DEPARTMENT OF HEALTH & HUMAN SERVICES

Food and Drug Administration
Rockville MD 20857

Br 2

December 30, 2009

RECEIVED
REGION 1
2009 DEC 31 AM 11:05

Licensing Assistance Team
Division of Nuclear Materials Safety
U.S. Nuclear Regulatory Commission, Region I
475 Allendale Road
King of Prussia, PA 19406-1415

RE: Final Radiological Status Survey Report for 12720 Twinbrook Parkway, Building 1, Rockville, MD
Food and Drug Administration
License No. 19-07538-01
Docket No. 030-04544

Dear Sir or Madam:

Enclosed is the Final Status Survey Report for the Food and Drug Administration's Center for Devices and Radiological Health (FDA/CDRH) laboratory facility located at 12720 Twinbrook Parkway, Building 1 in Rockville, Maryland and other supporting documents related to the final status survey process.

Upon satisfactory review of the information provided, FDA/CDRH requests an amendment to its license under the provisions specified in Title 10, Code of Federal Regulations, Part 20.1402 to release 12720 Twinbrook Parkway, Building 1 for unrestricted use.

Clym Environmental had been contracted by the U.S. Food and Drug Administration (FDA) to perform these surveys. The point of contact at the firm is Mr. Charles Watts who can be reached by phone at (301) 694-6000 or by email at cwatts@clymenvironmental.com .

We request that NRC grant FDA permission to initiate the removal of lead shielding from the walls in this building, while the review of the decommissioning documents takes place. The shielding materials will remain within the structure until NRC releases the building. The intent of this effort is to save FDA tens of thousands dollars of rent.

144358

We look forward to hearing from you regarding the expedited removal of shielding and the Final Status Survey Report. If you have any questions, please contact me at either phone (301) 796-5889 or email at petro.shandruk@fda.hhs.gov .

Sincerely Yours,

Petro Shandruk, RSO
Chief, Radiation Programs Branch
(301)796-5889
petro.shandruk@fda.hhs.gov
FAX: (301) 847-8502
Center for Devices and Radiological Health,
Food and Drug Administration
WO #66, Room 4676
10903 New Hampshire Avenue
Silver Spring, MD 20993-0002

Enc: License amendment
Final Radiological Status Survey Report
(2 copies of each)

cc: Lillian J. Gill
Senior Associate Director, CDRH

NRC FORM 313 (10-2005) 10 CFR 30, 32, 33, 34, 35, 36, 39, and 40

U.S. NUCLEAR REGULATORY COMMISSION

APPLICATION FOR MATERIAL LICENSE

APPROVED BY OMB: NO. 3150-0120 **EXPIRES: 10/31/2008**

Estimated burden per response to comply with this mandatory collection request: 4.4 hours. Submittal of the application is necessary to determine that the applicant is qualified and that adequate procedures exist to protect the public health and safety. Send comments regarding burden estimate to the Records and FOIA/Privacy Services Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0120), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

INSTRUCTIONS: SEE THE APPROPRIATE LICENSE APPLICATION GUIDE FOR DETAILED INSTRUCTIONS FOR COMPLETING APPLICATION. SEND TWO COPIES OF THE ENTIRE COMPLETED APPLICATION TO THE NRC OFFICE SPECIFIED BELOW.

APPLICATION FOR DISTRIBUTION OF EXEMPT PRODUCTS FILE APPLICATIONS WITH:

DIVISION OF INDUSTRIAL AND MEDICAL NUCLEAR SAFETY
OFFICE OF NUCLEAR MATERIALS SAFETY AND SAFEGUARDS
U.S. NUCLEAR REGULATORY COMMISSION
WASHINGTON, DC 20555-0001

ALL OTHER PERSONS FILE APPLICATIONS AS FOLLOWS:

IF YOU ARE LOCATED IN:

ALABAMA, CONNECTICUT, DELAWARE, DISTRICT OF COLUMBIA, FLORIDA, GEORGIA, KENTUCKY, MAINE, MARYLAND, MASSACHUSETTS, MISSISSIPPI, NEW HAMPSHIRE, NEW JERSEY, NEW YORK, NORTH CAROLINA, PENNSYLVANIA, PUERTO RICO, RHODE ISLAND, SOUTH CAROLINA, TENNESSEE, VERMONT, VIRGINIA, VIRGIN ISLANDS, OR WEST VIRGINIA, SEND APPLICATIONS TO:

LICENSING ASSISTANCE TEAM
DIVISION OF NUCLEAR MATERIALS SAFETY
U.S. NUCLEAR REGULATORY COMMISSION, REGION I
475 ALLENDALE ROAD
KING OF PRUSSIA, PA 19406-1415

IF YOU ARE LOCATED IN:

ILLINOIS, INDIANA, IOWA, MICHIGAN, MINNESOTA, MISSOURI, OHIO, OR WISCONSIN, SEND APPLICATIONS TO:

MATERIALS LICENSING BRANCH
U.S. NUCLEAR REGULATORY COMMISSION, REGION III
2443 WARRENVILLE ROAD, SUITE 210
LISLE, IL 60532-4352

ALASKA, ARIZONA, ARKANSAS, CALIFORNIA, COLORADO, HAWAII, IDAHO, KANSAS, LOUISIANA, MONTANA, NEBRASKA, NEVADA, NEW MEXICO, NORTH DAKOTA, OKLAHOMA, OREGON, PACIFIC TRUST TERRITORIES, SOUTH DAKOTA, TEXAS, UTAH, WASHINGTON, OR WYOMING, SEND APPLICATIONS TO:

NUCLEAR MATERIALS LICENSING BRANCH
U.S. NUCLEAR REGULATORY COMMISSION, REGION IV
611 RYAN PLAZA DRIVE, SUITE 400
ARLINGTON, TX 76011-4005

03004544

PERSONS LOCATED IN AGREEMENT STATES SEND APPLICATIONS TO THE U.S. NUCLEAR REGULATORY COMMISSION ONLY IF THEY WISH TO POSSESS AND USE LICENSED MATERIAL IN STATES SUBJECT TO U.S.NUCLEAR REGULATORY COMMISSION JURISDICTIONS.

1. THIS IS AN APPLICATION FOR *(Check appropriate item)*

- [ ] A. NEW LICENSE
- [x] B. AMENDMENT TO LICENSE NUMBER 19-07538-01
- [ ] C. RENEWAL OF LICENSE NUMBER

2. NAME AND MAILING ADDRESS OF APPLICANT *(Include ZIP code)*

Department of Health and Human Services
Food and Drug Administration
Center for Devices and Radiological Health/OCER/DMQRP
WO#66, Room 4676
10903 New Hampshire Avenue,

3. ADDRESS WHERE LICENSED MATERIAL WILL BE USED OR POSSESSED

10903 New Hampshire Ave., Silver Spring, MD 20993-0002

4. NAME OF PERSON TO BE CONTACTED ABOUT THIS APPLICATION

PETRO SHANDRUK

TELEPHONE NUMBER

(301) 796-5889

SUBMIT ITEMS 5 THROUGH 11 ON 8-1/2 X 11" PAPER. THE TYPE AND SCOPE OF INFORMATION TO BE PROVIDED IS DESCRIBED IN THE LICENSE APPLICATION GUIDE.

5. RADIOACTIVE MATERIAL
a. Element and mass number; b. chemical and/or physical form; and c. maximum amount which will be possessed at any one time.

6. PURPOSE(S) FOR WHICH LICENSED MATERIAL WILL BE USED.

7. INDIVIDUAL(S) RESPONSIBLE FOR RADIATION SAFETY PROGRAM AND THEIR TRAINING EXPERIENCE.

8. TRAINING FOR INDIVIDUALS WORKING IN OR FREQUENTING RESTRICTED AREAS.

9. FACILITIES AND EQUIPMENT.

10. RADIATION SAFETY PROGRAM.

11. WASTE MANAGEMENT.

12. LICENSE FEES *(See 10 CFR 170 and Section 170.31)*

FEE CATEGORY Exempt Federal | AMOUNT ENCLOSED $ 0.00

13. CERTIFICATION *(Must be completed by applicant)* THE APPLICANT UNDERSTANDS THAT ALL STATEMENTS AND REPRESENTATIONS MADE IN THIS APPLICATION ARE BINDING UPON THE APPLICANT.

THE APPLICANT AND ANY OFFICIAL EXECUTING THIS CERTIFICATION ON BEHALF OF THE APPLICANT, NAMED IN ITEM 2, CERTIFY THAT THIS APPLICATION IS PREPARED IN CONFORMITY WITH TITLE 10, CODE OF FEDERAL REGULATIONS, PARTS 30, 32, 33, 34, 35, 36, 39, AND 40, AND THAT ALL INFORMATION CONTANED HEREIN IS TRUE AND CORRECT TO THE BEST OF THEIR KNOWLEDGE AND BELIEF.

WARNING: 18 U.S.C. SECTION 1001 ACT OF JUNE 25, 1948 62 STAT. 749 MAKES IT A CRIMINAL OFFENSE TO MAKE A WILLFULLY FALSE STATEMENT OR REPRESENTATION TO ANY DEPARTMENT OR AGENCY OF THE UNITED STATES AS TO ANY MATTER WITHIN ITS JURISDICTION.

CERTIFYING OFFICER – TYPED/PRINTED NAME AND TITLE	SIGNATURE	DATE
Petro Shandruk, Radiation Safety Officer, CDRH	Petro Shandruk	12/30/08

FOR NRC USE ONLY

TYPE OF FEE	FEE LOG	FEE CATEGORY	AMOUNT RECEIVED	CHECK NUMBER	COMMENTS
			$		
APPROVED BY				DATE	

144358

U. S. FOOD AND DRUG ADMINISTRATION
CENTER FOR DEVICES AND RADIOLOGICAL HEALTH

REQUEST FOR AMENMENT OF LICENSE 19-07538-01

DELETION OF: -FACILITY LOCATION

This request employs the number format used on the NRC MATERIALS LICENSE, Form 374. The additions will be preceded in the request by the italicized word *Add.*

Licensee:

1. Department of Health and Human Services
   Food and Drug Administration
   Center for Devices and Radiological Health

2. Center for Devices and Radiological Health, FDA
   WO #66, Room 4676
   10903 New Hampshire Avenue
   Silver Spring, MD 20993-0002

Item to be amended in this renewal:

Page

Conditions 10.....1

CONDITIONS

10. *Delete* 12720 Twinbrook Parkway, Building 1, Rockville, MD

For additional information, please contact:

Petro Shandruk, RSO
Chief, Radiation Programs Branch
(301) 796-5889; petro.shandruk@fda.hhs.gov
Fax: (301) 847-8502
Center for Devices and Radiological Health, FDA
WO #66, Room 4676
10903 New Hampshire Avenue
Silver Spring, MD 20993

FINAL RADIOLOGICAL STATUS SURVEY REPORT

FOOD AND DRUG ADMINISTRATION
CENTER FOR DEVICES AND RADIOLOGICAL HEALTH
Building T1
12720 Twinbrook Parkway Rockville, MD

FINAL REPORT

December 2009

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Attachment 3	DandD Occupancy Scenario Reports
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Attachment 6	Reference Maps of Individual Laboratories/Areas
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Abbreviations

ALARA	As Low As Reasonably Achievable
CDRH	Center for Devices and Radiological Health
CLYM	Clym Environmental Services, LLC
CPM	Counts per minute
DCGL	Derived Concentration Guideline Level
DPM	Disintegrations per minute
FDA	Food and Drug Administration
FSS	Final Status Survey
GCPM	Gross counts per minute
LBGR	Lower bound of the gray region
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MDC	Minimum detectable concentration
MDCR	Minimum Detectable Count Rate
NCPM	Net counts per minute
NRC	Nuclear Regulatory Commission
QA	Quality Assurance

References

1. NUREG-1507, "Minimum Detectable Concentrations With Typical Radiation Survey Instruments for Various Contaminants and Field Conditions", NRC-Washington, DC, June 1998

2. NUREG-1575, "Multi-Agency Radiological Survey and Site Investigation Manual, Revision 1", August 2000

3. NUREG-1757, Vol. 1, "Consolidated NMSS Decommissioning Guidance, Decommissioning Process for Materials Licenses", Final Report, NRC-Washington, DC, September 2002

4. NUREG-1757, Vol. 2, "Consolidated NMSS Decommissioning Guidance, Decommissioning Process for Materials Licenses", Final Report, NRC-Washington, DC, September 2003

5. NUREG-CR-5512, Vol. 2, SAND2001-0822P, "Residual Radioactive Contamination From Decommissioning, Users Manual DandD, Version 2.1", NRC-Washington, DC, April 2001

6. DandD, Version 2.1 computer code

7. Resrad-Build, Version 3.4 computer code

8. Title 10, Code of Federal Regulations

1. Background

The Food and Drug Administration is part of the Executive Branch of the United States Government within the Department of Health and Human Services. The Food and Drug Administration (FDA) is a Nuclear Regulatory Commission (NRC) radioactive materials licensee. The possession, use and storage of these radioactive materials at this facility are authorized by the U.S. Nuclear Regulatory Commission (NRC) via a broadscope Radioactive Materials license, number 19-07538-01 (with 31 attachments). This license provides a limited scope of use directly associated with research activities. The FDA operated research laboratories at a facility located in Rockville, MD. This facility address is 12720 Twinbrook Parkway. The FDA occupant has been the Center for Devices and Radiological Health (CDRH). CDRH is one of six product-oriented centers that carry out the mission of the Food and Drug Administration. CDRH has and continues to conduct research employing the use of radioactive materials.

There are five, one story buildings located at the facility. Buildings 2 thru 5 have previously been released from radiological control. The FDA has relocated research operations to another facility in the Washington, DC metropolitan area.

The remaining building, known as T1 consists of 19,229 square feet of mixed laboratory and office space. A diagram of the Building T1 has been provided as Attachment 1. This facility located at 12720 Twinbrook Parkway is presently owned and managed by Avalonbay Communities, Inc. located at 2400 Research Blvd., Suite 120 in Rockville, MD 20850. The facility is managed by Cassidy Pinkard Colliers Property Management, with offices located at 9801 Washingtonian Blvd., Suite 550, Gaithersburg, MD 20878. The building owner has designated the facility for major renovation after the FDA/CDRH vacates the premises.

The FDA/CDRH wants to remove Building T1 from their license as an authorized place of use in order to facilitate other remedial operations. As an NRC licensee, the FDA/CDRH is required to demonstrate that the facility located at 12720 Twinbrook Parkway located in Rockville, MD is acceptable for release in accordance with the requirements and conditions specified by the NRC. The FDA/CDRH has retained the services of Clym Environmental Services, LLC (CLYM) to assist in the decommissioning process. All decommissioning related activities (scoping surveys, characterization surveys, remediation and waste disposal) were conducted under the authority of the current FDA/CDRH radioactive materials license.

2. Radiological Surveys

The Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) assigns a greater level of effort on surveys conducted in areas that have, or had,

the highest potential for contamination. Areas are classified based on the radiological characteristics. Those areas that have no reasonable potential or extremely low probability of residual contamination are classified as non-impacted. Areas with some potential for residual contamination are classified as impacted. Twenty-seven laboratories where materials were used and/or stored were identified.

There were research protocols that involved the use of radioactive materials in sealed form. The FDA/CDRH Radiation Safety Officer stated that he could not recall a sealed source ever having leaked. There is a sealed source storage well located in the west corner of laboratory 177.

The licensee stored materials in a safe located in an adjacent building known as T2 when not in use. This safe was constructed from battleship grade steel. The FDA/CDRH Radiation Safety Officer stated that he could not recall a sealed source ever having leaked. However, during a previous survey the contents of the safe were evaluated. The inventory included a 100gram bottle of uranyl acetate, along with several sources and lead pigs. The interior surfaces of the safe as well as lead pigs were contaminated and several small sources were found to be leaking. The interior surfaces of the safe and lead pigs were evaluated for total and removable surface contamination. The results of swipe sample collected from items stored in the safe as well as detectable surface activity identified during surface scans have been provided as Attachment 2.

It was assumed these items were contaminated as a result of leaking sources and/or contaminated from materials in unsealed form. The ratio of these contaminants was determined and has been provided in Table 1. One swipe sample identified both beta and alpha emitting radionuclides. The beta energies, .188MeV and .096MeV, were determined to be similar to betas emitted by ^{234}Th. The alpha, 4.2MeV, was similar to ^{238}U. Additional contaminants identified as a result of this survey were ^{137}Cs, ^{133}Ba and ^{241}Am.

Table 1

Nuclide	Total activity (DPM/100cm2)	Percent of the Total Activity
^{238}U+C	391,867	46%
^{137}Cs	333,900	39%
^{241}Am	106,050	13%
^{133}Ba	15,020	2%

The DCGL's were determined prior to beginning a scoping survey of the facility. The DCGL's for the alpha emitting radionuclides were evaluated in an effort to construct a DCGL that represented the uranium that could be present at the site. The abundance of uranium typically associated with natural uranium is 99.27% ^{238}U, 0.72% ^{235}U and .0057% ^{234}U. The DandD software program was used to generate a DCGL for natural uranium (Unat); 93dpm/100cm^2, 24.7mrem. The

ratio of ^{234}U and ^{235}U was determined and found to be .005dpm/100cm^2 of ^{234}U and 0.7 dpm/100cm^2 of ^{235}U. The TEDE for ^{235}U remaining at the site having a surface activity level of 0.7dpm/100cm^2 over an unlimited surface area was found to be .175mrem/year using the DandD software program. The contribution of ^{235}U is less than ten percent of the dose criteria and was considered insignificant. The DCGL for ^{238}U+C was selected as it is representative of the uranium that could remain at the site as a contaminant.

It was concluded that the nuclides that could remain at the site were those identified as contaminants inside the safe, ^{137}Cs, ^{133}Ba, ^{238}U+C and ^{241}Am. The logic being that any container(s) and/or sealed sources having been stored in the safe could spread contamination when removed and returned to use.

Screening values for surface contamination were obtained using the values provided in NUREG-1757, Volume 1, Table B.1 in Appendix B. DandD Version 2.1 was used to obtain screening values for ^{238}U+C and ^{241}Am, not provided in Table B.1. Copies of the DandD Building Occupancy Scenario reports are provided as Attachment 3. The Resrad-Build computer code, version 3.4, was used to obtain a screening value for ^{133}Ba. A copy of the Resrad-Build report is provided as Attachment 4. A listing of the adopted screening values for building/surface contamination at Building T1 has been provided in Table 2.

The Final Status survey would designate each survey unit for surface scans and static measurement. The scoping survey was designed to meet the requirements of the Final Status survey. All laboratory space as well as areas adjacent to usage areas, including a hallway leading to and from Building T2 were designated as impacted. The adjacent hallways were subdivided into eight survey units. They were identified by compass direction and assigned a unique identifying number, e.g. "North/South Hallway – 1".

The lower wall area was defined as the surface area from the floor to a height of eight feet. Surface scans were designated to cover 100% of accessible floor and 50% of accessible lower wall areas. Surface scans were designated to cover 10% of upper wall and ceiling areas. Scoping surveys were designed to evaluate levels of; 1) total surface activity using surface scans as well as static measurements, and 2) removable surface contamination using smear samples. Smear sample locations were determined using the surveyor's professional judgment. These surveys would focus on surfaces deemed "high risk areas" e.g. floors and lower walls. Any area found to have residual surface contamination was designated for further evaluation. These investigative levels are outlined below;

Surface Scans –any surface area found to be greater than twice the reference background for the surface matrices in beta mode, or 2 cpm above the reference background for the matrices being evaluated in the alpha mode.

Smears – any activity detected above the minimum detectable level.

Any area found to be at the investigative level for surface scans would be designated for evaluation in both alpha and beta mode. Further evaluations would be made using static measurements and smears to quantify the level of the contamination and better define the area. Any area where residual activity is identified at the investigative level would be sufficient cause to designate the area as a usage area, thereby increasing the coverage area for surface scans.

Table 2

Radionuclide	Symbol	Acceptable Screening Levels ($dpm/100cm^2$)
137-Cesium	^{137}Cs	2.4E+04
133-Barium	^{133}Ba	5.5E+04
241-Americium	^{241}Am	26
238Uranium+C	$^{238}U+C$	250

Survey instruments were selected based on the detection sensitivities to the radiations of concern. The detection sensitivity of large area gas proportional detectors was evaluated to ensure detection levels are within acceptable parameters (10%-50% of the DCGL). These detectors were equipped with 0.8mm thick windows. This meant the detector could be operated in an alpha or alpha/beta mode. Copies of calibration certificates are on file at CLYM and are available upon request.

The DCGL's were weighted to reflect gross alpha and gross beta. The gross alpha DCGL was calculated;

$$\text{Gross Alpha DCGLw} - \frac{1}{0.79/250 + 0.21/26}$$

Gross Alpha DCGLw - $89 dpm/100cm^2$

The gross alpha $DCGL_{weighted}$ ($DCGL_w$) was found to be 89 $dpm/100cm^2$. One half the $DCGL_w$, 44 $dpm/100cm^2$, was determined to be 11 $cpm/100cm^2$ by converting from a unit of radioactivity to counts per minute using a value of 0.25 for E_{total}. An instrument efficiency of 0.17 determined during calibration was used, as well as a surface efficiency (E_s) of 0.25. The active probe surface area of a 43-37 detector is 582 cm^2.

The gross beta $DCGL_{weighted}$ ($DCGL_w$) was found to be 24,554 $dpm/100cm^2$. One half the $DCGL_w$ would be 12,277 $dpm/100cm^2$. One half the $DCGL_w$ was determined to be 6,875 $cpm/100cm^2$ by converting from a unit of radioactivity to

counts per minute using a value of 0.56 for $E_{weighted, total}$. An instrument efficiency of 0.20 was used for 137Cs. The total efficiency (E) was weighted according to the relative ratios. The surface efficiency (E_s) of 0.5 is applied for greater than 0.4 MeV beta emitting radionuclides. The active probe surface area of a 43-37 detector is 582 cm^2. The gross beta DCGL was calculated;

$$\text{Gross Beta DCGLw -} \quad \frac{1}{0.96/2.4E{+}04 + 0.04/5.5E{+}04}$$

Gross Beta DCGLw - 24,554 dpm/100cm^2

2.1 Field Measurements, Methods and Instrumentation

Surface scans and static measurements for beta emitting radionuclides were made using scaler/rate meters equipped with large area gas proportional detectors (Ludlum model 43-37 and 43-68). Variations in background readings in beta mode were found throughout the building. The contributing factors were determined to be 1) variations in the composition of surface matrices as well as 2) the presence of radon.

The Scan MDC for a 43-37 detector on a concrete floor surface was determined to be 878 dpm/100cm^2. The Scan MDC is well below the $DCGL_w$ of 24,554 dpm/100cm^2. The following variables were used in determination of the Scan MDC; 1) a background count rate of 1760 cpm, 2) $E_{weighted}$ of 0.096, 3) the variable of 0.5 for the "ideal" surveyor and 4) the active area of the probe is 582 cm^2. A minimum detectable count rate (MDCR) of 2,251 cpm was determined for the ideal surveyor during the first scanning stage using an index of sensitivity (d') of 1.51 and a 2 second observation interval.

Surface scans and static measurements for alpha emitting radionuclides were conducted using a 43-37 large area gas proportional detector. One half of the gross alpha $DCGL_w$ (89 dpm/100cm^2) is 44 dpm/100cm^2 or 11 cpm/100 cm^2. The probability of detecting two or more counts when passing over 44dpm/100cm^2 was determined to be 15% (NUREG-1575, 6.7.2.2 (6-14)) using a probe dimension of 15 cm and a scan rate of 4cm/s. The time interval a surveyor should hold over a suspect area was determined to be 3 seconds (NUREG 1575, 6.7.2.2 (6-13)) using an ambient background of 4 cpm.

Reference areas were located in Building T1 for each type of matrices identified in affected areas. These reference areas are identified as the Reading room, Conference room, kitchen and the janitorial closet located

next to the restrooms. A listing of the reference matrices and associated measurement for each portable survey instrument used has been provided as Attachment 5.

The detector was employed on the scanned surface at no greater than the prescribed speed as indicated below;

43-68, alpha/beta mode ½ a probe width per second (2inches/sec)

43-68, alpha mode ¼ a probe width per second (1inch/sec)

43-37, alpha/beta mode ½ a probe width per second (3inches/sec)

43-37, alpha mode ¼ a probe width per second (1.5inches/sec)

The minimum observational interval or hold time over a suspect area was specified for the first stage scan as; Beta - 2 seconds, Alpha - 3 seconds.

Surface scans were systematically conducted on accessible surfaces in each survey area as to ensure the 100% coverage in usage areas and 50% in non-usage areas. Special attention was made to joints, cracks, seams, etc. in any accessible survey area.

The sealed source storage well and source well holder were designated for evaluation. The source well holder was removed from the sealed source storage well and disassembled. The individual parts of the source holder were evaluated for total and removable surface contamination. No activity was detected above the investigative level. The sealed source storage well itself was evaluated for total surface contamination to the extent practicable, as no removable activity was detected on the source holder. No activity detected above the investigative level.

Ground water was visible from the top of the sealed source storage well at an estimated depth of ten feet from the opening. A sample of the water was collected from the sealed source storage well and analyzed using a Wallac 1282 gamma counter, equipped with a 3" x 3" NaI well detector and a full open window setting established, 0-2048kev. No activity was detected above a minimum detectable of 5.5E-07 microcuries per milliter.

2.2 Laboratory Analysis of Smear Samples

The evaluation of removable surface activity was conducted using a dry paper wipe, covering an area of 100 cm^2 while applying moderate pressure. A total of two hundred and eighty two smear samples were collected and analyzed from the affected areas. Forty-two swipe samples were collected from sinks, drains, exhaust ducts and building air handling returns. A total of two hundred and forty swipe samples were collected from the affected areas. Swipe sample locations were left to the surveyor's discretion. Swipe samples were analyzed by Clym Environmental

Services, LLC (license nr. MD-21-035-01) for gross alpha and beta. Samples were analyzed using liquid scintillation counting techniques. A region of interest was established 0 to 1000 MeV. The typical minimum detectable activity for gross beta was 28 dpm, using a four minute count time, a background of 28 cpm and a worst case efficiency of 46%. Any sample found to have detectable activity in excess of the minimum detectable was designated for quantitative analysis. The results of the analysis of these swipe samples are on file at CLYM and are available upon request.

2.3 Activity Detected At or Above Investigative Levels

The evaluation of total and removable surface contamination in the affected areas identified no surface contamination at or above investigative levels.

3. Final Status Survey Plan

The Derived Concentration Guideline Levels and Final Status Survey method to demonstrate compliance with the provisions specified in Title 10 CFR part 20 for releasing the facility for unrestricted use were determined. All affected areas were combined to form one Class 3 survey unit.

The Final Status Survey designated the survey unit for surface scans and static measurements. Surface scans were completed in each laboratory/area during scoping surveys to the required specifications as detailed in Section 2. The static measurements would be made using a predetermined count time of one minute in alpha/beta mode and two minutes in alpha mode.

3.1 Determining the Number of Data Points for Statistical Tests

This section details the determination process in the selection and implementation of statistical tests.

3.1.1 Contaminants Not Present in Background

The Sign Test was selected to compare beta emitting nuclides or those contaminants not present in background ^{137}Cs and ^{133}Ba. The objective of the Final Status Surveys is to demonstrate that the residual radioactivity levels meet the release criterion. Scenario A has been selected to demonstrate this objective for residual contamination on building/structure surfaces. In demonstrating that this objective is met the null hypothesis tested, H_o; is the median concentration of residual radioactivity in the survey unit is greater than the $DCGL_w$.
The Type I error (α) was specified as 0.05 and a Type II decision error (β) was set at 0.05.

3.1.1.1 Calculate the Relative Shift

The lower bound of the gray region was determined to be 2,670. The standard deviation of the contaminants in the survey unit was estimated to be 101. The relative shift for the survey unit was determined to be 2.98.

3.1.1.2 Determination of Sign p

The value of the relative shift calculated in section 3.1.1.1 was used to obtain the corresponding value of Sign p using Table 5.4 as found in NUREG-1575 (December 1997).

3.1.1.3 Determination of Decision Error Percentiles

The determination of percentiles, $Z_{1-\alpha}$ and $Z_{1-\beta}$ was conducted by selecting the designated values using Table 5.2 as found in NUREG-1575 (December 1997).

3.1.1.4 Determine the Number of Data points for the Sign Test

The number of data points for each survey unit was determined by selecting the designated values using Table 5.5 as found in NUREG-1575 (December 1997). The number of data points for the survey unit was found to be 14.

3.1.2 Contaminants Present in Background

3.1.2.1 Scenario A

The Wilcoxon Rank Sum (WRS) Test was selected to compare those contaminants present in background, ^{238}U+C and ^{241}Am. In demonstrating the objective that the Final Status Survey has met the null hypothesis, H_0 tested is the median concentration of residual radioactivity in the survey unit exceeds that in the reference area by more than the DCGL. The Type I error (α) was specified as 0.05 and a Type II decision error (β) was set at 0.05.

3.1.2.1.1 Calculate the Relative Shift

The lower bound of the gray region was estimated to be 11. The standard deviation was found to be 3.6. The relative shift was determined to be 3.05.

3.1.2.1.2 Determination of P_r

The value of the relative shift calculated in section 3.1.2.1.1 was used to obtain the corresponding value of P_r using Table 5.1 as found in NUREG-1575 (December 1997).

3.1.2.1.3 Determination of Decision Error Percentiles

The determination of percentiles, $Z_{1-\alpha}$ and $Z_{1-\beta}$ was conducted by selecting the designated values using Table 5.2 as found in NUREG-1575 (December 1997).

3.1.2.1.4 Determine the Number of Data points for the WRS Test

The number of data points for the survey unit was determined by selecting the designated values using Table 5.3 as found in NUREG-1575 (December 1997). The number of data points in the survey unit was found to be 10.

4. Final Status Survey

A one meter square grid system was constructed in each area of the survey unit.

The Final Status sample points were identified using the alpha-numeric designation for the grid coordinate by laboratory/area residing in the survey unit. Diagram maps of each laboratory/area that comprised the single survey unit are provided in Attachment 6.

The reference areas for establishing background for the different matrices were identified in Building T1. Sample measurements were then made at various locations within each of the reference areas on each type of matrices (e.g. benchtop, floor, casework, etc.). Variations in "background" were encountered for each type of matrices throughout the facility.

Random sample points were selected by first assigning each point in the survey unit a sequential numerical value. A random number generator was utilized to select the sample points.

A floor diagram and designated sample points were provided to the surveyor. The results of static measurements made in each survey unit have been provided as Attachment 7.

4.1 Summary of Statistical Tests

The measurements made as a result of Final Status Survey were evaluated.

4.1.1 Contaminants Not Present in Background

The Sign Test was selected to compare contaminants not present in background ^{137}Cs and ^{133}Ba. The objective of the Final Status Surveys is to demonstrate that the residual radioactivity levels meet the release criterion.

H_o: The median concentration of residual radioactivity in the survey unit is greater than the $DCGL_w$.

All measurements were found to be less than the $DCGL_w$ however the measured standard deviation, 124, was different than original estimation. The relative shift was determined to be 2.43. The number of sample points required was increased by 1; from 14 to 15. The additional sample point location was determined and the measurement made. The standard deviation was recalculated and found to be 122. The relative shift was determined to be 2.47. The number of sample points required was 15.

All fifteen measurements were found to be less than the $DCGL_w$. The average of the measurements was found to be -75 dpm/100cm^2 and is less than the $DCGL_w$. The Sign test did not need to be performed as the survey unit met the release criterion.

4.1.2 Contaminants Present in Background

The Wilcoxon Rank Sum (WRS) Test was selected to compare alpha emitting nuclides or those contaminants present in background, ^{238}U and ^{241}Am. In demonstrating the objective of the Final Status Survey is met the null hypothesis, H_o tested is the median concentration of residual radioactivity in the survey unit exceeds that in the reference area by more than the $DCGL_w$.

All measurements were found to be less than the $DCGL_w$ however the measured standard deviation was found to be 2.8, and the relative shift determined to be 3.89. The number of sample points required was decreased by 1; from 10 to 9. The evaluation of data collected from the original number of data points, 10, was conducted.

The largest measurement recorded in the survey unit was found to be 32 dpm/100cm^2. The smallest measurement recorded in the reference area was 12 dpm/100cm^2. The difference between the two measurements was found to be 20 dpm/100cm^2. The difference is less than the $DCGL_w$, 89 dpm/100cm^2. The WRS test did not need to be performed as the survey unit met the release criterion.

5. Quality Assurance

The performance of decommissioning activities has been managed within a framework of policies and procedures, which assure the validity and quality of data. Procedures were established for activities requiring the application of standard and approved methods to ensure regulatory requirements were met.

These procedures document the technical competence of the survey approach thus ensuring the use of effective processes. Procedures utilized by Clym are documented using program-specific applications.

5.1 Daily Operational Checks for Portable Survey Instruments

The purpose of these procedures was to ensure portable scaler/rate meters equipped with gas proportional detectors were in proper working condition prior to placement into service.

When an instrument failed an operational check, both the instrument and detector were removed from service until the discrepancy could be resolved.

Both source and background measurements must fall within the acceptable range established for the site and were performed as follows:

Prior to beginning the performance of data measurements and/or scanning for the day,

After the lunch or noon break,

Any time the detector is suspected of being contaminated and

Any time instrument operation is in question.

Daily checks included 1) a determination of operational readiness, 2) ambient background determination and verification that each reading is within ±20% of the average in beta mode and 200% of the average in alpha mode and 3) check source reproducibility determination.

The check source reproducibility determination involved obtaining the data necessary to calculate the average source count and verify that each section of the detector face was reading within ±10% of the average in beta and alpha mode. Additionally, the 2σ and 3σ values for the background and check source counts were calculated. The acceptable value for 3σ was established at ±10% of the mean.

A copy of these daily checks has been provided as Attachment 8.

5.2 Internal Quality Assurance Checks

Quality assurance evaluations were conducted for each surveyor. These evaluations involved verification measurements to confirm 10% of the Final Status Survey measurements for total surface contamination. That would be one sample point for alpha and two sample points for beta.

Sample points were randomly selected from Final Status Survey sample points for each surveyor. The procedures and techniques utilized to make these measurements were identical to those used in the FSS. Additionally, surface scans were conducted on what were deemed "high risk" surfaces in each survey unit. "High risk" surfaces included laboratory benchtops, chemical fume hoods, fixtures, including door knobs and light switches.

The results of these evaluations are provided as Table 3. This evaluation was conducted assessing the measured values for each survey point both verification and FSS, to determine if overlap occurred, at the 95% confidence level.

Table 3

Sample ID	Final Status Survey Range		Acceptable Range (verification measurement)		Does overlap occur at the 95% CL?
Alpha BP11179-167-D8	59	-3	23	-31	Yes
Beta BP11189-176-A4	561	247	710	394	Yes
Beta BP11189-EW1-A8	108	-183	147	-143	Yes

6. Disposition of Materials and Waste

All radioactive materials have been transferred to another licensed FDA/CDRH facility.

7. Findings

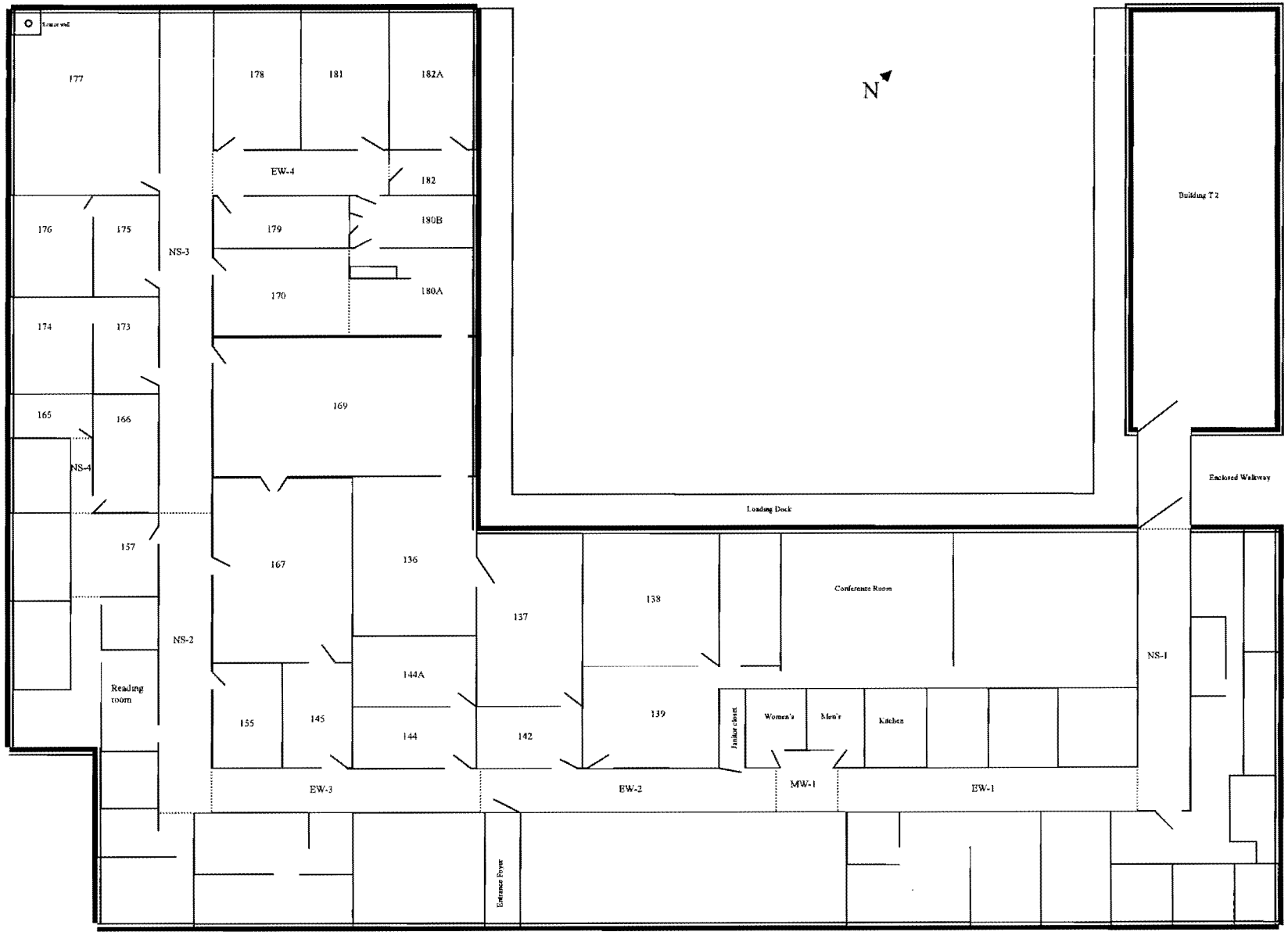
The objective of the Final Status Survey to demonstrate that the survey met the release criteria was achieved.

8. Conclusion

The Final Status Surveys conducted by the FDA/CDRH demonstrate compliance with the provisions specified in Title 10 CFR Part 20 for releasing the Building T1 located at 12720 Twinbrook Parkway in Rockville, MD for unrestricted use.

ATTACHMENT 1

12720 Twinbrook Parkway Building T1



ATTACHMENT 2

Swipe Sample ID Number	Swipe Sample Location	Removable Surface Activity in DPM/100cm2			
		Gross Gamma	Uncertainty (95%CL)	MDA	Radionuclide
BZ11108 - 102	Sealed source leak test - 5	8552	84	101	137Cs
BZ11108 - 103	Sealed source leak test - 6	29310	144	101	137Cs
BZ11108 - 104	Sealed source leak test - 7	5793	73	101	137Cs
BZ11108 - 105	Sealed source leak test - 8	9655	89	101	137Cs

Swipe Sample ID Number	Swipe Sample Location	Removable Surface Activity in DPM/100cm2			
		Gross Gamma	Uncertainty (95%CL)	MDA	Radionuclide
R1	Lead pig- top, interior, labeled "ICN P"	297271	152	50	137Cs
R3	Lead pig- top, interior, not labeled	31389	51	50	137Cs
R5	Lead base, not labeled	5240	23	48	137Cs
R5	Lead base, not labeled	15020	31	58	133Ba

Swipe Sample ID Number	Swipe Sample Location	Removable Surface Activity in DPM/100cm2			
		Gross Alpha	Uncertainty (95%CL)	MDA	Radionuclide
R1	Lead pig- top, interior, labeled "ICN P"	89250	60	7	241Am
R5	Lead base, not labeled	16800	26	7	241Am

Swipe Sample ID Number	Swipe Sample Location	Removable Surface Activity in DPM/100cm2			
		Gross Alpha/Beta	Uncertainty (95%CL)	MDA	Radionuclide
R2	Lead pig- top, interior, labeled "57Co"	391867	42	14	238U, 234Th

Direct Measurements - Safe Interior

Sample Point	Bkg (counts)	Gross (counts)	Count time (in min)	Total Surface Activity[1] in DPM/100cm2		
				Gross Alpha	Uncertainty[2]	MDA
Interior door - lower left	6	399	1	6550	657	193
Interior door - lower left mid	6	404	1	6633	661	193
Interior door - lower right mid	6	325	1	5317	594	193
Interior door - lower right mid	6	286	1	4667	558	193
Interior door - middle left	6	450	1	7400	698	193
Interior door - middle left mid	6	707	1	11683	872	193
Interior door - middle right mid	6	375	1	6150	638	193
Interior door - middle right mid	6	359	1	5883	624	193
Interior door - top left	6	453	1	7450	700	193
Interior door - top left mid	6	520	1	8567	749	193
Interior door - top right mid	6	476	1	7833	717	193
Interior door - top right	6	366	1	6000	630	193
Floor - left front	12	93	1	1350	335	271
Floor - left mid front	12	100	1	1467	346	271
Floor - right mid front	12	88	1	1267	327	271
Floor - right front	12	99	1	1450	344	271
Floor - left rear	12	118	1	1767	372	271
Floor - left mid rear	12	110	1	1633	361	271
Floor - right mid rear	12	94	1	1367	336	271
Floor - right rear	12	135	1	2050	396	271

[1] - $E_{weighted, total}$; 0.06, probe active area 126cm2

[2] - at the 95% confidence level

Averaged Activity

4824 (DPM/100cm2)

Direct Measurements - Safe Interior

Sample Point	Bkg (counts)	Gross (counts)	Count time (in min)	Total Surface Activity[1] in DPM/100cm2		
				Gross Beta	Uncertainty[2]	MDA
Interior door - lower left	201	1269	1	16952	1193	1049
Interior door - lower left mid	201	1408	1	19159	1248	1049
Interior door - lower right mid	201	1222	1	16206	1174	1049
Interior door - lower right mid	201	1006	1	12778	1081	1049
Interior door - middle left	201	1779	1	25048	1384	1049
Interior door - middle left mid	201	2557	1	37397	1634	1049
Interior door - middle right mid	201	1325	1	17841	1215	1049
Interior door - middle right mid	201	1204	1	15921	1166	1049
Interior door - top left	201	1452	1	19857	1265	1049
Interior door - top left mid	201	1662	1	23190	1343	1049
Interior door - top right mid	201	1749	1	24571	1374	1049
Interior door - top right	201	1226	1	16270	1175	1049
Floor - left front	258	336	1	1238	758	1188
Floor - left mid front	258	298	1	635	734	1188
Floor - right mid front	258	316	1	921	745	1188
Floor - right front	258	337	1	1254	759	1188
Floor - left rear	258	319	1	968	747	1188
Floor - left mid rear	258	436	1	2825	820	1188
Floor - right mid rear	258	316	1	921	745	1188
Floor - right rear	258	460	1	3206	834	1188

[1] - $E_{weighted, total}$; 0.063, probe active area 126cm2

[2] - at the 95% confidence level

Averaged Activity

12858 (DPM/100cm2)

ATTACHMENT 3

DandD Building Occupancy Scenario

DandD Version: 2.1.0
Run Date/Time: 11/20/2008 2:30:48 PM
Site Name: 12720 Twinbrook Pkwy
Description: DCGL Determination
FileName:C:\Documents and Settings\Finley Watts\My Documents\12720\12720 DCGL.mcd

Options:

Implicit progeny doses NOT included with explicit parent doses
Nuclide concentrations are distributed among all progeny
Number of simulations: 400
Seed for Random Generation: 8718721
Averages used for behavioral type parameters

External Pathway is ON
Inhalation Pathway is ON
Secondary Ingestion Pathway is ON

Initial Activities:

Nuclide	Area of Contamination (m^2)	Distribution
238U+C	UNLIMITED	CONSTANT(dpm/100 cm**2)
Justification for concentration: DCGL Determination		Value 2.50E+02

Site Specific Parameters:

General Parameters:

None

Correlation Coefficients:

None

Summary Results:

90.00% **of the** 400 **calculated TEDE values are <** 2.32E+01 **mrem/year .**
The 95 % Confidence Interval for the 0.9 **quantile value of TEDE is** 2.19E+01 **to** 2.46E+01 **mrem/year**

DandD Building Occupancy Scenario

DandD Version: 2.1.0
Run Date/Time: 11/20/2008 2:39:56 PM
Site Name: 12720 Twinbrook Pkwy
Description: DCGL Determination
FileName:C:\Documents and Settings\Finley Watts\My Documents\12720\12720 DCGL.mcd

Options:

Implicit progeny doses NOT included with explicit parent doses
Nuclide concentrations are distributed among all progeny
Number of simulations: 6400
Seed for Random Generation: 8718721
Averages used for behavioral type parameters

External Pathway is ON
Inhalation Pathway is ON
Secondary Ingestion Pathway is ON

Initial Activities:

Nuclide	Area of Contamination (m^2)	Distribution
241Am	UNLIMITED	CONSTANT(dpm/100 cm**2)
Justification for concentration: DCGL Determination		Value 2.60E+01

Site Specific Parameters:

General Parameters:

None

Correlation Coefficients:

None

Summary Results:

90.00% **of the** 6400 **calculated TEDE values are** < 2.45E+01 **mrem/year .**
The 95 % Confidence Interval for the 0.9 **quantile value of TEDE is** 2.42E+01 **to** 2.49E+01 **mrem/year**

ATTACHMENT 4

Title : DCGL Determination 133Ba
Input File : C:\RESRAD_Family\BUILD\site1.bld

RESRAD-BUILD Table of Contents

RESRAD-BUILD Input Parameters..... 2
Building Information..... 3
Source Information..... 4
For time = 0.00E+00 yr
Time Specific Parameters..... 5
Receptor-Source Dose Summary..... 6
Dose by Pathway Detail..... 7
Dose by Nuclide Detail..... 8
For time = 1.00E+00 yr
Time Specific Parameters..... 9
Receptor-Source Dose Summary..... 10
Dose by Pathway Detail..... 11
Dose by Nuclide Detail..... 12
Full Summary..... 13

Title : DCGL Determination 133Ba
Input File : C:\RESRAD_Family\BUILD\site1.bld

RESRAD-BUILD Input Parameters

Number of Sources : 1
Number of Receptors: 1
Total Time : 3.650000E+02 days
Fraction Inside : 5.000000E-01

Receptor Information

Receptor	Room	x [m]	y [m]	z [m]	FracTime	Inhalation [m3/day]	Ingestion(Dust) [m2/hr]
1	1	1.000	1.000	1.000	1.000	1.80E+01	1.00E-04

Receptor-Source Shielding Relationship

Receptor	Source	Density [g/cm3]	Thickness [cm]	Material
1	1	2.40E+00	0.00E+00	Concrete

Building Information

Building Air Exchange Rate: 3.00E-01 1/hr

```
 Height[m]          Air Exchanges [m3/hr]
 Area [m2]
                   ******************************
                   *                            *
                   *                            *
                   *                           <=Q03: 6.00E+01
 H3:   2.500       *           Room  3          *      Q30 :  6.00E+01
                   *   LAMBDA: 1.00E+00         *
Area  36.000       *                            *
                   * /\   N23: 0.00E+00
                   **||***************************      Q32 :  3.00E+01
                     ||
                   **||***************************      Q23 :  3.00E+01
                   *                            *
                   *                            *
                   *                           <=Q02: 6.00E+01
 H2:   2.500       *           Room  2          *      Q20 :  6.00E+01
                   *   LAMBDA: 1.00E+00         *
Area  36.000       *                            *
                   * /\   N12: 0.00E+00
                   **||***************************      QLR :  0.00E+00
                     ||
                   **||***************************      Q12 :  0.00E+00
                   *                            *
                   *                            *
                   *                           <=Q01: 9.60E+01
 H1:   2.500       *           Room  1          *      Q10 :  9.60E+01
                   *   LAMBDA: 1.07E+00         *
Area  36.000       *                            *
                   *                            *
                   ******************************
```

Deposition velocity: 1.00E-02 [m/s] Resuspension Rate: 5.00E-07 [1/s]

Title : DCGL Determination 133Ba
Input File : C:\RESRAD_Family\BUILD\site1.bld

Source Information

Source: 1

Location:: Room : 1 x: 0.00 y: 0.00 z: 0.00[m]

Geometry:: Type: Area Area:3.60E+01 [m2] Direction: x

Pathway ::

Direct Ingestion Rate: 0.000E+00 [1/hr]

Fraction released to air: 1.000E-01

Removable fraction: 5.000E-01

Time to Remove: 3.650E+02 [day]

Contamination::

Nuclide	Concentration [pCi/m2]	Dose Conversion Factor (Library: FGR 11) Ingestion [mrem/pCi]	Inhalation [mrem/pCi]	Submersion [mrem/yr/ (pCi/m3)]
BA-133	2.500E+06	3.400E-06	7.810E-06	2.079E-03

Title : DCGL Determination 133Ba

Input File : C:\RESRAD_Family\BUILD\site1.bld

Evaluation Time: 0.00000000E+00 years

```
==================================================
==================================================
===        Assessment for Time:  1             ===
===              Time =0.00E+00 yr             ===
==================================================
==================================================
```

========== Source Information ==========

Source: 1

Location:: Room : 1 x: 0.00 y: 0.00 z: 0.00 [m]

Geometry:: Type: Area Area:3.60E+01 [m2] Direction: x

Pathway ::

Direct Ingestion Rate: 0.000E+00 [1/hr]

Fraction released to air: 1.000E-01

Removable fraction: 5.000E-01

Time to Remove: 3.650E+02 [day]

Contamination::	Nuclide	Concentration [pCi/m2]
	BA-133	2.500E+06

Title : DCGL Determiration 133Ba

Input File : C:\RESRAD_Family\BUILD\site1.bld

Evaluation Time: 0.00000000E+00 years

RESRAD-BUILD Dose Tables

Source Contributions to Receptor Doses

[mrem]

	Source 1	Total
Receptor 1	1.92E+01	1.92E+01
Total	1.92E+01	1.92E+01

Title : DCGL Determination 133Ba
Input File : C:\RESRAD_Family\BUILD\site1.bld
Evaluation Time: 0.00000000E+00 years

Pathway Detail of Doses

[mrem]

Source: 1

Receptor	External	Deposition	Immersion	Inhalation	Radon	Ingestion
1	1.79E+01	1.00E+00	5.01E-03	1.23E-01	0.00E+00	1.43E-01
Total	1.79E+01	1.00E+00	5.01E-03	1.23E-01	0.00E+00	1.43E-01

Title : DCGL Determiration 133Ba
Input File : C:\RESRAD_Family\BUILD\site1.bld
Evaluation Time: 0.00000000E+00 years

Nuclide Detail of Doses

[mrem]

Source: 1

Nuclide	Receptor 1	Total
BA-133	1.92E+01	1.92E+01

Title : DCGL Determination 133Ba

Input File : C:\RESRAD_Family\BUILD\site1.bld

Evaluation Time: 1.00000000 years

```
==========================================
==========================================
===      Assessment for Time:  2       ===
===            Time =1.00E+00 yr       ===
==========================================
==========================================
```

========== Source Information ==========

Source: 1

Location:: Room : 1 x: 0.00 y: 0.00 z: 0.00 [m]

Geometry:: Type: Area Area:3.60E+01 [m2] Direction: x

Pathway ::

Direct Ingestion Rate: 0.000E+00 [1/hr]

Fraction released to air: 1.000E-01

Removable fraction: 0.000E+00

Time to Remove: 3.650E+02 [day]

Contamination::	Nuclide	Concentration [pCi/m2]
	BA-133	1.172E+06

Title : DCGL Determination 133Ba

Input File : C:\RESRAD_Family\BUILD\site1.bld

Evaluation Time: 1.00000000 years

RESRAD-BUILD Dose Tables

Source Contributions to Receptor Doses

[mrem]

	Source 1	Total
Receptor 1	1.12E+01	1.12E+01
Total	1.12E+01	1.12E+01

Title : DCGL Determination 133Ba

Input File : C:\RESRAD_Family\BUILD\site1.bld

Evaluation Time: 1.00000000 years

Pathway Detail of Doses

[mrem]

Source: 1

Receptor	External	Deposition	Immersion	Inhalation	Radon	Ingestion
1	1.12E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total	1.12E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Title : DCGL Determination 133Ba
Input File : C:\RESRAD_Family\BUILD\site1.bld
Evaluation Time: 1.00000000 years

Nuclide Detail of Doses

[mrem]

Source: 1

Nuclide	Receptor 1	Total
BA-133	1.12E+01	1.12E+01

Title : DCGL Determination 133Ba
Input File : C:\RESRAD_Family\BUILD\site1.bld
Full Summary

RESRAD-BUILD Dose (Time) Tables

Receptor Dose Received for the Exposure Duration

(mrem)

	Evaluation Time [yr] 0.00E+00	1.00E+00
1	1.92E+01	1.12E+01

Receptor Dose/Yr Averaged Over Exposure Duration

(mrem/yr)

	Evaluation Time [yr] 0.00E+00	1.00E+00
1	1.92E+01	1.12E+01

ATTACHMENT 5

REFERENCE MATRICES and ASSOCIATED MEASUREMENTS

Scaler/rate meter: L2221 **Detector:** 43-37B
SN: 211785 **SN:** 120216

	Laminate surface horiz.	Metal surface vert.	Metal surface horiz.	Cinderblock wall (painted)	Wood surface vert.	Ceiling tiles	Drywall	Drywall over cinder block	Vinyl tile	Concrete floor
Counts/minute	1070 ± 32	781 ± 39	1064 ± 30	1486 ± 27	769 ± 24	1760 ± 43	897 ± 76	1206 ± 51	1068 ± 24	1294 ± 36
MDCR	1453	1108	1446	1937	1093	2251	1331	1612	1450	1715

Scaler/rate meter: L2221 **Detector:** 43-37A
SN: 211785 **SN:** 120216

	Metal surface vert.	Metal surface horiz.	Cinderblock wall (painted)	Wood surface vert.	Ceiling tiles	Drywall	Drywall over cinder block	Vinyl tile
Counts/minute	14 ± 3	12 ± 2	18 ± 3	11 ± 2	14 ± 3	11 ± 2	16 ± 2	12 ± 2

Scaler/rate meter: L2221 **Detector:** 43-68A
SN: 211785 **SN:** 127616

	Metal surface vert.	Metal surface horiz.	Laminate surface horiz.	Concrete floor	Vinyl tile 12x12
Counts/minute	3 ± 2	3 ± 1	2 ± 1	4 ± 1	2 ± 1

REFERENCE MATRICES and ASSOCIATED MEASUREMENTS

Scaler/rate meter: L2221 **Detector:** 43-37A
SN: 108881 **SN:** O92503

	Laminate surface horiz.	Concrete floor	Vinyl tile 12x12
Counts/minute	20 ± 3	19 ± 4	20 ± 4

REFERENCE MATRICES and ASSOCIATED MEASUREMENTS

Scaler/rate meter: L2221 **Detector:** 43-37B
SN: 163697 **SN:** O92501

	Laminate surface horiz.	Metal surface vert.	Metal surface horiz.	Cinderblock wall (painted)	Concrete floor	Wood surface vert.	Ceiling tiles	Drywall	Drywall over cinder block	Vinyl tile 12x12
Counts/minute	1111 ± 37	782 ± 20	1075 ± 29	1577 ± 42	1272 ± 37	758 ± 36	1749 ± 49	860 ± 69	1087 ± 53	1005 ± 22
MDCR	1501	1109	1459	2042	1689	1080	2238	1203	1473	1376

Scaler/rate meter: L2221 **Detector:** 43-37A
SN: 163697 **SN:** O92501

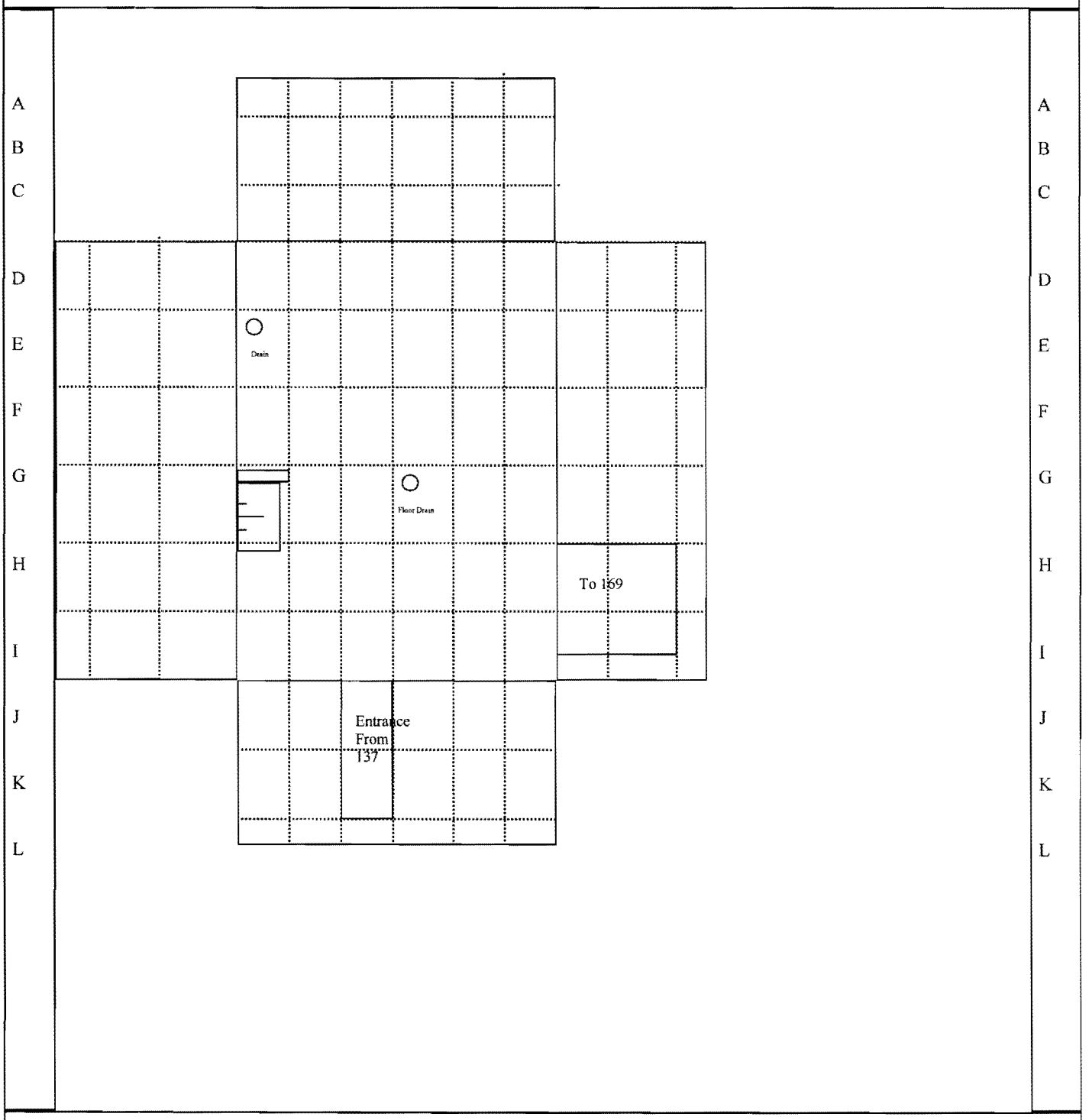
	Wood surface vert.	Metal surface vert.	Metal surface horiz.	Laminate wood horizontal	Ceiling tile	Drywall	Drywall over cinder block	Cinderblock painted	Vinyl tile	Concrete floor
Counts/minute	8 ± 2	8 ± 2	8 ± 2	8 ± 1	9 ± 2	12 ± 2	11 ± 2	11 ± 2	12 ± 2	15 ± 2

caler/rate meter: L2221 **Detector:** 43-68B
SN: 163697 **SN:** O75164

	Metal surface vert.	Metal surface horiz.	Laminate surface horiz.	Concrete floor	Vinyl tile 12x12
Counts/minute	265 ± 17	204 ± 14	275 ± 11	313 ± 16	253 ± 10
MDCR	455	371	469	520	439

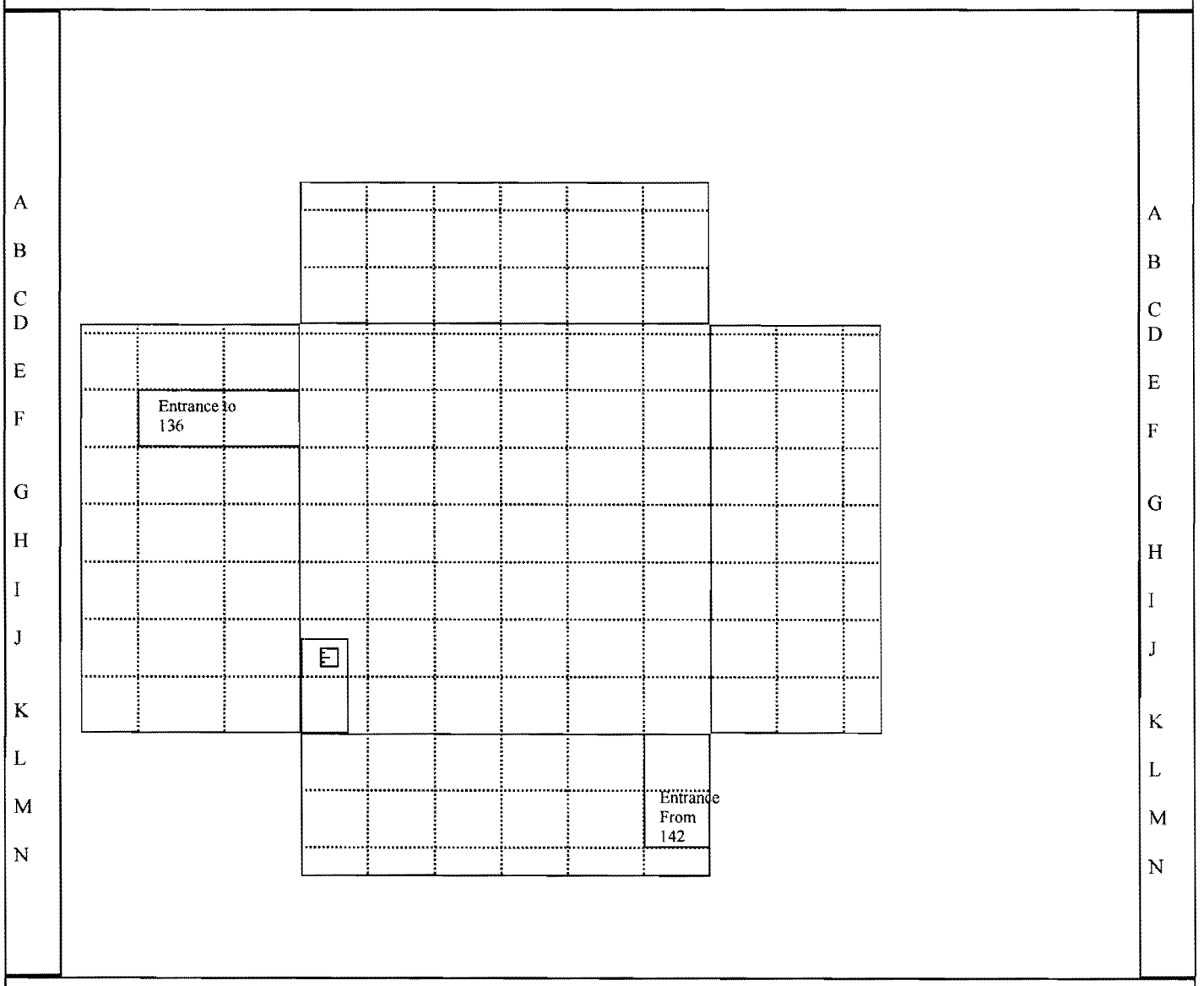
ATTACHMENT 6

RADIATION SAFETY SURVEY REPORT	SURVEYOR NAME:	DATE:
	LAB: 136	TIME:



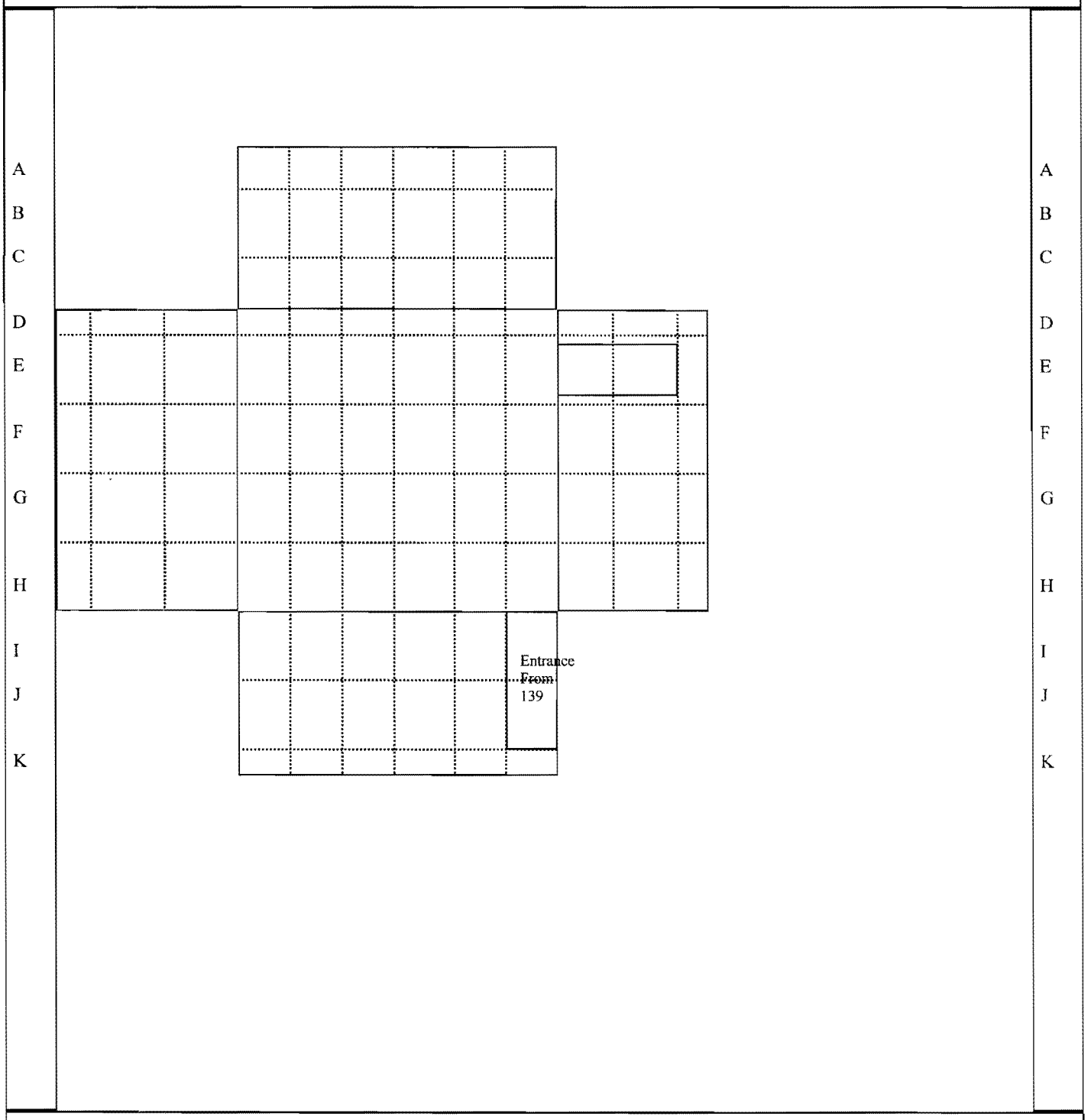
Comments:

RADIATION SAFETY SURVEY REPORT	SURVEYOR NAME:	DATE:
	LAB: 137	TIME:



Comments:

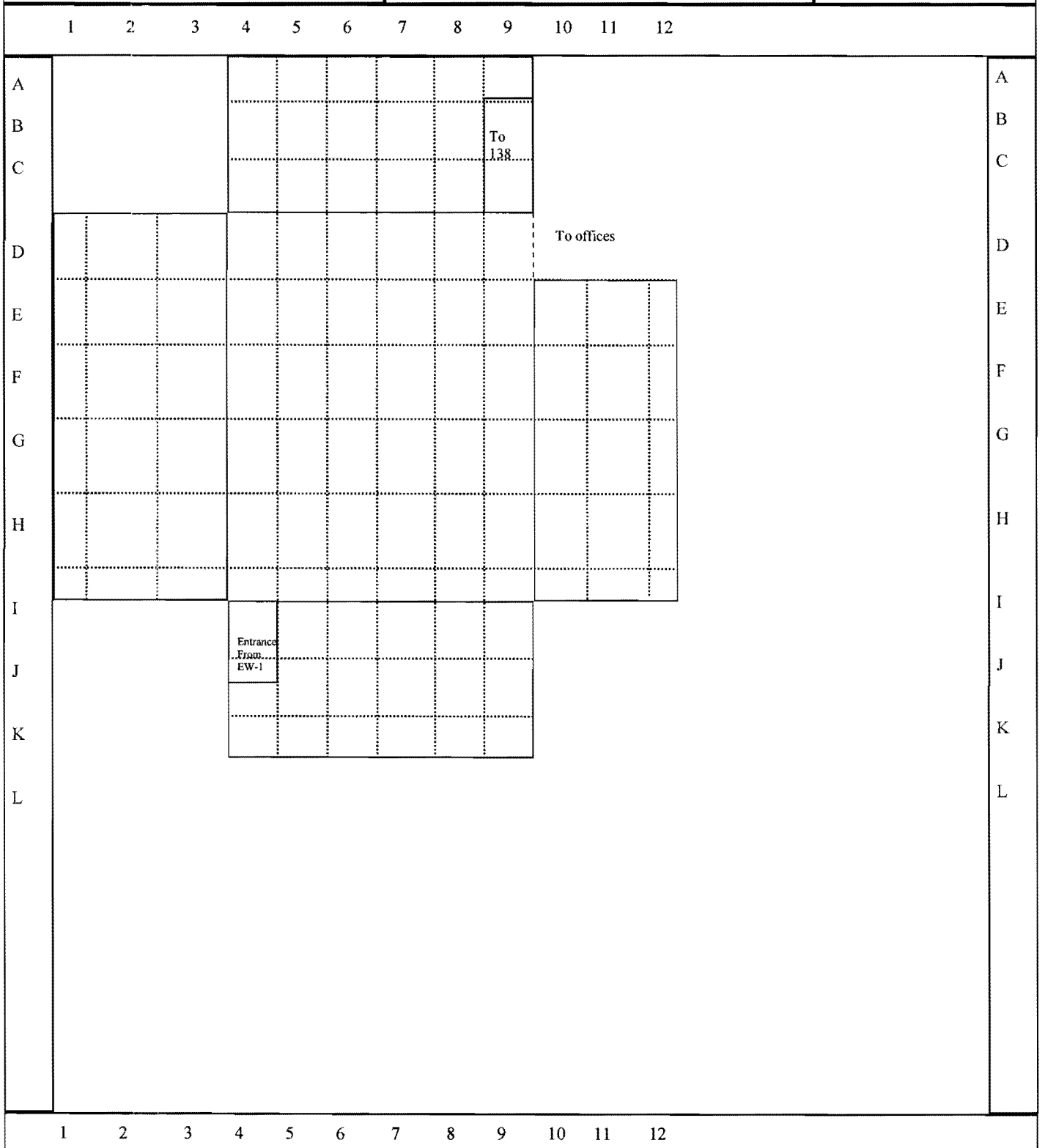
RADIATION SAFETY SURVEY REPORT	SURVEYOR NAME:	DATE:
	LAB: 138	TIME:



Comments:

CES Form #1, Rev 03/03

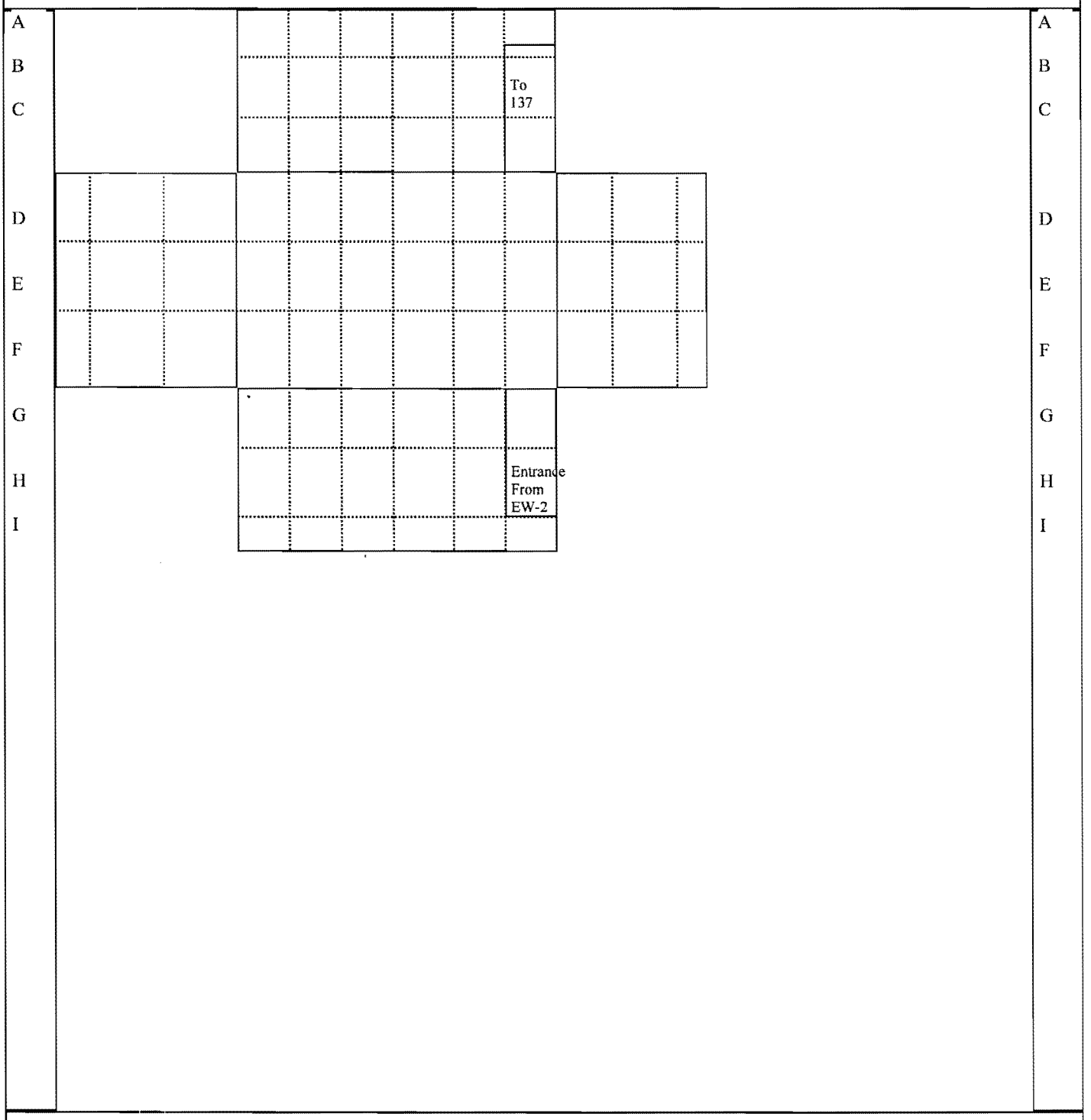
RADIATION SAFETY SURVEY REPORT	SURVEYOR NAME:	DATE:
	LAB: 139	TIME:



Comments:

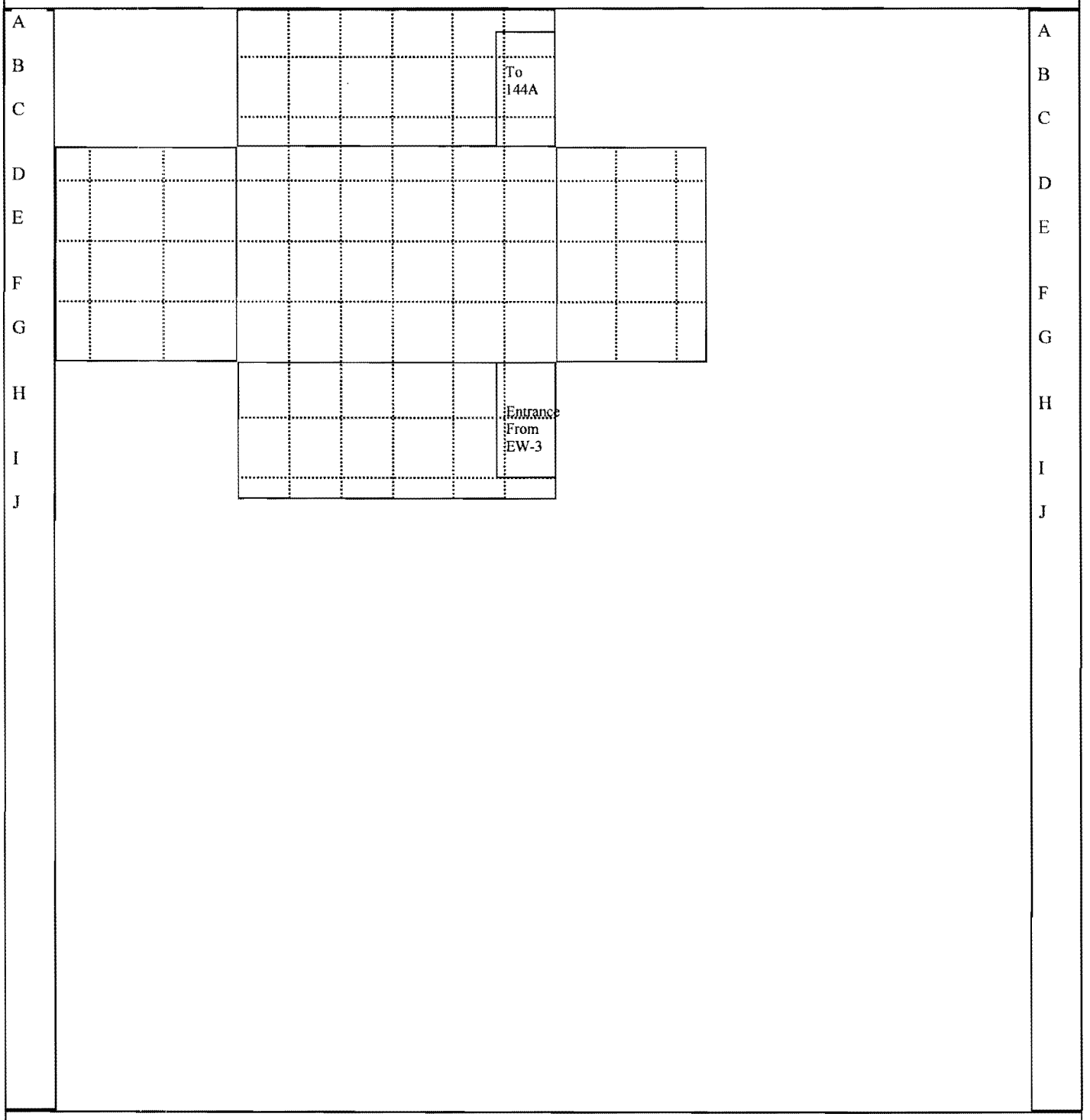
CES Form #1, Rev 03/03

RADIATION SAFETY SURVEY REPORT	SURVEYOR NAME:	DATE:
	LAB: 142	TIME:



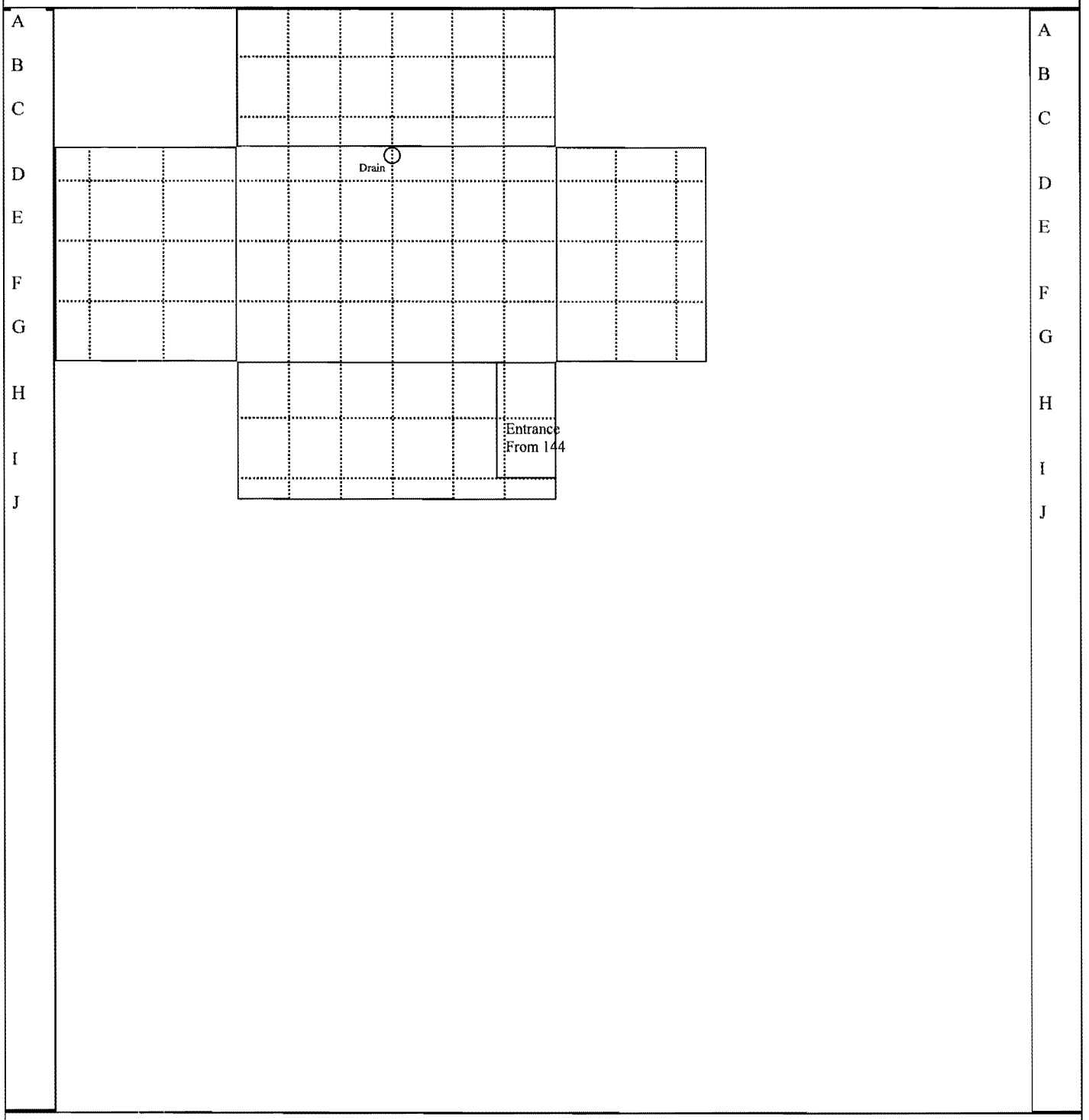
Comments:

RADIATION SAFETY SURVEY REPORT	SURVEYOR NAME:	DATE:
	LAB: 144	TIME:



Comments:

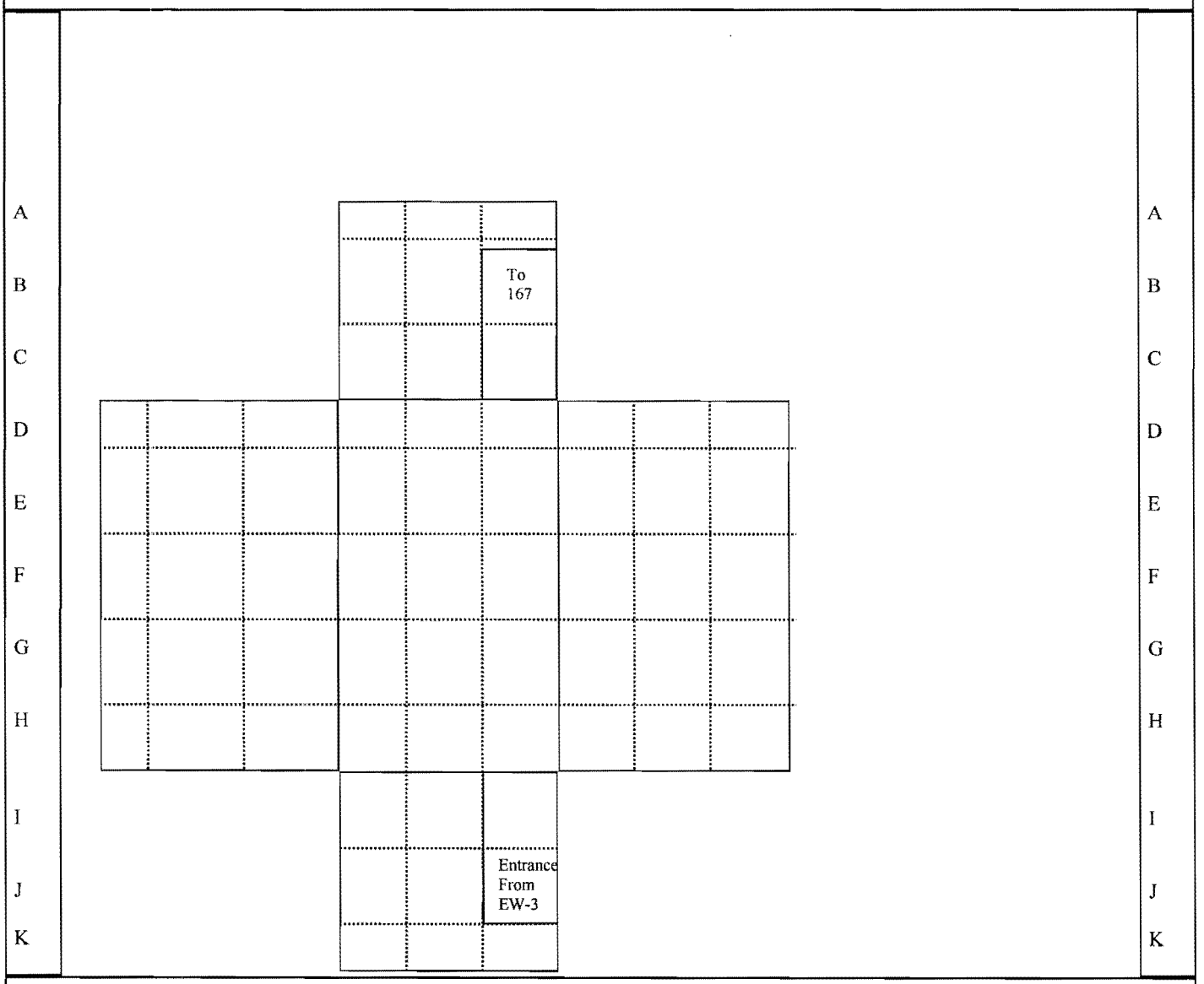
RADIATION SAFETY SURVEY REPORT	SURVEYOR NAME:	DATE:
	LAB: 144A	TIME:



Comments:

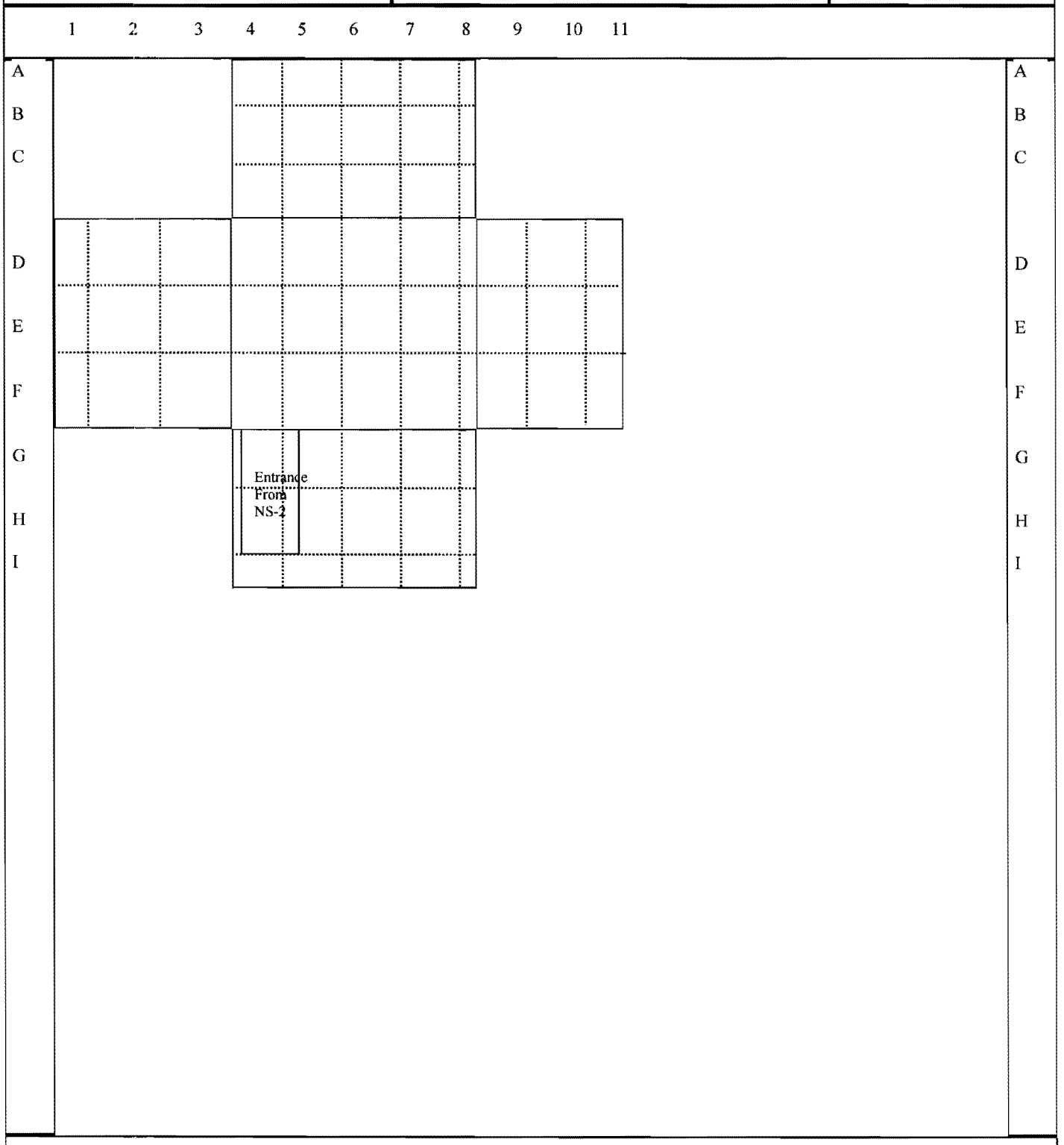
CES Form #1, Rev 03/03

RADIATION SAFETY SURVEY REPORT	SURVEYOR NAME:	DATE:
	LAB: 145	TIME:



Comments:

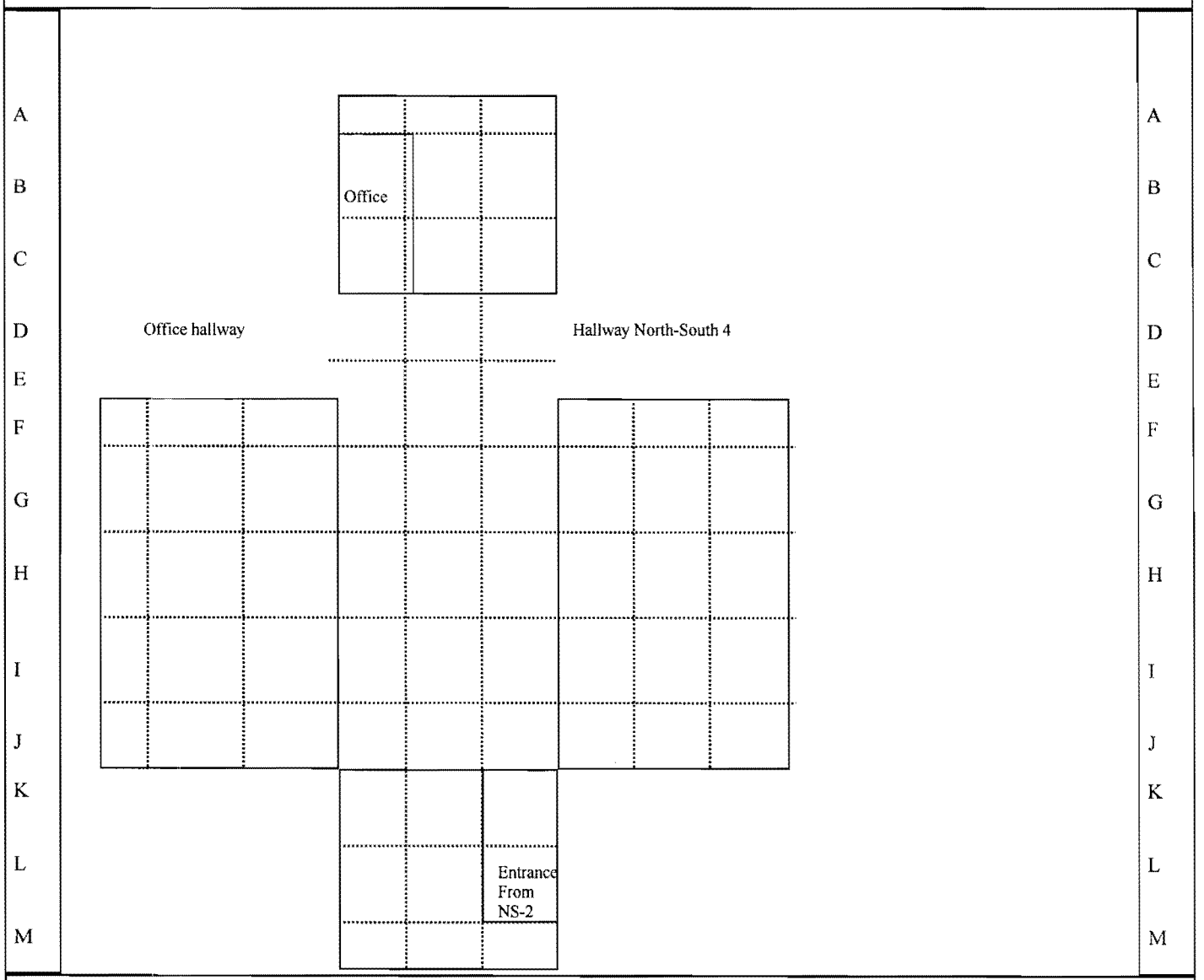
RADIATION SAFETY SURVEY REPORT	SURVEYOR NAME:	DATE:
	LAB: 155	TIME:



Comments:

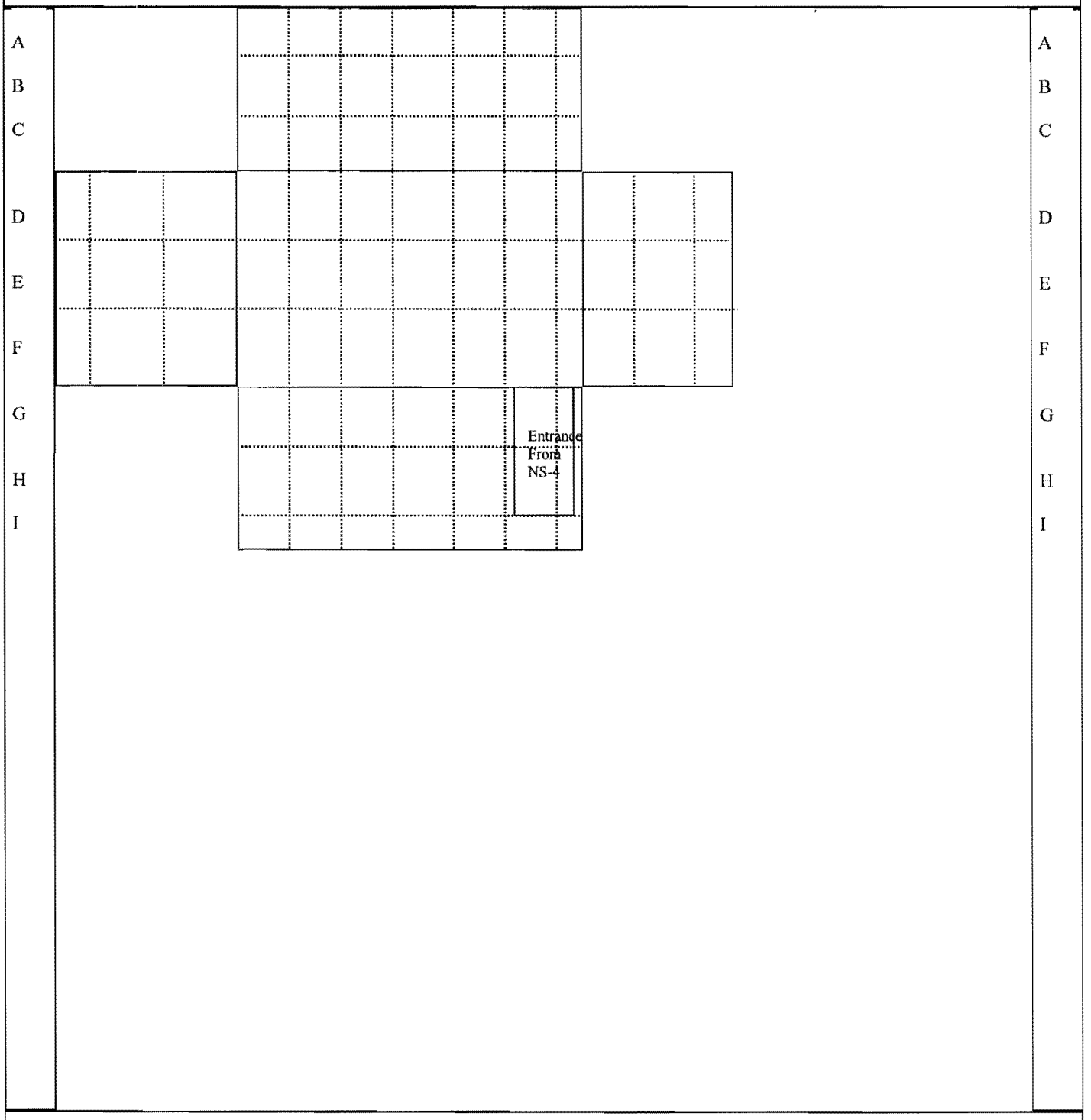
CES Form #1, Rev 03/03

RADIATION SAFETY SURVEY REPORT	SURVEYOR NAME:	DATE:
	LAB: 157	TIME:



Comments:

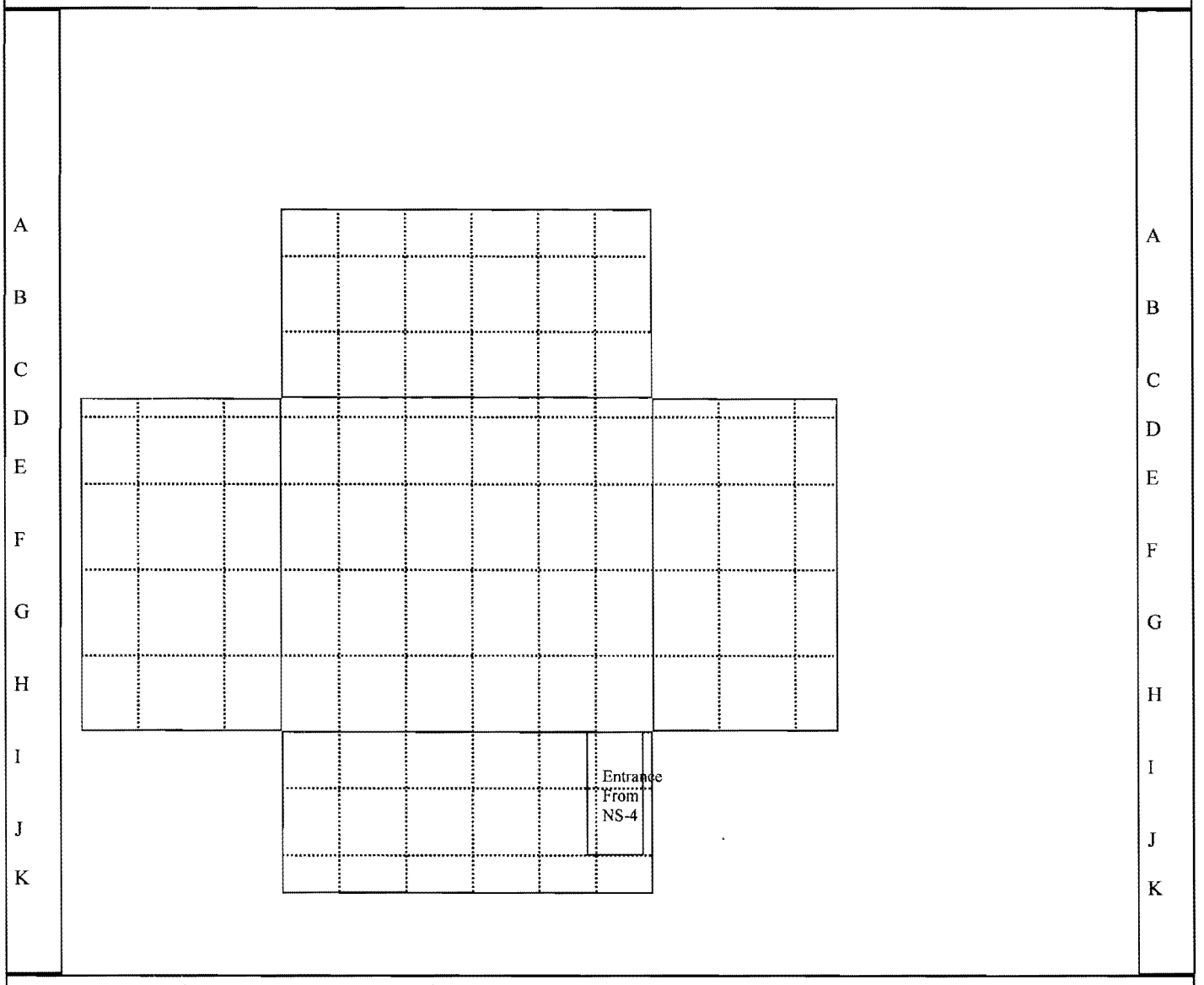
RADIATION SAFETY SURVEY REPORT	SURVEYOR NAME:	DATE:
	LAB: 165	TIME:



Comments:

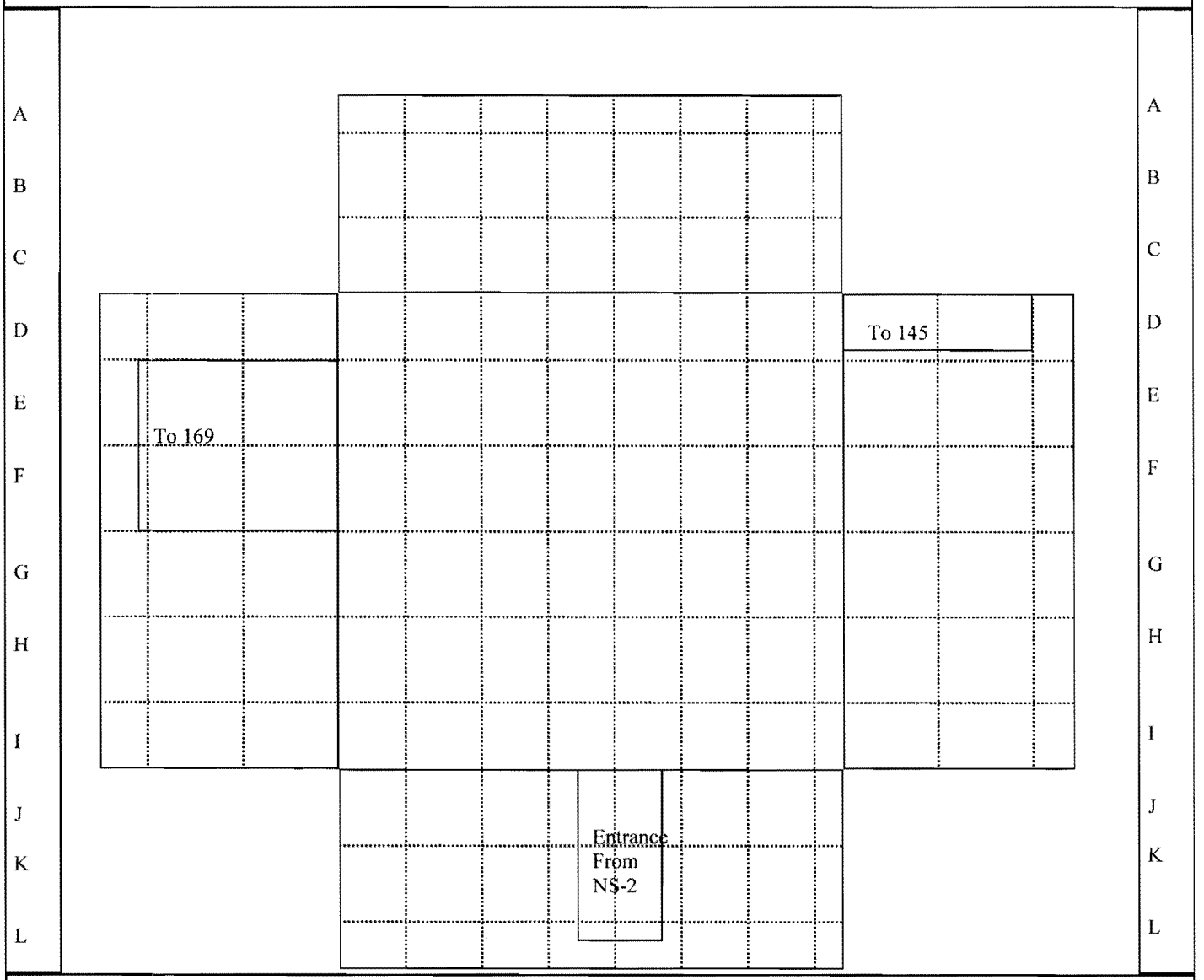
CES Form #1, Rev 03/03

RADIATION SAFETY SURVEY REPORT	SURVEYOR NAME:	DATE:
	LAB: 166	TIME:



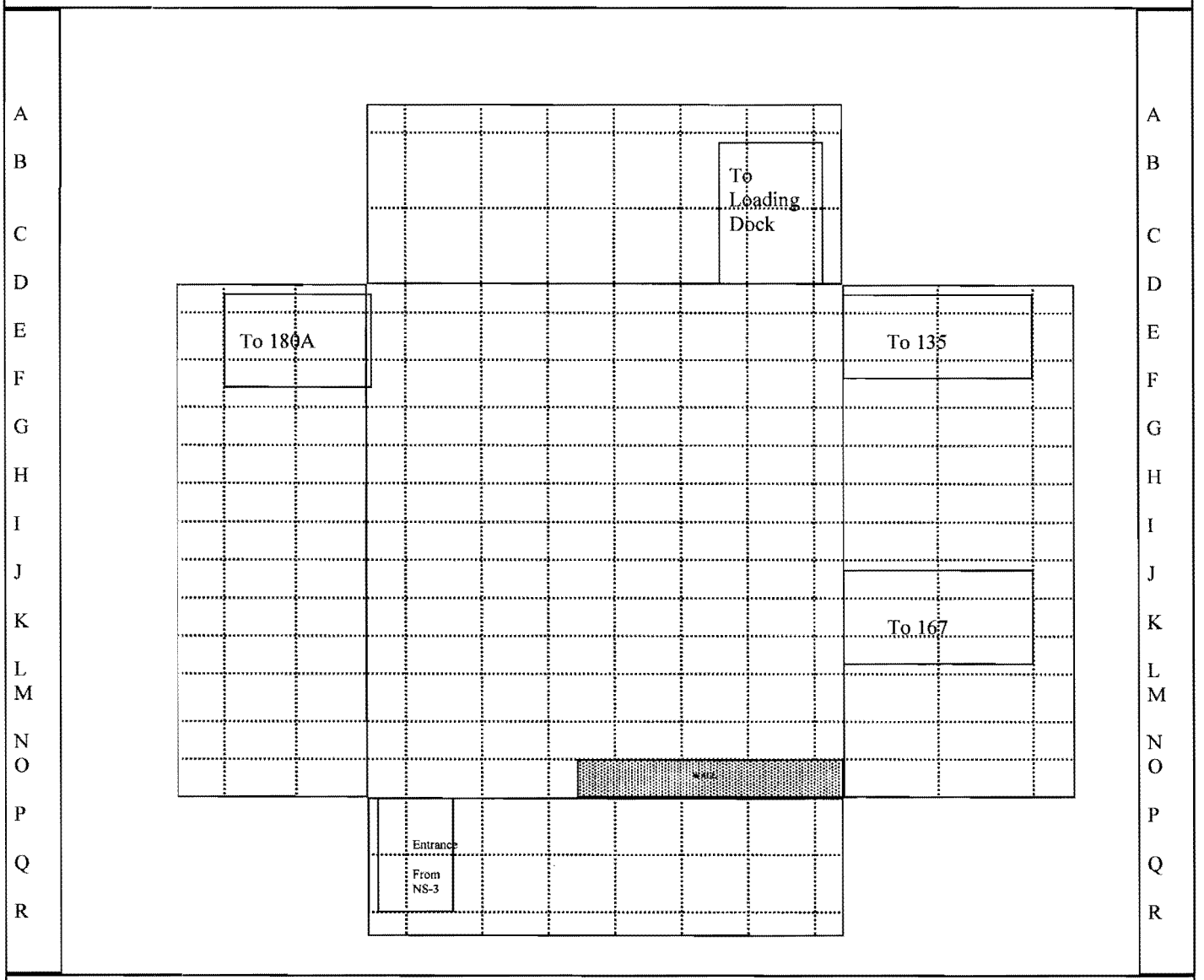
Comments:

RADIATION SAFETY SURVEY REPORT	SURVEYOR NAME:	DATE:
	LAB: 167	TIME:



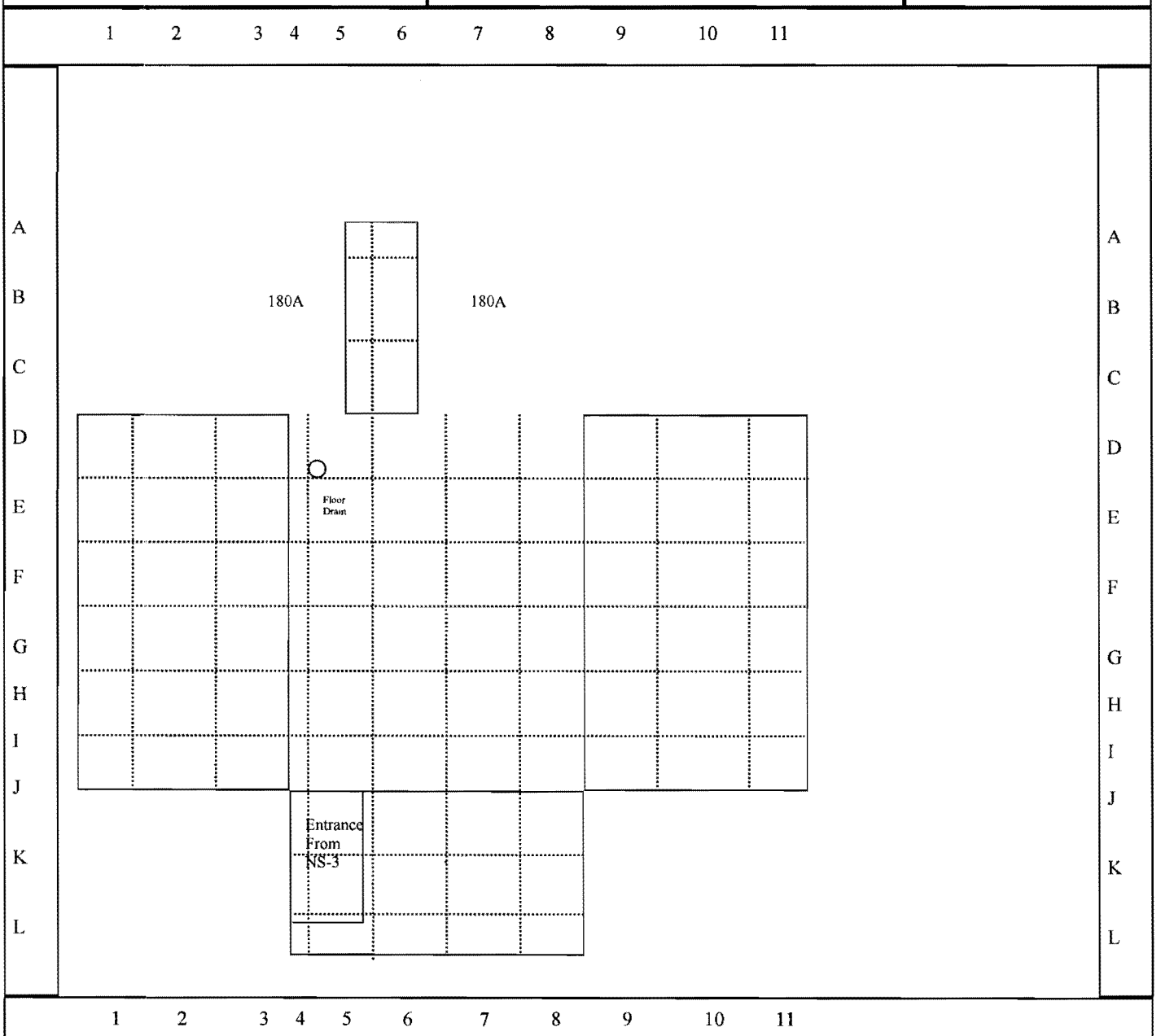
Comments:

RADIATION SAFETY SURVEY REPORT	SURVEYOR NAME:	DATE:
	LAB: 169	TIME:



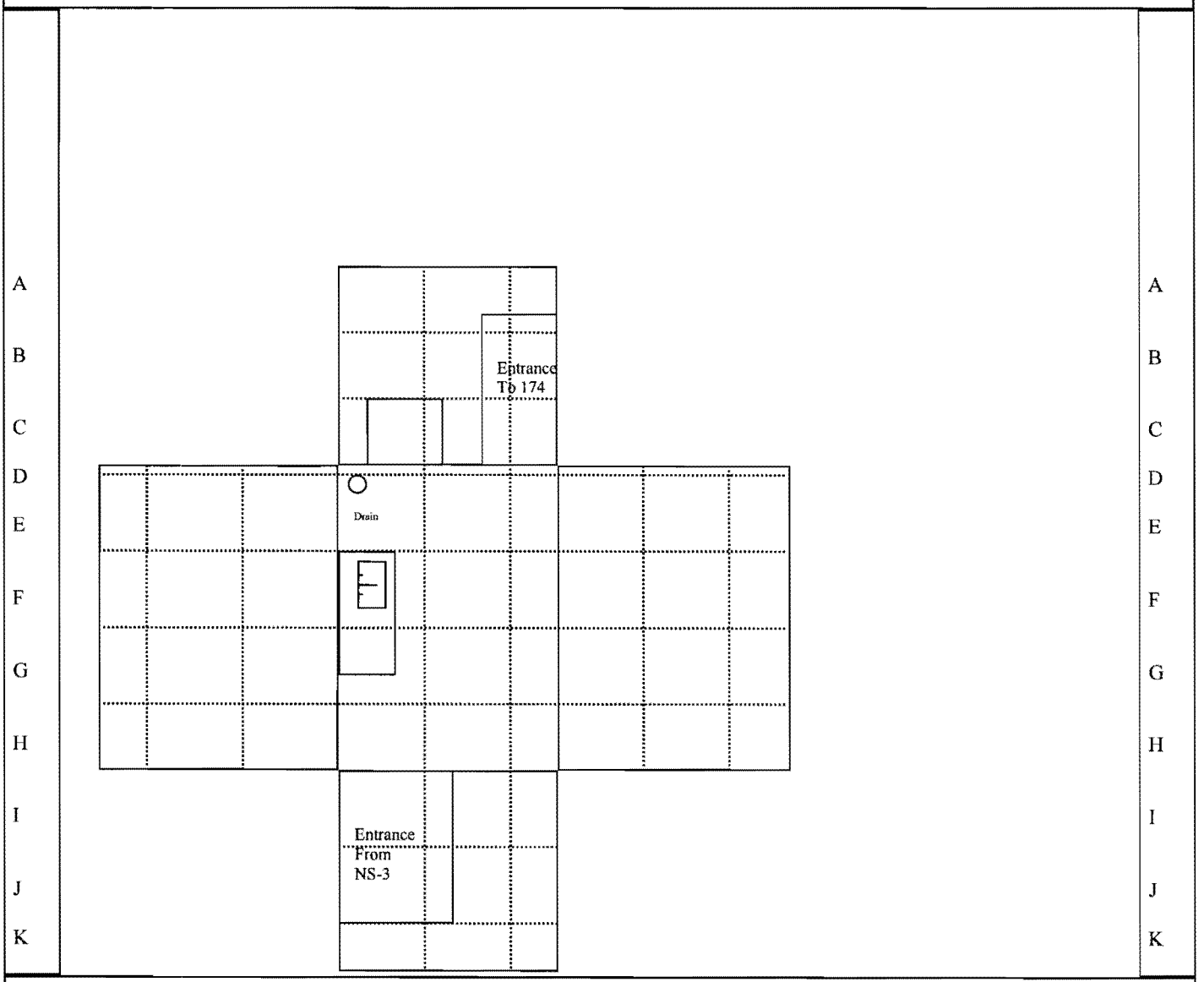
Comments:

RADIATION SAFETY SURVEY REPORT	SURVEYOR NAME:	DATE:
	LAB: 170	TIME:



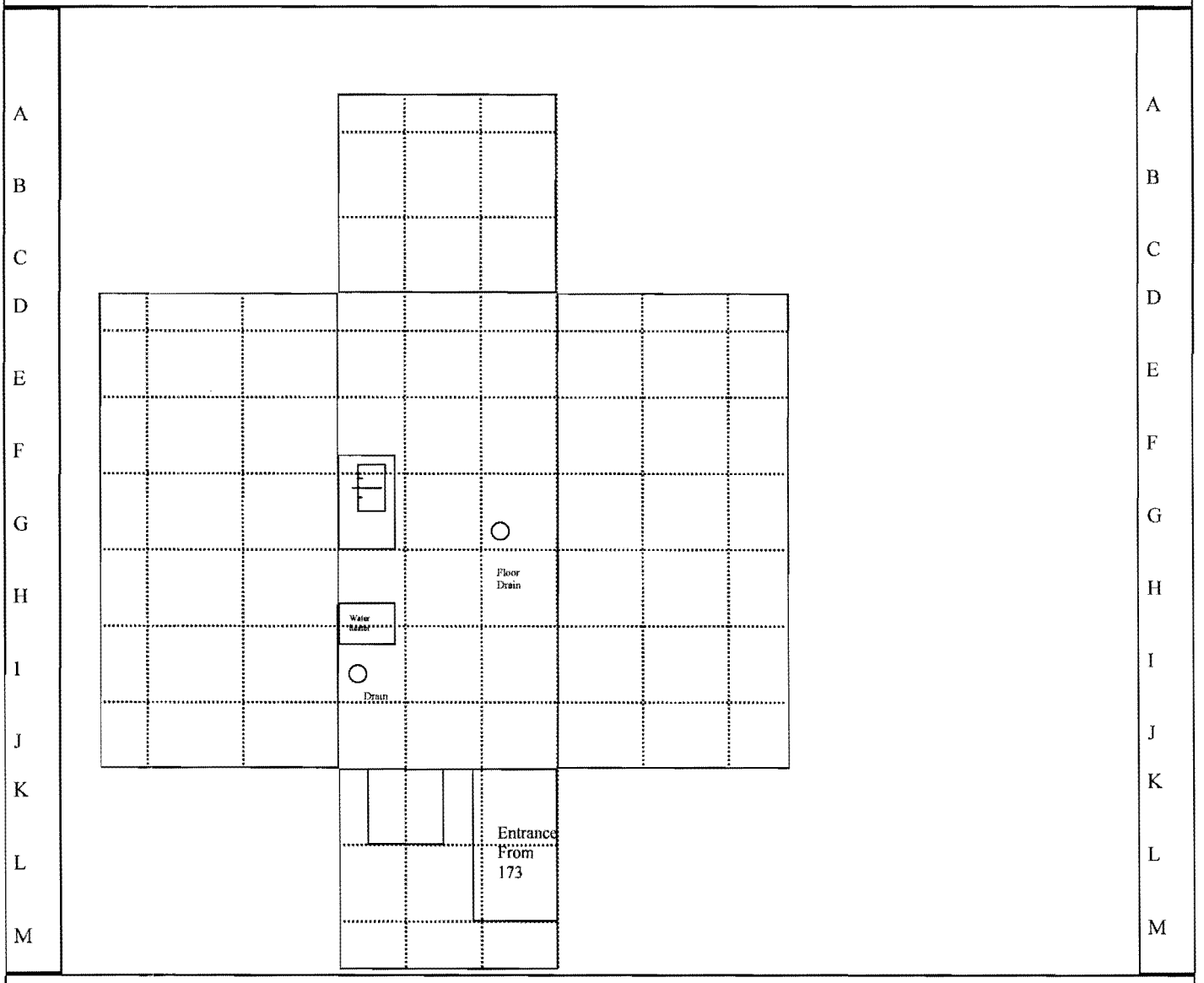
Comments:

RADIATION SAFETY SURVEY REPORT	SURVEYOR NAME:	DATE:
	LAB: 173	TIME:



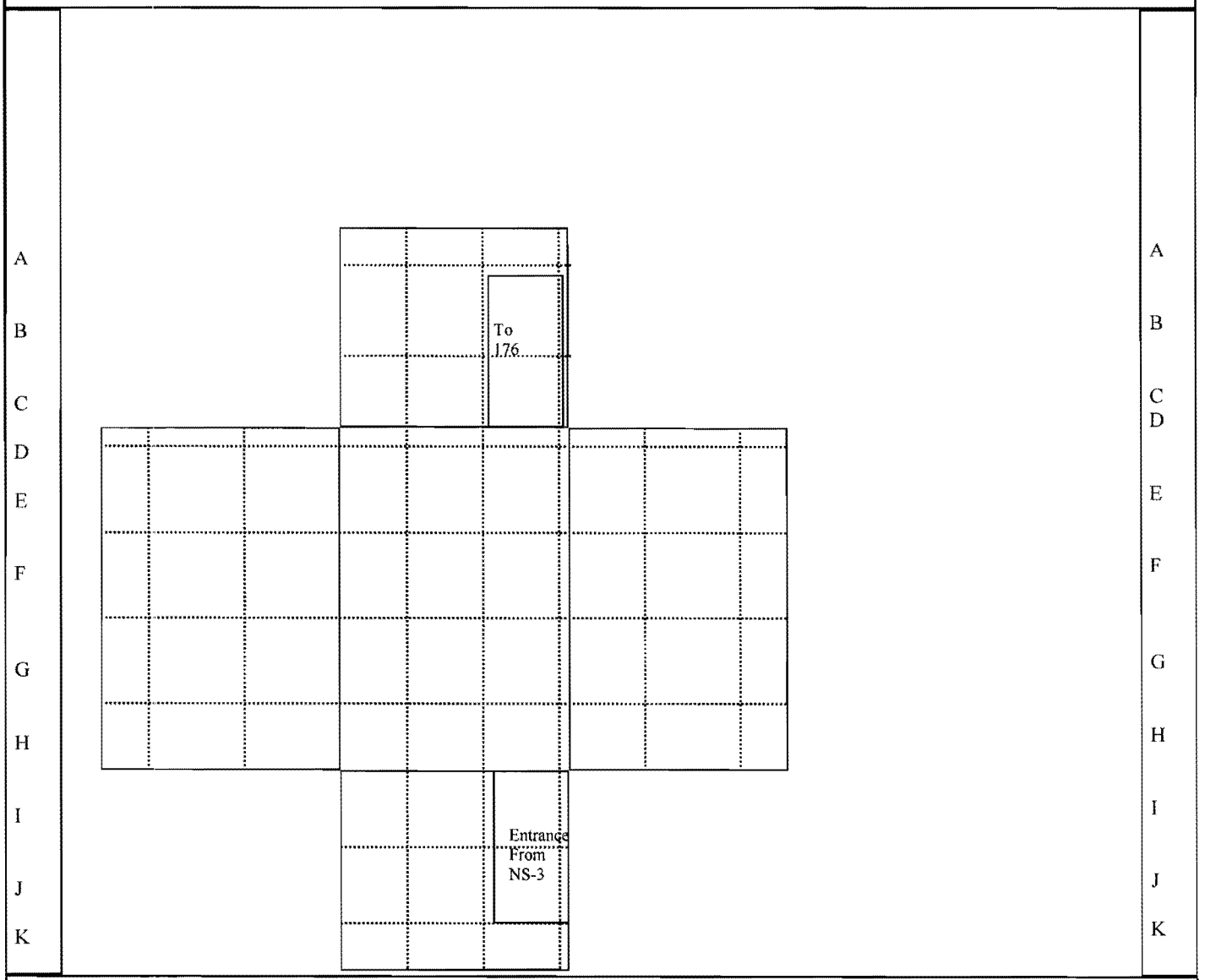
Comments:

RADIATION SAFETY SURVEY REPORT	SURVEYOR NAME:	DATE:
	LAB: 174	TIME:



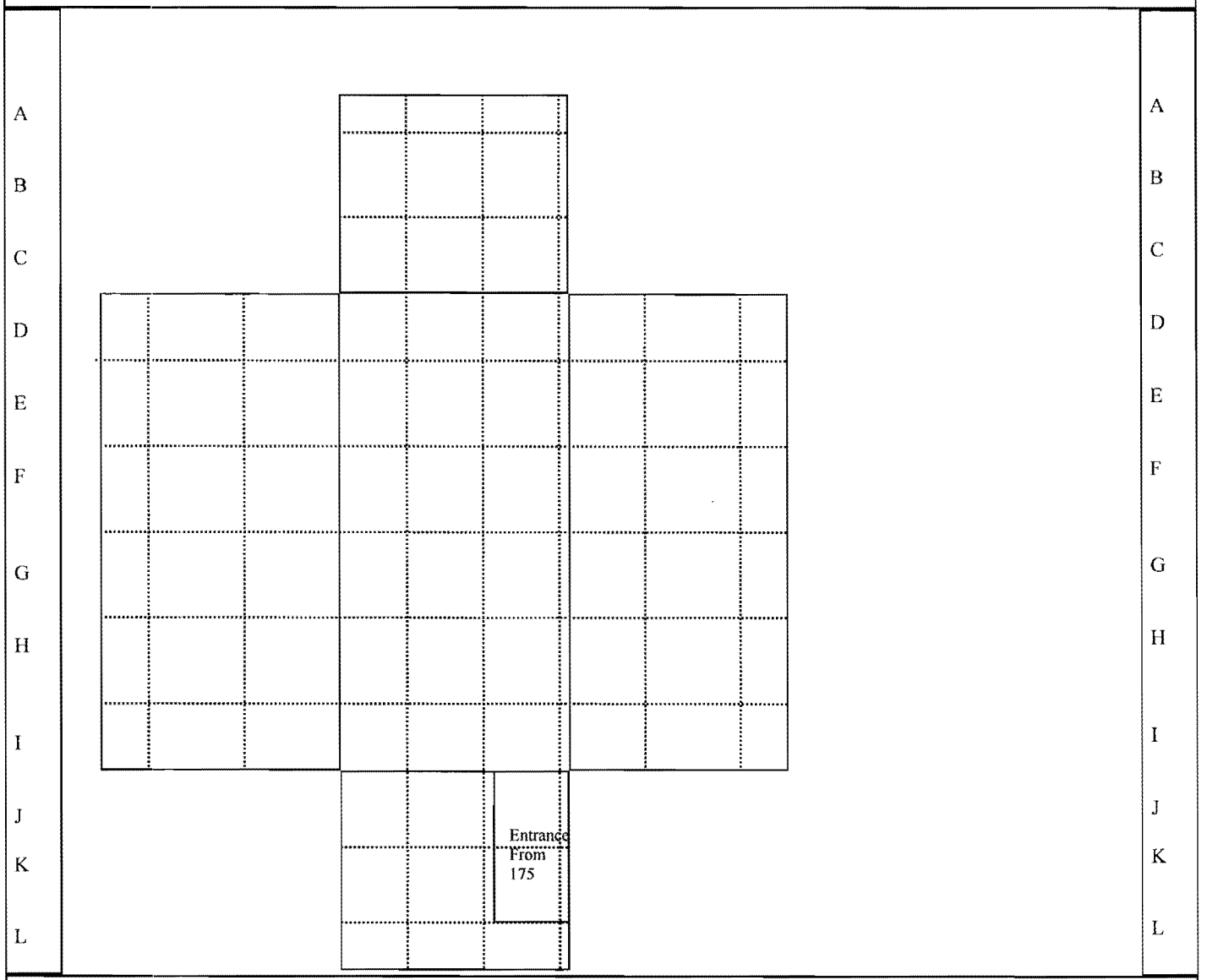
Comments:

RADIATION SAFETY SURVEY REPORT	SURVEYOR NAME:	DATE:
	LAB: 175	TIME:



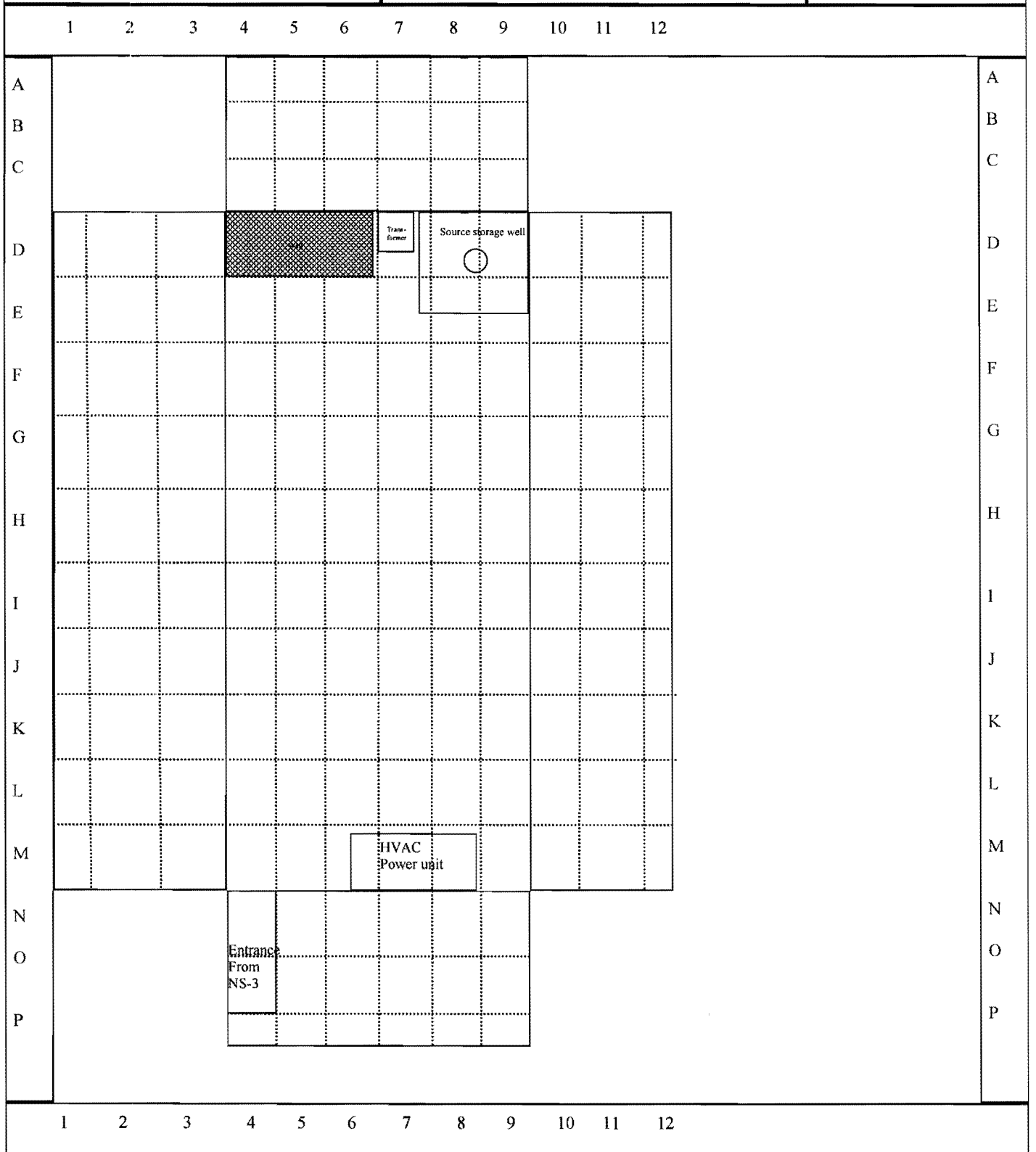
Comments:

RADIATION SAFETY SURVEY REPORT	SURVEYOR NAME:	DATE:
	LAB: 176	TIME:



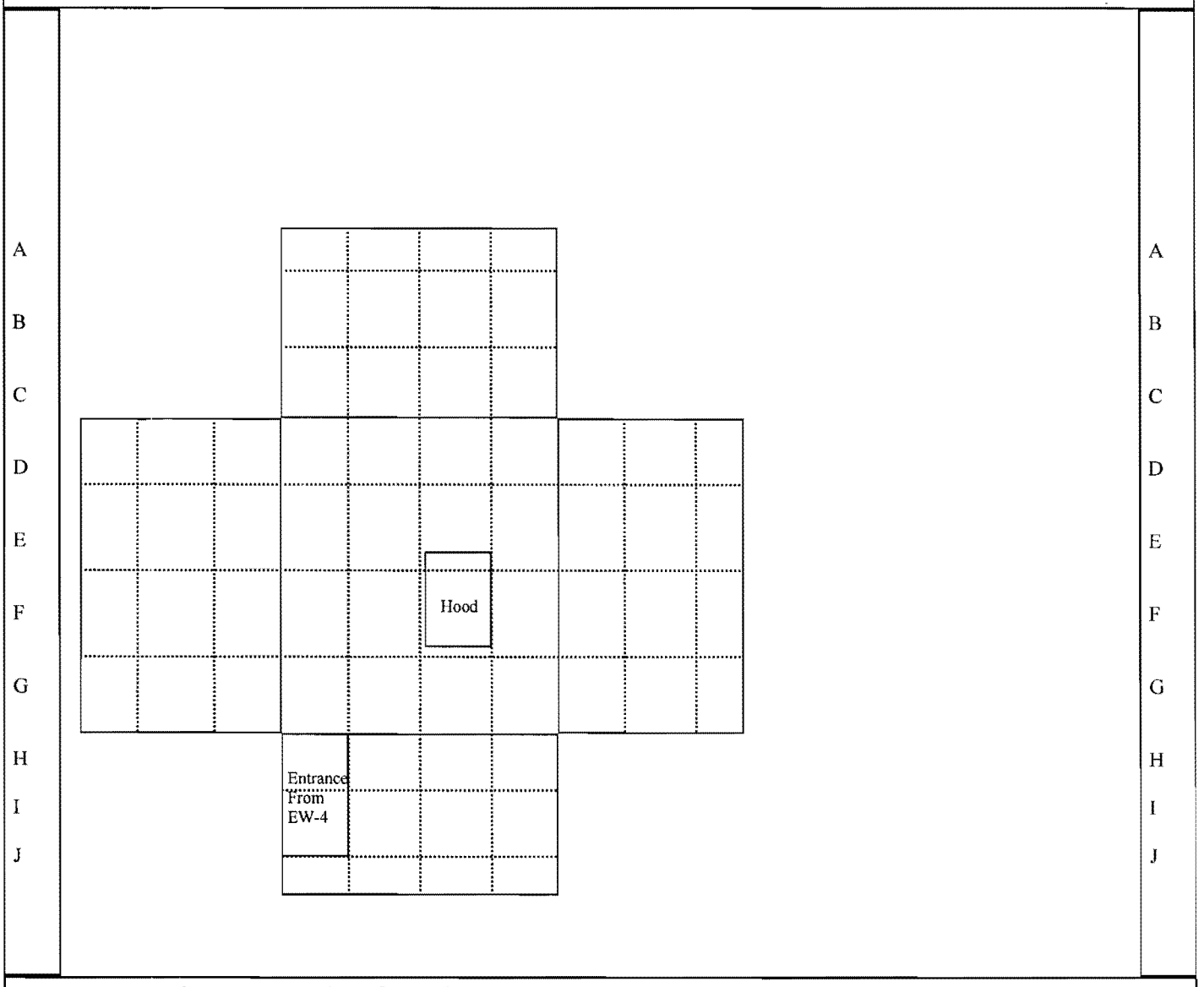
Comments:

RADIATION SAFETY SURVEY REPORT	SURVEYOR NAME:	DATE:
	LAB: 177	TIME:



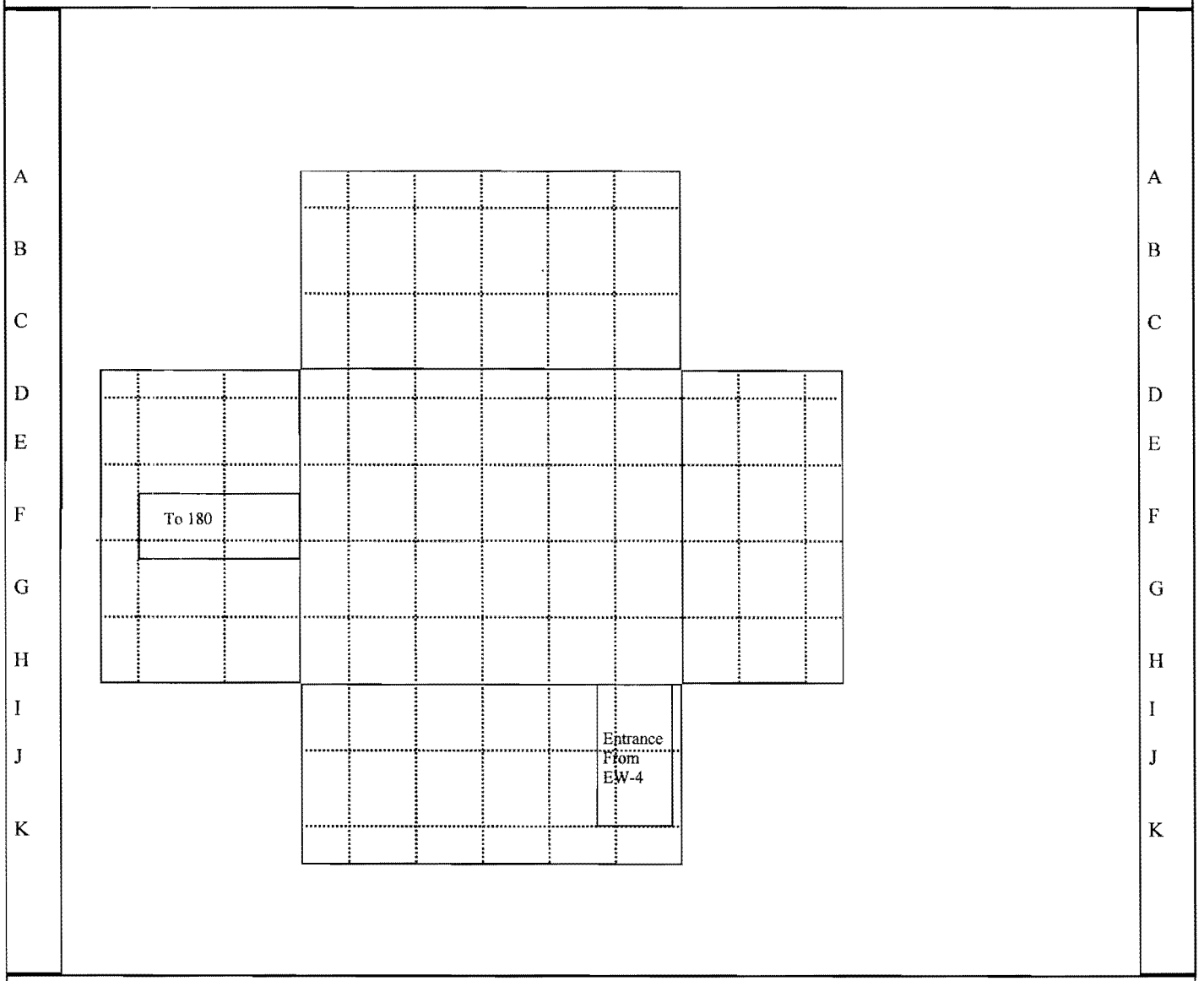
Comments:

RADIATION SAFETY SURVEY REPORT	SURVEYOR NAME:	DATE:
	LAB: 178	TIME:



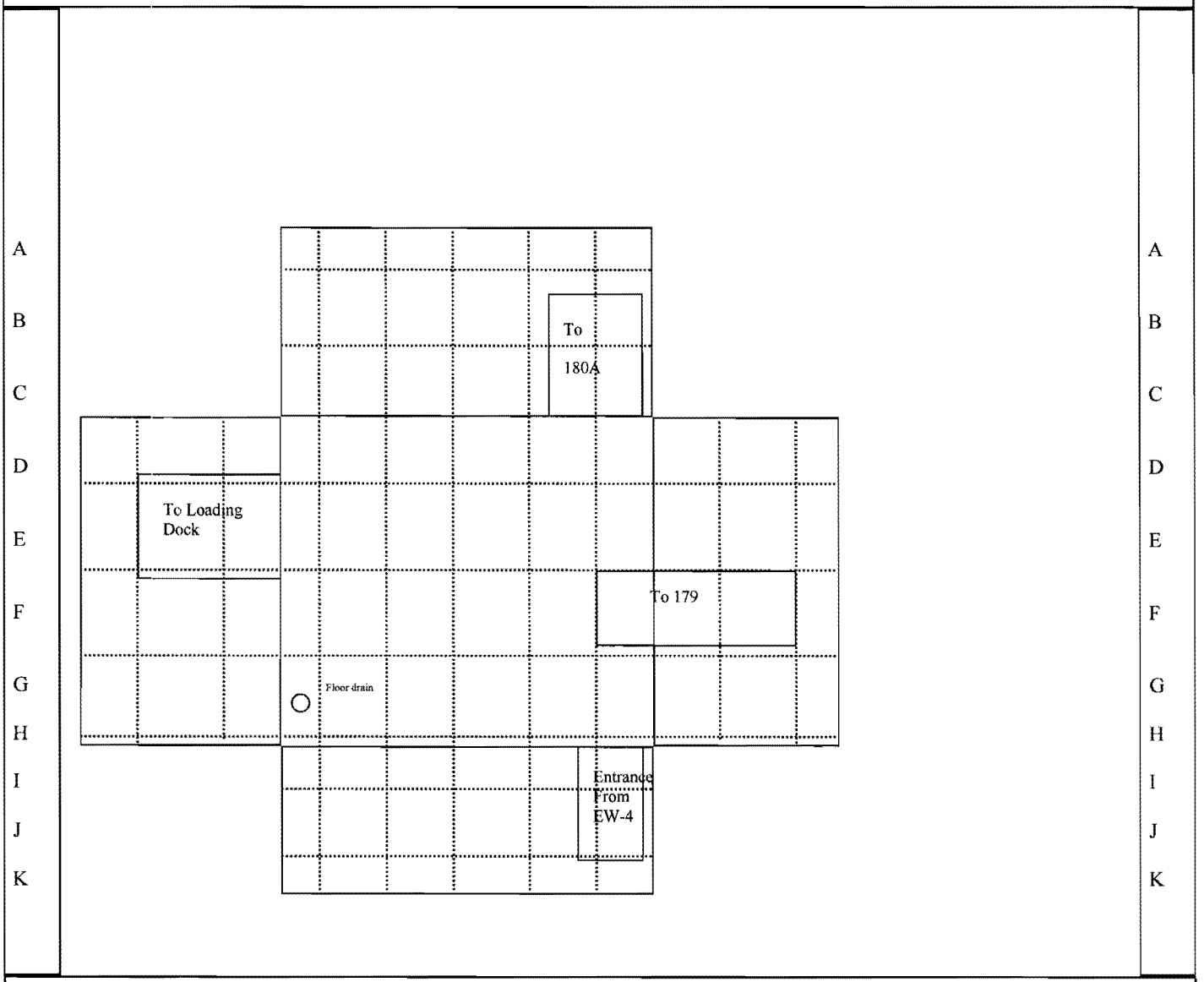
Comments:

RADIATION SAFETY SURVEY REPORT	SURVEYOR NAME:	DATE:
	LAB: 179	TIME:



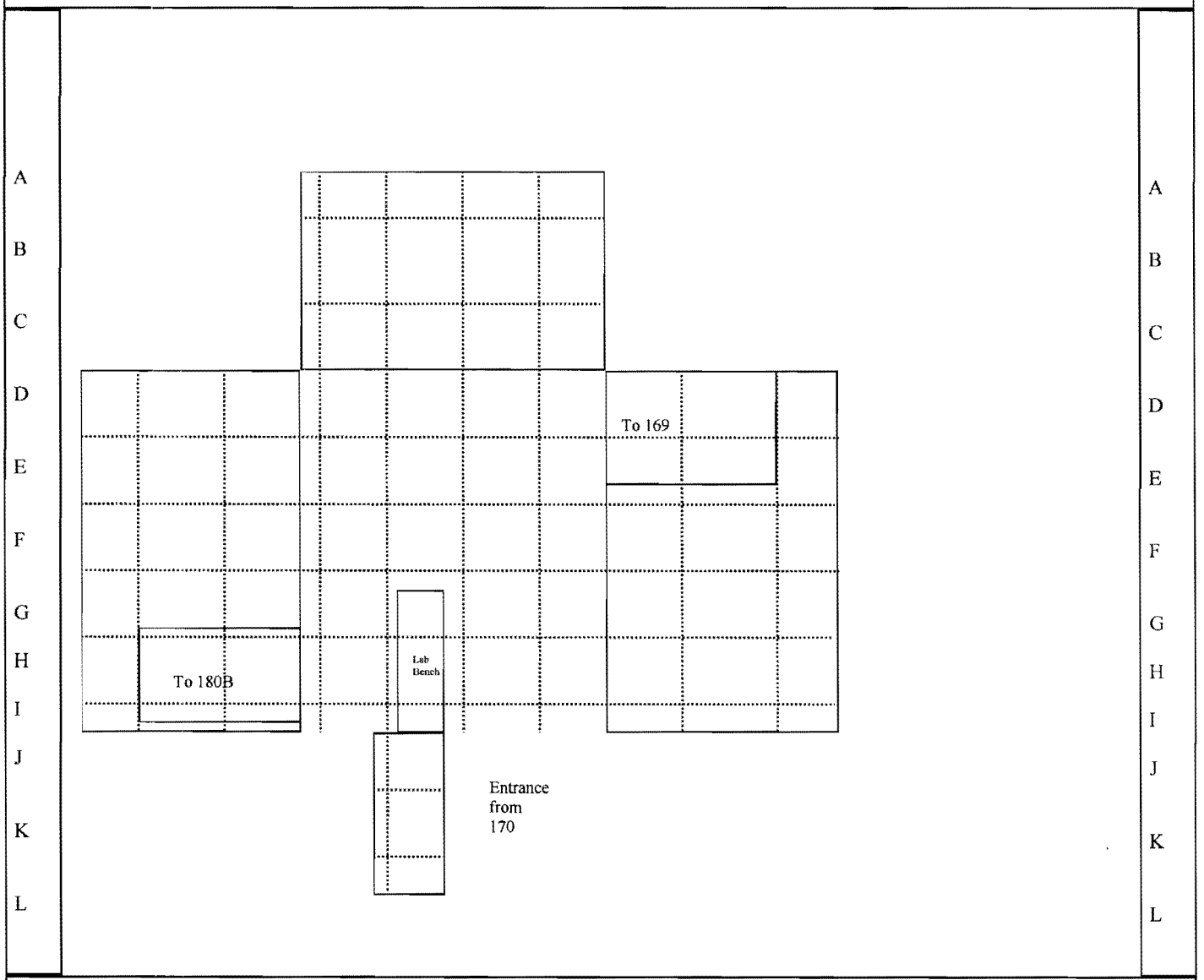
Comments:

RADIATION SAFETY SURVEY REPORT	SURVEYOR NAME:	DATE:
	LAB: 180	TIME:



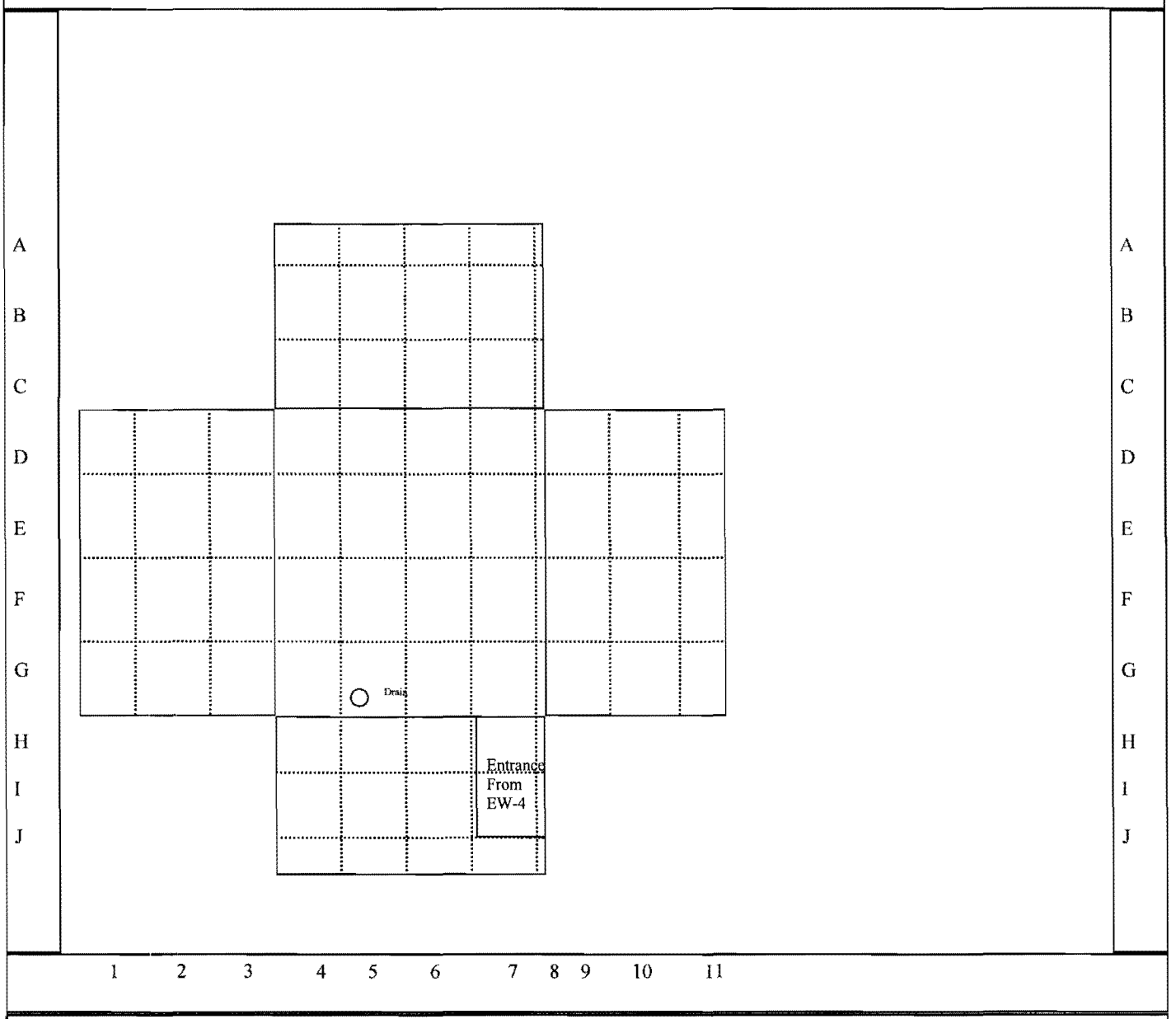
Comments:

RADIATION SAFETY SURVEY REPORT	SURVEYOR NAME:	DATE:
	LAB: 180A	TIME:



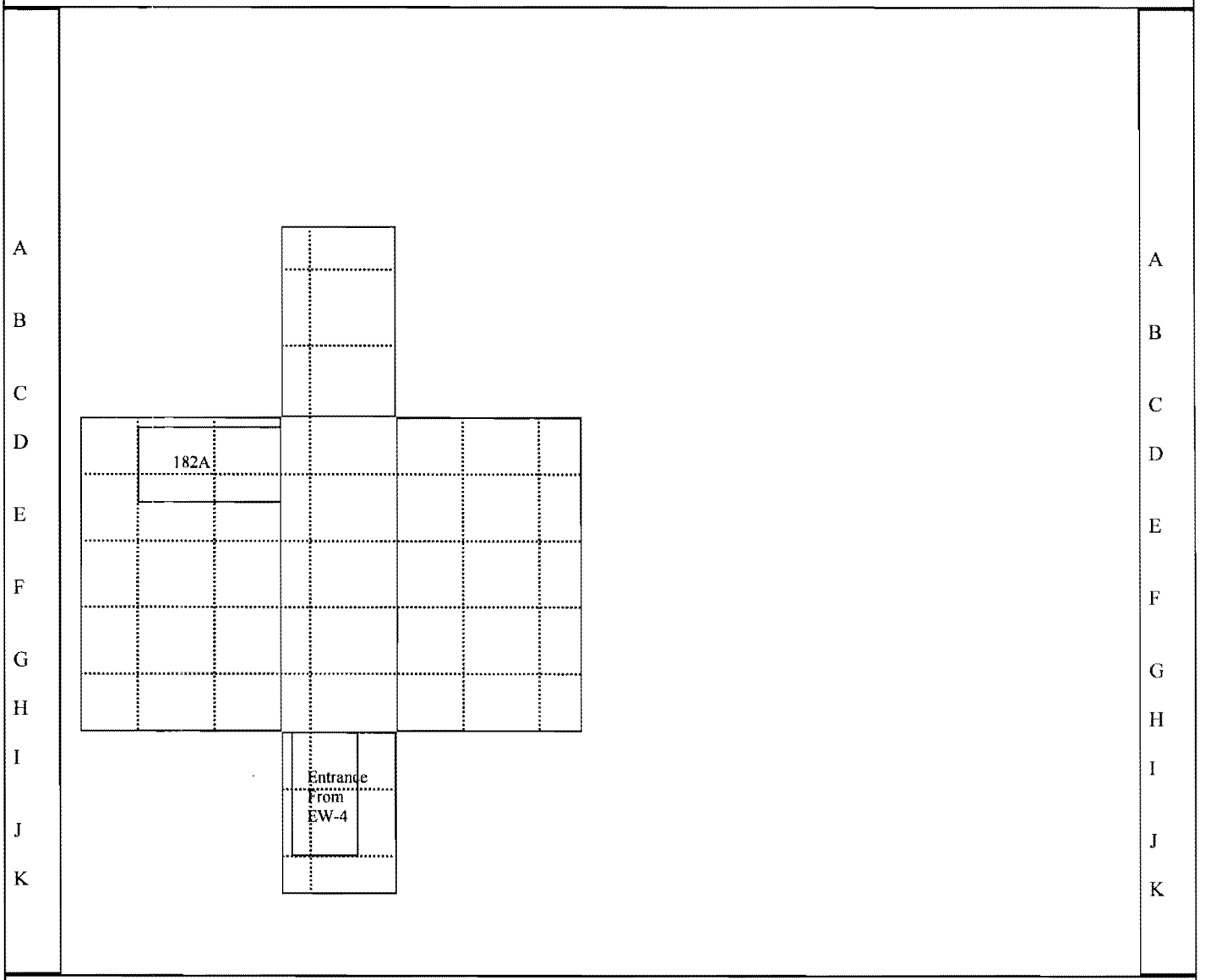
Comments:

RADIATION SAFETY SURVEY REPORT	SURVEYOR NAME:	DATE:
	LAB: 181	TIME:



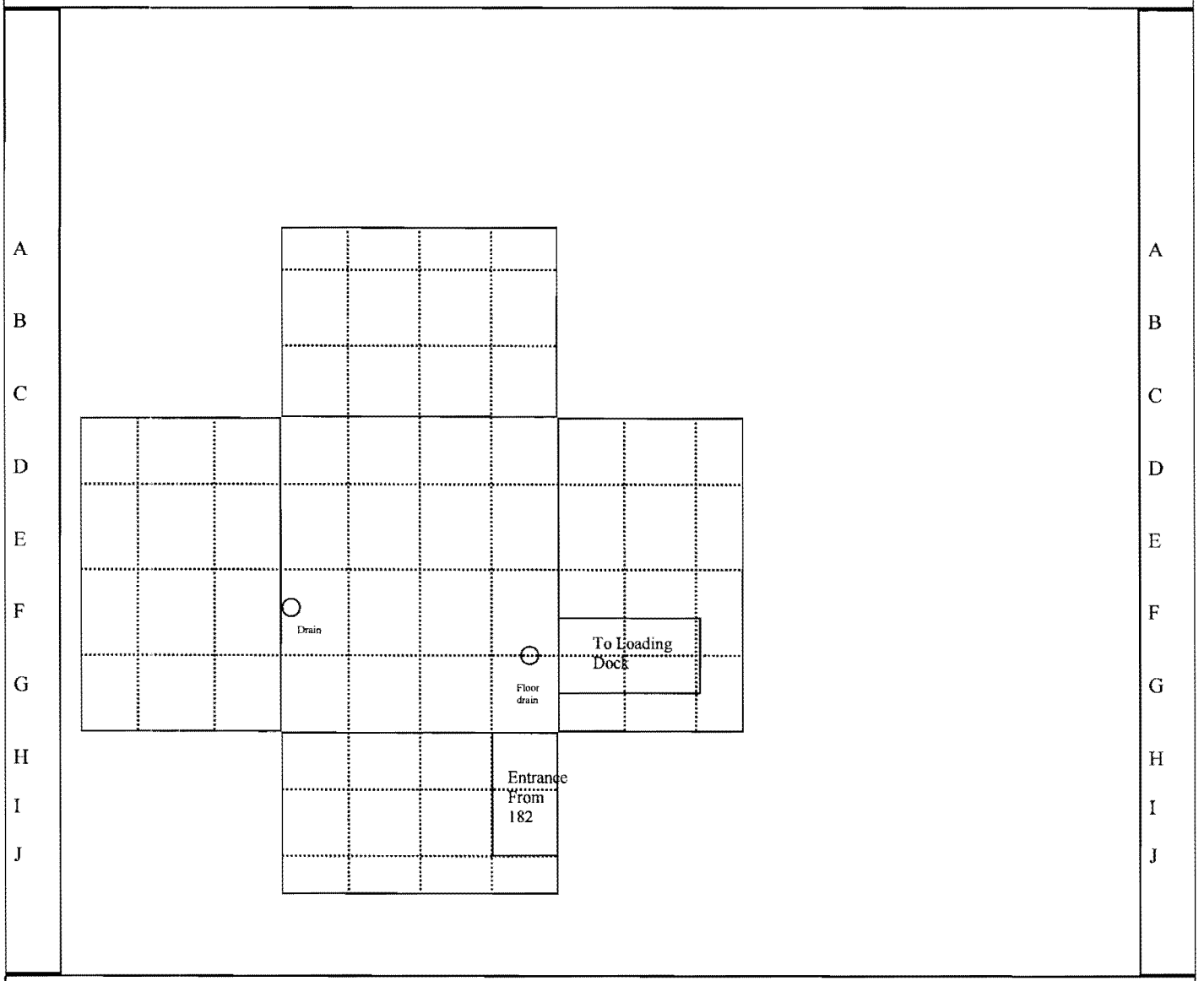
Comments:

RADIATION SAFETY SURVEY REPORT	SURVEYOR NAME:	DATE:
	LAB: 182	TIME:



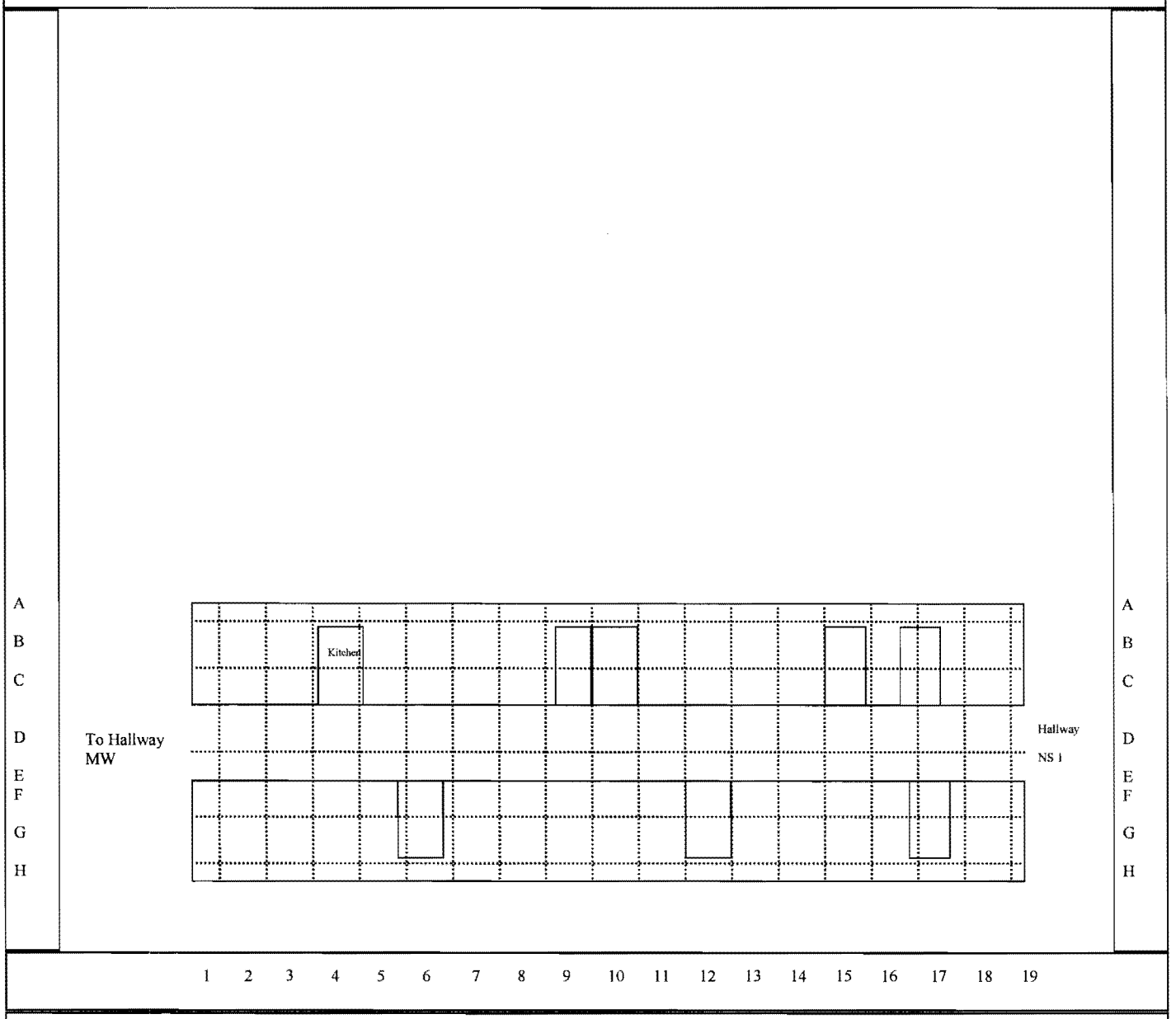
Comments:

RADIATION SAFETY SURVEY REPORT	SURVEYOR NAME:	DATE:
	LAB: 182A	TIME:



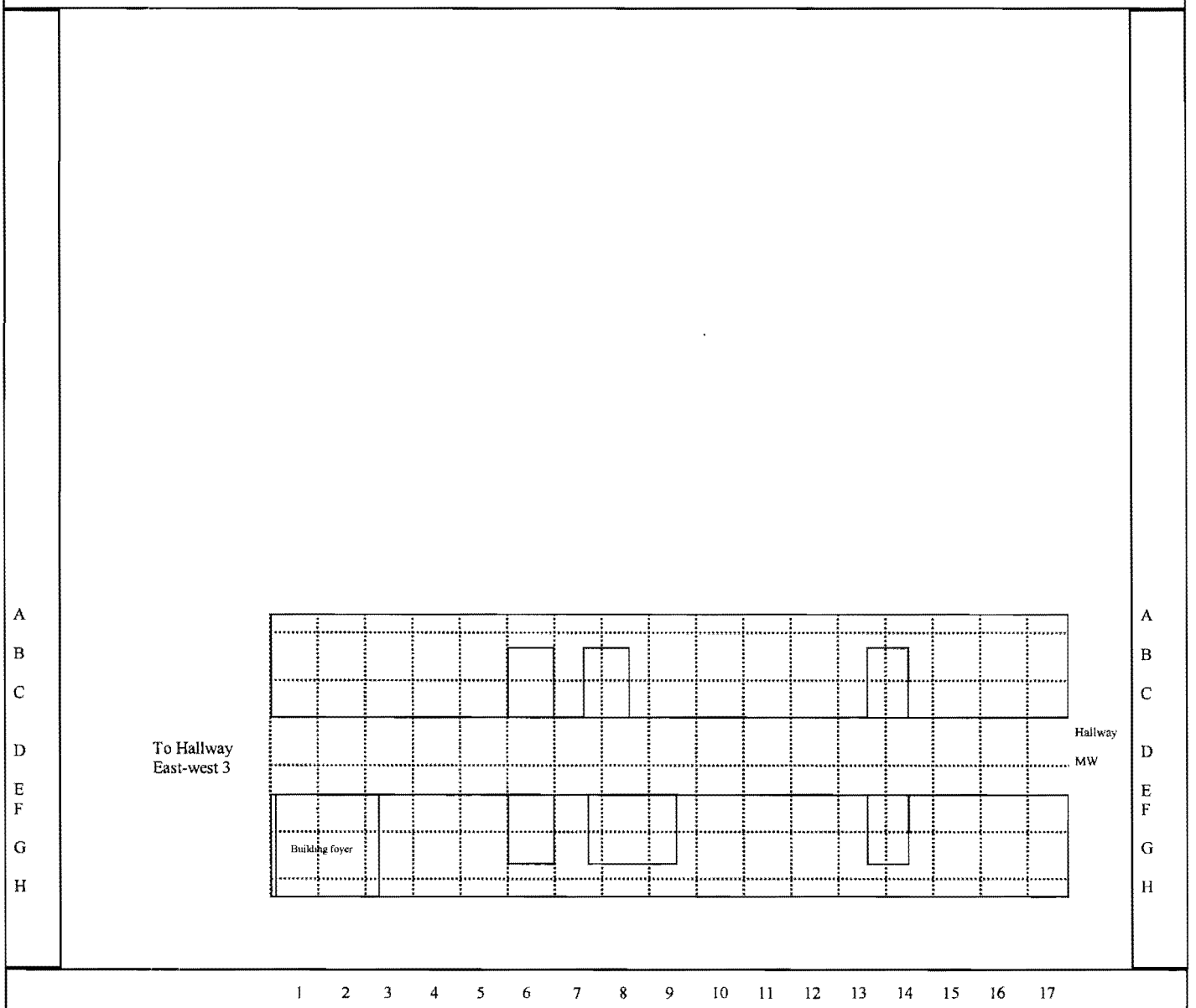
Comments:

RADIATION SAFETY SURVEY REPORT	SURVEYOR NAME:	DATE:
	LAB: HALLWAY EAST-WEST 1	TIME:



Comments:

RADIATION SAFETY SURVEY REPORT	SURVEYOR NAME:	DATE:
	LAB: HALLWAY EAST-WEST 2	TIME:

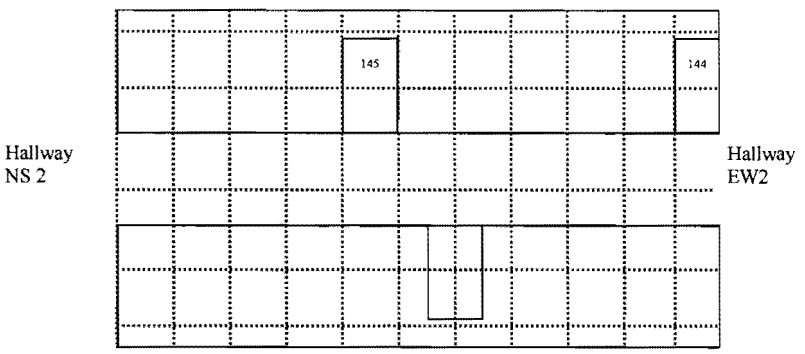


Comments:

RADIATION SAFETY SURVEY REPORT	SURVEYOR NAME:	DATE:
	LAB: HALLWAY EAST-WEST 3	TIME:

1 2 3 4 5 6 7 8 9 10 11

A
B
C
D
E
F
G
H



A
B
C
D
E
F
G
H

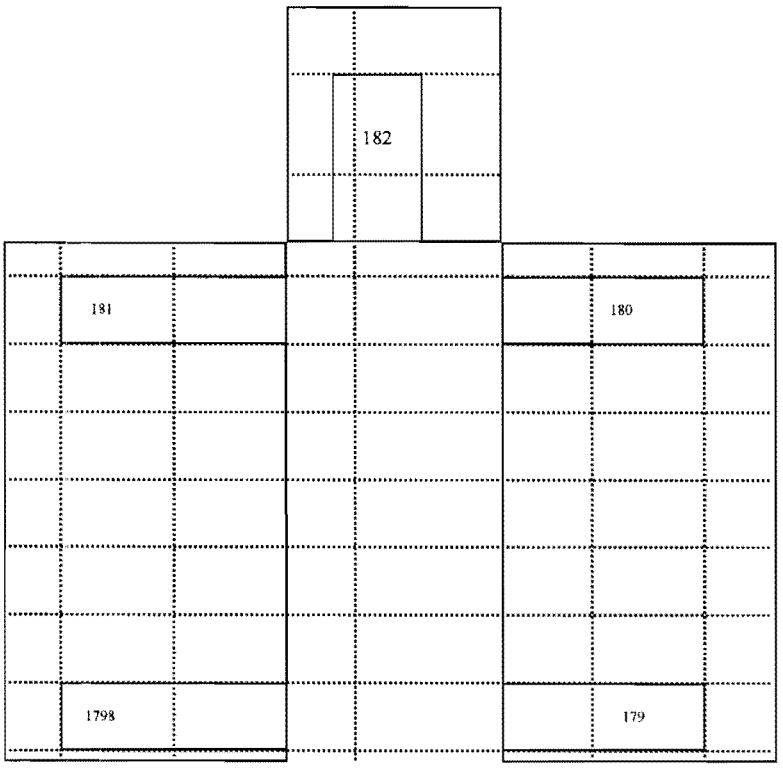
1 2 3 4 5 6 7 8 9 10 11

Comments:

RADIATION SAFETY SURVEY REPORT	SURVEYOR NAME:	DATE:
	LAB: HALLWAY EAST-WEST 4	TIME:

1 2 3 4 5 6 7 8 9

A B C D E F G H I J K L



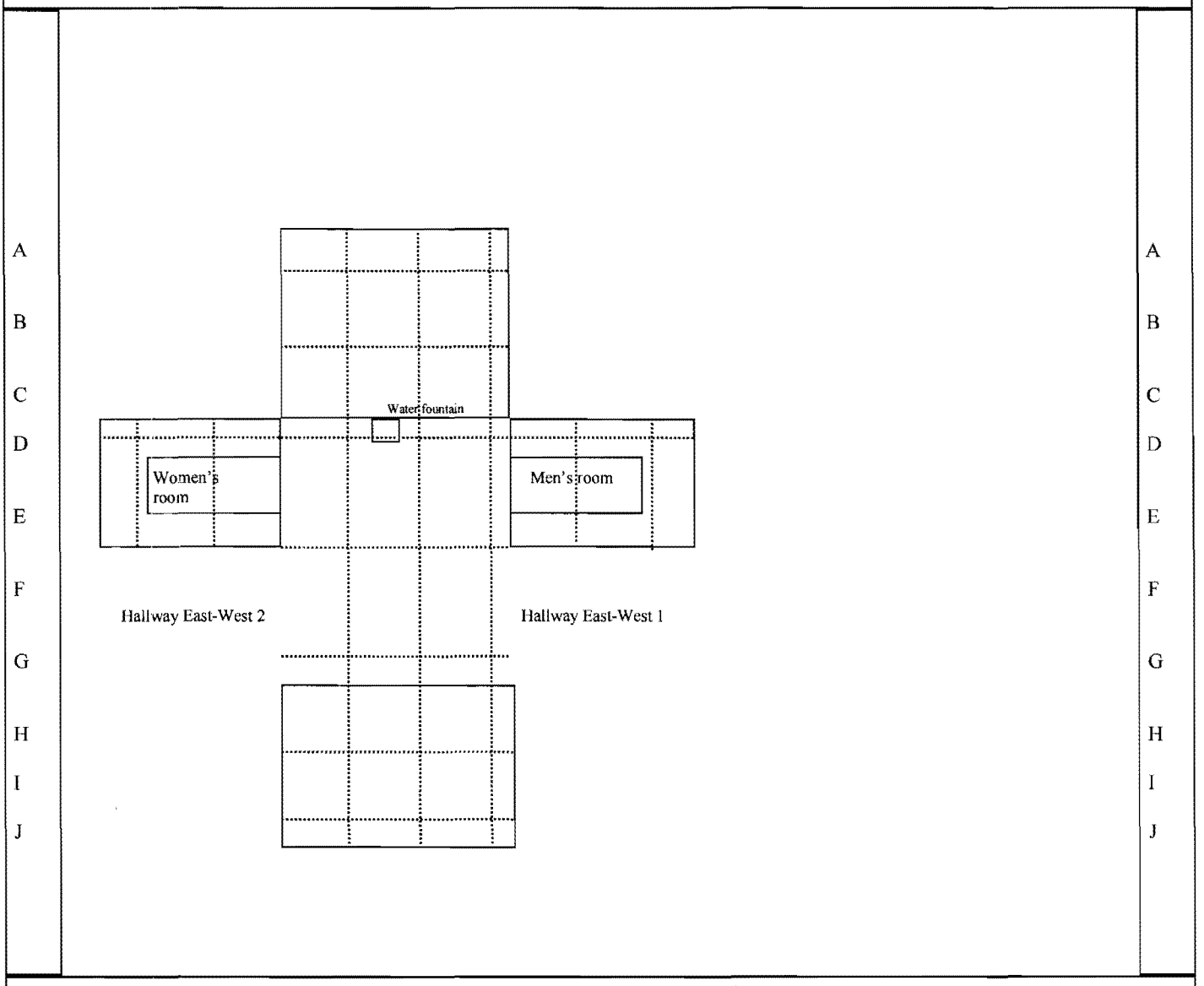
Hallway NS 3

A B C D E F G H I J K L

1 2 3 4 5 6 7 8 9

Comments:

RADIATION SAFETY SURVEY REPORT	SURVEYOR NAME:	DATE:
	LAB: HALLWAY MW	TIME:

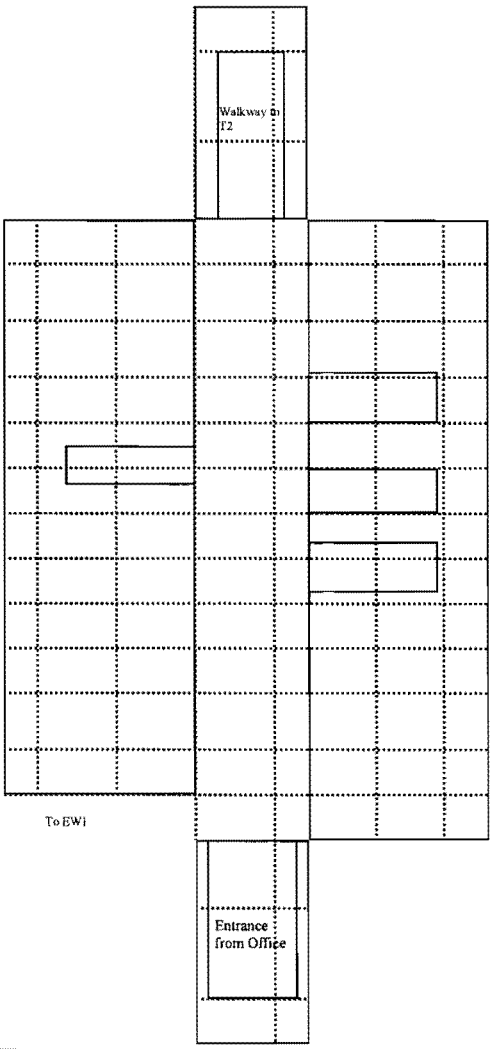


Comments:

RADIATION SAFETY SURVEY REPORT	SURVEYOR NAME:	DATE:
	LAB: HALLWAY NORTH-SOUTH 1	TIME:

1 2 3 4 5 6 7 8

A B C D E F G H I J K L M N O P Q R S

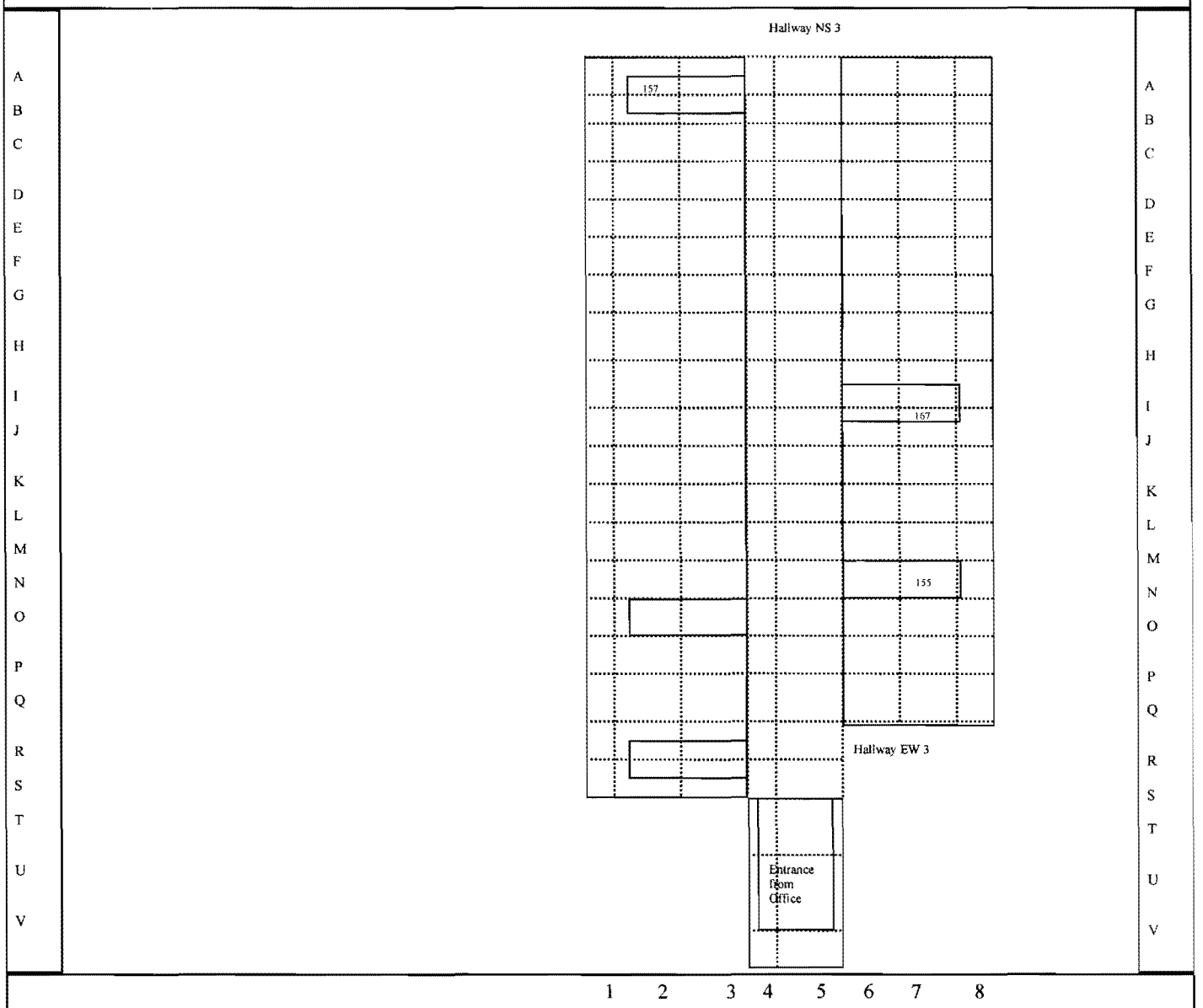


A B C D E F G H I J K L M N O P Q R S

1 2 3 4 5 6 7 8

Comments:

RADIATION SAFETY SURVEY REPORT	SURVEYOR NAME:	DATE:
	LAB: HALLWAY NORTH-SOUTH 2	TIME:

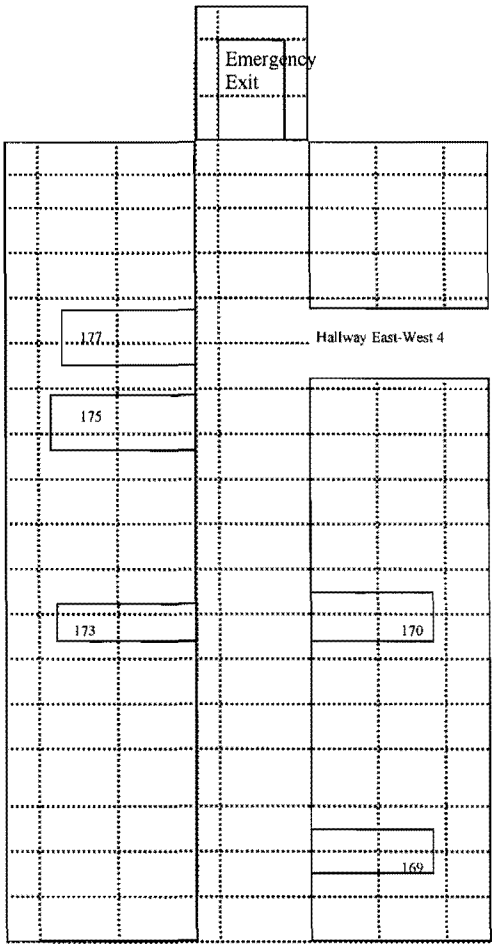


Comments:

RADIATION SAFETY SURVEY REPORT	SURVEYOR NAME:	DATE:
	LAB: HALLWAY NORTH-SOUTH 3	TIME:

1 2 3 4 5 6 7 8

A B C D E F G H I J K L M N O P Q R S T U

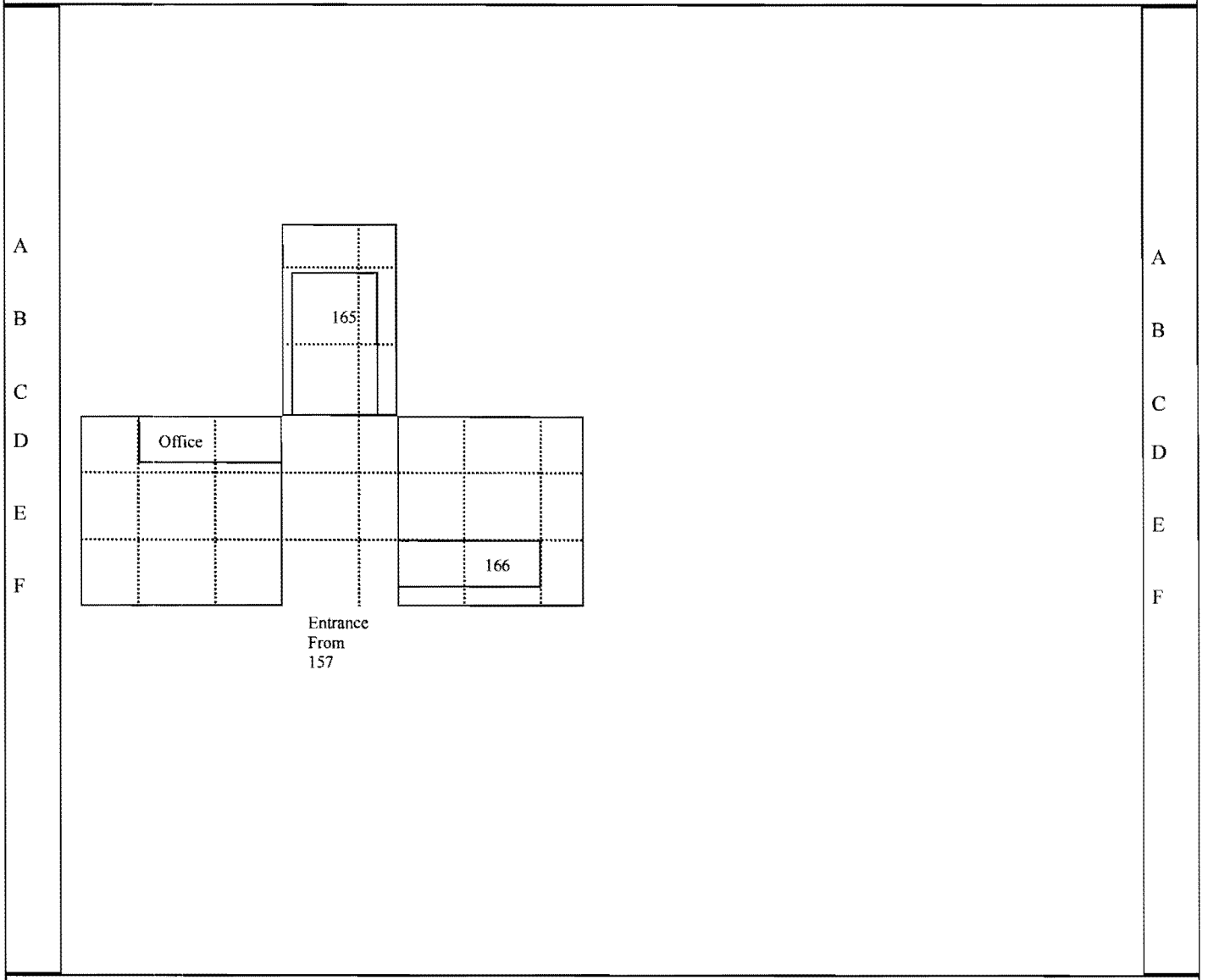


A B C D E F G H I J K L M N O P Q R S T U

1 2 3 4 5 6 7 8

Comments:

RADIATION SAFETY SURVEY REPORT	SURVEYOR NAME:	DATE:
	LAB: HALLWAY NORTH-SOUTH 4	TIME:



Comments:

ATTACHMENT 7

FINAL STATUS SURVEY GROSS BETA MEASUREMENTS

Sample Point	Bkg (counts)	Gross (counts)	Count time (in min)	Total Surface Activity[1] in DPM/100cm2		
				Gross Beta	Uncertainty[2]	MDA
NS - 2 - D8	897	734	1	-291	141	251
167 - D12	769	711	1	-104	135	233
182A - B7	897	916	1	34	149	251
176 - A4	897	1123	1	404	157	251
NS - 1 - K6	897	796	1	-180	144	251
EW - 1 - A8	897	877	1	-36	147	251
EW - 2 - A9	897	813	1	-150	145	251
136 - J4	897	851	1	-82	146	251
169 - F13	897	828	1	-123	145	251
170 - E1	897	883	1	-25	148	251
170 - E2	897	811	1	-154	145	251
179 - C5	897	827	1	-125	145	251
180 - H10	897	784	1	-202	144	251
175 - E6	1068	1082	1	25	162	274
NS - 4 - D4	1068	999	1	-123	159	274

[1] - $E_{weighted, total}$; 0.56, probe active area 582cm2

[2] - at the 95% confidence level

Averaged Activity

-75 (DPM/100cm2)

FINAL STATUS REFERENCE AREA
GROSS ALPHA MEASUREMENTS

Sample Point	Bkg (counts)	Gross (counts)	Count time (in min)	Total Surface Activity[1] in DPM/100cm2		
				Gross Alpha	Uncertainty[2]	MDA
167 - D8	24	38	2	28	31	48
181 - E8	22	38	2	32	30	46
173 - G5	24	33	2	18	30	48
EW - 1 - H9	24	38	2	28	31	48
136 - K9	22	33	2	22	29	46
169 - H14	24	35	2	22	30	48
144 - E3	24	37	2	26	31	48
179 - D1	24	32	2	16	29	48
180 - E2	16	32	2	32	27	40
178 - F7	24	26	2	4	28	48

[1] - $E_{weighted, total}$; 0.25, probe active area 582cm2

[2] - at the 95% confidence level

DPM/100cm2

32 Largest Survey Unit Measurement
12 Smallest Reference Area Measurement
20 Difference

Reference Area Measurements

Sample Point	Bkg (counts)	Gross (counts)	Count time (in min)	Total Surface Activity[1] in DPM/100cm2		
				Gross Alpha	Uncertainty[2]	MDA
RA for 167 - D8	24	39	2	30	31	48
RA for 181 - E8	22	36	2	28	30	46
RA for 173 - G5	24	36	2	24	30	48
RA for EW - 1 - H9	24	35	2	22	30	48
RA for 136 - K9	22	35	2	26	30	46
RA for 169 - H14	24	40	2	32	31	48
RA for 144 - E3	24	32	2	16	29	48
RA for 179 - D1	24	31	2	14	29	48
RA for 180 - E2	16	33	2	34	27	40
RA for 178 - F7	24	30	2	12	29	48

[1] - $E_{weighted, total}$; 0.25, probe active area 582cm2

[2] - at the 95% confidence level

ATTACHMENT 8

Instrument:	Scaler/rate meter	**Model:**	Ludlum 2221	**Serial Nr:**	163697	**Calibration Date:**	11/05/09
Detector:	Gas proportional	**Model:**	Ludlum 43-37B	**Serial Nr:**	092501	**Calibration Date:**	11/09/09

Date	Time	Technician / Reviewer	Background In CPM		Acceptable Range (CPM)		Source ID Nr.	Isotope	Source Reading In CPM		Acceptable Range (CPM)		Results
			X	X	+20% / -20%	+3σ / -3σ			X	X	+10% / -10%	+3σ / -3σ	
11/13/2009	0730	BP	1285	1285	1542	1389	119716	99Tc	7057	7057	7763	7547	Pass
		FW			1028	1182					6351	6567	

Instrument:	Scaler/rate meter	**Model:**	Ludlum 2221	**Serial Nr:**	163697
Detector:	Gas proportional	**Model:**	Ludlum 43-37A	**Serial Nr:**	092501

Calibration Date:	11/05/09
Calibration Date:	11/09/09

Date	Time	Technician / Reviewer	Background in CPM		Acceptable Range (CPM)		Source ID Nr.	Isotope	Source Reading in CPM		Acceptable Range (CPM)		Results
			X	$\bar{X}$	+200% / -200%	+3σ / -3σ			X	$\bar{X}$	+10% / -10%	+3σ / -3σ	
11/10/2009	0600	BP	6	6	11	8	119704	230Th	3188	3188	3507	3438	Pass
		FW			-11	3					2869	2938	
11/12/2009	0600	BP	5	5	11	8	119704	230Th	3185	3188	3507	3434	Pass
		FW			-11	3					2869	2942	
11/13/2009	0600	BP	7	6	11	8	119704	230Th	3354	3193	3512	3447	Pass
		FW			-11	3					2874	2940	
11/13/2009	1330	BP	8	6	12	9	119704	230Th	3272	3196	3515	3448	Pass
		FW			-12	3					2876	2943	
11/16/2009	0600	BP	6	6	12	8	119704	230Th	3255	3197	3517	3447	Pass
		FW			-12	3					2878	2948	
11/16/2009	1430	BP	5	6	11	8	119704	230Th	3270	3199	3519	3447	Pass
		FW			-11	3					2879	2951	
11/18/2009	0600	BP	7	6	12	9	119704	230Th	3376	3204	3525	3460	Pass
		FW			-12	3					2884	2548	

Instrument:	Scaler/rate meter	**Model:**	Ludlum 2221	**Serial Nr:**	163697
Detector:	Gas proportional	**Model:**	Ludlum 43-68B	**Serial Nr:**	075164

Calibration Date:	11/05/09
Calibration Date:	11/09/09

Date	Time	Technician / Reviewer	Background in CPM		Acceptable Range (CPM)		Source ID Nr.	Isotope	Source Reading in CPM		Acceptable Range (CPM)		Results
			X	X̄	+20% / -20%	+3σ / -3σ			X	X̄	+10% / -10%	+3σ / -3σ	
11/15/2009	0800	BP	241	241	290	281	119716	99Tc	5817	5817	6399	6333	Pass
		FW			193	202					5236	5302	
11/16/2009	0800	BP	265	243	292	285	119716	99Tc	5915	5822	6404	6327	Pass
		FW			195	201					5240	5317	

Instrument:	Scaler/rate meter	**Model:**	Ludlum 2221	**Serial Nr:**	108881
Detector:	Gas proportional	**Model:**	Ludlum 43-37A	**Serial Nr:**	092503

Calibration Date:	11/10/08
Calibration Date:	11/25/08

Date	Time	Technician / Reviewer	Background in CPM		Acceptable Range (CPM)		Source ID Nr.	Isotope	Source Reading in CPM		Acceptable Range (CPM)		Results
			X	X̄	+200% / -200%	+3σ / -3σ			X	X̄	+10% / -10%	+3σ / -3σ	
11/3/2009	0600	BP	11	11	22	14	119704	230Th	3277	3277	3605	3410	Pass
		FW			-22	8					2950	3145	
11/4/2009	0600	BP	12	11	23	14	119704	230Th	3232	3276	3603	3408	Pass
		FW			-23	8					2948	3144	
11/5/2009	0600	BP	10	11	22	14	119704	230Th	3279	3276	3604	3406	Pass
		FW			-22	8					2948	3146	
11/6/2009	1300	BP	10	11	22	14	119704	230Th	3342	3278	3606	3409	Pass
		FW			-22	8					2950	3147	

Instrument:	Scaler/rate meter		**Model:**	Ludlum 2221	**Serial Nr:**	211785		**Calibration Date:**	12/03/08						
Detector:	Gas proportional		**Model:**	Ludlum 43-37B	**Serial Nr:**	120106		**Calibration Date:**	12/03/08						

Date	Time	Technician / Reviewer	Background in CPM		Acceptable Range (CPM)		Source ID Nr.	Isotope	Source Reading in CPM		Acceptable Range (CPM)		Results
			X	X̄	+20% / -20%	+3σ / -3σ			X	X̄	+10% / -10%	+3σ / -3σ	
11/3/2009	0600	BP	1269	1269	1572	1335	119716	99Tc	6637	6637	7301	6901	Pass
		FW			1015	1202					5973	6372	
11/4/2009	0600	BP	1268	1269	1522	1332	119716	99Tc	6523	6633	7296	6899	Pass
		FW			1015	1205					5970	6368	
11/4/2009	1300	BP	1377	1278	1533	1378	119716	99Tc	6531	6630	7293	6895	Pass
		FW			1022	1177					5967	6365	
11/5/2009	0600	BP	1295	1279	1535	1376	119716	99Tc	6587	6629	7292	6890	Pass
		FW			1023	1182					5966	6369	
11/6/2009	0800	BP	1272	1278	1534	1372	119716	99Tc	6520	6625	7288	6888	Pass
		FW			1023	1185					5963	6363	
11/6/2009	1430	BP	1252	1277	1532	1369	119716	99Tc	6591	6624	7287	6883	Pass
		FW			1021	1185					5962	6366	
11/12/2009	0700	BP	1227	1274	1528	1368	119716	99Tc	6546	6622	7285	6880	Pass
		FW			1019	1179					5960	6365	
11/13/2009	0600	BP	1329	1277	1532	1375	119716	99Tc	6605	6622	7284	6876	Pass
		FW			1021	1179					5960	6368	
11/16/2009	0600	BP	1325	1280	1535	1379	119716	99Tc	6546	6620	7282	6872	Pass
		FW			1024	1180					5958	6368	
11/18/2009	0600	BP	1191	1275	1530	1385	119716	99Tc	6414	6615	7276	6878	Pass
		FW			1020	1165					5953	6351	

Instrument:	Scaler/rate meter	**Model:**	Ludlum 2221	**Serial Nr:**	211785	**Calibration Date:**	12/03/08
Detector:	Gas proportional	**Model:**	Ludlum 43-37A	**Serial Nr:**	120106	**Calibration Date:**	12/03/08

Date	Time	Technician / Reviewer	Background in CPM		Acceptable Range (CPM)		Source ID Nr.	Isotope	Source Reading in CPM		Acceptable Range (CPM)		Results
			X	X̄	+200% / -200%	+3σ / -3σ			X	X̄	+10% / -10%	+3σ / -3σ	
11/9/2009	0700	BP	6	6	13	9	119704	230Th	3326	3326	3658	3465	Pass
		FW			-13	4					2993	3187	
11/9/2009	1300	BP	9	7	13	10	119704	230Th	3322	3326	3658	3462	Pass
		FW			-13	3					2993	3189	
11/10/2009	0555	BP	6	7	14	11	119704	230Th	3333	3326	3659	3460	Pass
		FW			-14	4					2993	3192	
11/10/2009	1330	BP	8	7	15	11	119704	230Th	3293	3325	3657	3458	Pass
		FW			-15	4					2992	3192	
11/11/2009	0630	BP	8	7	15	11	119704	230Th	3305	3324	3657	3456	Pass
		FW			-15	4					2292	3193	
11/12/2009	0600	BP	7	7	15	11	119704	230Th	3268	3323	3655	3454	Pass
		FW			-15	4					2990	3191	

Instrument:	Scaler/rate meter	**Model:**	Ludlum 2221	**Serial Nr:**	211785	**Calibration Date:**	12/03/08
Detector:	Gas proportional	**Model:**	Ludlum 43-68A	**Serial Nr:**	127616	**Calibration Date:**	12/03/08

Date	Time	Technician / Reviewer	Background In CPM		Acceptable Range (CPM)		Source ID Nr.	Isotope	Source Reading In CPM		Acceptable Range (CPM)		Results
			X	X̄	+200% / -200%	+3σ / -3σ			X	X̄	+10% / -10%	+3σ / -3σ	
11/3/2009	0800	BP	2	2	4	4	119704	230Th	3317	3317	3648	3515	Pass
		FW			-4	3					2985	3118	
11/5/2009	0800	BP	2	2	4	4	119704	230Th	3378	3320	3652	3516	Pass
		FW			-4	0					2988	3123	

This is to acknowledge the receipt of your letter/application dated

12/30/2008, and to inform you that the initial processing which includes an administrative review has been performed.

AMEND. 19-07538-01

☑ There were no administrative omissions. Your application was assigned to a technical reviewer. Please note that the technical review may identify additional omissions or require additional information.

☐ Please provide to this office within 30 days of your receipt of this card

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A copy of your action has been forwarded to our License Fee & Accounts Receivable Branch, who will contact you separately if there is a fee issue involved.

Your action has been assigned **Mail Control Number** 144358.
When calling to inquire about this action, please refer to this control number.
You may call us on (610) 337-5398, or 337-5260.

NRC FORM 532 (RI)
(6-96)

Sincerely,
Licensing Assistance Team Leader