CONFIRMATORY SURVEY
OF
BUILDING 2, GROUP 8B LABORATORIES
GENERAL ATOMICS
SAN DIEGO, CALIFORNIA

Prepared by

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U.S. Nuclear Regulatory Commission

DRAFT REPORT

OCTOBER 1996

This draft report has not been given full review and patent clearance, and the dissemination of its information is only for official use. No release to the public shall be made without the approval of the Office of Information Services, Oak Ridge Institute for Science and Education.

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ABBREVIATIONS AND ACRONYMS

µR/h	microroentgens per hour
ASME	American Society of Mechanical Engineers
cm	centimeter
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 Measurements Laboratory
EPA	Environmental Protection Agency
ESSAP	Environmental Survey and Site Assessment Program
GA	General Atomics
GM	Geiger-Mueller
ha	hectare
km	kilometer
m	meter
m^2	square meter
MDC	Minimum Detectable Concentration
NaI	sodium iodide
NIST	National Institute of Standards and Technology
NRC	Nuclear Regulatory Commission
ORISE	Oak Ridge Institute for Science and Education
pCi/g	picocuries per gram
ZnS	zinc sulfide

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INTRODUCTION AND SITE HISTORY

General Atomics (GA) has been in the process of decommissioning and obtaining the release for unrestricted use for a number of selected laboratories and associated offices in GA's Building 2 (also known as the Science Laboratories Building or "L" Building). Building 2, built in 1958, was used to conduct research and developmental activities. Activities involving radioactive material included scanning electron microscopy and x-ray diffraction on uranium and thorium samples, assembly of irradiation capsules containing enriched uranium, U-238, and thorium, and analysis of nuclear fuel elements. GA is licensed by the Nuclear Regulatory Commission (NRC) under license SNM-696, Docket 70-734. The facility is also licensed by the State of California.

Decommissioning efforts began in 1988 with a block of laboratories known as "Group 1". To date, approximately eight groups of labs have been decontaminated and released for unrestricted use. GA has recently performed a final status survey for another group of 11 laboratories in Building 2, identified as the "Group 8B" laboratories (GA 1996). The primary radionuclides used in these laboratories were uranium (including enriched uranium) and thorium. In the past, many of these laboratories were decontaminated and then used for non-radiological purposes.

At the request of the NRC's Division of Fuel Cycle Safety and Safeguards, the Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) performed a confirmatory survey of the Group 8B labs. ESSAP performed a radiological survey of the Group 6 laboratories of Building 2 in February 1995 (ORISE 1995a).

SITE DESCRIPTION

The GA facilities are located near the intersection of Interstate 5 and Genesee Avenue in San Diego, California (Figure 1). Building 2 is divided into three laboratory sections: Laboratories A, B, and C. All laboratories in Group 8B are located in laboratory section A (Figure 2). The eleven laboratories and one mezzanine consist of a total area of about 350 m^2. The labs range in size from 10 m^2 to 60 m^2, while the mezzanine for labs 635, 637, and 639 has an area of 62 m^2. The labs are designated: 506, 506A, 508, 508A, 515, 519/521 (combined lab), 523, 530/532, 635, 637/639, and the mezzanine for labs 635 and 637/639. The wall surfaces consist of standard construction materials such as cement block, plasterboard, drywall, and wood. Some of the walls are painted and the floors are typically poured concrete. Tile was removed from the floor in some labs by the licensee to facilitate the final status survey.

OBJECTIVES

The objectives of the confirmatory survey are to provide independent contractor field data reviews and radiological data for use by the NRC in evaluating the adequacy and accuracy of the licensee's procedures and final status survey results.

DOCUMENT REVIEW

ESSAP has reviewed the licensee's final status survey report (GA 1996). Procedures and methods used by the licensee were reviewed for adequacy and appropriateness. The data were reviewed for accuracy, completeness, and compliance with guidelines.

PROCEDURES

ESSAP personnel performed visual inspections and independent measurements and sampling of the Group 8B laboratories on September 16 and 17, 1996. Survey activities were conducted in accordance with a site-specific survey plan (ORISE 1996), using procedures and instruments described in the ORISE/ESSAP Survey Procedures and Quality Assurance Manuals (ORISE 1995b

and c) and summarized in Appendices A and B. Rooms 506, 506A, 508, 508A, 519/521 (combined), 635, 637/639, and the mezzanine were selected for confirmatory survey. This report summarizes the procedures and results of the survey.

Reference Grid

Measurement and sampling locations were referenced to prominent building features (e.g., doorways, wall intersections, etc.) and recorded on representative area drawings.

Surface Scans

Surface scans for alpha, beta, and gamma activity were performed at a frequency of approximately 100 percent of the floors and 10 percent of the lower walls (up to 2 meters). Scans were performed using gas proportional and NaI scintillation detectors coupled to ratemeters or ratemeter-scaler with audible indicators. Locations of elevated direct radiation detected by scans were marked for further investigation.

Surface Activity Measurements

Background measurements of surface activity on poured concrete, sheet rock and concrete blocks, were performed at building locations that did not have a history of radioactive materials use.

Direct measurements for total alpha and total beta activity were performed at a total of 66 floor and lower wall locations in the surveyed lab areas. In addition, two five-point measurements were performed to determine the 1 m^2 grid block average beta surface activity in room 508. Direct measurements were performed using gas proportional detectors coupled to ratemeter-scalers. A smear sample for the determination of removable gross alpha and gross beta activity was collected at each direct measurement location. Figures 3 through 7 show measurement and sampling locations.

Additional direct measurements were performed at locations of elevated direct radiation identified by surface scans.

Exposure Rate Measurements

Background exposure rate levels were determined for the building interior at 5 locations of similar construction but without a history of radioactive materials use. Exposure rates were performed at a total of 16 locations in the surveyed labs and the mezzanine area. Exposure rate measurements were performed at 1 m above the floor surface using a microrem meter. Figures 3 through 7 show measurement locations.

Miscellaneous Sampling

A paint sample was collected from a 100 cm^2 area located off the lower portion of the south wall of Room 508. Sample location is indicated on Figure 3.

Sample Analysis and Data Interpretation

Samples and survey data were returned to ORISE's ESSAF laboratory in Oak Ridge, Tennessee for analysis and interpretation. The paint sample was analyzed by gamma and alpha spectrometry and results reported in dpm/100 cm^2 for the paint sample. Direct measurements for surface activity were converted to units of disintegrations per minute per 100 square centimeters (dpm/100 cm^2). Smears were analyzed for gross alpha and gross beta activity using a low background gas proportional counter, and the results converted to units of dpm/100 cm^2. Exposure rate measurements were reported in units of μR/h. The radionuclides of interest are uranium and thorium; however, spectra were reviewed for other identifiable photopeaks. Sample analyses were performed in accordance with the ORISE/ESSAP Laboratory Procedures Manual (ORISE 1995d). Additional information concerning major instrumentation is provided in Appendices A and B. Results were compared to the licensee's documentation and NRC guidelines established for release for unrestricted use, which are provided in Appendix C.

FINDINGS AND RESULTS

DOCUMENT REVIEW

ESSAP reviewed the licensee's radiological survey data and comments were provided verbally to the NRC and licensee. The licensee provided responses to those comments. In ESSAP's opinion, the licensee's documentation provided an adequate description of the radiological condition of the facility relative to the NRC guidelines for release for unrestricted use.

Surface Scans

Surface scans identified one area of elevated beta-gamma activity in room 508 (Figure 3).

Surface Activity Levels

Surface activity levels are summarized in Table 1. The results of single-point measurements ranged from less than 52 dpm/100 cm^2 for alpha activity and less than 310 to 1700 dpm/100 cm^2 for beta activity. Grid block average activity in room 508 was less than 52 dpm/100 cm^2 and 400 to 1,000 dpm/100 cm^2 for alpha and beta, respectively. Removable activity levels were less than 14 dpm/100 cm^2 for gross alpha and less than 16 dpm/100 cm^2 for gross beta.

Exposure Rates

Exposure rate measurement data is provided in Table 2. Background interior exposure rates ranged from 13 to 14 µR/h and averaged 14 µR/h. Exposure rates for the surveyed labs and the mezzanine area ranged from 11 to 17 µR/h.

Radionuclide Concentration in Paint

The radionuclide concentration in paint was qualitatively assessed to be enriched uranium.

COMPARISON OF RESULTS WITH GUIDELINES

The primary contaminants of concern for this site are natural thorium and enriched uranium. The applicable NRC guidelines for residual thorium and enriched uranium surface activity levels are (NRC 1987):

Natural thorium

1,000 dpm/100 cm^2, averaged over a 1 m^2 area

3,000 dpm/100 cm^2, maximum in a 100 cm^2 area

200 dpm/100 cm^2, removable activity

Enriched uranium

5,000 dpm α/100 cm^2, total, averaged over a 1 m^2 area

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

1,000 dpm α/100 cm^2, removable activity

Direct measurements performed on the south wall of laboratory 508 exceeded the average guideline for natural thorium—average surface activity measured 1,000 dpm/100 cm^2 (surface activity slightly exceeded guideline prior to rounding to two significant figures). After further investigation by the licensee, it was discovered that calibration gamma sources were being stored in the adjacent active laboratory. Direct measurements taken by the licensee before and after the removal of the sources indicate that the sources may be the cause of the elevated measurements. However, a paint sample collected by ESSAP from this area identified that the contamination was due to enriched uranium. The alpha-to-beta ratio for low enriched uranium may be approximated by a 3:1 ratio; therefore, the corresponding average beta activity guideline may be adjusted to 1,700 dpm/100 cm^2.

The guideline for exposure rates measured at 1 m above the surface is 5 μR/h above background (NRC 1991). All exposure rate measurements were within these guidelines.

SUMMARY

The Environmental Survey and Site Assessment Program of the Oak Ridge Institute for Science and Education conducted confirmatory activities for the Group 8B laboratories at the General Atomics Building 2 in San Diego, California. Confirmatory activities included document reviews and on September 16 and 17, 1996, ESSAP personnel visited the site and performed independent surface scans, surface activity measurements, miscellaneous sampling and exposure rate measurements.

The results of the independent confirmatory measurements and sampling supported the conclusions of the licensee's survey, relative to satisfying the guidelines established for this project.

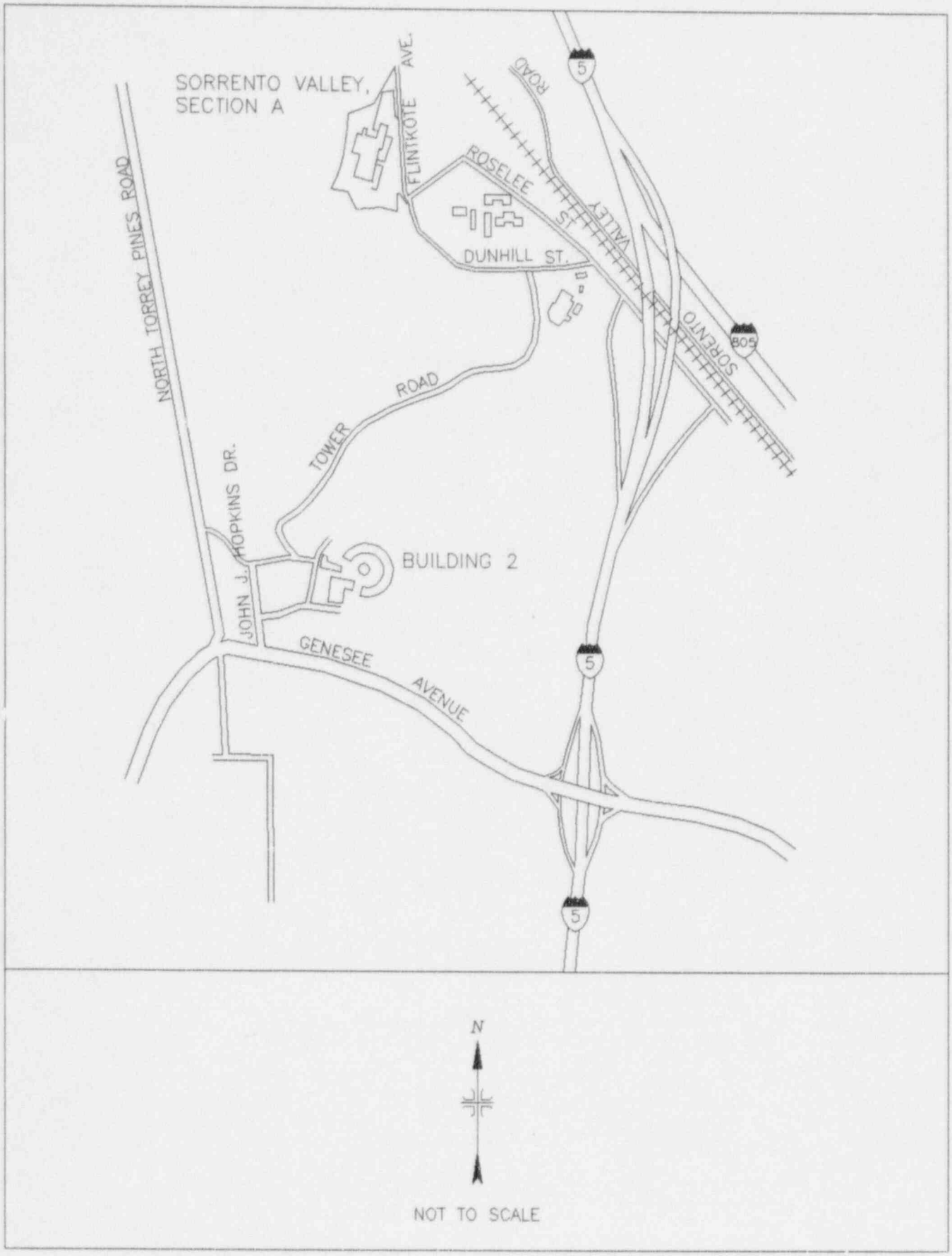
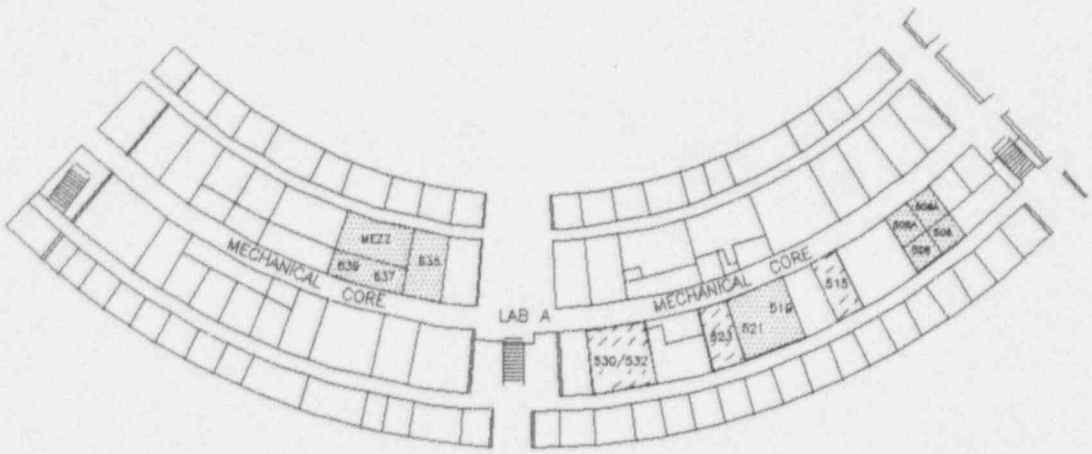


FIGURE 1: General Atomics Facility Indicating Location of Building 2



SECTION A BUILDING 2

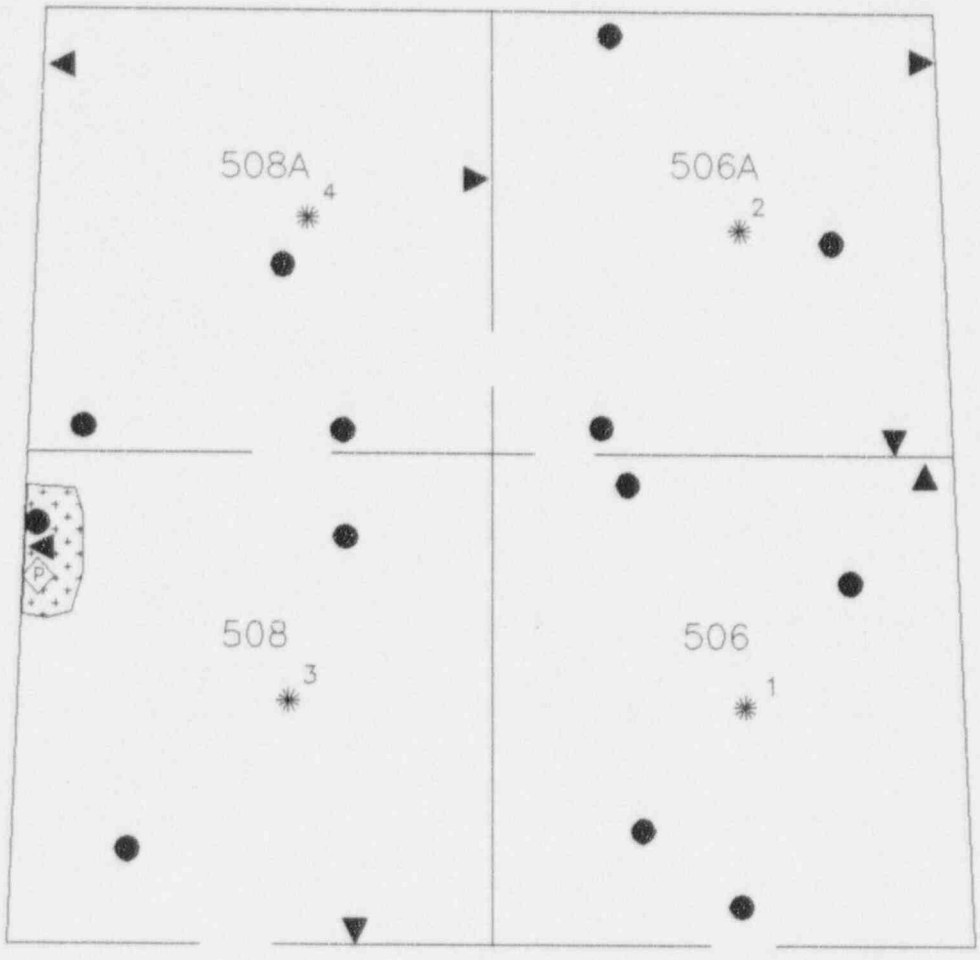
GROUP 8B LABS NOT SURVEYED

SURVEYED AREA

N

NOT TO SCALE

FIGURE 2: Building 2 – Group 8B Laboratories



MEASUREMENT/SAMPLING LOCATIONS

- SINGLE-POINT FLOOR
- SINGLE-POINT LOWER WALL
- (P) MISCELLANEOUS SAMPLE
- # EXPOSURE RATE

ELEVATED DIRECT RADIATION

N

FEET 0 3

METERS 0 1

FIGURE 3: Building 2, Rooms 506, 506A, 508, 508A – Measurement and Sampling Locations

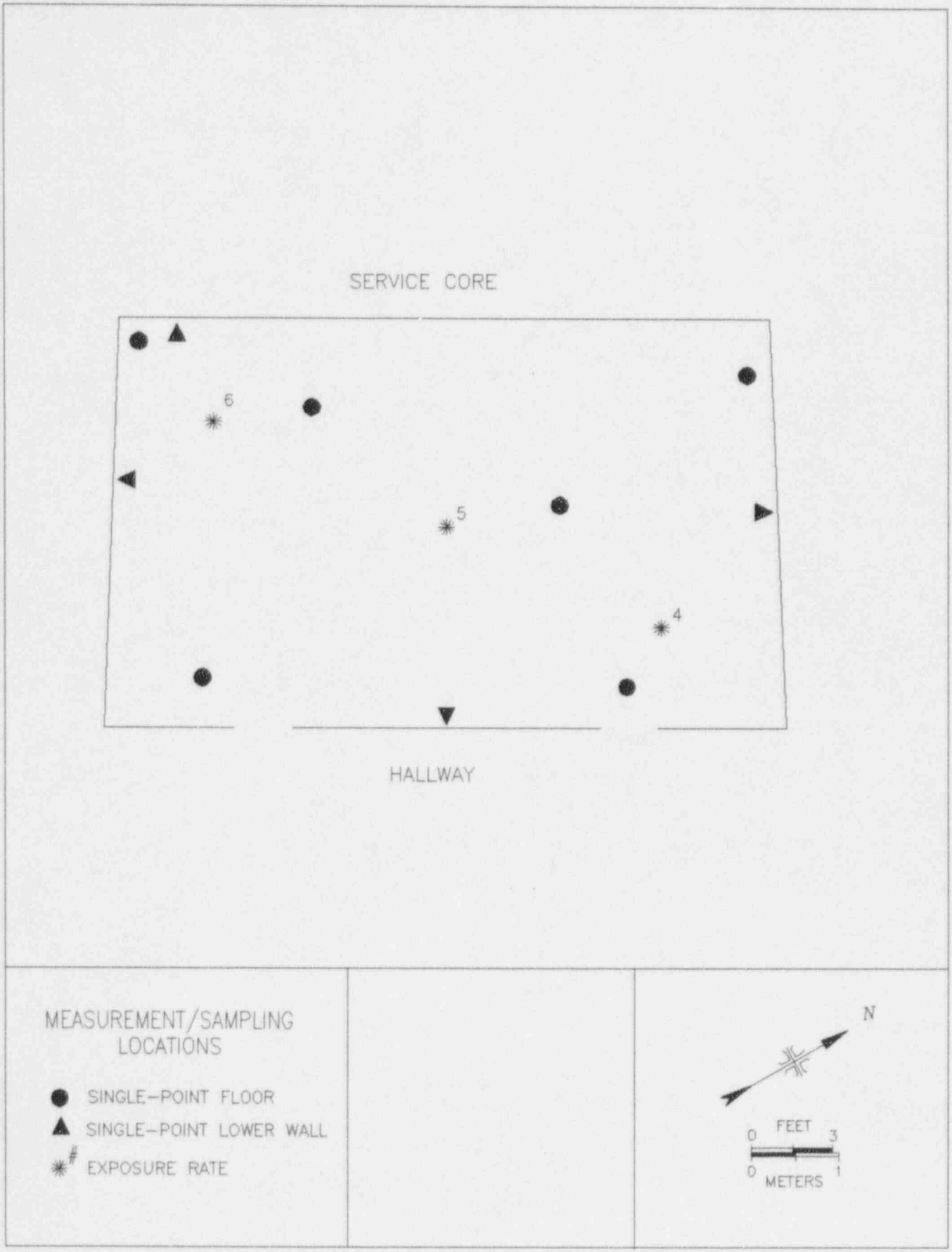


FIGURE 4: Building 2, Rooms 519/521 – Measurement and Sampling Locations

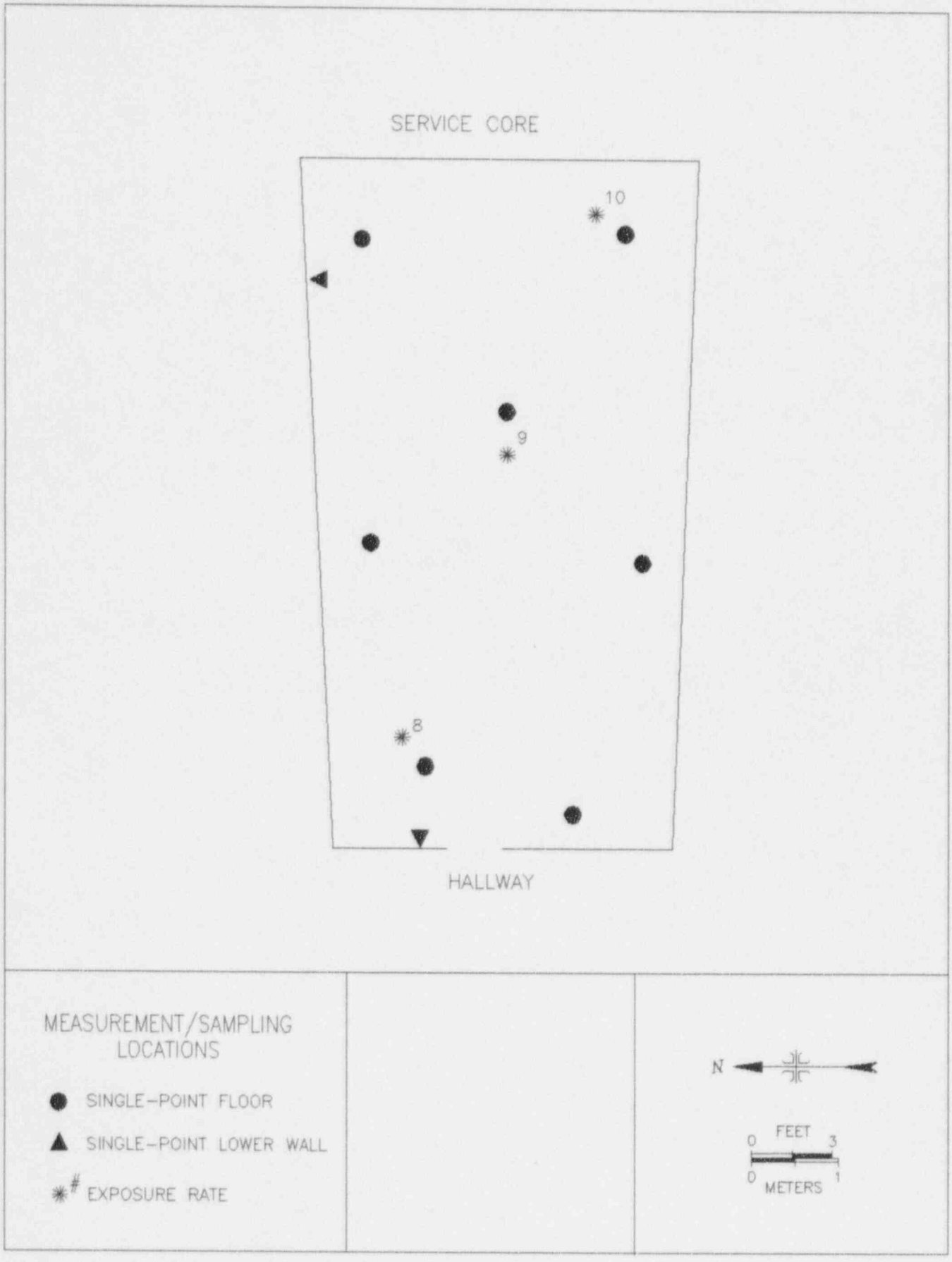


FIGURE 5: Building 2, Rooms 635 – Measurement and Sampling Locations

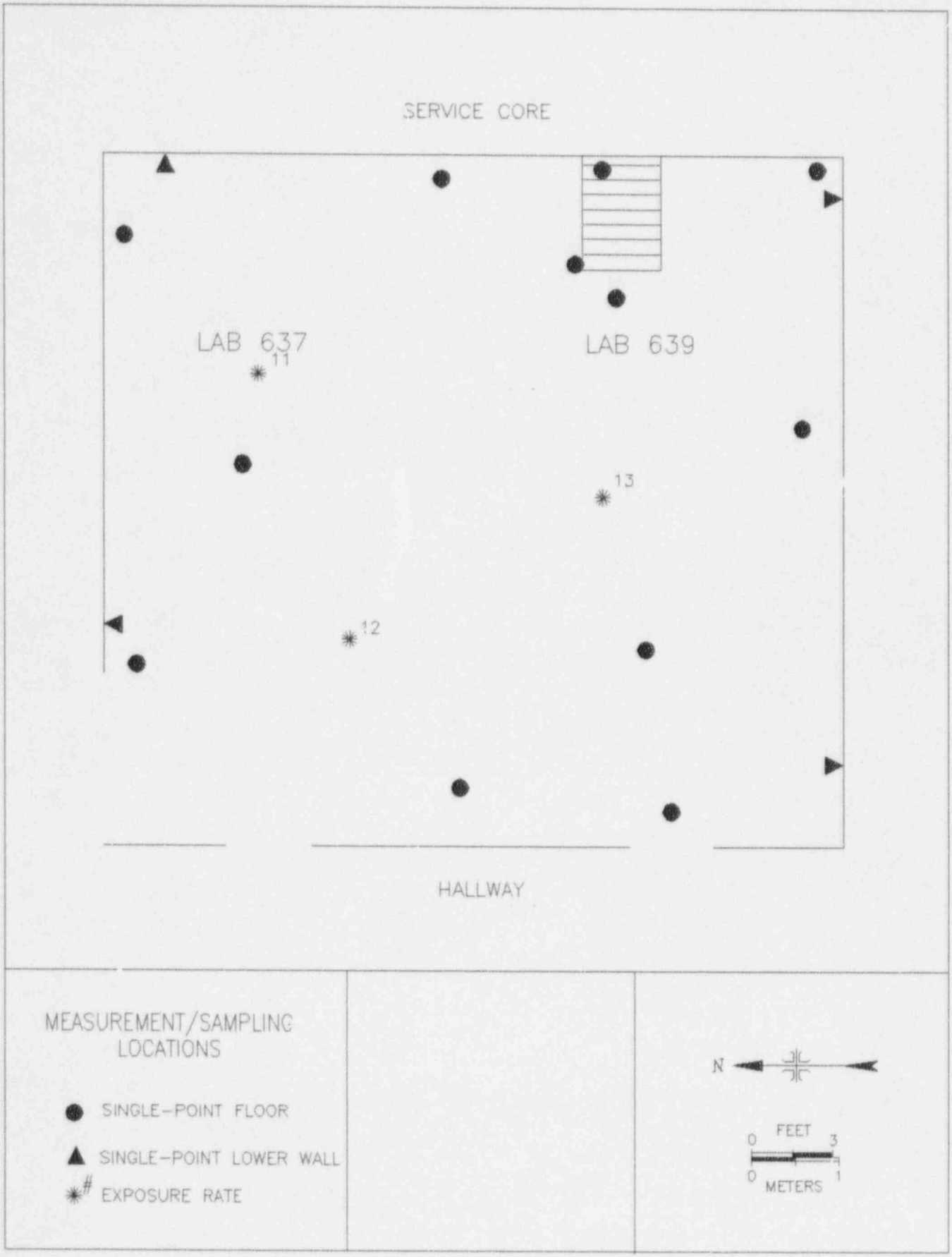


FIGURE 6: Building 2, Rooms 637/639 - Measurement and Sampling Locations

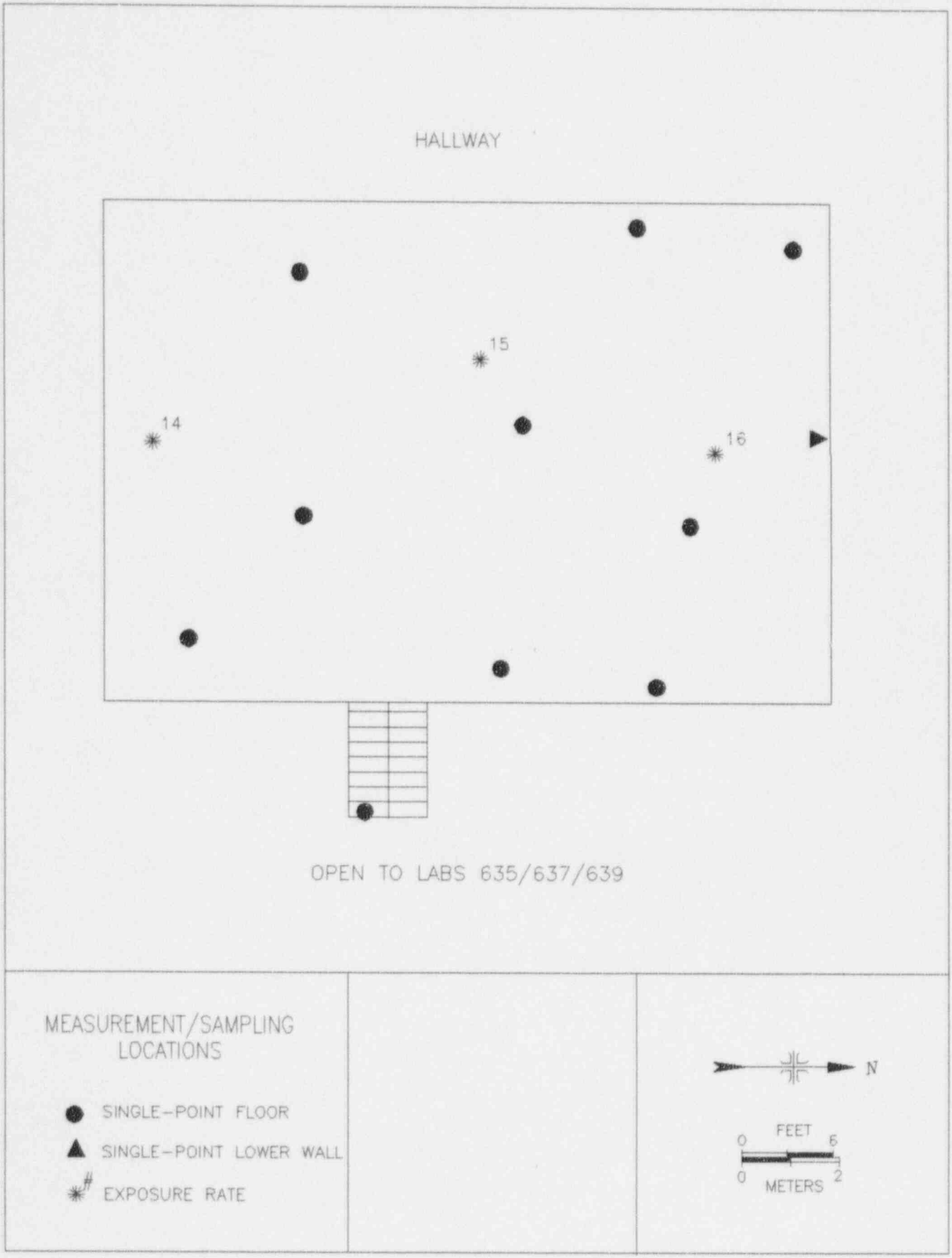


FIGURE 7: Building 2, Mezzanine above Rooms 637/639 – Measurement and Sampling Locations

TABLE 1

SUMMARY OF SURFACE ACTIVITY LEVELS OF BUILDING 2, GROUP 8B LABORATORIES GENERAL ATOMICS SAN DIEGO, CALIFORNIA

Location[a]	Number Measurement Location	Range of Total Activity (dpm/100 cm^2)		Range of Removable Activity (dpm/100 cm^2)	
		Alpha	Beta	Alpha	Beta
Labs 506/506A/508/508A	13 floor	<52	<310-830	<14	<16
	7 Lower wall	<29	<260-1,700	<14	<16
Labs 519/521	6 floor	<52	<310	<14	<16
	4 Lower wall	<29	<290	<14	<16
Lab 635	7 floor	<52	<310	<14	<16
	2 Lower wall	<29	<290	<14	<16
Lab 637/639	12 floor	<52	<310	<14	<16
	4 Lower wall	<29	<290	<14	<16
Mezzanine 635/637/639	10 floor	<29	<260	<14	<16
	1 Lower wall	<29	<290	<14	<16

[a]See Figures 3 through 7.

TABLE 2

EXPOSURE RATES
OF
BUILDING 2, GROUP 8B LABORATORIES
GENERAL ATOMICS
SAN DIEGO, CALIFORNIA

Location[a]	Exposure Rate Measurement (μR/hr)
Labs 506 #1	13
Lab 506A #2	16
Lab 508 #3	15
Labs 519/521 #5	15
Labs 519/521 #6	17
Labs 519/521 #7	14
Lab 635 #8	13
Lab 635 #9	12
Lab 635 #10	11
Labs 637/639 #11	14
Labs 637/639 #12	14
Labs 637/639 #13	14
Mezzanine #14	12
Mezzanine #15	11
Mezzanine #16	13

[a]See Figures 3 through 7.

REFERENCES

General Atomics (GA). Decontamination of Selected General Atomics' Science Laboratories for Release to Unrestricted Use (Group 8B). August 23, 1996.

Oak Ridge Institute for Science and Education. Radiological Survey for the Group 6 Laboratories, Building 2, General Atomics, San Diego, California. Oak Ridge, TN; May 1995a.

Oak Ridge Institute for Science and Education. Survey Procedures Manual for the Energy/Environment Systems Division, Environmental Survey and Site Assessment Program, Revision 9. Oak Ridge, Tennessee; April 30, 1995b.

Oak Ridge Institute for Science and Education. Quality Assurance Manual for the Energy/Environment Systems Division, Environmental Survey and Site Assessment Program, Revision 7. Oak Ridge, Tennessee; January 31, 1995c.

Oak Ridge Institute for Science and Education. Laboratory Procedures Manual for the Energy/Environment Systems Division, Environmental Survey and Site Assessment Program, Revision 9. Oak Ridge, Tennessee; January 31, 1995d.

Oak Ridge Institute for Science and Education (ORISE). Confirmatory Survey Plan for Building 2, Group 8B Laboratories, General Atomics, San Diego, California. Oak Ridge, Tennessee; September 1996.

U.S. Nuclear Regulatory Commission (NRC). Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of License for Byproduct, Source, or Special Nuclear Material. Washington, DC: NRC; August 1987.

U.S. Nuclear Regulatory Commission. Policy and Guideline Directive FC91-2, Standard Review Plan: Evaluating Decommissioning Plans for Licenses Under 10 CFR Parts 30, 40, and 70. Washington, DC: NRC; August 1991.

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 employer.

DIRECT RADIATION MEASUREMENT

Instruments

Eberline Pulse Ratemeter
Model 12
(Eberline, Santa Fe, NM)

Ludlum Floor Monitor
Model 239-1
(Ludlum Measurements, Inc.,
Sweetwater, TX)

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

Detectors

Eberline GM Detector
Model HP-260
Effective Area, 20 cm^2
(Eberline, Santa Fe, NM)

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

Ludlum Gas Proportional Detector
Model 43-68
Effective Area, 126 cm^2
(Ludlum Measurements, Inc., Sweetwater, TX)

Bicron Micro-RemMeter
Tissue Equivalent Survey Meter
(Bicron Corporation, Newberry, OH)

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

LABORATORY ANALYTICAL INSTRUMENTATION

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 by passing the detectors slowly over the surface; the distance between the detector 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 (20 cm^2 or 126 cm^2) hand-held detectors. Identification of elevated 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
	-	GM detector with ratemeter-scaler
Gamma	-	NaI scintillation detector with ratemeter

Surface Activity Measurements

Measurements of total beta activity levels were primarily performed using gas proportional 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. Because different building materials (poured concrete, concrete block, metal, wood, etc.) can have very different background levels, average background counts were

determined for each material encountered in the surveyed area at a location of similar construction and having no known radiological history. The beta activity background count rates for the gas proportional detectors averaged 618 cpm for poured concrete, 430 cpm for sheet rock, and 524 cpm for cinder block. Alpha background count rates for the gas proportional detectors averaged 5 cpm for poured concrete, 1 cpm for sheet rock and 1 cpm for cinder block. Net count rates were determined by subtracting the appropriate material background from the gross count rate for each measurement location. The beta efficiency factor was 0.29 for the gas proportional detector calibrated to Tl-204. The beta minimum detectable concentrations (MDC) for the gas proportional detectors varied by material and ranged from 260 to 310 dpm/100 cm^2. The alpha efficiency factor was 0.2 for the gas proportional detectors calibrated to Th-230 and MDCs ranged from 30 to 50 dpm/100 cm^2. The physical window area for the gas proportional detectors is 126 cm^2.

Removable Activity Measurements

Removable activity levels were determined using numbered filter paper disks, 47 mm in diameter. Moderate pressure was applied to the smear 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

Measurements of gamma exposure rates were performed using a microrem meter. The instrument was held at one meter above the surface. The measurement was read directly in μR/h.

ANALYTICAL PROCEDURES

Gross Alpha/Beta

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

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 concentration (MDC), were based on 2.71 plus 4.65 times the standard deviation of the background count [$2.71 + 4.65\sqrt{BKG}$]. When the activity was determined to be less than the MDC of the measurement procedure, the result was reported as less than MDC. Because of variations in background levels, measurement efficiencies, and contributions from other radionuclides in samples, 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 standard/sources were available. In cases where they were not available, standards of an industry recognized organization were used.

Analytical and field survey activities were conducted in accordance with procedures from the following documents of the Environmental Survey and Site Assessment Program:

- Survey Procedures Manual, Revision 9 (April 1995)
- Laboratory Procedures Manual, Revision 9 (January 1995)
- Quality Assurance Manual, Revision 7 (January 1995)

The procedures contained in these manuals were developed to meet the requirements of DOE Order 5700.6C and ASME NQA-1 for Quality Assurance 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

GUIDELINES FOR DECONTAMINATION OF FACILITIES AND EQUIPMENT PRIOR TO RELEASE FOR UNRESTRICTED USE OR TERMINATION OF LICENSES FOR BYPRODUCT, SOURCE OR SPECIAL NUCLEAR MATERIAL

U. S. Nuclear Regulatory Commission
Division of Fuel Cycle & Material Safety
Washington, D.C. 20555

August 1987

The instructions in this guide, in conjunction with Table 1, specify the radionuclides and radiation exposure rate limits which should be used in decontamination and survey of surfaces or premises and equipment prior to abandonment or release for unrestricted use. The limits in Table 1 do not apply to premises, equipment, or scrap containing induced radioactivity for which the radiological considerations pertinent to their use may be different. The release of such facilities or items from regulatory control is considered on a case-by-case basis.

1. The licensee shall make a reasonable effort to eliminate residual contamination.

2. Radioactivity on equipment or surfaces shall not be covered by paint, plating, or other covering material unless contamination levels, as determined by a survey and documented, are below the limits specified in Table 1 prior to the application of the covering. A reasonable effort must be made to minimize the contamination prior to use of any covering.

3. The radioactivity on the interior surfaces of pipes, drain lines, or ductwork shall be determined by making measurements at all traps, and other appropriate access points, provided that contamination at these locations is likely to be representative of contamination on the interior of the pipes, drain lines, or ductwork. Surfaces or premises, equipment, or scrap which are likely to be contaminated, but are of such size, construction, or location as to make the surface inaccessible for purposes of measurement, shall be presumed to be contaminated in excess of the limits.

4. Upon request, the Commission may authorize a licensee to relinquish possession or control of premises, equipment, or scrap having surfaces contaminated with materials in excess of the limits specified. This may include, but would not be limited to special circumstances such as razing of buildings, transfer from premises to another organization continuing work with radioactive materials, or conversion of facilities to a long-term storage or standby status. Such requests must:

a. Provide detailed, specific information describing the premises, equipment or scrap, radioactive contaminants, and the nature, extent, and degree of residual surface contamination.

b. Provide a detailed health and safety analysis which reflects that the residual amounts of materials on surface areas, together with other considerations such as prospective use of the premises, equipment, or scrap, are unlikely to result in an unreasonable risk to the health and safety of the public.

5. Prior to release of premises for unrestricted use, the licensee shall make a comprehensive radiation survey which establishes that contamination is within the limits specified in Table 1. A copy of the survey report shall be filed with the Division of Fuel Cycle, Medical, Academic, and Commercial Use Safety, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, and also the Administrator of the NRC Regional Office having jurisdiction. The report should be filed at least 30 days prior to the planned date of abandonment. The survey report shall:

a. Identify the premises.

b. Show that reasonable effort has been made to eliminate residual contamination.

c. Describe the scope of the survey and general procedures followed.

d. State the findings of the survey in units specified in the instruction.

Following review of the report, the NRC will consider visiting the facilities to confirm the survey.

TABLE 1

ACCEPTABLE SURFACE CONTAMINATION LEVELS

Nuclides[a]	Average[b,c,f]	Maximum[b,d,f]	Removable[b,e,f]
U-nat, U-235, U-238, and associated decay products	5,000 dpm α/100 cm^2	15,000 dpm α/100 cm^2	1,000 dpm α/100 cm^2
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	100 dpm/100 cm^2	300 dpm/100 cm^2	20 dpm/100 cm^2
Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	1,000 dpm/100 cm^2	3,000 dpm/100 cm^2	200 dpm/100 cm^2
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above.	5,000 dpm $\beta\gamma$/100 cm^2	15,000 dpm $\beta\gamma$/100 cm^2	1,000 dpm $\beta\gamma$/100 cm^2

[a]Where surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits established for alpha- and beta-gamma-emitting nuclides 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 observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

[c]Measurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.

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

[e]The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.

[f]The average and maximum radiation levels associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mrad/h at 1 cm and 1.0 mrad/h at 1 cm, respectively, measured through not more than 7 milligrams per square centimeter of total absorber.

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DRAFT REPORT

OCTOBER 1996

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ACKNOWLEDGMENTS

The authors would like to acknowledge the significant contributions of the following staff members:

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ABBREVIATIONS AND ACRONYMS

µR/h	microroentgens per hour
ASME	American Society of Mechanical Engineers
cm	centimeter
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 Measurements Laboratory
EPA	Environmental Protection Agency
ESSAP	Environmental Survey and Site Assessment Program
GA	General Atomics
GM	Geiger-Mueller
ha	hectare
km	kilometer
m	meter
m^2	square meter
MDC	Minimum Detectable Concentration
NaI	sodium iodide
NIST	National Institute of Standards and Technology
NRC	Nuclear Regulatory Commission
ORISE	Oak Ridge Institute for Science and Education
pCi/g	picocuries per gram
ZnS	zinc sulfide

CONFIRMATORY SURVEY
OF
BUILDING 2, GROUP 8B LABORATORIES
GENERAL ATOMICS
SAN DIEGO, CALIFORNIA

INTRODUCTION AND SITE HISTORY

General Atomics (GA) has been in the process of decommissioning and obtaining the release for unrestricted use for a number of selected laboratories and associated offices in GA's Building 2 (also known as the Science Laboratories Building or "L" Building). Building 2, built in 1958, was used to conduct research and developmental activities. Activities involving radioactive material included scanning electron microscopy and x-ray diffraction on uranium and thorium samples, assembly of irradiation capsules containing enriched uranium, U-238, and thorium, and analysis of nuclear fuel elements. GA is licensed by the Nuclear Regulatory Commission (NRC) under license SNM-696, Docket 70-734. The facility is also licensed by the State of California.

Decommissioning efforts began in 1988 with a block of laboratories known as "Group 1". To date, approximately eight groups of labs have been decontaminated and released for unrestricted use. GA has recently performed a final status survey for another group of 11 laboratories in Building 2, identified as the "Group 8B" laboratories (GA 1996). The primary radionuclides used in these laboratories were uranium (including enriched uranium) and thorium. In the past, many of these laboratories were decontaminated and then used for non-radiological purposes.

At the request of the NRC's Division of Fuel Cycle Safety and Safeguards, the Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) performed a confirmatory survey of the Group 8B labs. ESSAP performed a radiological survey of the Group 6 laboratories of Building 2 in February 1995 (ORISE 1995a).

SITE DESCRIPTION

The GA facilities are located near the intersection of Interstate 5 and Genesee Avenue in San Diego, California (Figure 1). Building 2 is divided into three laboratory sections: Laboratories A, B, and C. All laboratories in Group 8B are located in laboratory section A (Figure 2). The eleven laboratories and one mezzanine consist of a total area of about 350 m^2. The labs range in size from 10 m^2 to 60 m^2, while the mezzanine for labs 635, 637, and 639 has an area of 62 m^2. The labs are designated: 506, 506A, 508, 508A, 515, 519/521 (combined lab), 523, 530/532, 635, 637/639, and the mezzanine for labs 635 and 637/639. The wall surfaces consist of standard construction materials such as cement block, plasterboard, drywall, and wood. Some of the walls are painted and the floors are typically poured concrete. Tile was removed from the floor in some labs by the licensee to facilitate the final status survey.

OBJECTIVES

The objectives of the confirmatory survey are to provide independent contractor field data reviews and radiological data for use by the NRC in evaluating the adequacy and accuracy of the licensee's procedures and final status survey results.

DOCUMENT REVIEW

ESSAP has reviewed the licensee's final status survey report (GA 1996). Procedures and methods used by the licensee were reviewed for adequacy and appropriateness. The data were reviewed for accuracy, completeness, and compliance with guidelines.

PROCEDURES

ESSAP personnel performed visual inspections and independent measurements and sampling of the Group 8B laboratories on September 16 and 17, 1996. Survey activities were conducted in accordance with a site-specific survey plan (ORISE 1996), using procedures and instruments described in the ORISE/ESSAP Survey Procedures and Quality Assurance Manuals (ORISE 1995b

and c) and summarized in Appendices A and B. Rooms 506, 506A, 508, 508A, 519/521 (combined), 635, 637/639, and the mezzanine were selected for confirmatory survey. This report summarizes the procedures and results of the survey.

Reference Grid

Measurement and sampling locations were referenced to prominent building features (e.g., doorways, wall intersections, etc.) and recorded on representative area drawings.

Surface Scans

Surface scans for alpha, beta, and gamma activity were performed at a frequency of approximately 100 percent of the floors and 10 percent of the lower walls (up to 2 meters). Scans were performed using gas proportional and NaI scintillation detectors coupled to ratemeters or ratemeter-scaler with audible indicators. Locations of elevated direct radiation detected by scans were marked for further investigation.

Surface Activity Measurements

Background measurements of surface activity on poured concrete, sheet rock and concrete blocks, were performed at building locations that did not have a history of radioactive materials use.

Direct measurements for total alpha and total beta activity were performed at a total of 66 floor and lower wall locations in the surveyed lab areas. In addition, two five-point measurements were performed to determine the 1 m^2 grid block average beta surface activity in room 508. Direct measurements were performed using gas proportional detectors coupled to ratemeter-scalers. A smear sample for the determination of removable gross alpha and gross beta activity was collected at each direct measurement location. Figures 3 through 7 show measurement and sampling locations.

Additional direct measurements were performed at locations of elevated direct radiation identified by surface scans.

EXPOSURE RATE MEASUREMENTS

Background exposure rate levels were determined for the building interior at 5 locations of similar construction but without a history of radioactive materials use. Exposure rates were performed at a total of 16 locations in the surveyed labs and the mezzanine area. Exposure rate measurements were performed at 1 m above the floor surface using a microrem meter. Figures 3 through 7 show measurement locations.

MISCELLANEOUS SAMPLING

A paint sample was collected from a 100 cm^2 area located off the lower portion of the south wall of Room 508. Sample location is indicated on Figure 3.

SAMPLE ANALYSIS AND DATA INTERPRETATION

Samples and survey data were returned to ORISE's ESSAP laboratory in Oak Ridge, Tennessee for analysis and interpretation. The paint sample was analyzed by gamma and alpha spectrometry and results reported in dpm/100 cm^2 for the paint sample. Direct measurements for surface activity were converted to units of disintegrations per minute per 100 square centimeters (dpm/100 cm^2). Smears were analyzed for gross alpha and gross beta activity using a low background gas proportional counter, and the results converted to units of dpm/100 cm^2. Exposure rate measurements were reported in units of µR/h. The radionuclides of interest are uranium and thorium; however, spectra were reviewed for other identifiable photopeaks. Sample analyses were performed in accordance with the ORISE/ESSAP Laboratory Procedures Manual (ORISE 1995d). Additional information concerning major instrumentation is provided in Appendices A and B. Results were compared to the licensee's documentation and NRC guidelines established for release for unrestricted use, which are provided in Appendix C.

FINDINGS AND RESULTS

DOCUMENT REVIEW

ESSAP reviewed the licensee's radiological survey data and comments were provided verbally to the NRC and licensee. The licensee provided responses to those comments. In ESSAP's opinion, the licensee's documentation provided an adequate description of the radiological condition of the facility relative to the NRC guidelines for release for unrestricted use.

Surface Scans

Surface scans identified one area of elevated beta-gamma activity in room 508 (Figure 3).

Surface Activity Levels

Surface activity levels are summarized in Table 1. The results of single-point measurements ranged from less than 52 dpm/100 cm^2 for alpha activity and less than 310 to 1700 dpm/100 cm^2 for beta activity. Grid block average activity in room 508 was less than 52 dpm/100 cm^2 and 400 to 1,000 dpm/100 cm^2 for alpha and beta, respectively. Removable activity levels were less than 14 dpm/100 cm^2 for gross alpha and less than 16 dpm/100 cm^2 for gross beta.

Exposure Rates

Exposure rate measurement data is provided in Table 2. Background interior exposure rates ranged from 13 to 14 μR/h and averaged 14 μR/h. Exposure rates for the surveyed labs and the mezzanine area ranged from 11 to 17 μR/h.

Radionuclide Concentration in Paint

The radionuclide concentration in paint was qualitatively assessed to be enriched uranium.

COMPARISON OF RESULTS WITH GUIDELINES

The primary contaminants of concern for this site are natural thorium and enriched uranium. The applicable NRC guidelines for residual thorium and enriched uranium surface activity levels are (NRC 1987):

Natural thorium

1,000 dpm/100 cm^2, averaged over a 1 m^2 area

3,000 dpm/100 cm^2, maximum in a 100 cm^2 area

200 dpm/100 cm^2, removable activity

Enriched uranium

5,000 dpm α/100 cm^2, total, averaged over a 1 m^2 area

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

1,000 dpm α/100 cm^2, removable activity

Direct measurements performed on the south wall of laboratory 508 exceeded the average guideline for natural thorium—average surface activity measured 1,000 dpm/100 cm^2 (surface activity slightly exceeded guideline prior to rounding to two significant figures). After further investigation by the licensee, it was discovered that calibration gamma sources were being stored in the adjacent active laboratory. Direct measurements taken by the licensee before and after the removal of the sources indicate that the sources may be the cause of the elevated measurements. However, a paint sample collected by ESSAP from this area identified that the contamination was due to enriched uranium. The alpha-to-beta ratio for low enriched uranium may be approximated by a 3:1 ratio; therefore, the corresponding average beta activity guideline may be adjusted to 1,700 dpm/100 cm^2.

The guideline for exposure rates measured at 1 m above the surface is 5 μR/h above background (NRC 1991). All exposure rate measurements were within these guidelines.

SUMMARY

The Environmental Survey and Site Assessment Program of the Oak Ridge Institute for Science and Education conducted confirmatory activities for the Group 8B laboratories at the General Atomics Building 2 in San Diego, California. Confirmatory activities included document reviews and on September 16 and 17, 1996, ESSAP personnel visited the site and performed independent surface scans, surface activity measurements, miscellaneous sampling and exposure rate measurements.

The results of the independent confirmatory measurements and sampling supported the conclusions of the licensee's survey, relative to satisfying the guidelines established for this project.

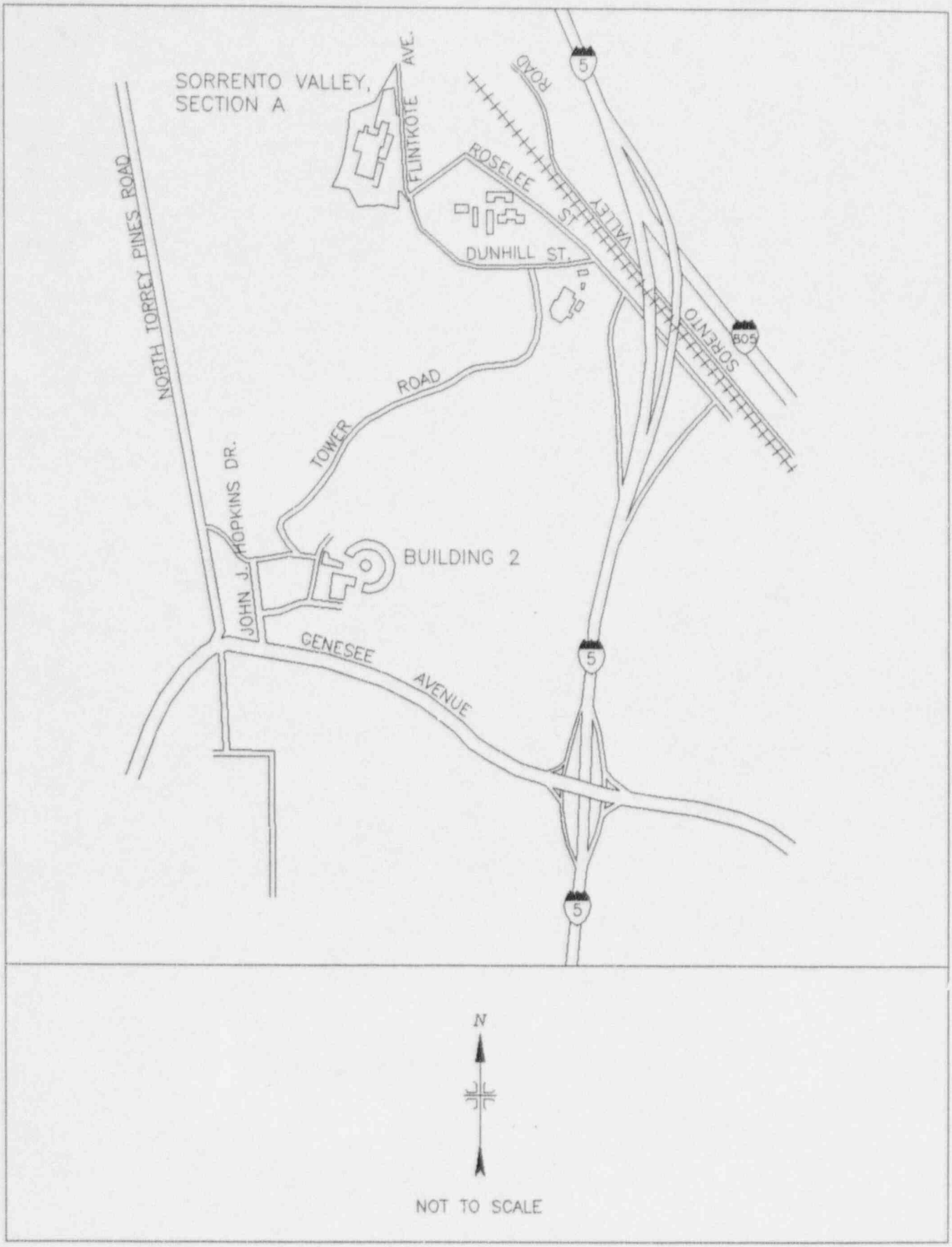
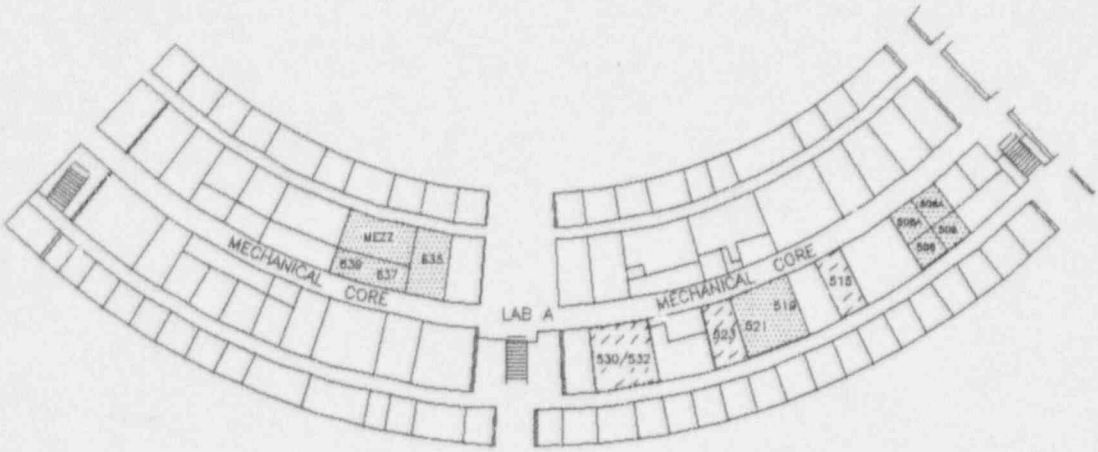


FIGURE 1: General Atomics Facility Indicating Location of Building 2



SECTION A BUILDING 2

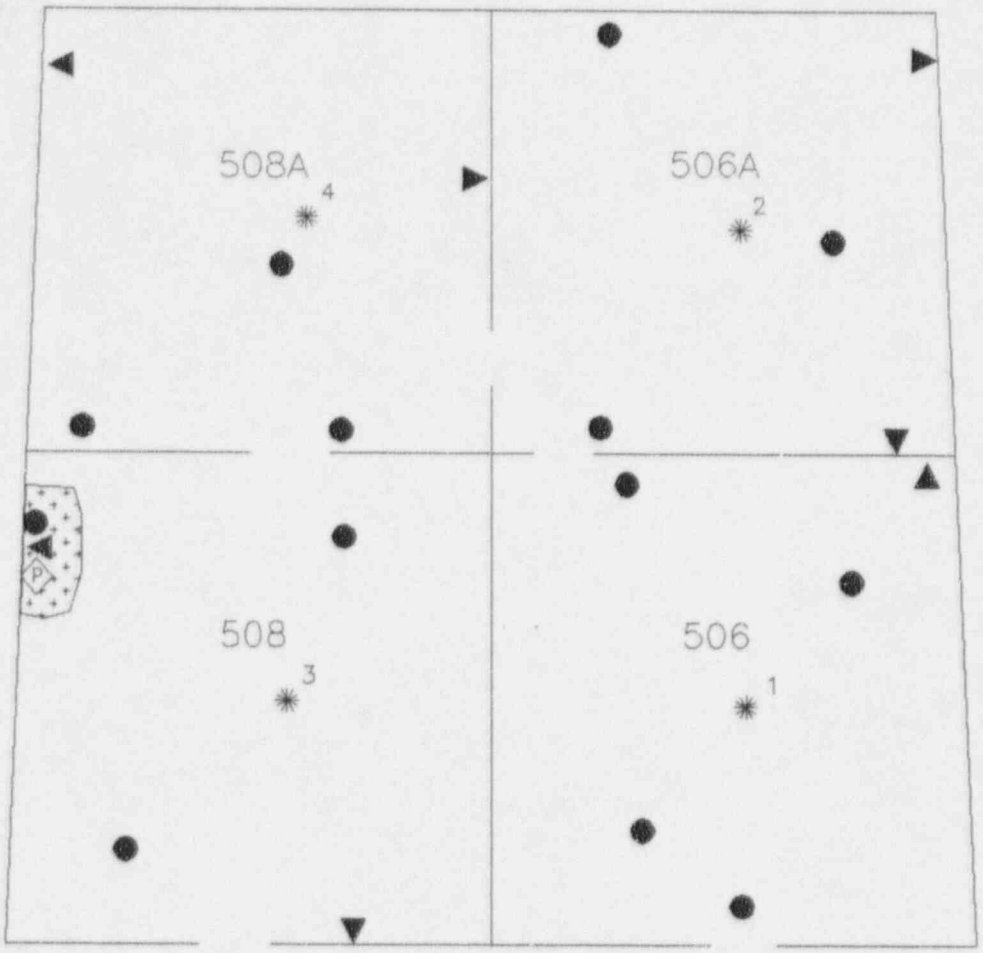
GROUP 8B LABS NOT SURVEYED

SURVEYED AREA

N

NOT TO SCALE

FIGURE 2: Building 2 – Group 8B Laboratories



MEASUREMENT/SAMPLING LOCATIONS

- SINGLE-POINT FLOOR
- SINGLE-POINT LOWER WALL
- MISCELLANEOUS SAMPLE
- # EXPOSURE RATE

ELEVATED DIRECT RADIATION

N

FEET 0 3

METERS 0 1

FIGURE 3: Building 2, Rooms 506, 506A, 508, 508A – Measurement and Sampling Locations

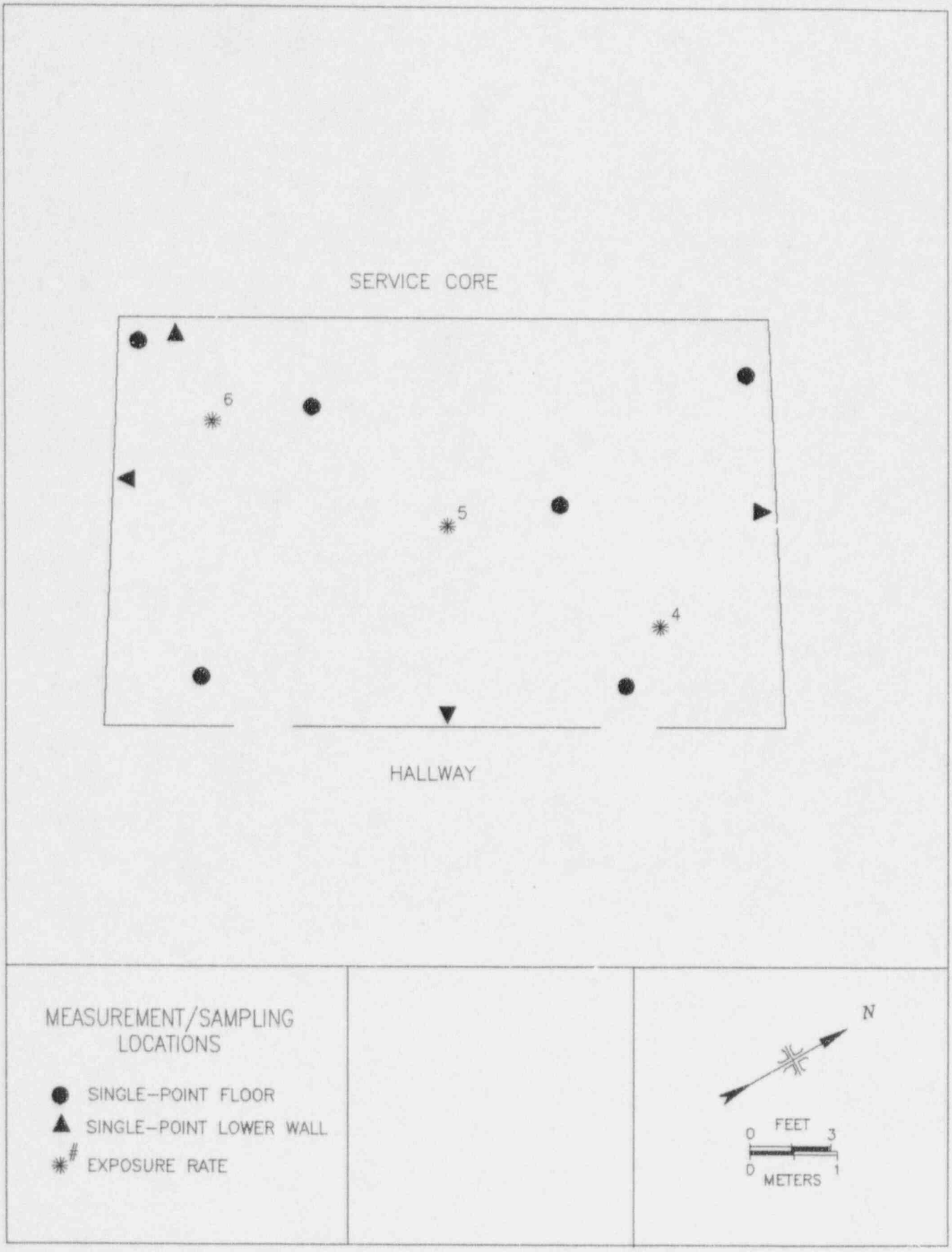


FIGURE 4: Building 2, Rooms 519/521 – Measurement and Sampling Locations

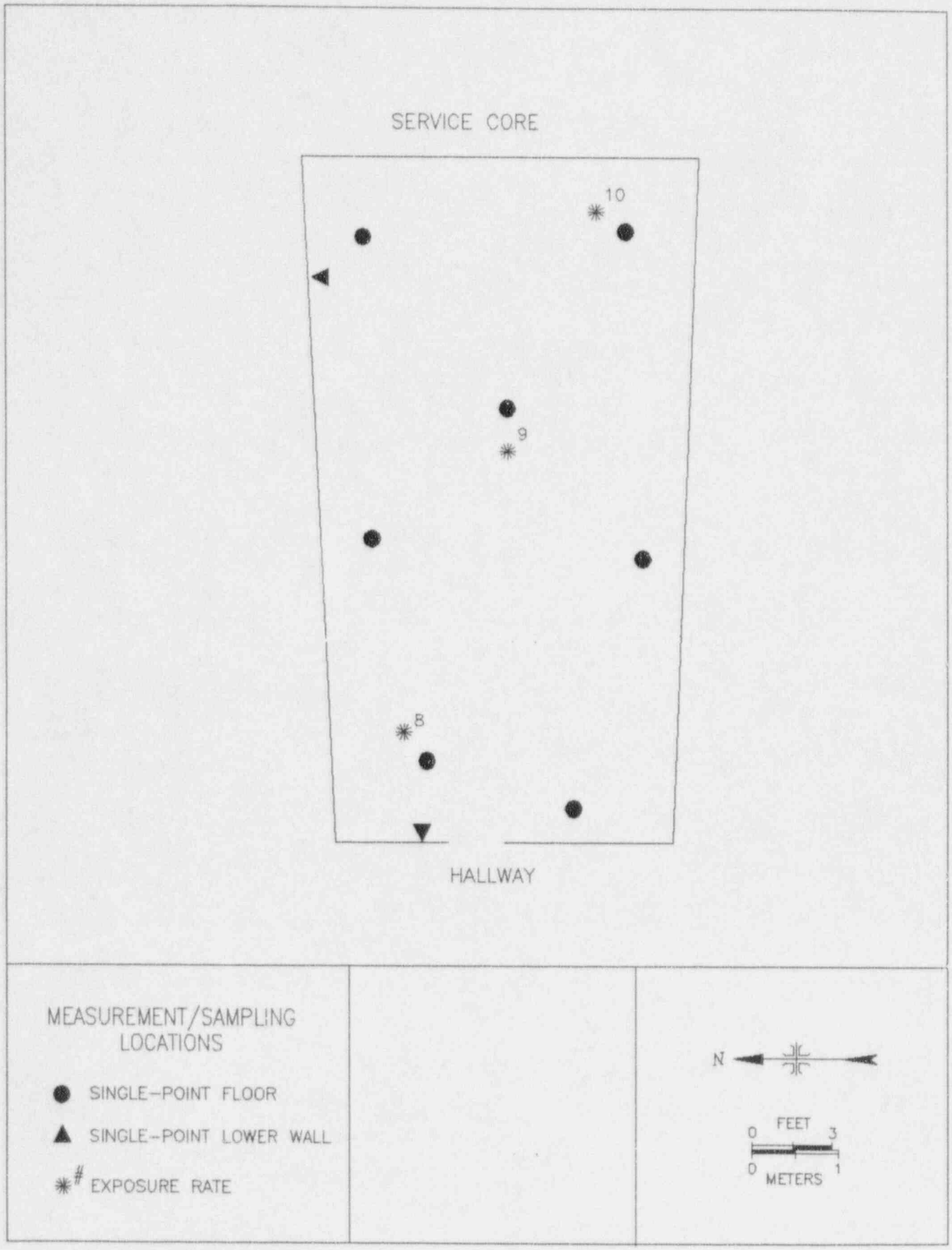


FIGURE 5: Building 2, Rooms 635 – Measurement and Sampling Locations

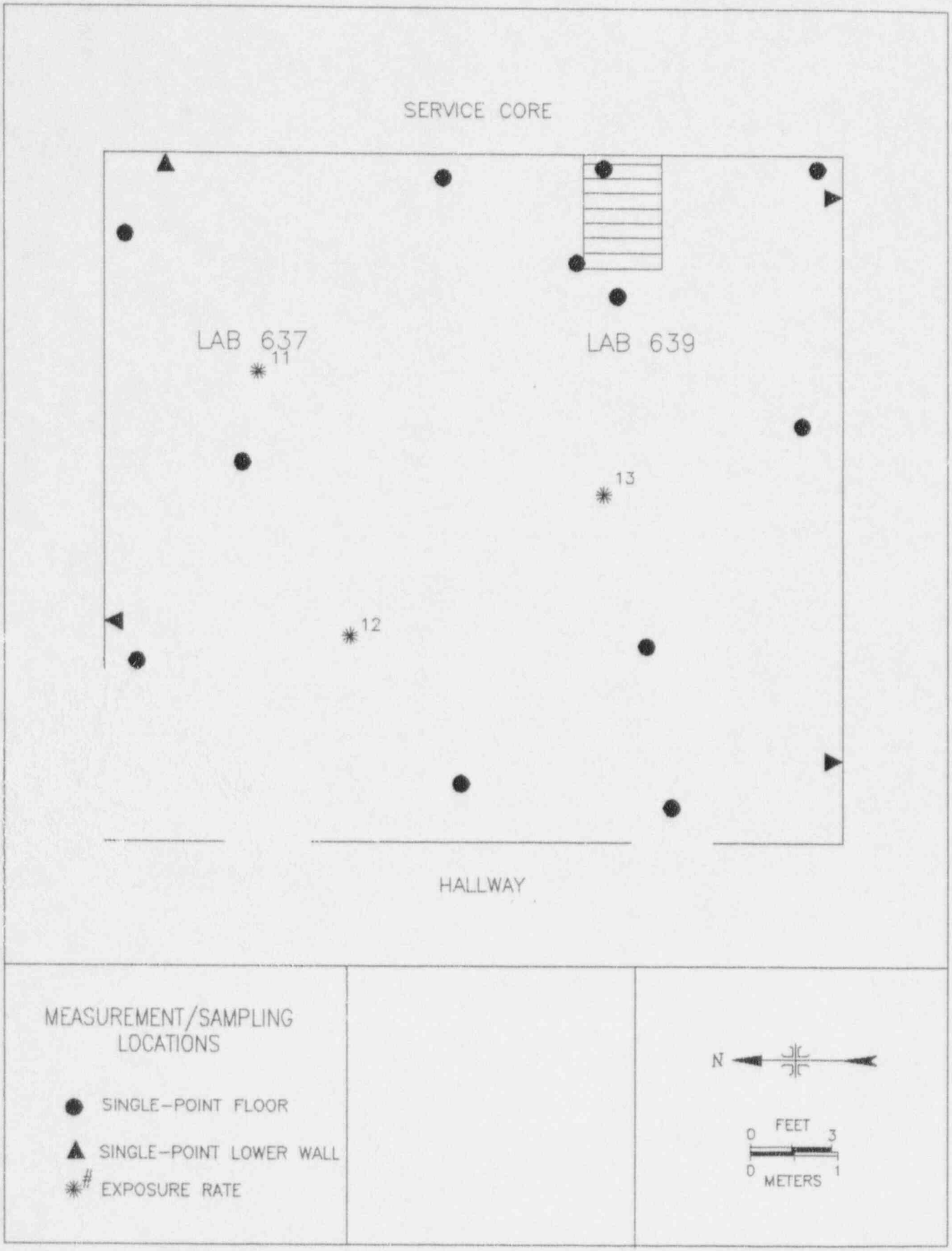


FIGURE 6: Building 2, Rooms 637/639 – Measurement and Sampling Locations

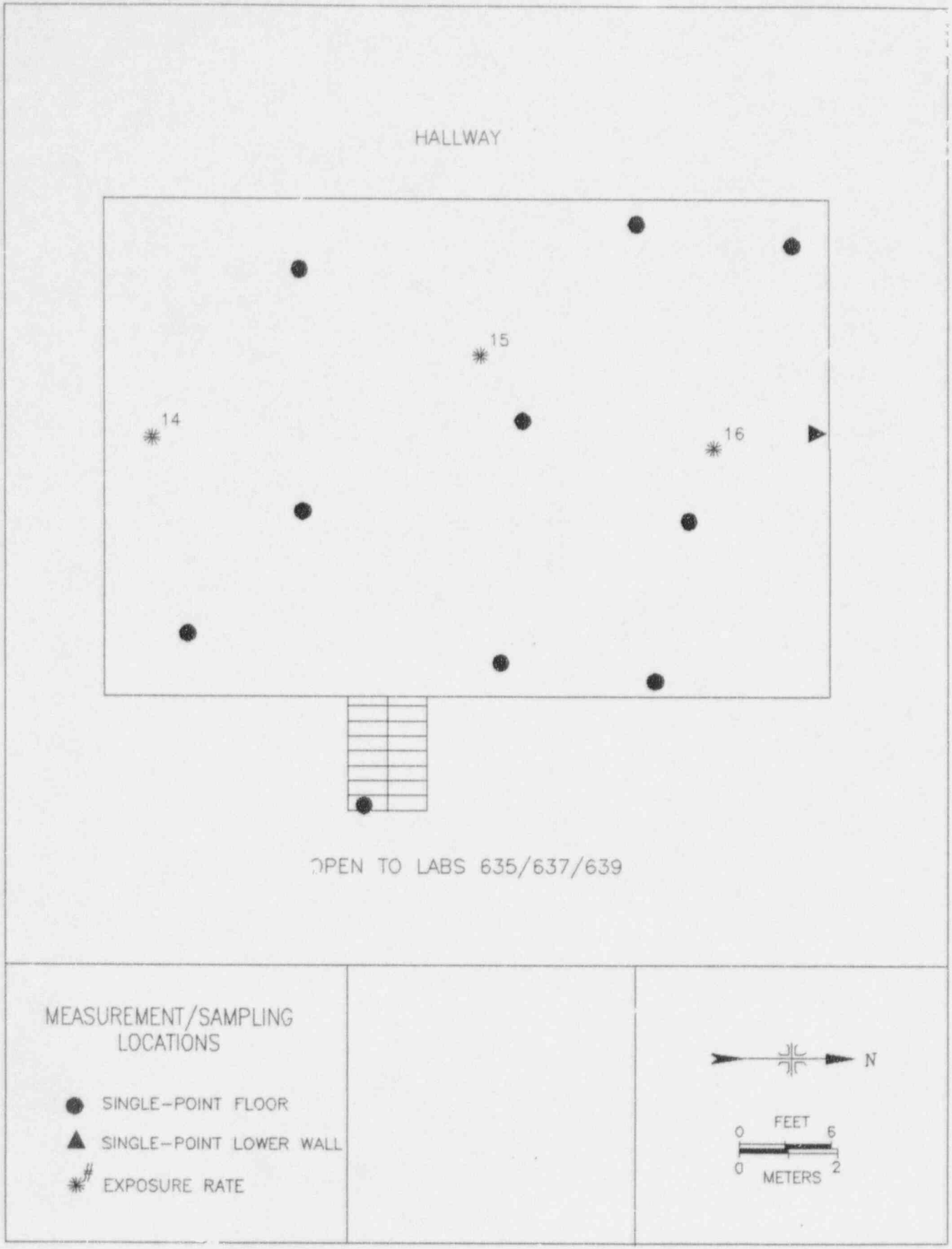


FIGURE 7: Building 2, Mezzanine above Rooms 637/639 - Measurement and Sampling Locations

TABLE 1

SUMMARY OF SURFACE ACTIVITY LEVELS OF BUILDING 2, GROUP 8B LABORATORIES GENERAL ATOMICS SAN DIEGO, CALIFORNIA

Location[a]	Number Measurement Location	Range of Total Activity (dpm/100 cm^2)		Range of Removable Activity (dpm/100 cm^2)	
		Alpha	Beta	Alpha	Beta
Labs 506/506A/508/508A	13 floor	<52	<310-830	<14	<16
	7 Lower wall	<29	<260-1,700	<14	<16
Labs 519/521	6 floor	<52	<310	<14	<16
	4 Lower wall	<29	<290	<14	<16
Lab 635	7 floor	<52	<310	<14	<16
	2 Lower wall	<29	<290	<14	<16
Lab 637/639	12 floor	<52	<310	<14	<16
	4 Lower wall	<29	<290	<14	<16
Mezzanine 635/637/639	10 floor	<29	<260	<14	<16
	1 Lower wall	<29	<290	<14	<16

[a]See Figures 3 through 7.

TABLE 2

EXPOSURE RATES
OF
BUILDING 2, GROUP 8B LABORATORIES
GENERAL ATOMICS
SAN DIEGO, CALIFORNIA

Location[a]	Exposure Rate Measurement (μR/hr)
Labs 506 #1	13
Lab 506A #2	16
Lab 508 #3	15
Labs 519/521 #5	15
Labs 519/521 #6	17
Labs 519/521 #7	14
Lab 635 #8	13
Lab 635 #9	12
Lab 635 #10	11
Labs 637/639 #11	14
Labs 637/639 #12	14
Labs 637/639 #13	14
Mezzanine #14	12
Mezzanine #15	11
Mezzanine #16	13

[a]See Figures 3 through 7.

REFERENCES

General Atomics (GA). Decontamination of Selected General Atomics' Science Laboratories for Release to Unrestricted Use (Group 8B). August 23, 1996.

Oak Ridge Institute for Science and Education. Radiological Survey for the Group 6 Laboratories, Building 2, General Atomics, San Diego, California. Oak Ridge, TN; May 1995a.

Oak Ridge Institute for Science and Education. Survey Procedures Manual for the Energy/Environment Systems Division, Environmental Survey and Site Assessment Program, Revision 9. Oak Ridge, Tennessee; April 30, 1995b.

Oak Ridge Institute for Science and Education. Quality Assurance Manual for the Energy/Environment Systems Division, Environmental Survey and Site Assessment Program, Revision 7. Oak Ridge, Tennessee; January 31, 1995c.

Oak Ridge Institute for Science and Education. Laboratory Procedures Manual for the Energy/Environment Systems Division, Environmental Survey and Site Assessment Program, Revision 9. Oak Ridge, Tennessee; January 31, 1995d.

Oak Ridge Institute for Science and Education (ORISE). Confirmatory Survey Plan for Building 2, Group 8B Laboratories, General Atomics, San Diego, California. Oak Ridge, Tennessee; September 1996.

U.S. Nuclear Regulatory Commission (NRC). Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of License for Byproduct, Source, or Special Nuclear Material. Washington, DC: NRC; August 1987.

U.S. Nuclear Regulatory Commission. Policy and Guideline Directive FC91-2, Standard Review Plan: Evaluating Decommissioning Plans for Licenses Under 10 CFR Parts 30, 40, and 70. Washington, DC: NRC; August 1991.

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 employer.

DIRECT RADIATION MEASUREMENT

Instruments

Eberline Pulse Ratemeter
Model 12
(Eberline, Santa Fe, NM)

Ludlum Floor Monitor
Model 239-1
(Ludlum Measurements, Inc.,
Sweetwater, TX)

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

Detectors

Eberline GM Detector
Model HP-260
Effective Area, 20 cm^2
(Eberline, Santa Fe, NM)

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

Ludlum Gas Proportional Detector
Model 43-68
Effective Area, 126 cm^2
(Ludlum Measurements, Inc., Sweetwater, TX)

Bicron Micro-RemMeter
Tissue Equivalent Survey Meter
(Bicron Corporation, Newberry, OH)

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

LABORATORY ANALYTICAL INSTRUMENTATION

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 by passing the detectors slowly over the surface; the distance between the detector 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 (20 cm^2 or 126 cm^2) hand-held detectors. Identification of elevated 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
	-	GM detector with ratemeter-scaler
Gamma	-	NaI scintillation detector with ratemeter

Surface Activity Measurements

Measurements of total beta activity levels were primarily performed using gas proportional 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. Because different building materials (poured concrete, concrete block, metal, wood, etc.) can have very different background levels, average background counts were

determined for each material encountered in the surveyed area at a location of similar construction and having no known radiological history. The beta activity background count rates for the gas proportional detectors averaged 618 cpm for poured concrete, 430 cpm for sheet rock, and 524 cpm for cinder block. Alpha background count rates for the gas proportional detectors averaged 5 cpm for poured concrete, 1 cpm for sheet rock and 1 cpm for cinder block. Net count rates were determined by subtracting the appropriate material background from the gross count rate for each measurement location. The beta efficiency factor was 0.29 for the gas proportional detector calibrated to Tl-204. The beta minimum detectable concentrations (MDC) for the gas proportional detectors varied by material and ranged from 260 to 310 dpm/100 cm^2. The alpha efficiency factor was 0.2 for the gas proportional detectors calibrated to Th-230 and MDCs ranged from 30 to 50 dpm/100 cm^2. The physical window area for the gas proportional detectors is 126 cm^2.

Removable Activity Measurements

Removable activity levels were determined using numbered filter paper disks, 47 mm in diameter. Moderate pressure was applied to the smear 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

Measurements of gamma exposure rates were performed using a microrem meter. The instrument was held at one meter above the surface. The measurement was read directly in μR/h.

ANALYTICAL PROCEDURES

Gross Alpha/Beta

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

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 concentration (MDC), were based on 2.71 plus 4.65 times the standard deviation of the background count [$2.71 + 4.65\sqrt{BKG}$]. When the activity was determined to be less than the MDC of the measurement procedure, the result was reported as less than MDC. Because of variations in background levels, measurement efficiencies, and contributions from other radionuclides in samples, 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 standard/sources were available. In cases where they were not available, standards of an industry recognized organization were used.

Analytical and field survey activities were conducted in accordance with procedures from the following documents of the Environmental Survey and Site Assessment Program:

- Survey Procedures Manual, Revision 9 (April 1995)
- Laboratory Procedures Manual, Revision 9 (January 1995)
- Quality Assurance Manual, Revision 7 (January 1995)

The procedures contained in these manuals were developed to meet the requirements of DOE Order 5700.6C and ASME NQA-1 for Quality Assurance 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

GUIDELINES FOR DECONTAMINATION OF FACILITIES AND EQUIPMENT PRIOR TO RELEASE FOR UNRESTRICTED USE OR TERMINATION OF LICENSES FOR BYPRODUCT, SOURCE OR SPECIAL NUCLEAR MATERIAL

U. S. Nuclear Regulatory Commission
Division of Fuel Cycle & Material Safety
Washington, D.C. 20555

August 1987

The instructions in this guide, in conjunction with Table 1, specify the radionuclides and radiation exposure rate limits which should be used in decontamination and survey of surfaces or premises and equipment prior to abandonment or release for unrestricted use. The limits in Table 1 do not apply to premises, equipment, or scrap containing induced radioactivity for which the radiological considerations pertinent to their use may be different. The release of such facilities or items from regulatory control is considered on a case-by-case basis.

1. The licensee shall make a reasonable effort to eliminate residual contamination.

2. Radioactivity on equipment or surfaces shall not be covered by paint, plating, or other covering material unless contamination levels, as determined by a survey and documented, are below the limits specified in Table 1 prior to the application of the covering. A reasonable effort must be made to minimize the contamination prior to use of any covering.

3. The radioactivity on the interior surfaces of pipes, drain lines, or ductwork shall be determined by making measurements at all traps, and other appropriate access points, provided that contamination at these locations is likely to be representative of contamination on the interior of the pipes, drain lines, or ductwork. Surfaces or premises, equipment, or scrap which are likely to be contaminated, but are of such size, construction, or location as to make the surface inaccessible for purposes of measurement, shall be presumed to be contaminated in excess of the limits.

4. Upon request, the Commission may authorize a licensee to relinquish possession or control of premises, equipment, or scrap having surfaces contaminated with materials in excess of the limits specified. This may include, but would not be limited to special circumstances such as razing of buildings, transfer from premises to another organization continuing work with radioactive materials, or conversion of facilities to a long-term storage or standby status. Such requests must:

a. Provide detailed, specific information describing the premises, equipment or scrap, radioactive contaminants, and the nature, extent, and degree of residual surface contamination.

b. Provide a detailed health and safety analysis which reflects that the residual amounts of materials on surface areas, together with other considerations such as prospective use of the premises, equipment, or scrap, are unlikely to result in an unreasonable risk to the health and safety of the public.

5. Prior to release of premises for unrestricted use, the licensee shall make a comprehensive radiation survey which establishes that contamination is within the limits specified in Table 1. A copy of the survey report shall be filed with the Division of Fuel Cycle, Medical, Academic, and Commercial Use Safety, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, and also the Administrator of the NRC Regional Office having jurisdiction. The report should be filed at least 30 days prior to the planned date of abandonment. The survey report shall:

a. Identify the premises.

b. Show that reasonable effort has been made to eliminate residual contamination.

c. Describe the scope of the survey and general procedures followed.

d. State the findings of the survey in units specified in the instruction.

Following review of the report, the NRC will consider visiting the facilities to confirm the survey.

TABLE 1

ACCEPTABLE SURFACE CONTAMINATION LEVELS

Nuclides[a]	Average[b,c,f]	Maximum[b,d,f]	Removable[b,e,f]
U-nat, U-235, U-238, and associated decay products	5,000 dpm α/100 cm^2	15,000 dpm α/100 cm^2	1,000 dpm α/100 cm^2
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	100 dpm/100 cm^2	300 dpm/100 cm^2	20 dpm/100 cm^2
Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	1,000 dpm/100 cm^2	3,000 dpm/100 cm^2	200 dpm/100 cm^2
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above.	5,000 dpm $\beta\gamma$/100 cm^2	15,000 dpm $\beta\gamma$/100 cm^2	1,000 dpm $\beta\gamma$/100 cm^2

[a]Where surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits established for alpha- and beta-gamma-emitting nuclides 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 observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

[c]Measurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.

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

[e]The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.

[f]The average and maximum radiation levels associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mrad/h at 1 cm and 1.0 mrad/h at 1 cm, respectively, measured through not more than 7 milligrams per square centimeter of total absorber.

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U.S. Nuclear Regulatory Commission

DRAFT REPORT

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ABBREVIATIONS AND ACRONYMS

µR/h	microroentgens per hour
ASME	American Society of Mechanical Engineers
cm	centimeter
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 Measurements Laboratory
EPA	Environmental Protection Agency
ESSAP	Environmental Survey and Site Assessment Program
GA	General Atomics
GM	Geiger-Mueller
ha	hectare
km	kilometer
m	meter
m^2	square meter
MDC	Minimum Detectable Concentration
NaI	sodium iodide
NIST	National Institute of Standards and Technology
NRC	Nuclear Regulatory Commission
ORISE	Oak Ridge Institute for Science and Education
pCi/g	picocuries per gram
ZnS	zinc sulfide

CONFIRMATORY SURVEY
OF
BUILDING 2, GROUP 8B LABORATORIES
GENERAL ATOMICS
SAN DIEGO, CALIFORNIA

INTRODUCTION AND SITE HISTORY

General Atomics (GA) has been in the process of decommissioning and obtaining the release for unrestricted use for a number of selected laboratories and associated offices in GA's Building 2 (also known as the Science Laboratories Building or "L" Building). Building 2, built in 1958, was used to conduct research and developmental activities. Activities involving radioactive material included scanning electron microscopy and x-ray diffraction on uranium and thorium samples, assembly of irradiation capsules containing enriched uranium, U-238, and thorium, and analysis of nuclear fuel elements. GA is licensed by the Nuclear Regulatory Commission (NRC) under license SNM-696, Docket 70-734. The facility is also licensed by the State of California.

Decommissioning efforts began in 1988 with a block of laboratories known as "Group 1". To date, approximately eight groups of labs have been decontaminated and released for unrestricted use. GA has recently performed a final status survey for another group of 11 laboratories in Building 2, identified as the "Group 8B" laboratories (GA 1996). The primary radionuclides used in these laboratories were uranium (including enriched uranium) and thorium. In the past, many of these laboratories were decontaminated and then used for non-radiological purposes.

At the request of the NRC's Division of Fuel Cycle Safety and Safeguards, the Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) performed a confirmatory survey of the Group 8B labs. ESSAP performed a radiological survey of the Group 6 laboratories of Building 2 in February 1995 (ORISE 1995a).

SITE DESCRIPTION

The GA facilities are located near the intersection of Interstate 5 and Genesee Avenue in San Diego, California (Figure 1). Building 2 is divided into three laboratory sections: Laboratories A, B, and C. All laboratories in Group 8B are located in laboratory section A (Figure 2). The eleven laboratories and one mezzanine consist of a total area of about 350 m^2. The labs range in size from 10 m^2 to 60 m^2, while the mezzanine for labs 635, 637, and 639 has an area of 62 m^2. The labs are designated: 506, 506A, 508, 508A, 515, 519/521 (combined lab), 523, 530/532, 635, 637/639, and the mezzanine for labs 635 and 637/639. The wall surfaces consist of standard construction materials such as cement block, plasterboard, drywall, and wood. Some of the walls are painted and the floors are typically poured concrete. Tile was removed from the floor in some labs by the licensee to facilitate the final status survey.

OBJECTIVES

The objectives of the confirmatory survey are to provide independent contractor field data reviews and radiological data for use by the NRC in evaluating the adequacy and accuracy of the licensee's procedures and final status survey results.

DOCUMENT REVIEW

ESSAP has reviewed the licensee's final status survey report (GA 1996). Procedures and methods used by the licensee were reviewed for adequacy and appropriateness. The data were reviewed for accuracy, completeness, and compliance with guidelines.

PROCEDURES

ESSAP personnel performed visual inspections and independent measurements and sampling of the Group 8B laboratories on September 16 and 17, 1996. Survey activities were conducted in accordance with a site-specific survey plan (ORISE 1996), using procedures and instruments described in the ORISE/ESSAP Survey Procedures and Quality Assurance Manuals (ORISE 1995b

and c) and summarized in Appendices A and B. Rooms 506, 506A, 508, 508A, 519/521 (combined), 635, 637/639, and the mezzanine were selected for confirmatory survey. This report summarizes the procedures and results of the survey.

Reference Grid

Measurement and sampling locations were referenced to prominent building features (e.g., doorways, wall intersections, etc.) and recorded on representative area drawings.

Surface Scans

Surface scans for alpha, beta, and gamma activity were performed at a frequency of approximately 100 percent of the floors and 10 percent of the lower walls (up to 2 meters). Scans were performed using gas proportional and NaI scintillation detectors coupled to ratemeters or ratemeter-scaler with audible indicators. Locations of elevated direct radiation detected by scans were marked for further investigation.

Surface Activity Measurements

Background measurements of surface activity on poured concrete, sheet rock and concrete blocks, were performed at building locations that did not have a history of radioactive materials use.

Direct measurements for total alpha and total beta activity were performed at a total of 66 floor and lower wall locations in the surveyed lab areas. In addition, two five-point measurements were performed to determine the 1 m^2 grid block average beta surface activity in room 508. Direct measurements were performed using gas proportional detectors coupled to ratemeter-scalers. A smear sample for the determination of removable gross alpha and gross beta activity was collected at each direct measurement location. Figures 3 through 7 show measurement and sampling locations.

Additional direct measurements were performed at locations of elevated direct radiation identified by surface scans.

Exposure Rate Measurements

Background exposure rate levels were determined for the building interior at 5 locations of similar construction but without a history of radioactive materials use. Exposure rates were performed at a total of 16 locations in the surveyed labs and the mezzanine area. Exposure rate measurements were performed at 1 m above the floor surface using a microrem meter. Figures 3 through 7 show measurement locations.

Miscellaneous Sampling

A paint sample was collected from a 100 cm^2 area located off the lower portion of the south wall of Room 508. Sample location is indicated on Figure 3.

Sample Analysis and Data Interpretation

Samples and survey data were returned to ORISE's ESSAP laboratory in Oak Ridge, Tennessee for analysis and interpretation. The paint sample was analyzed by gamma and alpha spectrometry and results reported in dpm/100 cm^2 for the paint sample. Direct measurements for surface activity were converted to units of disintegrations per minute per 100 square centimeters (dpm/100 cm^2). Smears were analyzed for gross alpha and gross beta activity using a low background gas proportional counter, and the results converted to units of dpm/100 cm^2. Exposure rate measurements were reported in units of µR/h. The radionuclides of interest are uranium and thorium; however, spectra were reviewed for other identifiable photopeaks. Sample analyses were performed in accordance with the ORISE/ESSAP Laboratory Procedures Manual (ORISE 1995d). Additional information concerning major instrumentation is provided in Appendices A and B. Results were compared to the licensee's documentation and NRC guidelines established for release for unrestricted use, which are provided in Appendix C.

FINDINGS AND RESULTS

DOCUMENT REVIEW

ESSAP reviewed the licensee's radiological survey data and comments were provided verbally to the NRC and licensee. The licensee provided responses to those comments. In ESSAP's opinion, the licensee's documentation provided an adequate description of the radiological condition of the facility relative to the NRC guidelines for release for unrestricted use.

Surface Scans

Surface scans identified one area of elevated beta-gamma activity in room 508 (Figure 3).

Surface Activity Levels

Surface activity levels are summarized in Table 1. The results of single-point measurements ranged from less than 52 dpm/100 cm^2 for alpha activity and less than 310 to 1700 dpm/100 cm^2 for beta activity. Grid block average activity in room 508 was less than 52 dpm/100 cm^2 and 400 to 1,000 dpm/100 cm^2 for alpha and beta, respectively. Removable activity levels were less than 14 dpm/100 cm^2 for gross alpha and less than 16 dpm/100 cm^2 for gross beta.

Exposure Rates

Exposure rate measurement data is provided in Table 2. Background interior exposure rates ranged from 13 to 14 μR/h and averaged 14 μR/h. Exposure rates for the surveyed labs and the mezzanine area ranged from 11 to 17 μR/h.

Radionuclide Concentration in Paint

The radionuclide concentration in paint was qualitatively assessed to be enriched uranium.

COMPARISON OF RESULTS WITH GUIDELINES

The primary contaminants of concern for this site are natural thorium and enriched uranium. The applicable NRC guidelines for residual thorium and enriched uranium surface activity levels are (NRC 1987):

Natural thorium

1,000 dpm/100 cm^2, averaged over a 1 m^2 area

3,000 dpm/100 cm^2, maximum in a 100 cm^2 area

200 dpm/100 cm^2, removable activity

Enriched uranium

5,000 dpm α/100 cm^2, total, averaged over a 1 m^2 area

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

1,000 dpm α/100 cm^2, removable activity

Direct measurements performed on the south wall of laboratory 508 exceeded the average guideline for natural thorium—average surface activity measured 1,000 dpm/100 cm^2 (surface activity slightly exceeded guideline prior to rounding to two significant figures). After further investigation by the licensee, it was discovered that calibration gamma sources were being stored in the adjacent active laboratory. Direct measurements taken by the licensee before and after the removal of the sources indicate that the sources may be the cause of the elevated measurements. However, a paint sample collected by ESSAP from this area identified that the contamination was due to enriched uranium. The alpha-to-beta ratio for low enriched uranium may be approximated by a 3:1 ratio; therefore, the corresponding average beta activity guideline may be adjusted to 1,700 dpm/100 cm^2.

The guideline for exposure rates measured at 1 m above the surface is 5 μR/h above background (NRC 1991). All exposure rate measurements were within these guidelines.

SUMMARY

The Environmental Survey and Site Assessment Program of the Oak Ridge Institute for Science and Education conducted confirmatory activities for the Group 8B laboratories at the General Atomics Building 2 in San Diego, California. Confirmatory activities included document reviews and on September 16 and 17, 1996, ESSAP personnel visited the site and performed independent surface scans, surface activity measurements, miscellaneous sampling and exposure rate measurements.

The results of the independent confirmatory measurements and sampling supported the conclusions of the licensee's survey, relative to satisfying the guidelines established for this project.

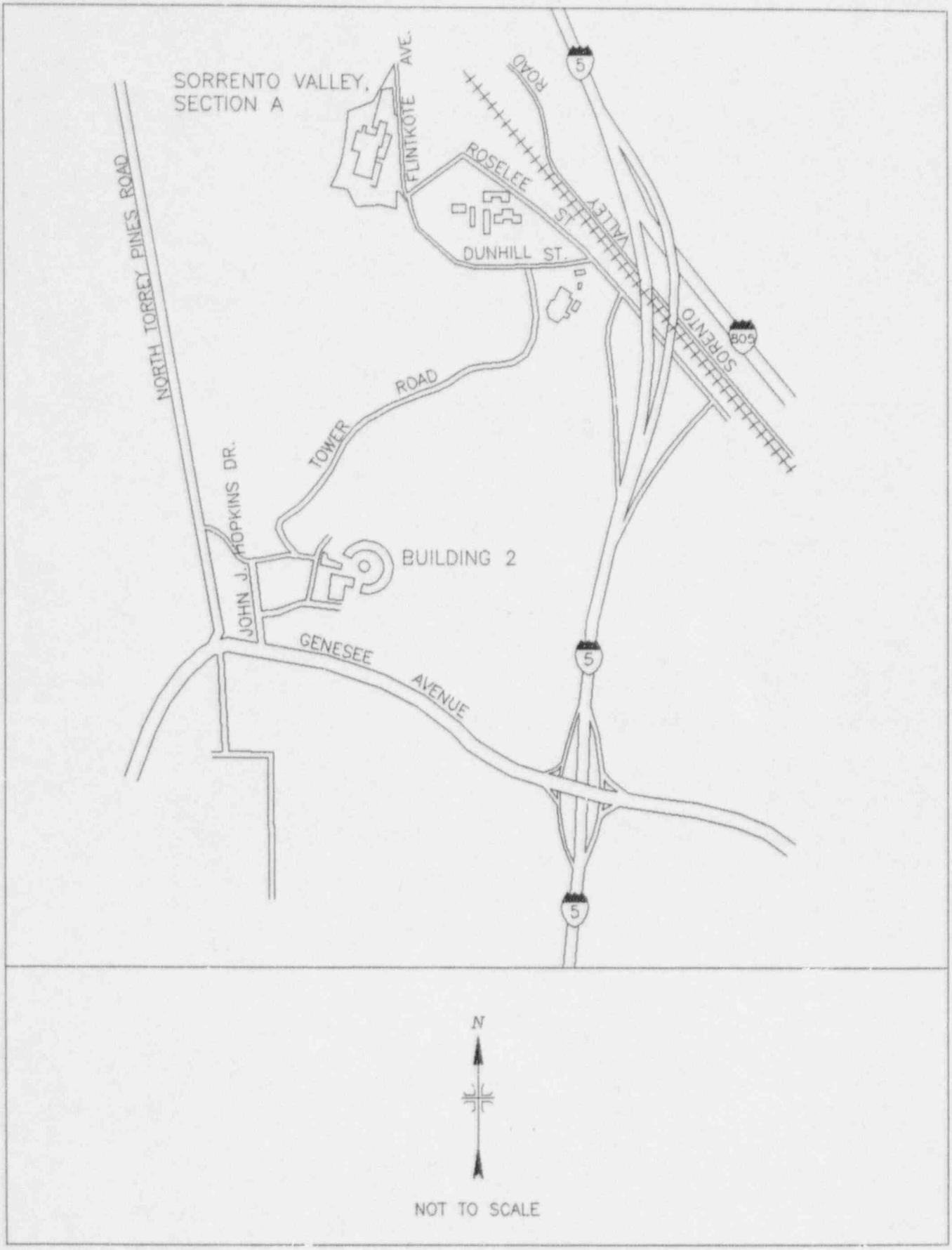
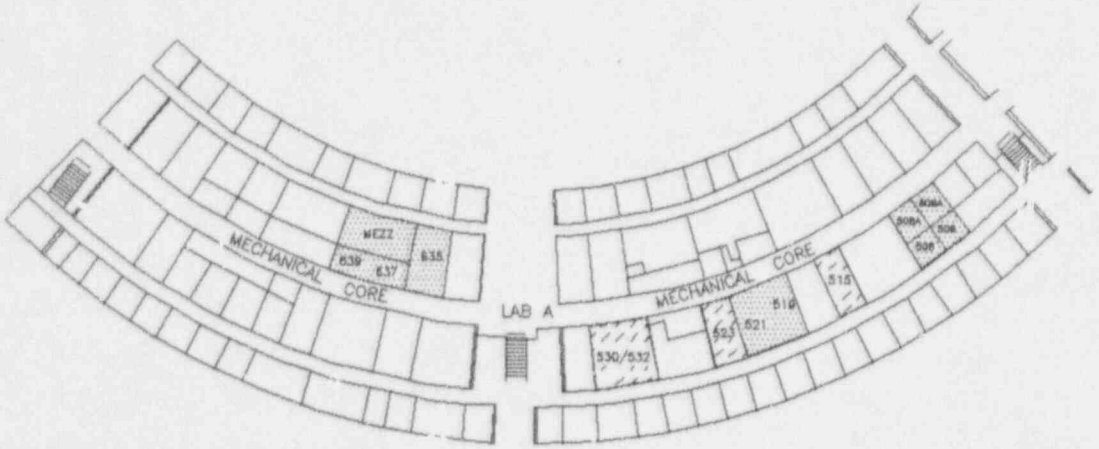


FIGURE 1: General Atomics Facility Indicating Location of Building 2



SECTION A BUILDING 2

GROUP 8B LABS NOT SURVEYED

SURVEYED AREA

N

NOT TO SCALE

FIGURE 2: Building 2 – Group 8B Laboratories

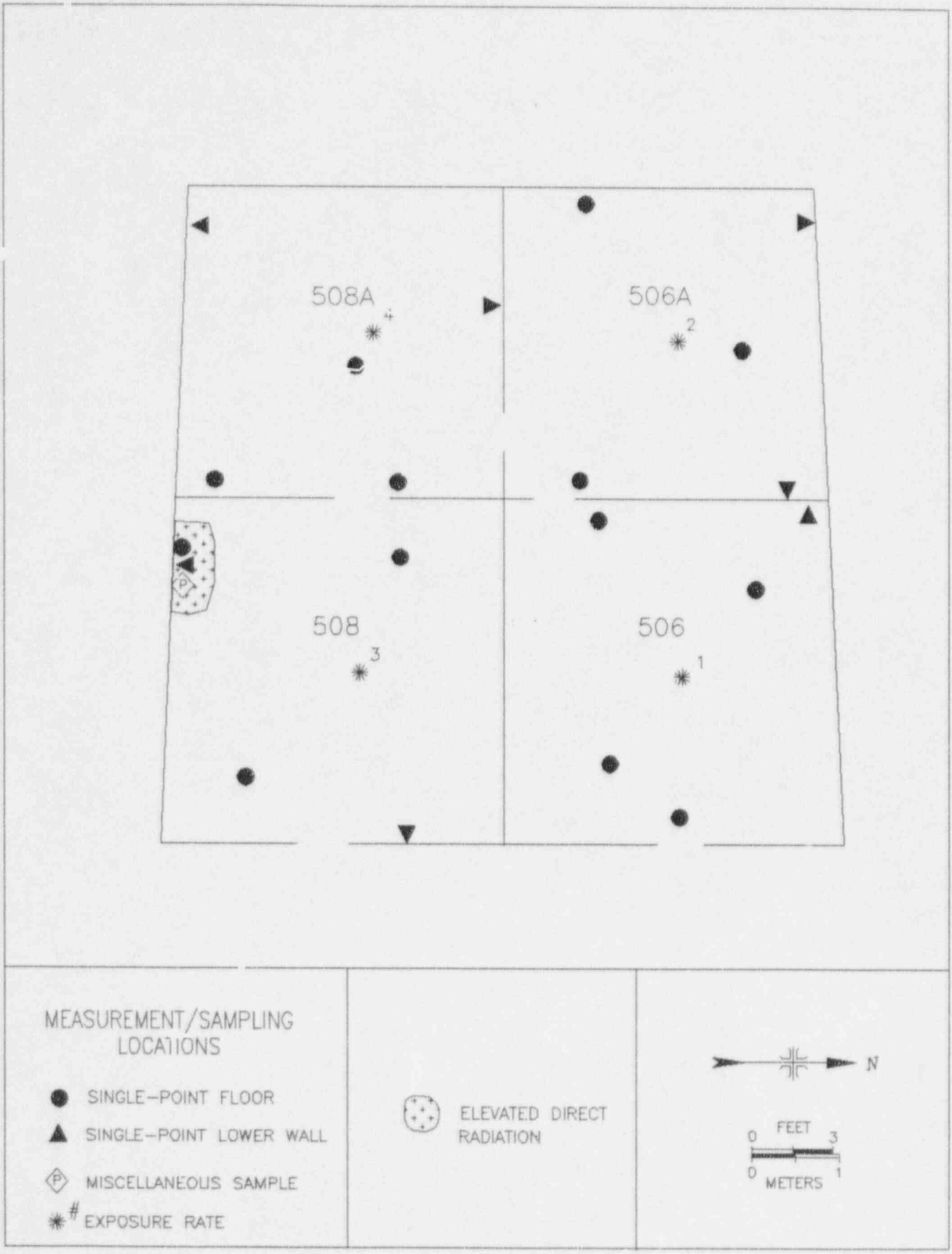


FIGURE 3: Building 2, Rooms 506, 506A, 508, 508A – Measurement and Sampling Locations

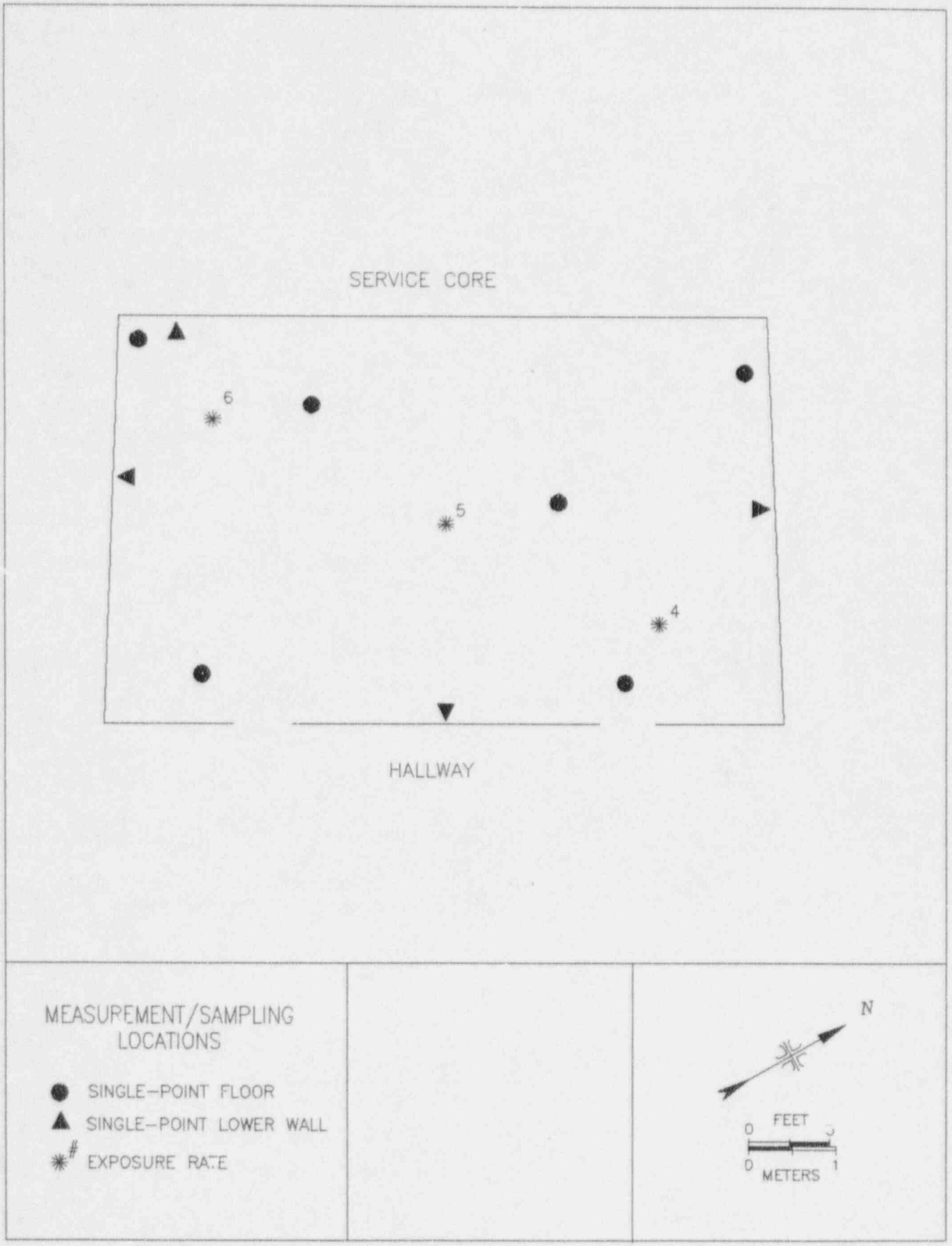


FIGURE 4: Building 2, Rooms 519/521 – Measurement and Sampling Locations

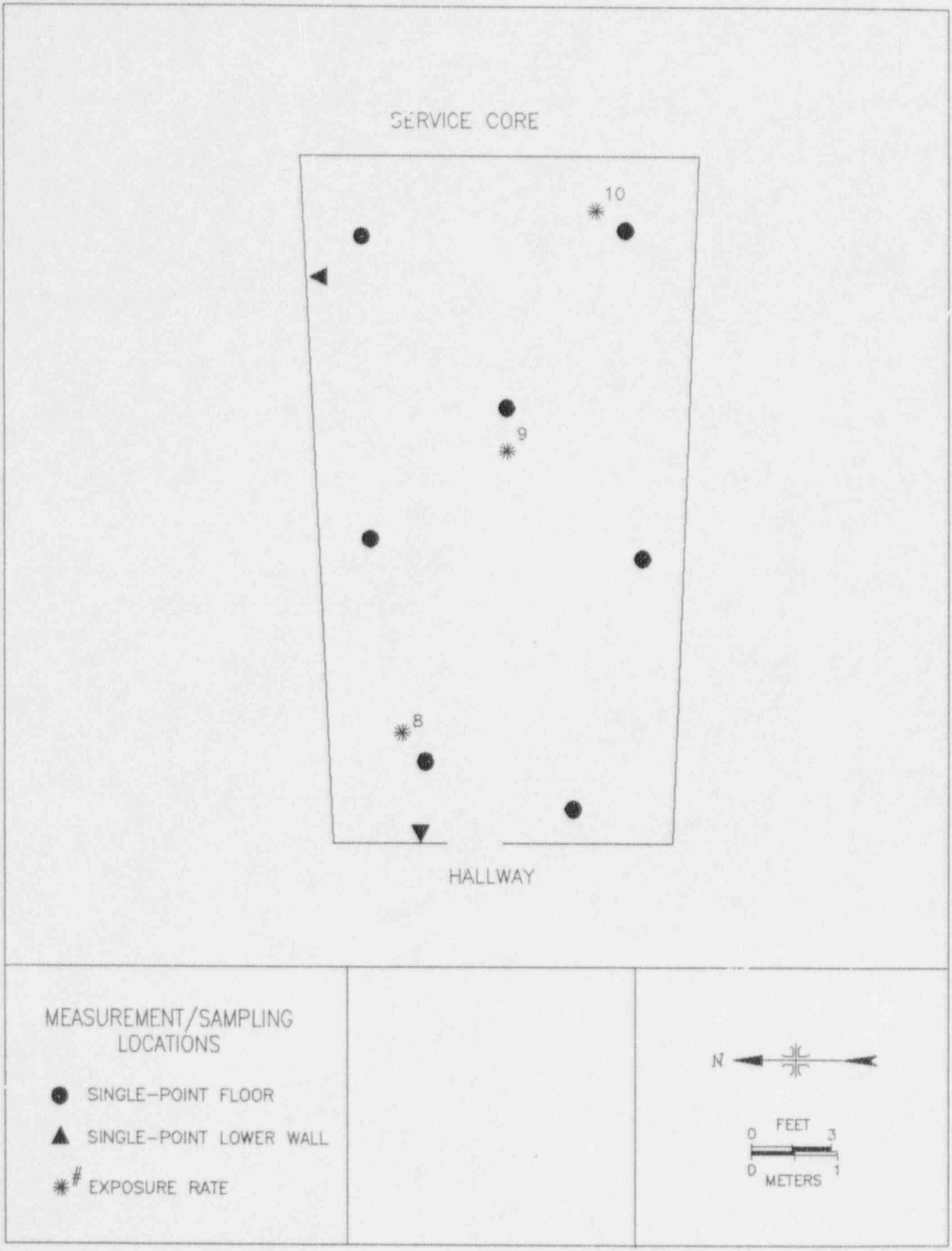


FIGURE 5: Building 2, Rooms 635 - Measurement and Sampling Locations

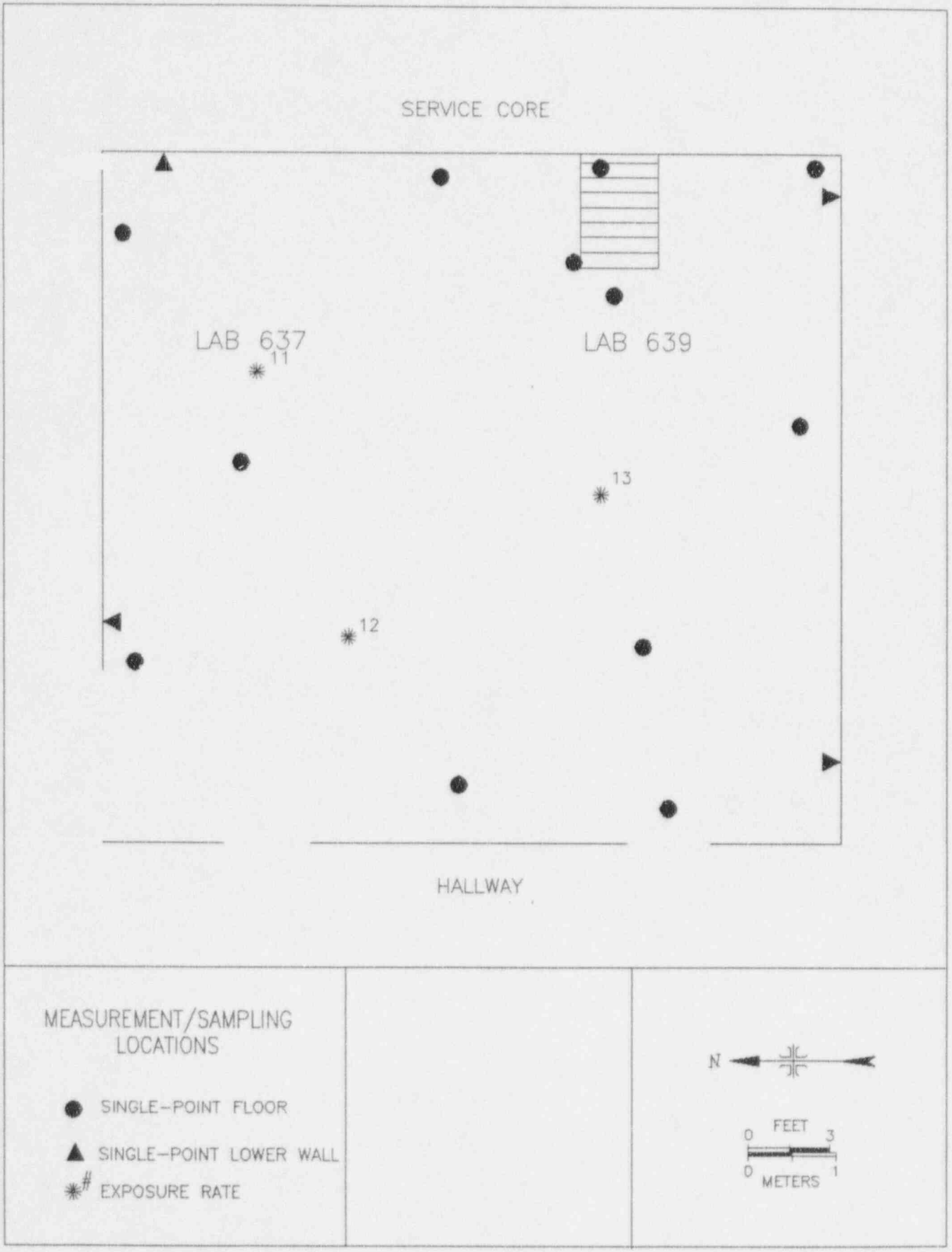


FIGURE 6: Building 2, Rooms 637/639 – Measurement and Sampling Locations

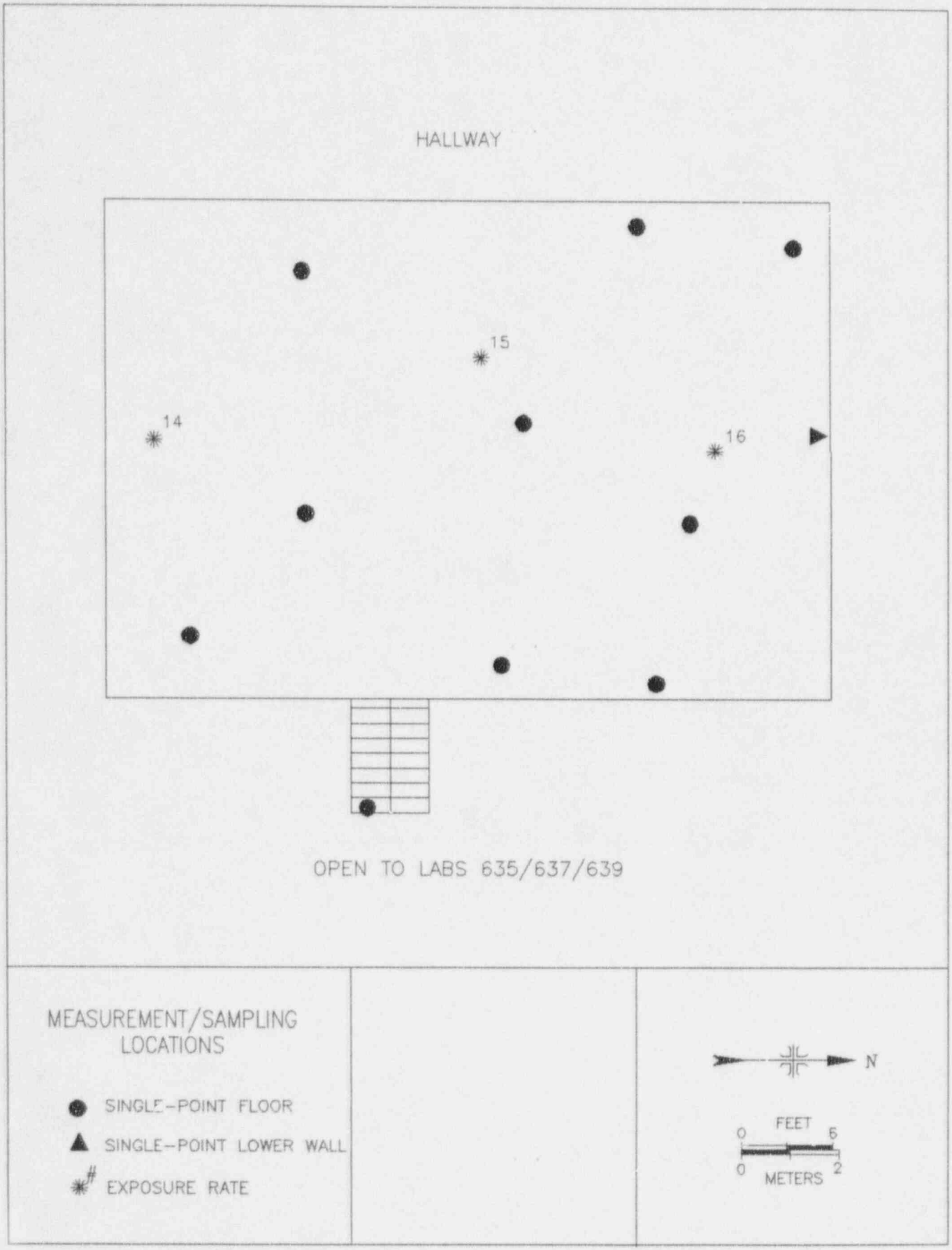


FIGURE 7: Building 2, Mezzanine above Rooms 637/639 – Measurement and Sampling Locations

TABLE 1

SUMMARY OF SURFACE ACTIVITY LEVELS OF BUILDING 2, GROUP 8B LABORATORIES GENERAL ATOMICS SAN DIEGO, CALIFORNIA

Location[a]	Number Measurement Location	Range of Total Activity (dpm/100 cm^2)		Range of Removable Activity (dpm/100 cm^2)	
		Alpha	Beta	Alpha	Beta
Labs 506/506A/508/508A	13 floor	<52	<310-830	<14	<16
	7 Lower wall	<29	<260-1,700	<14	<16
Labs 519/521	6 floor	<52	<310	<14	<16
	4 Lower wall	<29	<290	<14	<16
Lab 635	7 floor	<52	<310	<14	<16
	2 Lower wall	<29	<290	<14	<16
Lab 637/639	12 floor	<52	<310	<14	<16
	4 Lower wall	<29	<290	<14	<16
Mezzanine 635/637/639	10 floor	<29	<260	<14	<16
	1 Lower wall	<29	<290	<14	<16

[a]See Figures 3 through 7.

TABLE 2

EXPOSURE RATES
OF
BUILDING 2, GROUP 8B LABORATORIES
GENERAL ATOMICS
SAN DIEGO, CALIFORNIA

Location[a]	Exposure Rate Measurement (μR/hr)
Labs 506 #1	13
Lab 506A #2	16
Lab 508 #3	15
Labs 519/521 #5	15
Labs 519/521 #6	17
Labs 519/521 #7	14
Lab 635 #8	13
Lab 635 #9	12
Lab 635 #10	11
Labs 637/639 #11	14
Labs 637/639 #12	14
Labs 637/639 #13	14
Mezzanine #14	12
Mezzanine #15	11
Mezzanine #16	13

[a]See Figures 3 through 7.

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General Atomics (GA). Decontamination of Selected General Atomics' Science Laboratories for Release to Unrestricted Use (Group 8B). August 23, 1996.

Oak Ridge Institute for Science and Education. Radiological Survey for the Group 6 Laboratories, Building 2, General Atomics, San Diego, California. Oak Ridge, TN; May 1995a.

Oak Ridge Institute for Science and Education. Survey Procedures Manual for the Energy/Environment Systems Division, Environmental Survey and Site Assessment Program, Revision 9. Oak Ridge, Tennessee; April 30, 1995b.

Oak Ridge Institute for Science and Education. Quality Assurance Manual for the Energy/Environment Systems Division, Environmental Survey and Site Assessment Program, Revision 7. Oak Ridge, Tennessee; January 31, 1995c.

Oak Ridge Institute for Science and Education. Laboratory Procedures Manual for the Energy/Environment Systems Division, Environmental Survey and Site Assessment Program, Revision 9. Oak Ridge, Tennessee; January 31, 1995d.

Oak Ridge Institute for Science and Education (ORISE). Confirmatory Survey Plan for Building 2, Group 8B Laboratories, General Atomics, San Diego, California. Oak Ridge, Tennessee; September 1996.

U.S. Nuclear Regulatory Commission (NRC). Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of License for Byproduct, Source, or Special Nuclear Material. Washington, DC: NRC; August 1987.

U.S. Nuclear Regulatory Commission. Policy and Guideline Directive FC91-2, Standard Review Plan: Evaluating Decommissioning Plans for Licenses Under 10 CFR Parts 30, 40, and 70. Washington, DC: NRC; August 1991.

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 employer.

DIRECT RADIATION MEASUREMENT

Instruments

Eberline Pulse Ratemeter
Model 12
(Eberline, Santa Fe, NM)

Ludlum Floor Monitor
Model 239-1
(Ludlum Measurements, Inc.,
Sweetwater, TX)

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

Detectors

Eberline GM Detector
Model HP-260
Effective Area, 20 cm^2
(Eberline, Santa Fe, NM)

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

Ludlum Gas Proportional Detector
Model 43-68
Effective Area, 126 cm^2
(Ludlum Measurements, Inc., Sweetwater, TX)

Bicron Micro-RemMeter
Tissue Equivalent Survey Meter
(Bicron Corporation, Newberry, OH)

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

LABORATORY ANALYTICAL INSTRUMENTATION

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 by passing the detectors slowly over the surface; the distance between the detector 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 (20 cm^2 or 126 cm^2) hand-held detectors. Identification of elevated 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
	-	GM detector with ratemeter-scaler
Gamma	-	NaI scintillation detector with ratemeter

Surface Activity Measurements

Measurements of total beta activity levels were primarily performed using gas proportional 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. Because different building materials (poured concrete, concrete block, metal, wood, etc.) can have very different background levels, average background counts were

determined for each material encountered in the surveyed area at a location of similar construction and having no known radiological history. The beta activity background count rates for the gas proportional detectors averaged 618 cpm for poured concrete, 430 cpm for sheet rock, and 524 cpm for cinder block. Alpha background count rates for the gas proportional detectors averaged 5 cpm for poured concrete, 1 cpm for sheet rock and 1 cpm for cinder block. Net count rates were determined by subtracting the appropriate material background from the gross count rate for each measurement location. The beta efficiency factor was 0.29 for the gas proportional detector calibrated to Tl-204. The beta minimum detectable concentrations (MDC) for the gas proportional detectors varied by material and ranged from 260 to 310 dpm/100 cm^2. The alpha efficiency factor was 0.2 for the gas proportional detectors calibrated to Th-230 and MDCs ranged from 30 to 50 dpm/100 cm^2. The physical window area for the gas proportional detectors is 126 cm^2.

Removable Activity Measurements

Removable activity levels were determined using numbered filter paper disks, 47 mm in diameter. Moderate pressure was applied to the smear 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

Measurements of gamma exposure rates were performed using a microrem meter. The instrument was held at one meter above the surface. The measurement was read directly in μR/h.

ANALYTICAL PROCEDURES

Gross Alpha/Beta

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

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 concentration (MDC), were based on 2.71 plus 4.65 times the standard deviation of the background count [$2.71 + 4.65\sqrt{BKG}$]. When the activity was determined to be less than the MDC of the measurement procedure, the result was reported as less than MDC. Because of variations in background levels, measurement efficiencies, and contributions from other radionuclides in samples, 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 standard/sources were available. In cases where they were not available, standards of an industry recognized organization were used.

Analytical and field survey activities were conducted in accordance with procedures from the following documents of the Environmental Survey and Site Assessment Program:

- Survey Procedures Manual, Revision 9 (April 1995)
- Laboratory Procedures Manual, Revision 9 (January 1995)
- Quality Assurance Manual, Revision 7 (January 1995)

The procedures contained in these manuals were developed to meet the requirements of DOE Order 5700.6C and ASME NQA-1 for Quality Assurance 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

GUIDELINES FOR DECONTAMINATION OF FACILITIES AND EQUIPMENT PRIOR TO RELEASE FOR UNRESTRICTED USE OR TERMINATION OF LICENSES FOR BYPRODUCT, SOURCE OR SPECIAL NUCLEAR MATERIAL

U. S. Nuclear Regulatory Commission
Division of Fuel Cycle & Material Safety
Washington, D.C. 20555

August 1987

The instructions in this guide, in conjunction with Table 1, specify the radionuclides and radiation exposure rate limits which should be used in decontamination and survey of surfaces or premises and equipment prior to abandonment or release for unrestricted use. The limits in Table 1 do not apply to premises, equipment, or scrap containing induced radioactivity for which the radiological considerations pertinent to their use may be different. The release of such facilities or items from regulatory control is considered on a case-by-case basis.

1. The licensee shall make a reasonable effort to eliminate residual contamination.

2. Radioactivity on equipment or surfaces shall not be covered by paint, plating, or other covering material unless contamination levels, as determined by a survey and documented, are below the limits specified in Table 1 prior to the application of the covering. A reasonable effort must be made to minimize the contamination prior to use of any covering.

3. The radioactivity on the interior surfaces of pipes, drain lines, or ductwork shall be determined by making measurements at all traps, and other appropriate access points, provided that contamination at these locations is likely to be representative of contamination on the interior of the pipes, drain lines, or ductwork. Surfaces or premises, equipment, or scrap which are likely to be contaminated, but are of such size, construction, or location as to make the surface inaccessible for purposes of measurement, shall be presumed to be contaminated in excess of the limits.

4. Upon request, the Commission may authorize a licensee to relinquish possession or control of premises, equipment, or scrap having surfaces contaminated with materials in excess of the limits specified. This may include, but would not be limited to special circumstances such as razing of buildings, transfer from premises to another organization continuing work with radioactive materials, or conversion of facilities to a long-term storage or standby status. Such requests must:

a. Provide detailed, specific information describing the premises, equipment or scrap, radioactive contaminants, and the nature, extent, and degree of residual surface contamination.

b. Provide a detailed health and safety analysis which reflects that the residual amounts of materials on surface areas, together with other considerations such as prospective use of the premises, equipment, or scrap, are unlikely to result in an unreasonable risk to the health and safety of the public.

5. Prior to release of premises for unrestricted use, the licensee shall make a comprehensive radiation survey which establishes that contamination is within the limits specified in Table 1. A copy of the survey report shall be filed with the Division of Fuel Cycle, Medical, Academic, and Commercial Use Safety, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, and also the Administrator of the NRC Regional Office having jurisdiction. The report should be filed at least 30 days prior to the planned date of abandonment. The survey report shall:

a. Identify the premises.

b. Show that reasonable effort has been made to eliminate residual contamination.

c. Describe the scope of the survey and general procedures followed.

d. State the findings of the survey in units specified in the instruction.

Following review of the report, the NRC will consider visiting the facilities to confirm the survey.

TABLE 1

ACCEPTABLE SURFACE CONTAMINATION LEVELS

Nuclides[a]	Average[b,c,f]	Maximum[b,d,f]	Removable[b,e,f]
U-nat, U-235, U-238, and associated decay products	5,000 dpm α/100 cm^2	15,000 dpm α/100 cm^2	1,000 dpm α/100 cm^2
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	100 dpm/100 cm^2	300 dpm/100 cm^2	20 dpm/100 cm^2
Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	1,000 dpm/100 cm^2	3,000 dpm/100 cm^2	200 dpm/100 cm^2
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above.	5,000 dpm $\beta\gamma$/100 cm^2	15,000 dpm $\beta\gamma$/100 cm^2	1,000 dpm $\beta\gamma$/100 cm^2

[a]Where surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits established for alpha- and beta-gamma-emitting nuclides 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 observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

[c]Measurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.

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

[e]The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.

[f]The average and maximum radiation levels associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mrad/h at 1 cm and 1.0 mrad/h at 1 cm, respectively, measured through not more than 7 milligrams per square centimeter of total absorber.