside Small Conference Roor	15	1751	8.14	0.19
Gaylord's Office Rm 111b	16	1701	7.91	0.19
Gibb's Office Rm 102a	17	1711	7.96	0.19
DeBear's Office Rm 102b	18	1655	7.70	0.19
Hallway Outside Rm 105	19	1738	8.08	0.19
Hallway Outside Lg. Conf. Rm	20	1838	8.55	0.20
Inside Rm 171	21	1701	7.91	0.19
Inside Rm 172	22	1699	7.90	0.19
Inside Rm 174	23	1744	8.11	0.19
Inside Rm 174	24	1618	7.52	0.19
Inside Rm 174	25	1702	7.91	0.19
Outside Men's Restroom	26	1731	8.05	0.19
Outside Rm 152	27	1727	8.03	0.19
Hallway	28	1705	7.93	0.19
Outside Rm 139	29	1838	8.55	0.20
Outside Vault	30	1935	9.00	0.20
South Exit	31	1800	8.37	0.20
BLANK>				
DATA>	Maximum	1953.00	9.08	0.21
DATA>	Minimum	1584.00	7.37	0.19
DATA>	Average	1741.47	8.10	0.19

EXHIBIT VI

NATIONAL ENVIRONMENTAL POLICY ACT DOCUMENTATION FOR DECONTAMINATION AND DECOMMISSIONING OF BUILDING 023 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

DMC
DAVIS
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