

# FINAL SURVEY REPORT

RADIOLOGICAL LABORATORIES  
BUILDING 1081

U.S. ARMY CHEMICAL SCHOOL  
FORT McCLELLAN, ALABAMA



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HEALTH PHYSICS OFFICE  
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## 1. EXECUTIVE SUMMARY AND GENERAL INFORMATION

This report covers the implementation of the Decommissioning Plan approved for the release of the radiological laboratories, located at building 1081, and the alpha field operated by the U.S. Army Chemical School, Fort McClellan, AL. Radioactive material was possessed under NRC License Number 01-02861-05, Docket Number 030-17584 and NRC License Number SNM-1877, Docket Number 070-02934. The survey was conducted according to the decommissioning plan. The results of all scans were at background levels and all smears of removable contamination were far below release criteria. Based upon the survey results, recommend unrestricted release of the areas. Radioactive material held under the licenses was transferred to Fort Leonard Wood Missouri under NRC License number 24-32221-01.

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## 2. DESCRIPTION OF DECOMMISSIONING ACTIVITIES

Decommissioning took place in increments as stated in the decommissioning plan. The objective of the decommissioning plan was the unrestricted release of the radiological laboratories in building 1081 and the alpha field. Since no radioactive material was ever introduced into the alpha field and the history of routine monthly surveys in the laboratories indicated no contamination, decommissioning consisted of transferring licensed material and performing a detailed survey of the facility to insure no contamination was present. Licensed material was transferred to the U.S. Army Chemical School at Fort Leonard Wood, Missouri under NRC license number 01-32063-01.

## 3. FACILITY RADIOLOGICAL HISTORY.

### 3.1 Radiological Laboratories, Building 1081.

Construction of the facility was completed in late 1988. On 14 November 1988, random smears were taken in the vault and laboratory 7 to establish a baseline. The smears were counted on the Tennelec LB5100 gas-proportional counter. Ten (10) smears were taken in the vault and counted. The highest activities were: 1.14 dpm alpha, 11.24 dpm beta, and 9.91 dpm gamma. Fifteen (15) smears were taken in laboratory 7. The highest activities were: 0.36 dpm alpha, 4.53 dpm beta, and 15.03 dpm gamma. On 9 December 1988, random smears were again taken in the vault and laboratory 7 and counted on the Tennelec LB5100. Fifteen (15) samples were taken in Laboratory 7. The highest activities were: 1.25 dpm alpha, 8.56 dpm beta, and 12.11 dpm gamma. Ten (10) samples were taken in the vault. The highest activities were: 0.34 dpm alpha, 4.08 dpm beta, and 12.47 dpm gamma. An instrument survey conducted 4-12 January 1989 using an Eberline E-520 survey meter indicated an average background reading of 0.02 mR/hr.

The only unsealed radioactive materials used in the facility were Au-198, Co-60, Cs-137, Ca-45 and Sr/Y-90. Less than 10 mCi of Co-60, Ca-45 and Au-198 were used at any one time and less than 100 uCi of Cs-137 and Sr/Y-90. The only locations where unsealed radioactive materials were present were Laboratory 1, the Preparation Laboratory, the Health Physics Laboratory, and the storage vault.

Only sealed sources were used in the other laboratories. Laboratory 2 housed a gamma calibrator with a Cs-137 source with a maximum activity of 120 Curies. Also used in Laboratory 2 were a 100 mCi Co-60 source and a 10 mCi Cs-137 source. Sealed sources of Co-60, Cs-137, Ca-45, Sr/Y-90, U-235, U-238, Pu-239, Am-241, H-3, P-147, Ni-63, Mn-54, Cd-109, Co-57, Na-22, C-14, Tc-99, Cl-36, Th-230 and Bi-210 of less than 10 uCi each were used in Laboratory 1, laboratory 5, Laboratory 7, the preparation laboratory and the Health Physics Laboratory. All sources were stored in the storage vault except the multi-curie Cs-137 calibrator. The largest sources in the storage vault were two 500 mCi Cs-137 sealed sources.

The only contamination during the history of the facility was in the preparation laboratory isotope hood and that intentionally introduced into laboratory 1 for training. Contamination in the isotope hood was Ca-45 and Au-198. Contamination in Laboratory 1 was Au-198. Areas are decontaminated after each use.

### 3.2 Alpha Field

The current operating license authorized operation of an alpha field. Even though licensed for operation, the field was never used. No licensed material was ever placed in the field. A baseline survey was conducted in June 1985. Swipes and soil samples were taken. Analysis of the soil samples indicated elevated levels of Cs-137 in the soil. There is no record of radioactive material ever being used in this area.

## 4. RADIATION SURVEY PLAN

The final radiation survey was conducted according to the decommissioning plan. The Multi-Agency Radiation Survey and Site Investigation Manuel (MARSSIM) and NUREG-5849 were used in developing the survey plan.

### 4.1 Release Limits (Derived Concentration Guideline Levels)

Activity release limits are based upon NRC Notice published in the Federal Register Vol. 63, No.222, November 18, 1998 "Supplemental Information on the Implementation of the Final Rule on Radiological Criteria for License Termination". The release limits for specific radionuclides are listed in the table below.

Table of Release Limits	
NUCLIDE	RELEASE CRITERIA (dpm/100 cm <sup>2</sup> )
Cobalt 60	7.1E+03
Cesium 137	2.8E+04
Strontium 90	8.7E+03

#### 4.2 Classification of Areas by Contamination Potential.

Each individual room or area within the impacted area was assigned a Classification based upon contamination potential. The contamination potential was determined based upon the types and quantity of radioactive material used or stored in each room. There were 4 Class 1 areas, 4 Class 2 areas, and 16 Class 3 areas. Also surveyed were 4 non-impacted areas adjacent to the impacted areas. Diagrams of the facility and individual rooms within the facility are attached. Survey units are indicated on the diagrams accompanying the survey data.

#### 4.3 Background Radiation

The Laboratories have been surveyed monthly during the entire history of operations and baseline surveys were conducted in August, November and December 1988 prior to radioactive material being moved to the facility. Two rooms of the laboratory were selected for the baseline, the radiation storage vault and laboratory 7. The data sheets for these surveys were included in the decommissioning plan. A summary of the data from these surveys is at the appendix to this report.

An instrument survey performed in January 1989 and subsequent monthly surveys to date indicate an average background of 0.015 mR/hr.

#### 4.4 Conduct of survey.

The survey consisted of:

Surface gamma scans using a Bicorn MicroRem meter. The rate of scan was 1 meter per 3 seconds at a distance of 5 cm or less from surface.

Surface beta scans using an Eberline E-520 survey meter with HP-260 pancake probe. The rate of scan was 1 meter per 3 seconds at a distance of 2.5 cm or less from surface.

Measurements of beta surface contamination using an Eberline E-520 survey meter with HP-260 pancake probe. A 30 second reading was taken per data point at a distance of 2.5 cm or less from surface. This data was recorded on the survey form in mR/hr with 0.01 mR/hr = 11 cpm, 0.02 mR/hr = 22 cpm, and 0.03 mR/hr = 33 cpm.

Measurements of removable alpha, beta, and gamma activity by taking a smear of 100 cm<sup>2</sup> per data point and counted on the Toenec LB-5100. Counts above LLD are recounted.

Measurements of low energy beta (Tritium) activity by taking a smear of 100 cm<sup>2</sup> per data point and counted on the Canberra Packard MD 1900 LSC. Counts above LLD are recounted.

##### 4.4.1 Class 1 Areas:

The floors, walls, and ceilings were marked out in 1 meter squares. Each 1 meter grid was divided into 4 quadrants. Each quadrant was scanned with the Eberline 520 survey meter with the HP 260 pancake probe. A 30 second reading was taken and recorded at the location of the highest scan reading in each quadrant. Two smears of 100 square centimeters each were taken in each quadrant at the location of the highest meter reading. One smear was counted in the Tennelec LB5100 and the second smear was counted in the Packard 1900. A 100% scan of the floor, walls and ceiling was also done with the Bicorn MicroRem meter. Survey results are at Attachments 2 and 3.

**4.4.2 Class 2 Areas:**

The floors and lower walls, to a height of 2 meters, were marked out in 1 meter squares. Each 1 meter grid was divided into 4 quadrants. Each quadrant was scanned with the Eberline 520 survey meter with the HP 260 pancake probe. A 30 second reading was taken and recorded at the location of the highest scan reading in each quadrant. Two smears of 100 square centimeters each were taken in each quadrant at the location of the highest meter reading. One smear was counted in the Tennelec LB5100 and the second smear was counted in the Packard 1900. A 100% scan of floors and walls, to a height of 2 meters, was also done with the Bicron MicroRem meter.

The upper walls, and ceiling were marked out in 1 meter squares. Each grid was scanned with the Eberline 520 survey meter with the HP 260 pancake probe. A 30 second reading was taken and recorded at the location of the highest scan reading in each grid. Two smears of 100 square centimeters each were taken in each grid at the location of the highest meter reading. One smear was counted in the Tennelec LB5100 and the second smear was counted in the Packard 1900. A 50% scan of upper walls and ceilings was done with the Bicron MicroRem meter. Survey results are at Attachments 4 and 5.

**4.4.3 Class 3 Area:**

The floors and lower walls, to a height of 2 meters, were marked out in 1 meter squares. Each grid was scanned with the Eberline 520 survey meter with the HP 260 pancake probe. A 30 second reading was taken and recorded at the location of the highest scan reading in each grid. Two smears of 100 square centimeters each were taken in each grid at the location of the highest meter reading. One smear was counted in the Tennelec LB5100 and the second smear was counted in the Packard 1900. A 25% scan of floors and walls, and ceilings was done with the Bicron MicroRem meter. Survey results are at Attachments 6 and 7.

**4.4.4 Non-Impacted Area:**

The floors and lower walls, to a height of 2 meters, were marked out in 2 meter square grids. Each grid was scanned with the Eberline 520 survey meter with the HP 260 pancake probe. A 30 second reading was taken and recorded at the location of the highest scan reading in each grid. Two smears of 100 square centimeters each were taken in each grid at the location of the highest meter reading. One smear was counted in the Tennelec LB5100 and the second smear was counted in the Packard 1900. A 10% scan of floors and lower walls was done with the Bicron MicroRem meter. Survey results are at Attachments 8 and 9.

**4.4.5 Alpha Field:**

Since no radioactive material was ever used in the Alpha Field a detailed survey was not required. Random smears were taken at the alpha field and counted on the Tennelec LB5100. A 10% scan was done with the Eberline 520 survey meter and a 25% scan of the field was done with the Bicron MicroRem meter. Survey results are at Attachment 10.

4.5 Instruments Used During Final Survey.

INSTRUMENT TYPE	MAKE & MODEL	RADIATION DETECTED	SENSITIVITY RANGE	WINDOW THICHNESS (mg/sqcm)	USE
Scintillation, NaI Proportional gas flow	Tennelec, LB5100-III	alpha beta gamma	to 999,999 counts	0.08	Low level Counting
Liquid Scintillation	Packard 1900	alpha beta	to 999,999 counts	NA	Low level Counting
Geiger-Mueller	Eberline Md 520 w/HP-260 probe	alpha beta gamma	0.01-200 mR/hr bkg-24k cpm	30 1.4	Survey & monitoring
Scintillation	Bicron MicroRem	gamma	bkg to 2k uRem/hr	NA	Survey

#### 4.5.1 Laboratory Counting Equipment

Tennelec LB-5100 Gas Proportional Counting System  
alpha and beta counting            gas flow proportional counter  
gamma counting                        NaI scintillation counter

Canberra-Packard LSA 1900CA  
Low energy beta counting            liquid Scintillation

##### Formulas Used:

LLD (Lower Limit of Detection) - "the smallest amount of sample activity that will yield a net count for which there is a confidence (95%) that activity is present".

$$LLD = 4.66 \sqrt{R_B / t}$$

L<sub>C</sub> (Critical Level) - "the net number of counts (total minus background) for reaching a decision of no detection signal if the actual net counts are less than the L<sub>C</sub> and detection if the actual net counts are larger than L<sub>C</sub>".

$$L_C = 2.33 \sqrt{R_B / t}$$

L<sub>D</sub> (Detection Limit) - "the signal level such that a signal at or above this level is likely to be detected".

$$L_D = 2.71 + 4.65 \sqrt{R_B / t}$$

L<sub>Q</sub> (Determination Limit) - "the Determination Limit" using 10 % as Relative Standard Deviation; or the True Value of the Net Signal using Standard Deviation of 10 %."

$$L_Q = 50 * (1 + \sqrt{1 + \sqrt{(R_B / t) / 12.5}})$$

##### CALIBRATION SOURCES USED:

###### Tennelec LB5100:

ALPHA: Pu-239 Disc Source Model 90PU470, S/N 2278, 34,200 dpm on 6 JUN 1990.  
recertified: 10 OCT 97

BETA: C-14 Disc Source Isotope Products, S/N 200-350-1, 0.0138 uCi on 1 Jun 87.  
Recertified: 10 OCT 97

GAMMA: Cs-137 Disc Source Model IPL, S/N K-102, 29,900 dpm on 1 MAR 1988.  
Recertified: 10 OCT 97

###### Packard TriCarb 1900:

BETA: A 15 ml Vial Spiked with H3, Model # 6008512, S/N 63-139, 268,600 dpm +/- 1.3% on 10 APR 1989,  
Recertified at 157,622 dpm +/- 1.11% on 14 OCT 97.

Quench Curves Established Monthly Utilizing NINE 15 ml Vials of Tridiated Solution, Model # 6018594, S/N 18, 256,100 dpm +/- 1.3% on 15 MAR 1989,  
recertified 12 Nov 1997.

BETA: A 15 ml Vial Spiked with C-14, Model # 6008513, S/N 63-139, 139,500 dpm +/- 1.7% on 17 JAN 1989.

Quench Curves Established Monthly Utilizing TEN 15 ml Vials of a C-14 Solution, Model # 6018595, S/N 3, 105,900 dpm +/- 1.7% on 4 NOV 1988.

4.5.2 Portable Survey Instruments

Eberline E-520

survey meter, S/N 3213, with HP-260 pancake probe.  
Used for beta scans.

Calibration Data

Source: Tc-99 MFR: New England Nuclear Model: NES-200B

Probe Surface Area: 15.5 cm<sup>2</sup>

A = 0.041 μCi on 6 Aug 76 = 91020 DPM

t<sub>1/2</sub> = 212000 yrs

E<sub>max</sub> = 0.292 MeV (100%)

Self Absorption = 22%

Meter Response (R<sub>s</sub>): 5000 CPM

Background Rate (R<sub>b</sub>): 20 CPM

$$\%Eff = \frac{R_s - R_b}{(DPM)(\%transmission)(other\_factors)} * 100$$

$$\%Eff = \frac{5000CPM - 20CPM}{(91020DPM)(\frac{2\pi}{4\pi})(0.78)} * 100 = 14.00\%$$

MDA, in DPM/100 cm<sup>2</sup>, for the meter is determined with the following equation:

$$MDA = \frac{3 * R_b}{EFF * (A/100)}$$

where R<sub>b</sub> = background rate

A = area of probe

Eff = % efficiency

$$MDA = \frac{3 * 20CPM}{(0.14)(15.5cm^2/100)} = 2765 \text{ DPM}/100 \text{ cm}^2$$

Bicron MicroRem

Survey Meter.

Low energy gamma scans (40 keV to 1.3 MeV)

Calibration Performed to +/-10% using AN/UDM-1A Calibrator, S/N D2.

Cs-137, 51 Curies, Certified 19 May 1998.

## 5. Final Survey Results

### Main Hallway (Area A)

This area is the main hallway outside the controlled area. The area was classified as a MARSSIM Class III area. The results of all gamma scans were at background. There were 206 measurement points in this area. Measurements of surface activity were at background levels. Measurements of removable surface activity were less than LLD, except one. The smear that was above LLD measured 50.7 dpm/100cm<sup>2</sup> beta and 12.1 dpm/100cm<sup>2</sup> gamma. This sample was included in the samples sent to Thermo NuTech for counting. Thermo NuTech measurements were 18 dpm beta. All levels were below the DCGLs.

### Room 1010, Lab Office (Area B)

This area is the instructor's office. The area was classified as a MARSSIM Class III area. The results of all gamma scans were at background. There were 84 measurement points in this area. Measurements of surface activity were at background levels. Measurements of removable surface activity were less than LLD. All levels were below the DCGLs.

### Room 1010A, Chief Instructor's Office (Area C)

This area is the Chief Instructor's Office. The area was classified as a MARSSIM Class III area. The results of all gamma scans were at background. There were 56 measurement points in this area. Measurements of surface activity were at background levels. Measurements of removable surface activity were less than LLD. All levels were below the DCGLs.

### Room 1010B, Lab Chief's Office (Area D)

This area is the Laboratory Chief's Office. The area was classified as a MARSSIM Class III area. The results of all gamma scans were at background. There were 56 measurement points in this area. Measurements of surface activity were at background levels. Measurements of removable surface activity were less than LLD. All levels were below the DCGLs.

### Room 1010C, Electronic Shop (Area E)

This area is a storage area for electronic equipment. The area was classified as a MARSSIM Class III area. The results of all gamma scans were at background. There were 120 measurement points in this area. Measurements of surface activity were at background levels. Measurements of removable surface activity were less than LLD. All levels were below the DCGLs.

### Room 1017, Laboratory 7 (Area F)

This area was used to teach the operation of RADIAC Instruments. Only sealed, exempt sources were used in this room. The area was classified as a MARSSIM Class III area. The results of all gamma scans were at background. There were 176 measurement points in this area. Measurements of surface activity were at background levels. Measurements of removable surface activity were less than LLD. All levels were below the DCGLs.

**Room 1013, Women's Restroom (Area G)**

This is a public restroom. The area was classified as a MARSSIM Class III area. The results of all gamma scans were at background. There were 20 measurement points in this area. Measurements of surface activity were at background levels. Measurements of removable surface activity were less than LLD. All levels were below the DCGLs.

**Room 1015, Men's Restroom (Area H)**

This is a public restroom. The area was classified as a MARSSIM Class III area. The results of all gamma scans were at background. There were 32 measurement points in this area. Measurements of surface activity were at background levels. Measurements of removable surface activity were less than LLD. All levels were below the DCGLs.

**Room 1016, Janitor's Closet (Area I)**

Used to store janitorial supplies used outside controlled area. The area was classified as a MARSSIM Class III area. The results of all gamma scans were at background. There were 26 measurement points in this area. Measurements of surface activity were at background levels. Measurements of removable surface activity were less than LLD. All levels were below the DCGLs.

**5.2 Room 1011, Health Physics Office (area J)**

General office area. The area was classified as a MARSSIM Class III area. The results of all gamma scans were at background. There were 80 measurement points in this area. Measurements of surface activity were at background levels. Measurements of removable surface activity were less than LLD. All levels were below the DCGLs.

**Room 1012, Storage Room, (Area K)**

Storage closet in the health Physics Office. The area was classified as a MARSSIM Class III area. The results of all gamma scans were at background. There were 20 measurement points in this area. Measurements of surface activity were at background levels. Measurements of removable surface activity were less than LLD. All levels were below the DCGLs.

**Room 1014, Storage Room (Area L)**

Storage Room off the main hallway, used to store office supplies. The area was classified as a MARSSIM Class III area. The results of all gamma scans were at background. There were 38 measurement points in this area. Measurements of surface activity were at background levels. Measurements of removable surface activity were less than LLD. All levels were below the DCGLs.

**Room 1018, Laboratory 8 (Area M)**

Used as a classroom, only exempt sealed sources (instrument check sources) used in this area. The area was classified as a MARSSIM Class III area. The results of all gamma scans were at background. There were 161 measurement points in this area. Measurements of surface activity were at background levels. Measurements of removable surface activity were less than LLD. All levels were below the DCGLs.

**Room 1023, Laboratory 6 (Area N)**

Used to teach laser safety. No ionizing radiation sources used in this room. The area was classified as a MARSSIM Class III area. The results of all gamma scans were at background. There were 86 measurement points in this area. Measurements of surface activity were at background levels. Measurements of removable surface activity were less than LLD. All levels were below the DCGLs.

**Room 1011A, Health Physics Laboratory (Area O)**

Health Physics Counting Lab. The area was classified as a MARSSIM Class I area. The results of all gamma scans were at background. There were 544 measurement points in this area. Measurements of surface activity were at background levels. Of the smears taken for measurement of removable surface activity, 60 were above LLD. The highest measurements were: 2.73 dpm/100cm<sup>2</sup> alpha and 48.9 dpm/100cm<sup>2</sup> beta. Thermo NuTech measurements of the same samples were <2 dpm alpha and 14 dpm beta. All levels were below the DCGLs.

**Room 1019, Laboratory 1 (Area P)**

This is a student laboratory. The area was classified as a MARSSIM Class I area. The results of all gamma scans were at background. There were 1288 measurement points in this area. Measurements of surface activity were at background levels. Of the smears taken for measurement of removable surface activity, 94 were above LLD. The highest measurements were: 4.06 dpm/100cm<sup>2</sup> alpha and 62.00 dpm/100cm<sup>2</sup> beta. Thermo NuTech measurements of the same samples were 4.0 dpm alpha and 20 dpm beta. All levels were below the DCGLs.

**Hallway (Area Q)**

This is the hallway inside the controlled area. The area was classified as a MARSSIM Class II area. The results of all gamma scans were at background. There were 963 measurement points in this area. Measurements of surface activity were at background levels. Of the smears taken for measurement of removable surface activity, 1 was above LLD. The highest measurements were: 3.32 dpm/100cm<sup>2</sup> alpha and 74.28 dpm/100cm<sup>2</sup> beta. Thermo NuTech measurements of the same samples were 6.3 dpm alpha and 16 dpm beta. All levels were below the DCGLs.

**Room 1011B (Area R)**

This is the isotope preparation laboratory and receiving room. The area was classified as a MARSSIM Class I area. The results of all gamma scans were at background. There were 838 measurement points in this area. Measurements of surface activity were at background levels. Of the smears taken for measurement of removable surface activity, 103 were above LLD. The highest measurements were: 2.55 dpm/100cm<sup>2</sup> alpha and 105.13 dpm/100cm<sup>2</sup> beta. Thermo NuTech measurements of the same samples were <1.8 dpm alpha and 4 dpm beta. All levels were below the DCGLs.

**Room 1021 (Area S)**

This is the X-Ray room. No x-ray machine was ever installed, the room was used for storage. The area was classified as a MARSSIM Class III area. The results of all gamma scans were at background. There were 88 measurement points in this area. Measurements of surface activity were at background levels. Of the smears taken for measurement of removable surface activity, 2 were above LLD. The highest measurement was: 267.6 dpm/100cm<sup>2</sup> beta. Thermo NuTech measurements of the same sample was 95.3 dpm beta. All levels were below the DCGLs.

**Room 1022 (Area T)**

This was laboratory 4, it was used for textbook storage. The area was classified as a MARSSIM Class III area. The results of all gamma scans were at background. There were 74 measurement points in this area. Measurements of surface activity were at background levels. Measurements of removable surface activity were less than LLD. All levels were below the DCGLs.

**Room 1024 (Area U)**

This was laboratory 5, it was used for cloud chamber demonstrations and to demonstrate gamma analysis. Only sealed, exempt sources were used in this laboratory. The area was classified as a MARSSIM Class II area. The results of all gamma scans were at background. There were 898 measurement points in this area. Measurements of surface activity were at background levels. Measurements of removable surface activity were less than LLD. All levels were below the DCGLs.

**Room 1011C (Area V)**

This was the storage vault for radioactive material. The area was classified as a MARSSIM Class I area. The results of all gamma scans were at background. There were 966 measurement points in this area. Measurements of surface activity were at background levels. Of the smears taken for measurement of removable surface activity, 215 were above LLD. The highest measurements were: 0.5 dpm/100cm<sup>2</sup> alpha and 104.5 dpm/100cm<sup>2</sup> beta. Thermo NuTech measurements of the same samples were <1.7 dpm alpha and <3.6 dpm beta. All levels were below the DCGLs.

**Room 1020 (Area W)**

This was laboratory 2, calibration laboratory. A sealed 52 Curie Cs-137 calibration source was installed in this room. The area was classified as a MARSSIM Class II area. The results of all gamma scans were at background. There were 1226 measurement points in this area. Measurements of surface activity were at background levels. Measurements of removable surface activity were less than LLD. All levels were below the DCGLs.

**Tank Room (Area X)**

This room housed the liquid waste tank. The holding tank was never used for holding contaminated waste and no radioactive materials were ever used in this room. The area was classified as a MARSSIM Class II area. The results of all gamma scans were at background. There were 229 measurement points in this area. Measurements of surface activity were at background levels. Measurements of removable surface activity were less than LLD. All levels were below the DCGLs.

**Loading Dock (Area Y)**

This was the loading dock for the building and was adjacent to the laboratories. The area was classified as a non-impact area. The results of all gamma scans were at background. There were 42 measurement points in this area. Measurements of surface activity were at background levels. Measurements of removable surface activity were less than LLD. All levels were below the DCGLs.

**Landing (Area Z)**

This is the landing and steps for the fire exit north of the laboratories, outside laboratories 2 and 5. This area was never used except for fire drills. The area was classified as a non-impact area. The results of all gamma scans were at background. There were 20 measurement points in this area. Measurements of surface activity were at background levels. Measurements of removable surface activity were less than LLD. All levels were below the DCGLs.

**Hallway in Sibert Hall (Area AA)**

This is the hallway in the main building adjacent to the laboratories. The area was classified as a non-impact area. The results of all gamma scans were at background. There were 31 measurement points in this area. Measurements of surface activity were at background levels. Measurements of removable surface activity were less than LLD. All levels were below the DCGLs.

**Sidewalk (Area AB)**

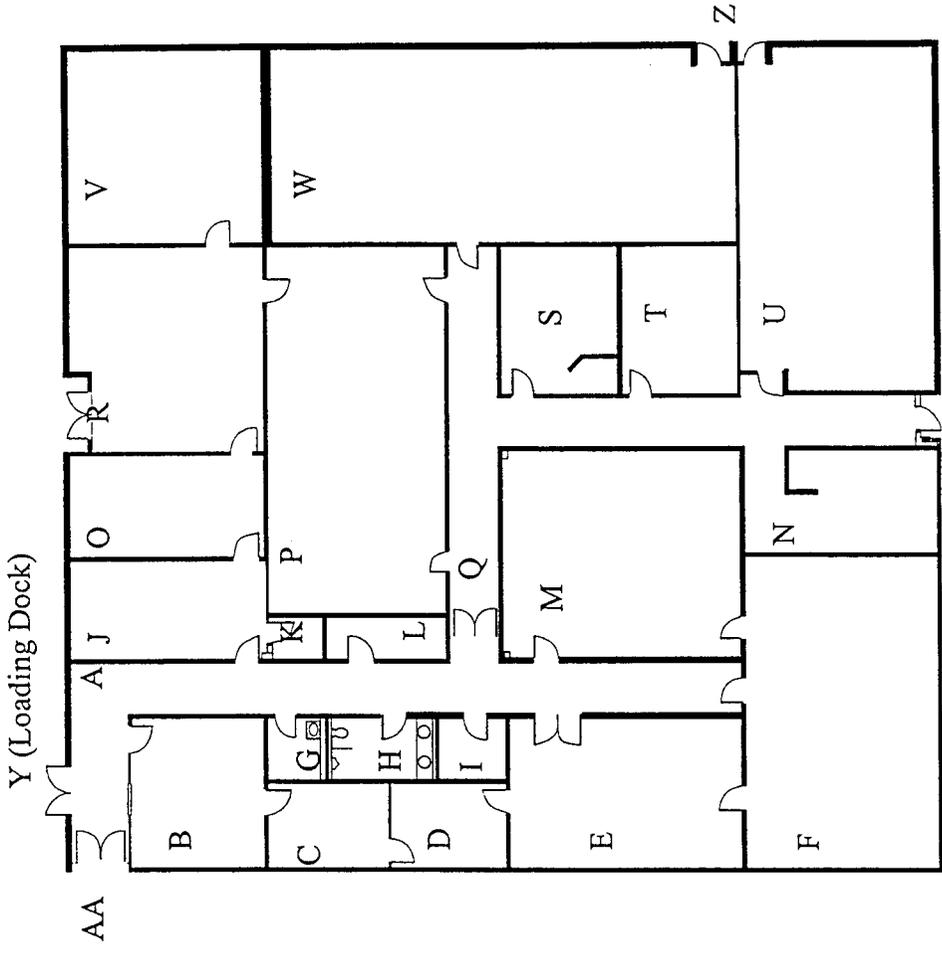
This is the sidewalk outside the tank room entrance. The area was classified as a non-impact area. The results of all gamma scans were at background. There were 49 measurement points in this area. Measurements of surface activity were at background levels. Measurements of removable surface activity were less than LLD. All levels were below the DCGLs.

**6. Independent Laboratory Confirmation.**

As a confirmation of counting results, 500 smears were sent to Thermo Nutech in Albuquerque, NM for analysis. All smears that indicated a final count above LLD were included, as well as other random samples. A list of smears by area and the results of the Thermo Nutech analysis are at attachment 12. All counts were below the DCGLs.

AREA CODE	LOCATION	ROOM NUMBER	AREA CLASS	# OF SMEARS A & B	LSC	Floor/Ceiling SIZE	WALL (L) SIZE	WALL (W) SIZE	AREA IN METERS SQ		NUMBER OF SMEARS FOR		
									FLOOR AREA	CEILING WALL AREA	FLOOR SMEARS	CEILING SMEARS	WALL SMEARS
	<b>IMPACT AREA</b>						H = 2.74	H = 2.74					
A	MAIN HALLWAY	NA	3	198		33.83 X 2.00	(2) 33.83	(2) 2.00	67.66	143.32	64	0	134
B	Rad Lab OFFICE	1010	3	84		5.56 X 5.18	(2) 5.56	(2) 5.18	28.81	58.86	36	0	48
C	Instructor's OFC	1010-A	3	56		4.57 X 3.51	(2) 4.57	(2) 3.51	16.02	44.28	20	0	36
D	Rad Lab CHIEF	1010-B	3	56		4.57 X 3.51	(2) 4.57	(2) 3.51	16.02	44.28	20	0	36
E	Electronic SHOP	1010-C	3	114		8.99 x 5.59	(2) 8.99	(2) 5.59	50.24	79.9	54	0	60
F	LAB 7	1017	3	176		11.89 x 7.67	(2) 11.89	(2) 7.67	91.18	107.19	96	0	80
G	WOMEN'S RM	1013	3	20		1.93 x 1.78	(2) 1.93	(2) 1.78	3.43	20.17	4	0	16
H	MEN'S RM	1015	3	32		3.45 x 1.78	(2) 3.45	(2) 1.78	6.14	28.66	8	0	24
I	JANITOR RM	1016	3	32		2.79 x 1.78	(2) 2.79	(2) 1.78	4.97	25.04	8	0	24
J	H. P. OFFICE	1011	3	80		7.62 x 3.71	(2) 7.62	(2) 3.71	28.26	62.09	32	0	48
K	H. P. STORAGE	1012	3	20		1.85 x 1.40	(2) 1.85	(2) 1.40	2.59	17.81	4	0	16
L	RAD Lab Storage	1014	3	38		4.57 x 1.40	(2) 4.57	(2) 1.40	6.38	32.72	10	0	28
M	LAB 8	1018	3	152		9.14 x 7.62	(2) 9.14	(2) 7.62	69.65	91.84	80	0	72
N	LAB 6	1023	3	80		7.62 x 3.45	(2) 7.62	(2) 3.45	26.32	60.66	32	0	48
Nw	Lab 6 X Wall	1023	3	4		Both Sides	(2) 0.94	NA	NA	5.15	0	0	4
O	H. P. LAB	1011-A	1	516		7.62 x 3.71	(2) 7.62	(2) 3.71	28.26	62.09	120	120	276
P	LAB 1	1019	1	1288		13.64 x 6.60	(2) 13.64	(2) 6.60	90.08	110.91	392	392	504
Q	Hallway To LABS	NA	2	850		29.57 x 1.93	(2) 29.57	(2) 1.93	57.06	172.62	264	66	520
R	PREP LAB	1011-B	1	810		7.62 x 7.47	(2) 7.62	(2) 7.47	56.92	82.69	225	225	360
S	LAB 3	1021	3	74		5.28 x 4.34	(2) 5.28	(2) 4.34	22.92	52.72	30	0	44
Sw	Lab 3 X Wall	1021	3	8		Both Sides	(2) 2.24	NA	NA	12.25	0	0	8
T	LAB 4	1022	3	74		5.28 x 4.47	(2) 5.28	(2) 4.47	23.60	53.43	30	0	44
U	LAB 5	1024	2	800		12.8 x 7.62	(2) 12.8	(2) 7.62	97.54	111.90	389	91	320
V	VAULT	1011-C	1	810		7.47 x 7.39	(2) 7.47	(2) 7.39	55.21	81.43	225	225	360
Vw	Vault, X Wall	1011-C	1	156		Both Sides	(2) 6.25	NA	NA	34.24	0	0	156
W	LAB 2	1020	2	0		18.08 x 7.37	(2) 18.08	(2) 7.37	133.29	139.47			
Ww	Lab 2 X Wall	1020	2	0		Both Sides	(2) 2.54	(2) 1.37	NA	21.44	0	0	0
X**	TANK ROOM	1025	2	0		5.31 x 2.11	(2) 5.31	(2) 2.11	11.20	40.66			
Xw	Tank Rm X Wall	1025	2	0		Both Sides	(2) 1.19	NA	NA	5.90	0	0	0
	<b>NON IMPACT AREA</b>												
Y	Loading Dock		non-imp	0									0
Z	Outside Lab 2&5		non-imp	0									0
AA	Adjacent		non-imp	0									0
AB	Outside Exit To Tank RM		non-imp	0									0
			TOTAL	6528	6528								0

NOTE: FOUR (4) CLASS 1; FOUR (4) CLASS 2; SIXTEEN (16) CLASS 3; & FOUR (4) NON AFFECTED AREAS.



X (Tank Room)  
 AB (Tank Room Landing)

RADIOLOGICAL LABORATORIES  
 BUILDING 1081, SIBERT HALL  
 FORT MCCLELLAN, AL 36205





**AREA A (SECTION 2) - MAIN HALLWAY - CLASS 3**

	A	B	C	D	E	F
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						

1 METER SQ.

**AREA A (SECTION 3) - MAIN HALLWAY - CLASS 3**

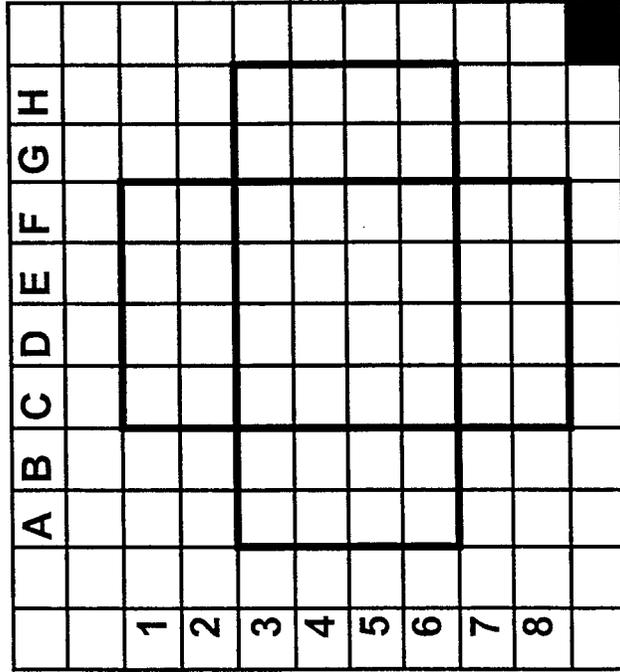
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	
1																					
2																					
3																					
4																					
5																					
6																					
7																					

1 METER SQ.





**AREA D - RAD LAB CHIEF'S OFFICE- ROOM 1010B - CLASS 3**



1 METER SQ.

**AREA E - ELECTRONIC SHOP - ROOM 1010C - CLASS 3**

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1														
2														
3														
4														
5														
6														
7														
8														
9														
10														

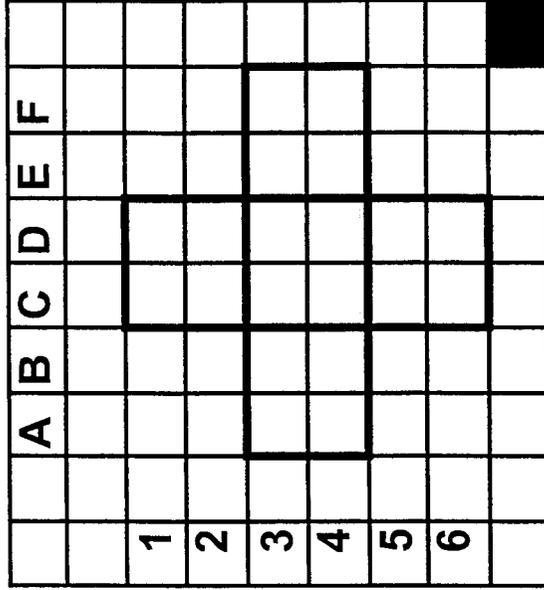
1 METER SQ.

**AREA F - LABORATORY 7 - ROOM 1017 - CLASS 3**

	A	B	C	D	E	F	G	H	I	J	K	
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												

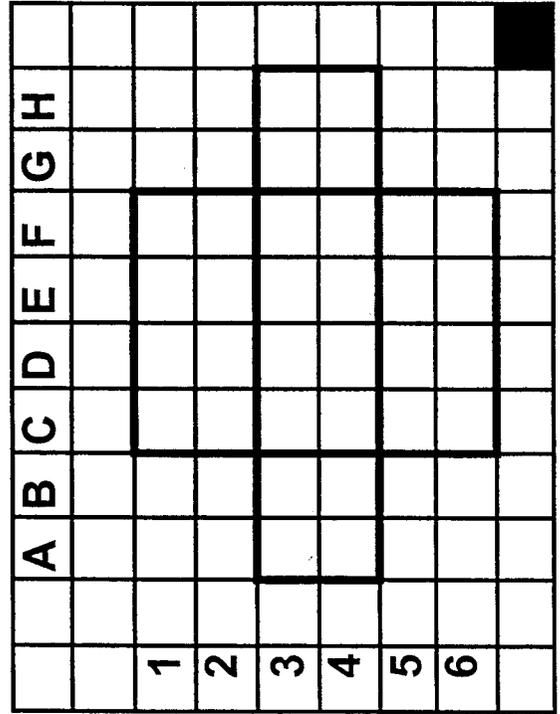
1 METER SQ.

**AREA G - WOMEN'S ROOM - RM 1013 - CLASS 3**



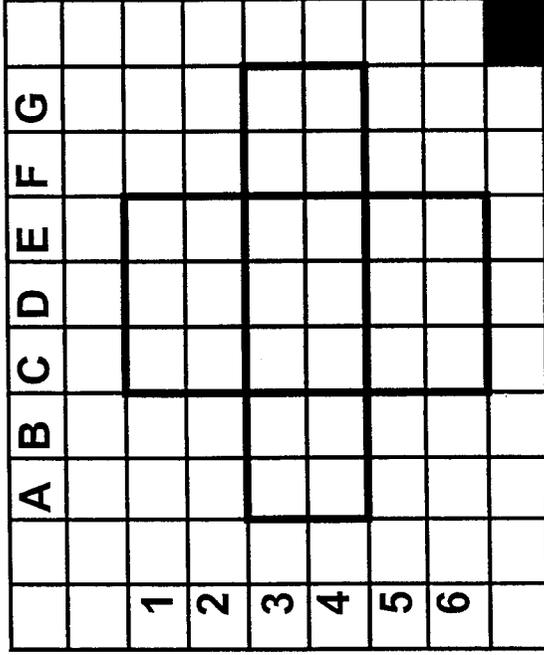
1 METER SQ.

**AREA H - MEN'S ROOM - RM 1015 - CLASS 3**



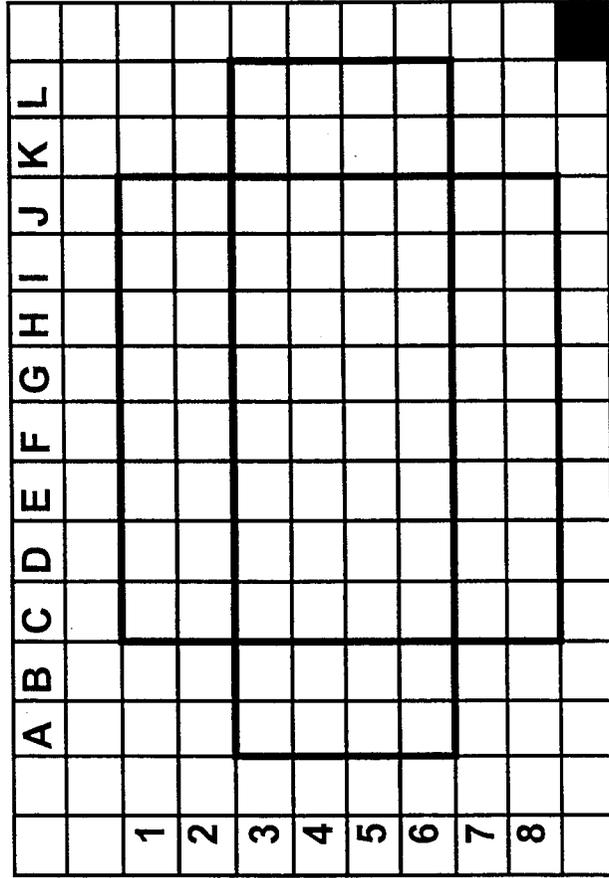
1 METER SQ.

**AREA I - JANITOR'S ROOM - RM 1016 - CLASS 3**



1 METER SQ.

**AREA J - HP OFFICES- RM 1011 - CLASS 3**



1 METER SQ.





**AREA M - LABORATORY 8 - RM 1018 - CLASS 3**

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1														
2														
3														
4														
5														
6														
7														
8														
9														
10														
11														
12														

1 METER SQ.





AREA P - LABORATORY 1 - ROOM 1019 - CLASS 1

	A	B	C	D	E	F	G	H	I	J	K	L	M	
1														
2														
3														
4														
5														
6														
7														
8														
9														
10														
11														
12														
13														
14														
15														
16														
17														
18														
19														
20														

1 METER SQ.





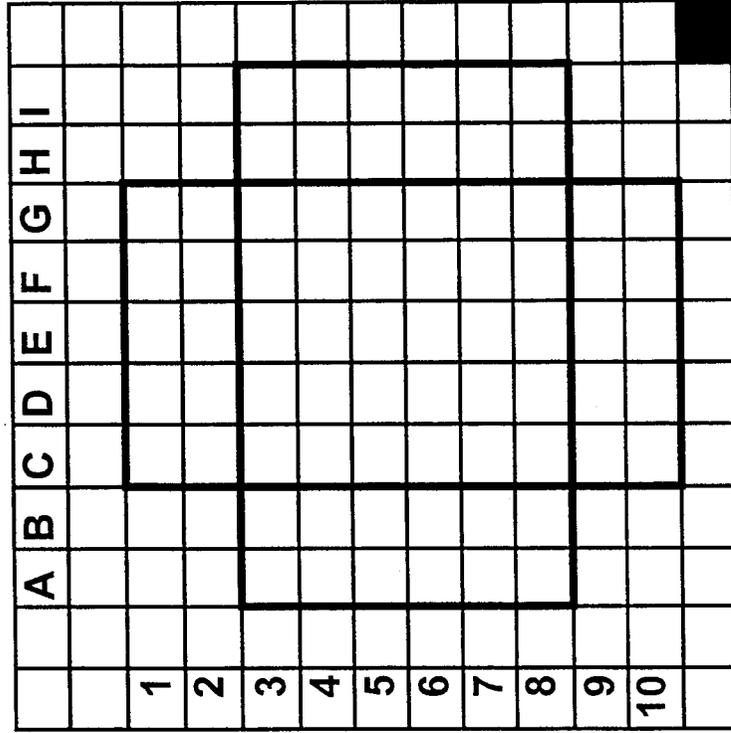


AREA R - PREP LABORATORY - RM 1011B - CLASS 1

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1														
2														
3														
4														
5														
6														
7														
8														
9														
10														
11														
12														
13														
14														

1 METER SQ.

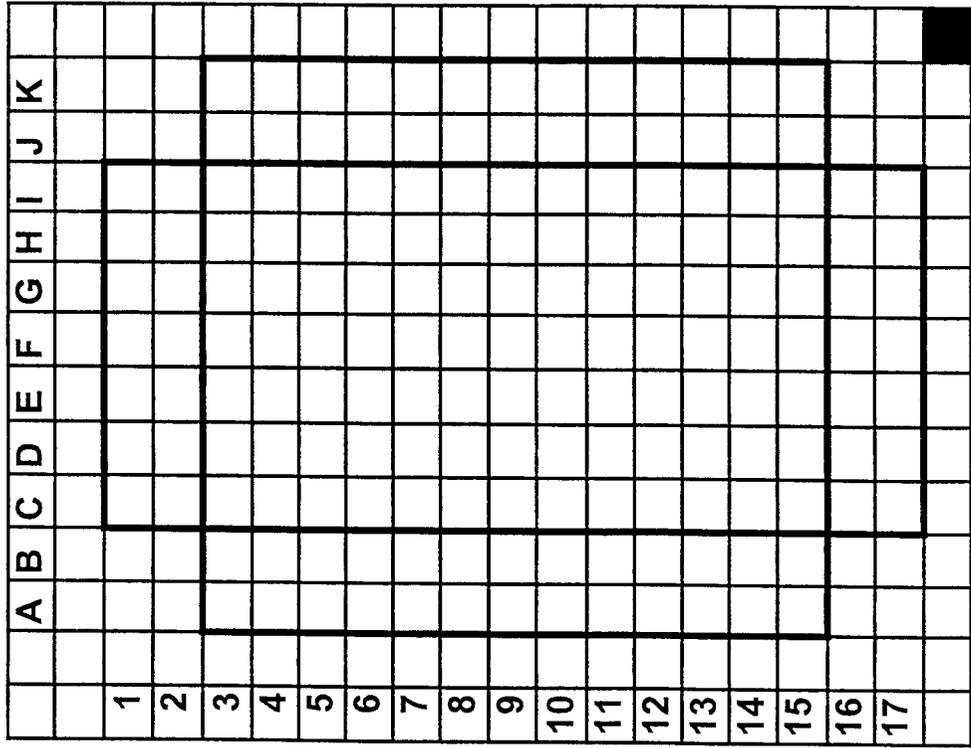
**AREA S, LABORATORY 3 - ROOM 1021 - CLASS 3**



1 METER SQ.

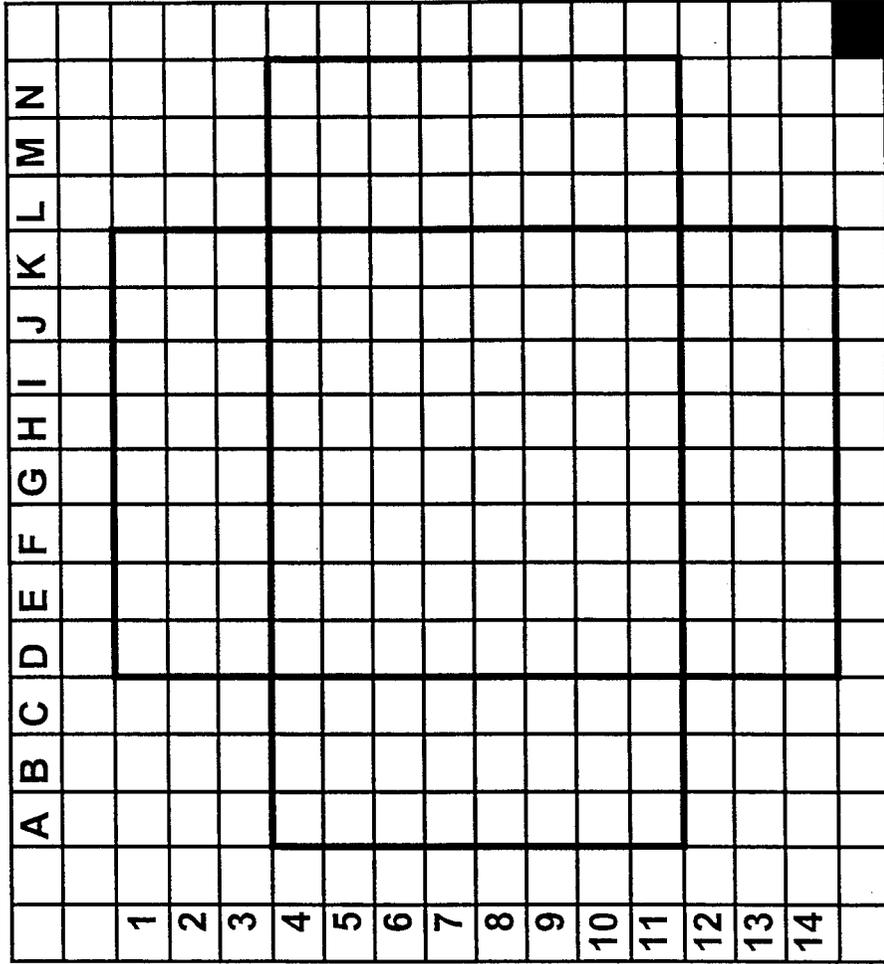


AREA U - LABORATORY 5 - ROOM 1024 - CLASS 2



1 METER SQ.

**AREA V - VAULT - RM 1011C - CLASS 1**



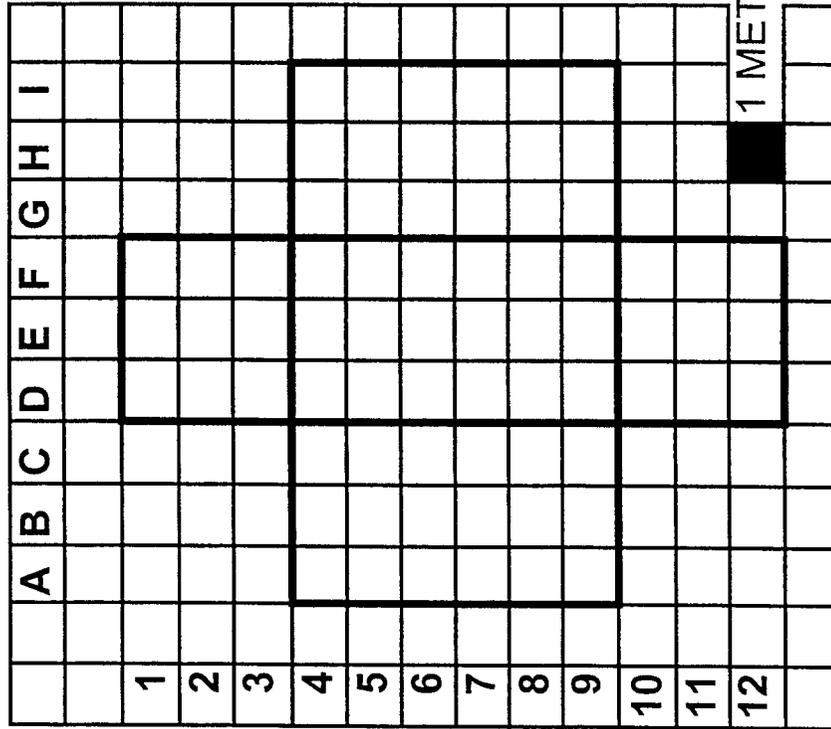
1 METER SQ.

AREA W - LABORATORY 2 - ROOM 1020 - CLASS 2

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	
1																							
2																							
3																							
4																							
5																							
6																							
7																							
8																							
9																							
10																							
11																							
12																							

1 METER SQ.

# AREA X - TANK ROOM - CLASS 1

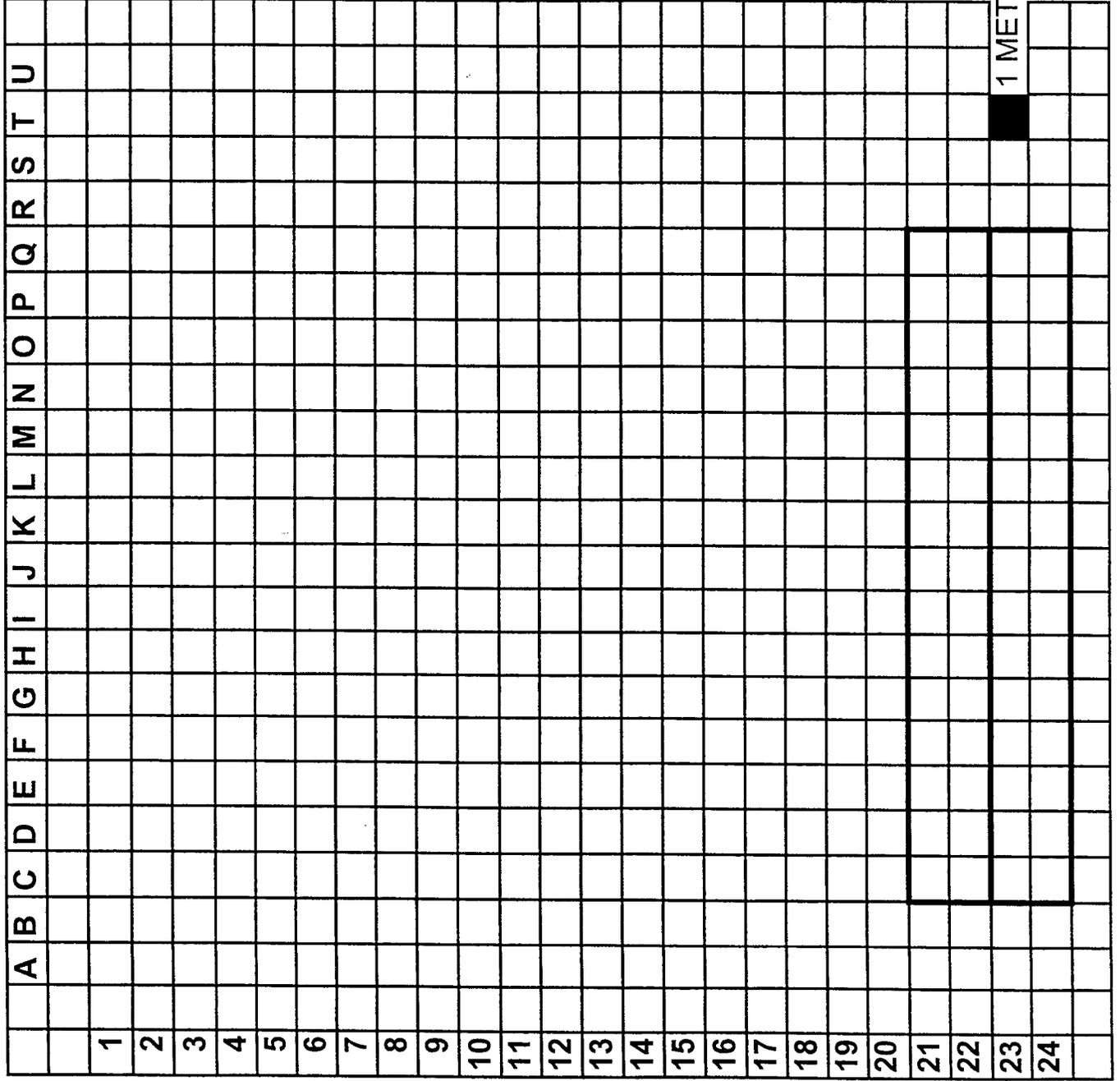








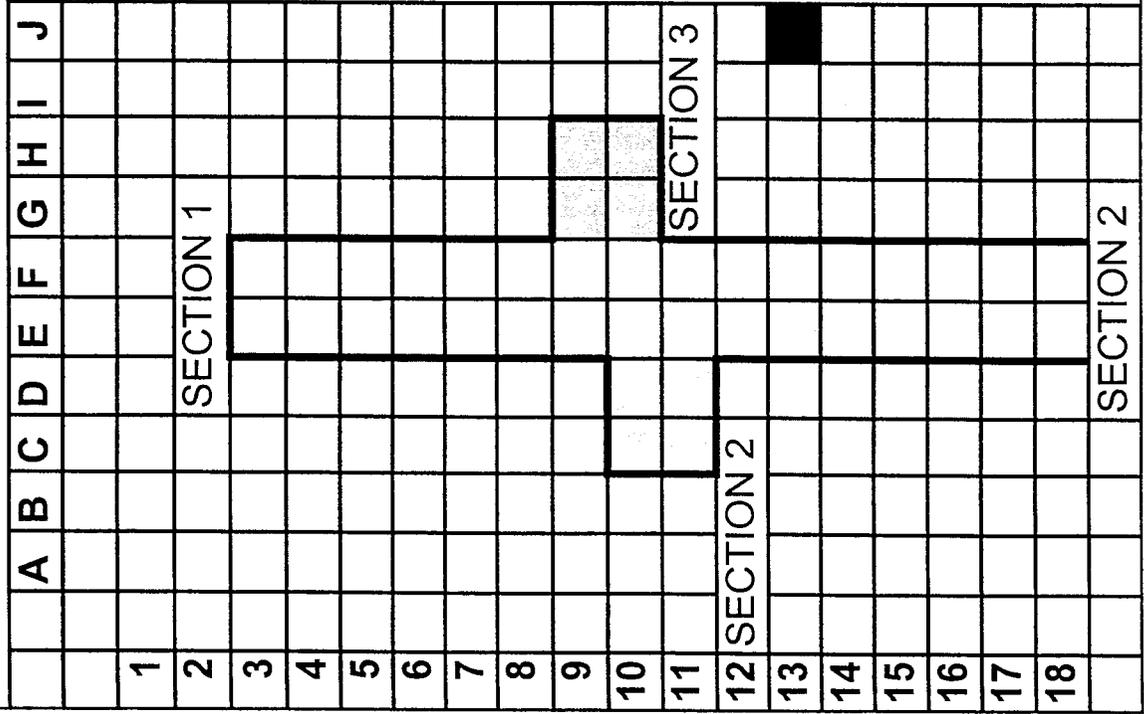
AREA Y - (SECTION 2) - WALKWAY ( VALLS  
NON IMPACT AREA





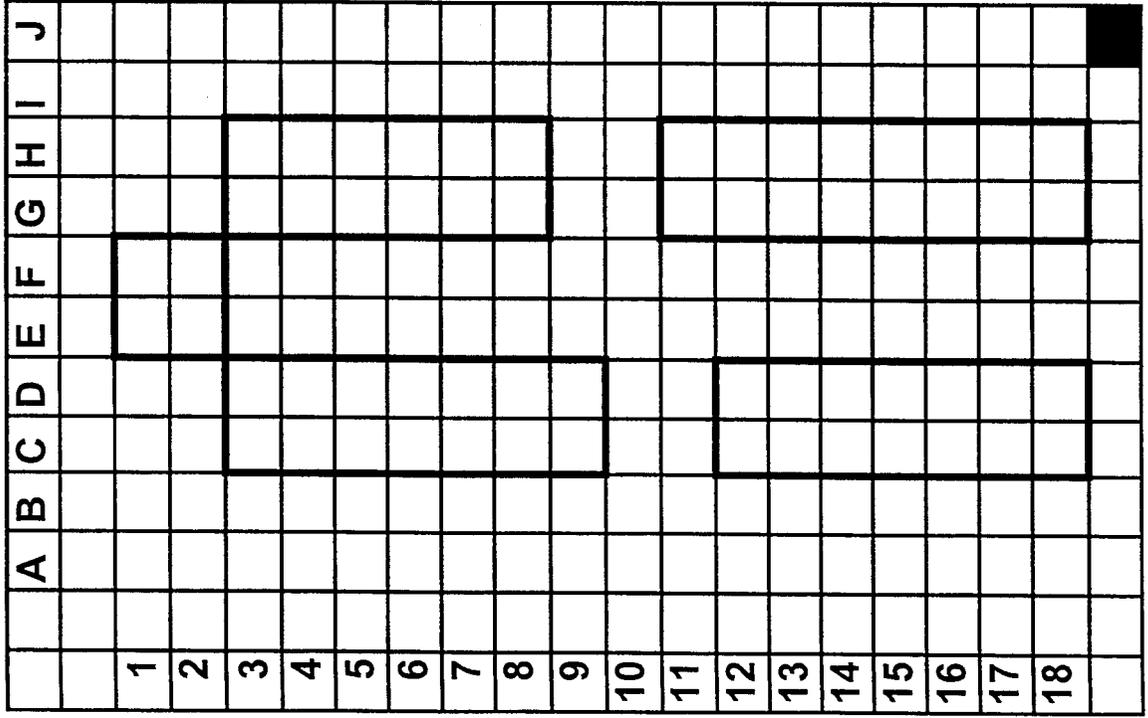


**AREA AA - SECTION FLOOR LAYOUT - ADJACENT HALLWAY  
NON - IMPACT AREA**



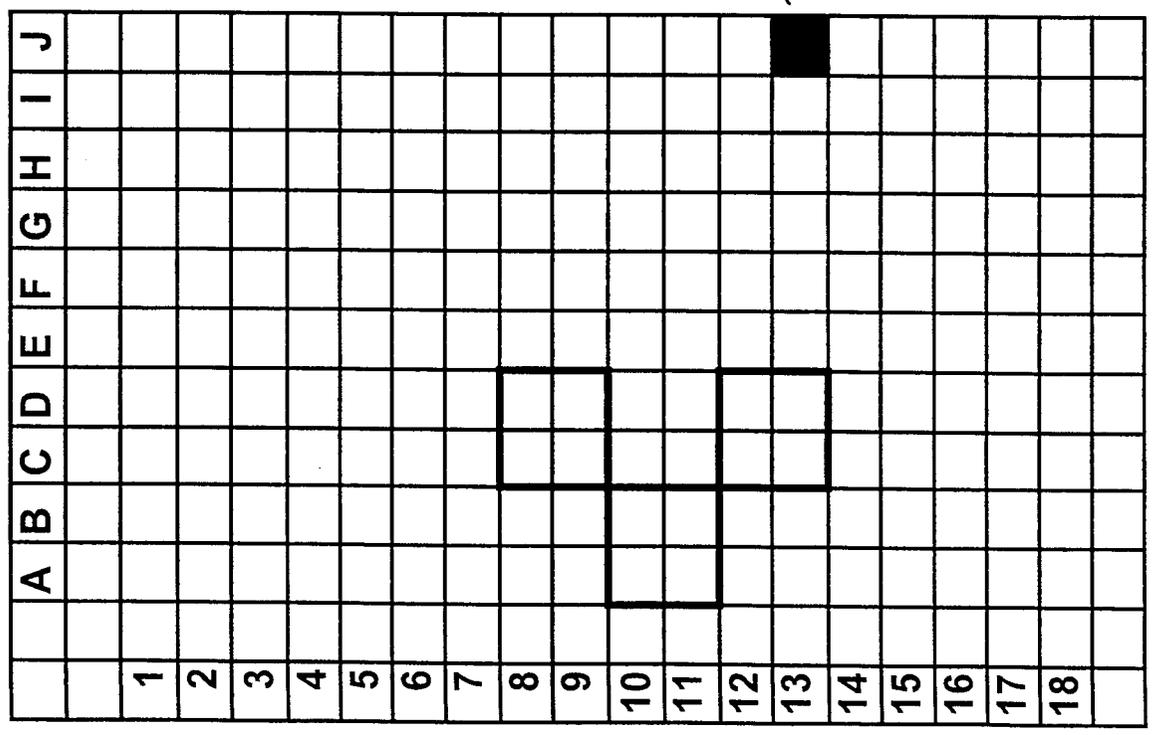
1 METER SQ.

**AREA AA - (SECTION 1) - ADJACENT HALLWAY  
NON - IMPACT AREA**



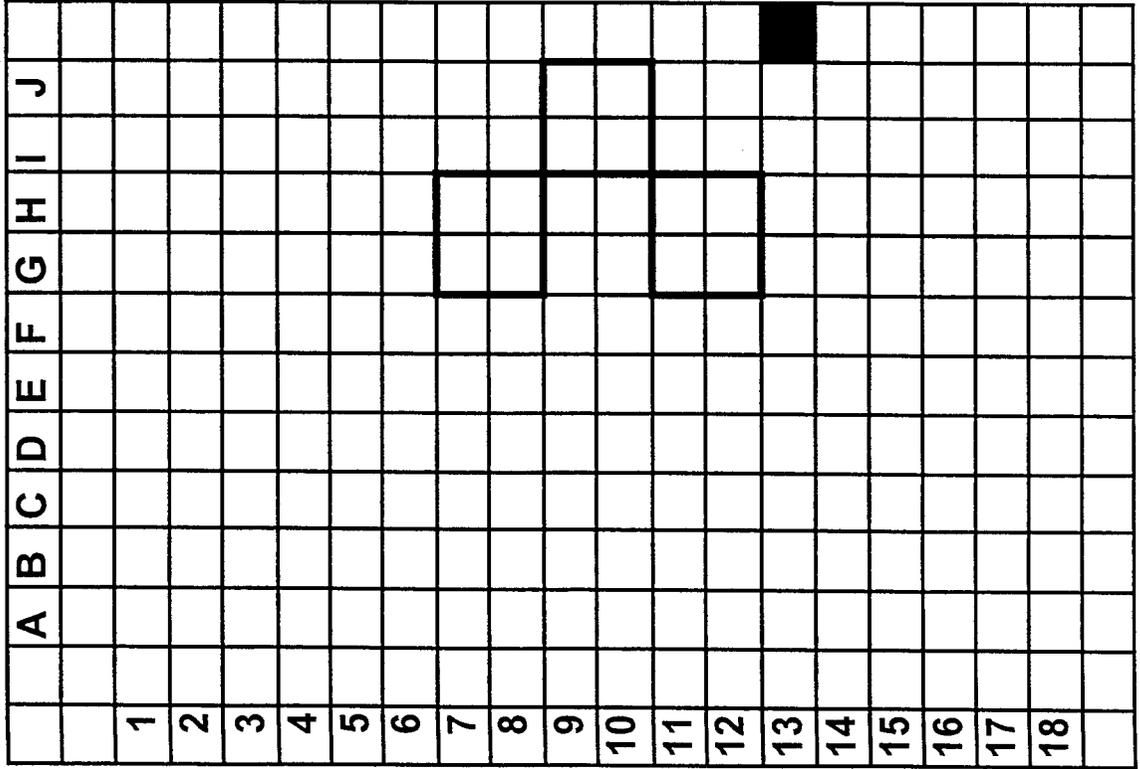
1 METER SQ.

**AREA AA - (SECTION 2) - ADJACENT HALLWAY  
NON - IMPACT AREA**



1 METER SQ.

**AREA AA - (SECTION 3) - ADJACENT HALLWAY  
NON - IMPACT AREA**



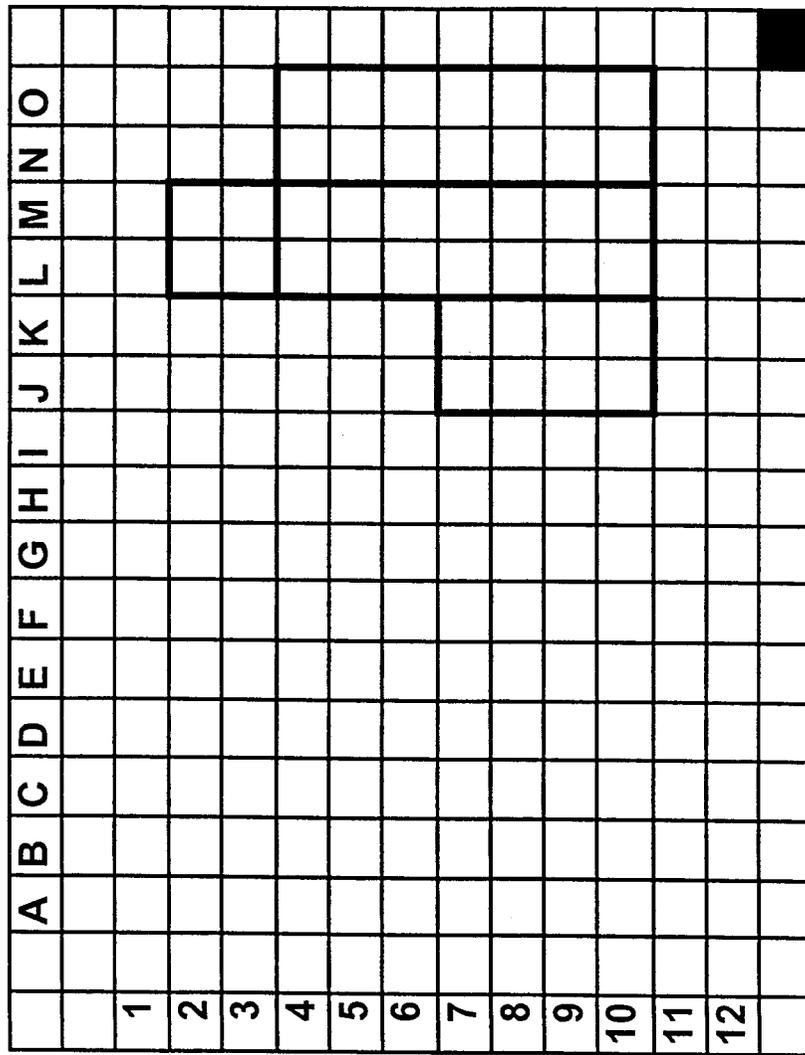
1 METER SQ.







**AREA AB - (SECTION 3) - STAIRS, LANDING & WALLS  
NON - IMPACT AREA**



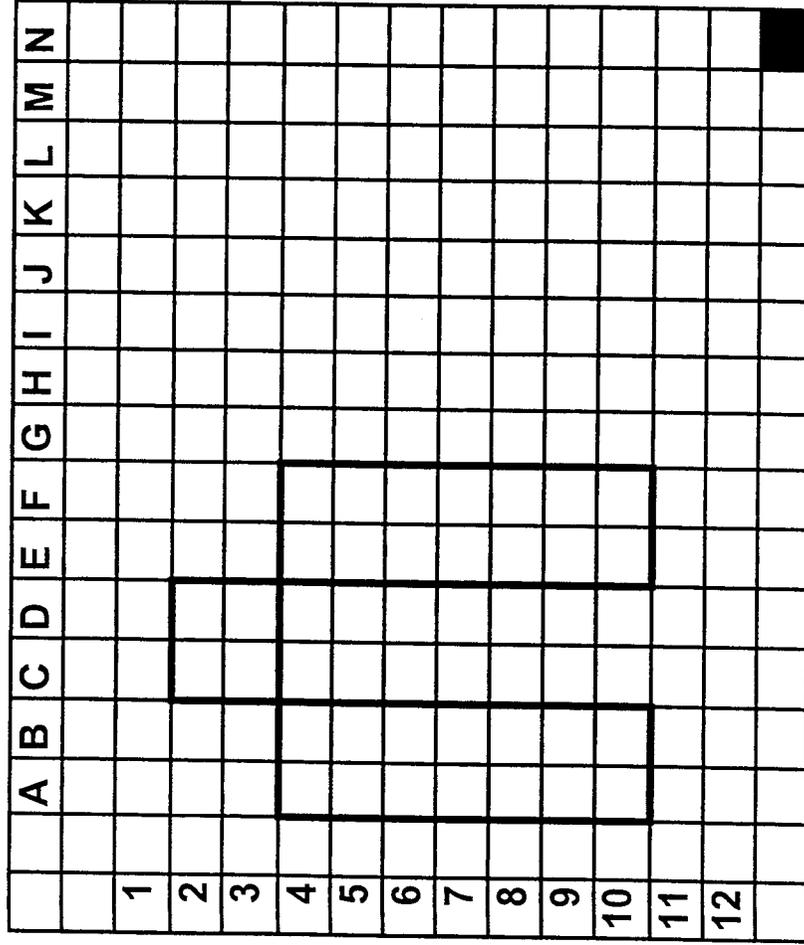
1 METER SQ

**AREA AB - (SECTION 4) - SIDEWALK  
NON - IMPACT AREA**

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1														
2														
3														
4														
5														
6														
7														
8														
9														
10														
11														
12														

1 METER SQ.

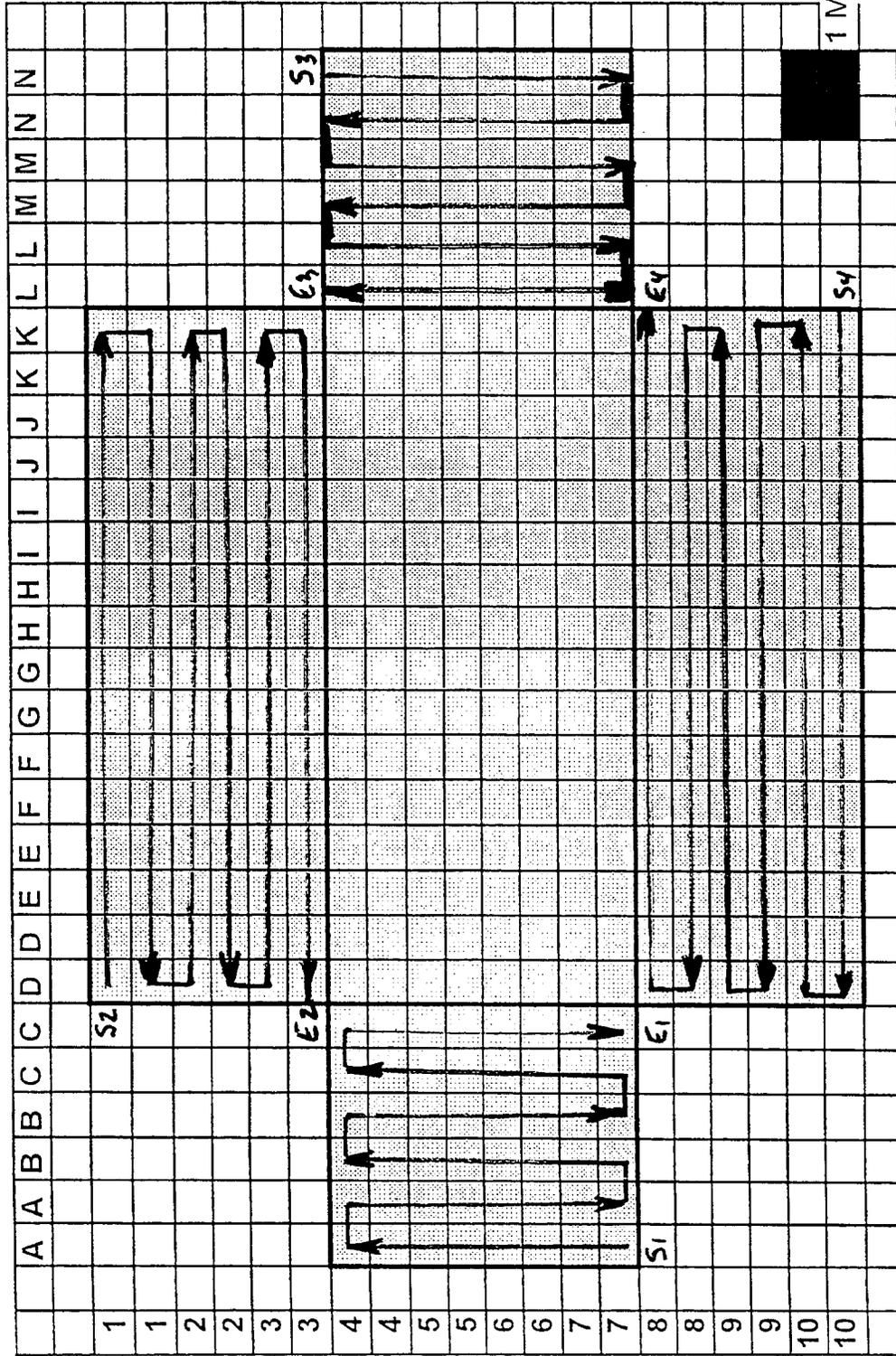
**AREA AB - (SECTION 5) - SIDEWALK & WALLS -  
NON - IMPACT AREA**



1 METER SQ.

WFN-65  
OD N

# AREA O - HPO LABORATORY - RM 1011A - CLASS 1

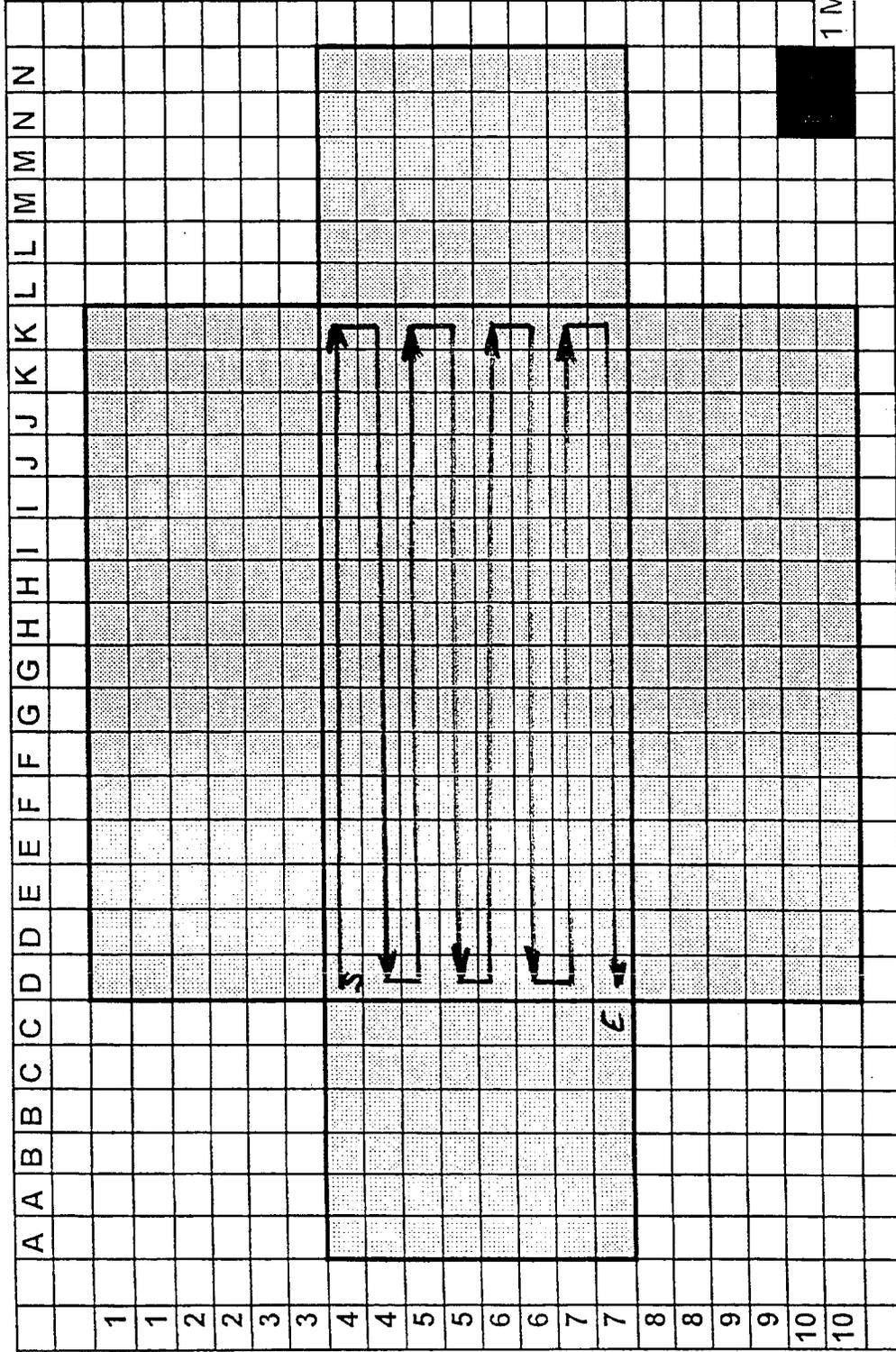


S= START POINT (1-4)  
 E= END POINT (1-4)

SCANNING METER:  
 BICRON MICRO REM METER  
 MODEL NUMBER 1056000 SN: C473E  
 CAL DUE DATE: 11 DEC 99  
 AT A RATE OF 1 METER PER THREE  
 SECONDS AT A DISTANCE OF FIVE  
 CENTIMETERS OR LESS FROM SURFACE  
 3.0 REM OR LESS

DATE SURVEYED:  
 24 August 99  
 TIME SURVEYED:  
 0730  
 SURVEYED BY:  
 SSG DE GUMBIA

OR N  
CEILING  
AREA O - HPO LABORATORY - RM 1011A - CLASS 1



S = START POINT  
E = END POINT

SCANNING METER:  
BICRON MICRO REM METER  
MODEL NUMBER 1056000 SN: C473E  
CAL DUE DATE: 11 DEC 99  
AT A RATE OF 1 METER PER THREE  
SECONDS AT A DISTANCE OF FIVE  
CENTIMETERS OR LESS FROM SURFACE  
3.0 REM OR LESS

DATE SURVEYED:  
25 AUG 99  
TIME SURVEYED:  
0700  
SURVEYED BY:  
SSG DEGUMBIA

WALL AND CEILING ROSE TAPE

AREA O - HPO LABORATORY - RM 1011A - CLASS 1

	A	B	C	C	D	D	E	E	F	F	G	G	H	H	I	I	J	J	K	K	L	L	M	M	N	N
1					.02	.02	.01	.02	.01	.01	.02	.01	.01	.02	.01	.01	.01	.01	.01	.01						
1					.02	.02	.01	.02	.01	.01	.02	.01	.01	.02	.01	.01	.01	.01	.01	.01						
2					.01	.02	.01	.02	.01	.02	.01	.01	.02	.01	.01	.02	.02	.02	.02	.02						
2					.01	.02	.02	.01	.02	.01	.02	.01	.02	.01	.01	.02	.01	.01	.01	.01						
3					.02	.01	.02	.01	.02	.01	.02	.01	.02	.01	.01	.02	.01	.01	.02	.01						
3					.01	.02	.02	.01	.02	.01	.02	.01	.02	.01	.02	.01	.01	.02	.01	.01						
4					.02	.02	.01	.02	.01	.02	.01	.02	.01	.02	.01	.02	.01	.02	.01	.01	.01	.01	.02	.01	.02	
4					.02	.01	.02	.01	.02	.01	.02	.01	.02	.01	.02	.01	.02	.01	.02	.01	.01	.02	.01	.02	.02	
5					.02	.01	.02	.01	.02	.01	.01	.01	.02	.01	.01	.02	.01	.01	.02	.02	.01	.02	.01	.01	.01	
5					.01	.01	.02	.01	.02	.01	.02	.01	.01	.02	.01	.02	.02	.01	.01	.02	.01	.01	.01	.02	.01	
6					.01	.02	.01	.02	.01	.02	.01	.01	.02	.01	.01	.02	.01	.01	.01	.01	.01	.01	.02	.01	.01	
6					.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	
7					.02	.01	.02	.01	.02	.01	.02	.01	.02	.01	.02	.01	.02	.01	.02	.01	.02	.01	.02	.01	.01	
7					.01	.01	.02	.01	.02	.01	.02	.01	.01	.02	.01	.02	.01	.02	.01	.02	.01	.02	.01	.02	.01	
8					.02	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02	
8					.02	.02	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	
9					.02	.02	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	
9					.01	.01	.02	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	
10					.02	.01	.02	.01	.02	.01	.02	.01	.02	.01	.02	.01	.02	.01	.02	.01	.02	.01	.02	.01	.01	
10					.02	.01	.01	.02	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	

1 METER SQ.

GC1 = .01  
GC2 = .02

DOSE RATE SURVEY METER:

EBERLINE E-520 SN: 3813

W/PROBE HP 260 SN: 3812

CAL DUE DATE: 8 SEP 1999

30 SECOND READINGS

AT 2.5 CENTIMETERS OR LESS FROM SURFACE

ALL READINGS IN mR/hr

DATE SURVEYED: 25 AUGUST 1999 CEILING  
24 AUGUST 1999 WALLS

TIME SURVEYED: 0800 Hours CEILING  
0800 Hours WALLS

SURVEYED BY:

SSG RONALD DEGUMBA



FLOOR - JOSE KATES

AREA O - HPO LABORATORY - RM 1011A - CLASS 1

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1														
1														
2														
2														
3														
3														
4				.01	.01	.01	.02	.01	.01	.01	.02	.01	.01	
4				.02	.01	.01	.02	.01	.01	.01	.02	.01	.01	
5				.02	.01	.02	.01	.01	.01	.01	.02	.01	.01	
5				.01	.01	.02	.01	.01	.02	.01	.01	.01	.01	
6				.01	.01	.02	.01	.01	.02	.01	.01	.01	.01	
6				.01	.02	.02	.01	.01	.02	.01	.01	.01	.02	
7				.01	.01	.02	.01	.01	.01	.02	.01	.01	.01	
7				.02	.01	.02	.01	.01	.02	.01	.01	.01	.01	
8														
8														
9														
9														
10														
10														

1 METER SQ.

DOSE RATE SURVEY METER:  
 EBERLINE E-520 SN: 3813  
 W/PROBE HP 260 SN: 3812-  
 CAL DUE DATE: 25 SEP 1999

DATE SURVEYED: 26 Aug 1999

TIME SURVEYED: 08:00 hours

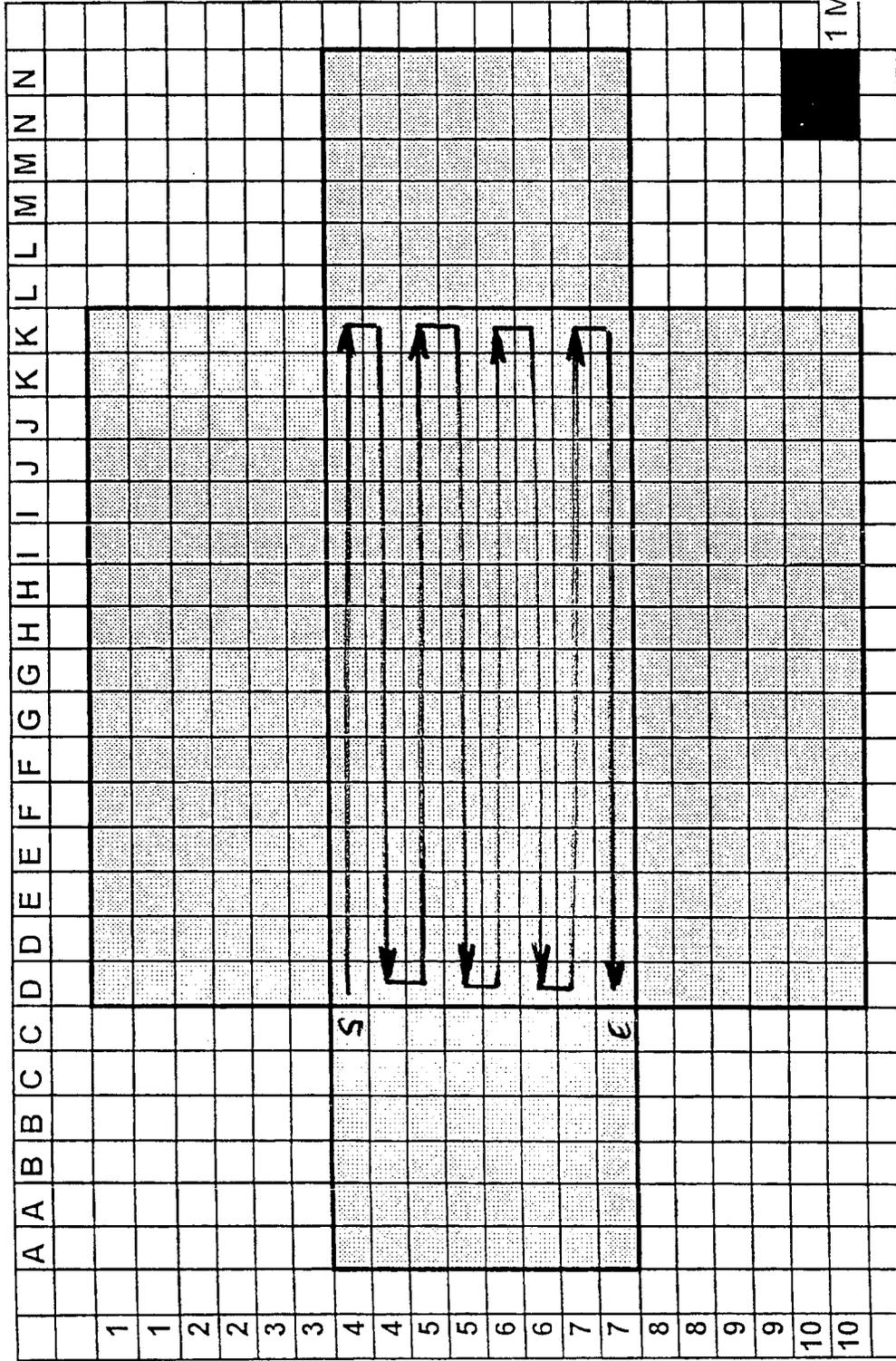
30 SECOND READINGS  
 AT 2.5 CENTIMETERS OR LESS FROM SURFACE  
 ALL READINGS IN mR/hr

SURVEYED BY:  
 SSG Rowaco DeGuzman



OS ↓  
Floor

AREA O - HPO LABORATORY - RM 1011A - CLASS 1



S= START POINT  
E= END POINT

SCANNING METER:

BICRON MICRO REM METER

MODEL NUMBER 1056000 SN: C473E

CAL DUE DATE: 11 DEC 99

AT A RATE OF 1 METER PER THREE

SECONDS AT A DISTANCE OF FIVE

CENTIMETERS OR LESS FROM SURFACE

3.0 m REM OR LESS

DATE SURVEYED:  
26 AUG 99

TIME SURVEYED:  
0700

SURVEYED BY:

SSG DEGUMBIA

P DOSE FL00R

AREA P - LABORATORY 1 - ROOM 1019 - CLASS 1

	A	B	C	D	D	E	E	F	F	G	G	H	H	I	I	J	J	K	K	L	L	M	
4																							
4																							
4																							
5																							
5																							
6																							
6																							
7																							
7																							
8																							
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15																							
16																							
16																							
17																							
17																							
18																							
18																							
19																							
19																							
20																							

1 METER SQ.

DATE SURVEYED:

TIME SURVEYED:

SURVEYED BY:

556 DEGRUMBA

DOSE RATE SURVEY METER:

EBERLINE E-520 SN: 3813

W/PROBE HP 260 SN: 3812

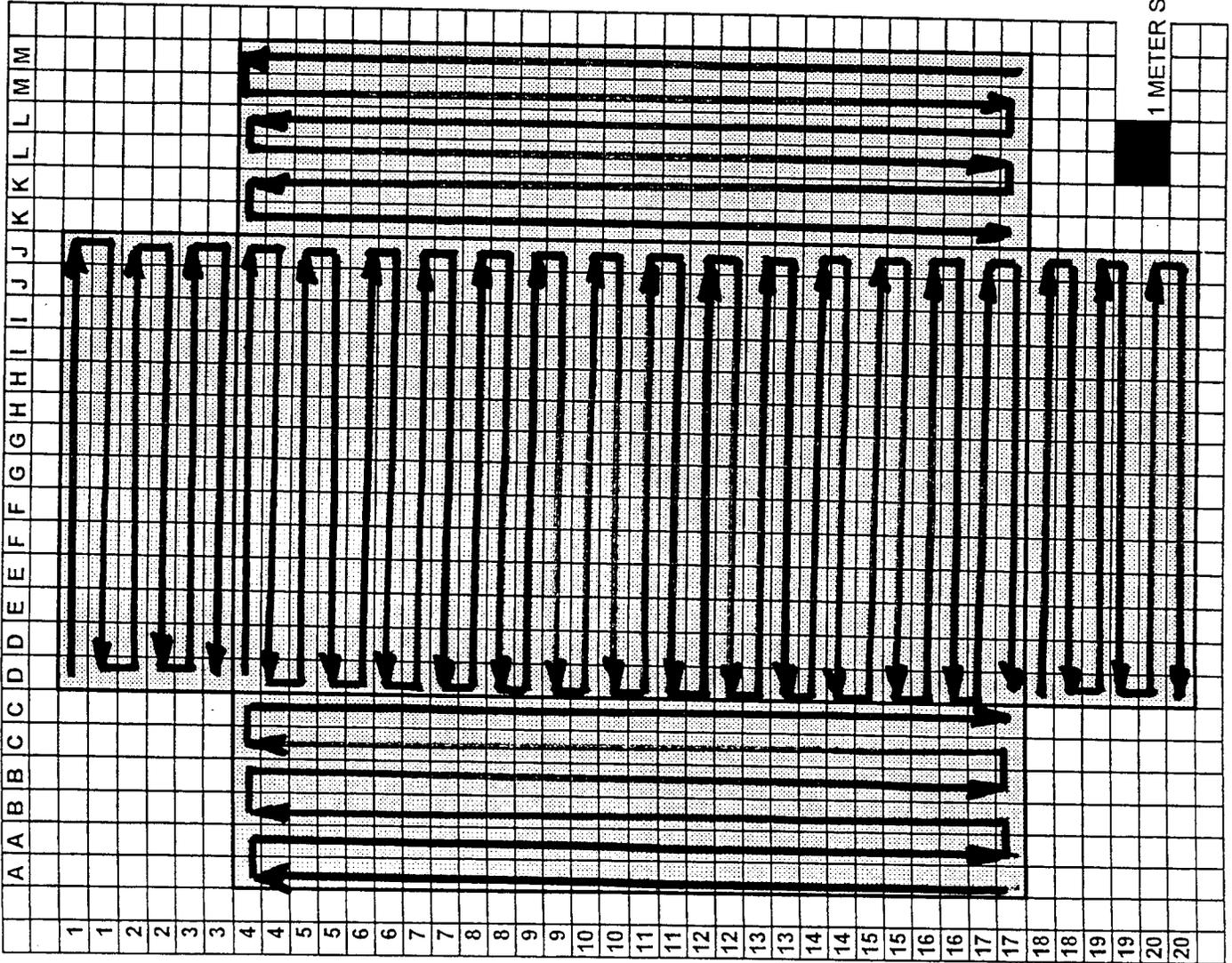
CAL DUE DATE: 8 SEP 99

30 SECOND READINGS AT A DISTANCE OF 2.5 CM OR LESS FROM SURFACE

ALL READINGS IN mR/hr

AREA P - LABORATORY 1 - ROOM 1019 - CLASS 1

WALLS  
↓  
CEILING



DATE SURVEYED: **18 AUG 99**  
 TIME SURVEYED: **0700**  
 SURVEYED BY: **SSG DEGUMBIA**  
 SCANNING METER: **BICRON MICRO REM METER**  
 MODEL NUMBER 1056000 SN: **C473E**  
 CAL DUE DATE: **11 DEC 99**  
 AT A RATE OF 1 METER PER THREE SECONDS AT A DISTANCE OF FIVE CENTIMETERS OR LESS FROM SURFACE  
**4.0 u REM OR LESS**

AREA P - LABORATORY 1 - ROOM 1019 - CLASS 1

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DATE SURVEYED: 18 AUG 99, WALLS - 19 AUG 99

TIME SURVEYED: 0800

SURVEYED BY: SSG DESSUMBIA

DOSE RATE SURVEY METER:

EBERLINE E-520 SN: 3813

W/PROBE HP 260 SN: 3812

CAL DUE DATE: 8 SEP 99

30 SECOND READINGS AT 2.5

CM OR LESS FROM SURFACE

ALL READINGS IN mR/hr