GENERAL ATOMICS

FINAL RADIOLOGICAL SURVEYS

OF

SELECTED BUILDING 2 LABORATORIES

FOR

RELEASE TO UNRESTRICTED USE

"GROUP 11"

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INTRODUCTION

General Atomics (GA) is continuing its efforts directed at decontaminating, as appropriate, and obtaining the release to unrestricted use of selected laboratories and associated offices in GA's Building 2. The building was built in 1958 for purposes of conducting research and development activities. To date, ten (10) groups of labs in this building have been decontaminated and released to unrestricted use.

GA has recently surveyed additional laboratories in Building 2 designated as "Group 11". This report summarizes the surveys completed for the "Group 11" laboratories which consist of nine (9) labs having a total area of 3662 ft². The nine labs are labs 216, 238, 240, 242, 325, 443, 445, 615, and 623. Labs 238/240 are combined labs as are labs 443/445. There is a mezzanine above labs 238/240/242 and one above labs 443/445. Labs 325 and 615 also have mezzanines but these mezzanines were released with the "Group 3" labs. Cs-137 was detected in labs 238/240 on the floor and 2 walls and on the overhead structures (both the lower level and the mezzanine). Uranium contamination was detected on a small (<100 cm²) area of the floor and a small area (<100 cm²) on the wall in labs 443/445. No contamination was detected in any other "Group 11" lab.

GA has no plans for conducting any future activities involving radioactive materials in these laboratories and/or mezzanines. (The offices across the hall from these laboratories have never been used for work involving radioactive materials). This report documents the results of extensive and comprehensive measurements completed in Building 2 "Group 11" Laboratories to demonstrate that these laboratories meet the approved criteria for release to unrestricted use. Accordingly, GA is requesting that these laboratories and their associated offices be released to unrestricted use.

SITE DESCRIPTION

The location of Building 2 with respect to other facilities on the GA Site is shown in Figure 1. A layout of Building 2 and the location of each "Group 11" laboratory is shown in Figure 2. The nine labs are labs 216, 238, 240, 242, 325, 443, 445, 615, and 623. Labs 238/240 and labs 443/445 are combined labs. There is a mezzanine above labs 238/240/242 and one above labs 443/445. Labs 325 and 615 also have mezzanines but these mezzanines were released with the "Group 3" labs. The total area to be released to unrestricted use is 3,662 ft² as follows:

"Group 11" Labs

Lab	ft²	m²
216	~336	~31
238/240	~540	~50
242	~444	~41
238/240/242 mezzanine	~646	~60

325	~276	~26
443/445	~660	~61
443/445 mezzanine	~436	~41
615	~324	~30
623	~321	~30
Totals	3,662	340

CRITERIA FOR RELEASE TO UNRESTRICTED USE

Table 1 is taken from U.S. NRC's criteria for releasing facilities and equipment to unrestricted use. It has been incorporated into GA's SNM-696 license. The State of California's guidelines, "DHS Criteria for Release of Facilities and Equipment to Unrestricted Use," also known as "DECON-1," are summarized in Table 2. These guidelines have been incorporated into GA's State of California License No. 0145-37.

PREVIOUS ACTIVITIES (HISTORY OF USE) AND CLASSIFICATION

GA's Work Authorization logs were researched in order to review the previous activities conducted in each lab and to identify the radionuclides of concern. Three of the six labs (labs 216, 325 and 615) had no history of use involving radioactive materials. The following is a brief summary of the activities performed in each lab and the classification of each lab based on its history.

Lab 216 - No history of use of radioactive materials; therefore this lab was classified as an "unaffected area."

Labs 238/240 and Mezzanine above Labs 238/240/242 - Beginning in early 1960's through the 1970's, these labs were used nuclear fuel chemistry and radiochemistry operations. Chemical analyses was performed on various types of nuclear fuels including Peach Bottom fuel, PSC fuel, HTGR nuclear fuel. This fuel typically contained 93% enriched uranium and thorium. The labs were authorized to have enriched uranium, thorium, mixed fission products, and tritium. Based on this, the labs were classified as a "suspect affected areas."

Lab 242- Beginning in early 1960's and through the 1970's, this lab was used to analyze nuclear fuel samples, fuel elements and fuel compacts. The lab was also used to determine fission products and induced activity concentrations in the conduct of other analyses of sleeves, spines, and reflectors of Peach Bottom nuclear fuel elements. Peach bottom fuel contained enriched uranium and thorium. Samples were counted in this lab (i.e., gamma spectroscopy and post irradiation analyses) and prepared for offsite analyses. The lab was authorized to handle fuel samples containing enriched uranium, thorium, mixed fission products and mixed activation products. The lab was classified as a

"non-suspect affected area".

Lab 325 - No history of use of radioactive materials. Therefore, this lab was classified as an "unaffected area."

Labs 443/445 and the Mezzanine above 443/445- Beginning in early 1974 into 1986 this lab was used for storage of Special Nuclear Materials (SNM) and source materials, including enriched uranium, depleted uranium and thorium. Therefore, these labs and mezzanine were classified as "non-suspect affected areas." The labs were re-classified to "suspect affected area" after uranium contamination was detected. The mezzanine above labs 443/445 remained a "non-suspect affected area".

Lab 615 - No history of use of radioactive materials: therefore, this lab was classified as an "unaffected area."

Lab 623- Beginning in early 1988 and up until 1994 this lab was used for storage and use of Special Nuclear Materials and source materials, including enriched uranium, depleted uranium and thorium.. Therefore, these labs were classified as a "non-suspect affected area."

INSTRUMENTATION

Table 3 lists the instruments used during the radiological surveys. The table includes: (1) a description of the instrument, (2) the model and serial numbers of the meters and detectors, (3) instrument ranges, (4) calibration due dates, (5) typical efficiencies, and (6) typical background count rates.

BACKGROUND MEASUREMENTS

Six (6) types of surfaces exist in the "Group 11" labs. These surfaces are tile over concrete, concrete, concrete block, dry wall, metal, and wood. Building 13 was selected for conducting background measurements due to the age of the building, because radioactive material has never been used in this building, and the various surfaces found in Building 2, could also be found in Building 13.

The fixed background measurements are shown in Table 4. The mean and standard deviation for each surface surveyed with the 100 cm^2 detector were calculated using equations 8-11 and 8-12 from NUREG/CR-5849 as shown below:

Equation (8-11):
$$\bar{x} = \frac{1}{n_s}\sum_{i=1}^{n_s} x_i$$

Equation (8-12):
$$s_x = \sqrt{\frac{\sum_{i=1}^{n} (\bar{x} - x_i)^2}{n-1}}$$

Background measurements and minimum detectable activities (MDA's) for each type of surface and for various counting times are also provided in Table 4. Minimum detectable activities (MDA's) for each type of surface, were calculated using equation (5-2) from NUREG/CR-5849 as shown below:

Equation (5-2):
$$MDA = \frac{2.71 + 4.65\sqrt{B_R \times t}}{t \times E \times \frac{A}{100}} (dpm/100cm^2)$$

Where:
B_R = *background rate (cpm)*
t = *count time (min)*
E = *efficiency*
A = *area of the detector* (cm^2)

SURVEY PLAN

Survey plans which documented the types of surveys to be performed and the locations were developed based upon the physical characteristics of the lab, the radioactive material used, the potential for contamination, and the results of the characterization surveys. The physical characteristics of the labs include the consideration of vents, ducts, whether surfaces are painted or unpainted, overhead structures, floor coverings, etc. Types of surveys performed include scanning, exposure rate measurements and survey measurements (wipes and fixed measurements). In areas where elevated readings were detected, additional surveys were taken.

The first surveys performed were surveys of the tile or floor covering. Only one contaminated tile was detected and that was in lab 238/240, all other floor coverings were at or near background levels. All the floor coverings and the mastic or glue were removed before the final surveys were started. The contaminated tile in 238/240 was removed and managed as low level waste before the rest of the tile was removed.

A comparison of the final radiological survey requirements in the Site Decommissioning Plan (SDP) with the surveys performed for the "Group 11" labs is provided in Table 8.

DECONTAMINATION

Contamination in labs 238/240 was found during scanning using a 434 cm^2 beta gas flow proportional detector. The maximum contamination level on the floor was 48,000 cpm , and the maximum contamination level on the wall was 10,000 cpm. A fixed reading was taken of the spot on the floor with the 100 cm^2 beta detector and it measured 6630 dpm/100 cm^2. A sample of the contaminated concrete was analyzed by gamma ray spectroscopy and the contaminant was identified as Cs-137. The floor required aggressive decontamination using a bead blast machine. As mentioned above, small areas of contamination were found on two walls and on the overhead

structures (i.e., I-beams and lights). The contaminated wallboard was removed and disposed of as radioactive waste. The ceiling and fixtures were decontaminated with foaming cleanser and paper towels.

Contamination was also detected on the overhead fixtures in the mezzanine above labs 238/240/242. These fixtures were decontaminated and subsequent surveys showed levels below the release criteria.

Small areas of contamination (i.e., <100 cm^2) were detected in labs 443/445. One area was on the floor and the other area was on the wall A paint sample was collected from the contaminated area on the wall and analyzed for gross alpha/beta activity. The results showed 51 dpm/100 cm^2 alpha activity and 757 dpm/100 cm^2 beta activity. Fixed radiation measurements were taken before and after removal of the paint sample. Measurements were 1203 dpm/100 cm^2 before the paint sample was removed and 1666 dpm/100 cm^2 after the paint sample was removed. A small section of concrete block was then removed and disposed of as radioactive waste. Subsequent measurements on and around this area showed that the levels were <189 dpm/100 cm^2. The small area on the floor was decontaminated to levels at or near background levels using a hammer and chisel. No decontamination was required in any other "Group 11" lab.

RESULTS OF THE FINAL SURVEYS

Comparison of Site Decommissioning Requirements with Survey Performed

A comparison of the final radiological survey requirements in the Site Decommissioning Plan (SDP) with the surveys performed for the "Group 11" labs is provided in Table 8. The table shows that sufficient surveys were performed in each lab to demonstrate compliance with the release criteria.

Scanning

In each area where tile was present, the tile was scanned over 100% of the surface using a floor monitor having a 434 cm^2 gas-flow proportional detector. After determining that the tile was clean, the tile was removed for the final survey.

Scanning of the floors, walls, and overhead fixtures was performed for alpha and/or beta radiations using a floor monitor with a 434 cm^2 gas-flow proportional detector whenever possible. In areas where the large area detectors could not be used, i.e., overhead structures and window sills, scanning was conducted using 15 cm^2 GM pancake detectors and/or 50 cm^2 alpha detectors.

In unaffected areas (labs 216, 325 and 615), 100% of the floors and lower walls (< 2m) were scanned for beta activity and 10% of the upper walls (> 2m) were scanned for beta activity. In addition, 10% of the floors were scanned for alpha activity. All results (shown in table 5 and associated figures) were at or near background levels.

In non-suspect affected areas (lab 242, mezzanine above labs 443/445 and lab 623), 100% of the floors and lower walls (< 2m) were scanned for beta activity and at least 10% of the floors were scanned for alpha activity. All results (shown in table 5 and associated figures) were at or near background levels. Initial scans in labs 443/445 showed elevated levels (see table 4 and associated figures). After decontamination, scan results were at or near background levels (see table 5).

In suspect affected areas (labs 238/240, mezzanine above labs 238/240/242 and labs 443/445) , 100% of the floors and lower walls (< 2m) were scanned for beta activity. In addition, 100% of the floors were scanned for alpha activity. In all suspect affected areas, 10% of the upper walls were also scanned for beta activity. On walls where contamination was detected on a lower wall (below 2 m), the upper portion of this wall was considered suspect. A supplemental survey of 25% of each of these upper walls was performed and the results (along with the instrument data) are provided in Figure 85. Final surveys in each of these labs after decontamination all showed levels that were at or near background levels (see table 5).

Fixed Measurements

In most cases, fixed measurements were performed using a beta gas-flow proportional counter having a 100 cm^2 detector. The counting time for the beta fixed measurements was two (2) minutes. In some cases, a 15 cm^2 GM detector was used to obtain fixed measurements primarily on overhead I-beams, lights, floor drains and other smaller surfaces. Alpha fixed measurements were obtained using the 50 cm^2 alpha detector. The counting time for each alpha fixed measurements was one minute.

For all fixed measurements, an appropriate background was determined for each type of surface and subtracted from the survey readings. The readings were converted to dpm/100 cm^2 using the efficiency of the detector.

The results of the fixed measurements are summarized in Table 5 and the locations are shown in the respective figure noted on Table 5. The location and results of the fixed measurements are also provided in the associated figures. A total of 240 fixed measurements were taken . The results show that all radiation levels were well below the release criteria, and in all cases were below 1000 dpm/100cm^2 (the maximum activity detected after decontamination was 767 dpm/100 cm^2) in labs 238/240 where Cs-137 was the contaminant (the release limit for Cs-137 is 5000 dpm/100 cm^2).

Removable Contamination Surveys

Removable contamination measurements (smears) were performed on all surfaces including the floors, walls, overhead structures, ducts, lights and support beams. Smear surveys consisted of using a Whatman Filter Paper (4.7 cm diameter) and wiping an area of ~100 cm^2. The smears were counted in GA's Health Physics Laboratory using a Canberra 2404 low level alpha/beta gas flow proportional counter.

A total of 377 smears were taken. The approximate locations where smears were collected are

shown in the Figures. The results of all removable contamination surveys are provided in Table 7. Removable contamination levels were all below the release criteria (alpha results were all <20 dpm/100 cm^2 and beta results were all <45 dpm/100 cm^2).

Exposure Rate Measurements

Direct radiation exposure rate measurements using a microR meter were taken in every room at randomly chosen areas. A total of 95 measurements were taken. The radiation levels ranged from 9-17 μR/hr, which are at or near normal background radiation levels.

INTERNAL CONFIRMATORY SURVEY

After completing its' final surveys, GA conducted internal confirmatory surveys of the "Group 11" labs. Small areas of additional contamination were detected on the floor in labs 238/240 and the overhead structures in these labs and on the mezzanine above labs 238/240/242. These areas were cleaned to levels below the release criteria and additional surveys performed. These supplemental surveys were in addition to the surveys performed for the confirmatory survey. A summary of each of the confirmatory surveys performed and the results are provided in Appendix A.

CONCLUSION

The results of the final and confirmatory surveys provided in this report, demonstrate that the labs, designated as **"Group 11"**, meet the NRC- and State- approved guidelines for release to unrestricted use.

TABLES

Table 1: USNRC'S ACCEPTABLE SURFACE CONTAMINATION LEVELS [1]

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

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

b As used in this table dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, an geometric factors associated with the instrumentation.

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

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

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

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

[1] **Guidelines For Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses For byproduct, Source, or Special Nuclear Material**, USNRC, July 1982, incorporated into GA's SNM 696 license.

Table 2: STATE OF CA ACCEPTABLE SURFACE CONTAMINATION LEVELS [1]

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

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

b As used in this table dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, an geometric factors associated with the instrumentation.

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

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

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

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

[1] Guidelines For Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses For byproduct, Source, or Special Nuclear Material, also known as "Decon-1" incorporated into GA's State of CA Radioactive Materials License.

Table 3: List of Instruments

Meter S/N	Detector	Detector S/N	Calibration Due Date	Efficiency	Range (cpm)	Background (cpm)	Description
Ludlum Rate Meter Model 2221 S/N 84734	Ludlum Model 43-37 434cm^2 Alpha	86236	04/20/99	21.65%	Four Linear Ranges 0-500,000 & One Log 50-500,000	See Table 4	The instrument is a gas-flow proportional counter with an active probe area of 434 cm^2. The detector and rate meter are combined and mounted on a roll around cart. The instrument features a static-flow system, quick connects, a portable gas bottle and a means to adjust the height of the detector from the floor for optimum performance.
Ludlum Rate Meter Model 2221 S/N 86302	Ludlum Model 43-37 434cm^2 Alpha	86215	01/24/00	21.70%	Four Linear Ranges 0-500,000 & One Log 50-500,000	See Table 4	The instrument is a gas-flow proportional counter with an active probe area of 434 cm^2. The detector and rate meter are combined and mounted on a roll around cart. The instrument features a static-flow system, quick connects, a portable gas bottle and a means to adjust the height of the detector from the floor for optimum performance.
Ludlum Rate Meter Model 2221 S/N 84459	Ludlum Model 43-37 434cm^2 Beta	86213	07/14/99	21.27%	Four Linear Ranges 0-500,000 & One Log 50-500,000	See Table 4	The instrument is a gas-flow proportional counter with an active probe area of 434 cm^2. The detector and rate meter are combined and mounted on a roll around cart. The instrument features a static-flow system, quick connects, a portable gas bottle and a means to adjust the height of the detector from the floor for optimum performance.
Ludlum Rate Meter Model 2221 S/N 86332	Ludlum Model 43-68 100 cm^2 Beta	142540	07/08/99	25.29%	Four Linear Ranges 0-500,000 & One Log 50-500,000	See Table 4	The instrument is a gas-flow proportional counter with an active probe area of 100 cm^2. The detector and rate meter are combined on a roll around cart. The instrument features a static-flow system, quick connects and a portable gas bottle. Used for taking fixed measurements.
Ludlum Rate Meter Model 2221 S/N84423	Ludlum Model 43-68 100 cm^2 Beta	119444	03/11/99	27.25%	Four Linear Ranges 0-500,000 & One Log 50-500,000	See Table 4	The instrument is a gas-flow proportional counter with an active probe area of 100 cm^2. The detector and rate meter are combined on a roll around cart. The instrument features a static-flow system, quick connects and a portable gas bottle. Used for taking fixed measurements.

Table 3: List of Instruments

Meter S/N	Detector	Detector S/N	Calibration Due Date	Efficiency	Range (cpm)	Background (cpm)	Description
Ludlum Model 3 S/N 138880	Ludlum Model 44-9 15 cm^2 Beta/Gamma	145963	06/02/99	22.05%	Four Ranges 0-500,000	See Table 4	The instrument is used for beta/gamma surveying. The detector has an active probe area of 15 cm^2.
Ludlum Model 12 S/N 138738	Ludlum Model 43-65 50 cm^2 Alpha	142349	07/18/99	21.85%	Four Ranges 0-500,000	0-5	Alpha Scintillator ZnS(Ag) with an active probe area of 50 cm^2.
Ludlum Model 19 Micro-R Meter S/N 87120	RCA 6199 coupled to a NaI (Tl) Scintillator	N/A	05/27/99	N/A	Five Ranges 0-5,000 μR/hr	10-18 μR/hr	Used for measuring external exposure rates on the surface and at one (1) meter from the surface (i.e., initial ground floor surveys). The scintillator [1"x 1" NaI (Tl)] is mounted internally.
Ludlum Model 19 Micro-R Meter S/N 144746	RCA 6199 coupled to a NaI(Tl) Scintillator	N/A	04/28/99	N/A	Five Ranges 0-5,000 μR/hr	10-18 μR/hr	Used for measuring external exposure rates on the surface and at one (1) meter from the surface (i.e., initial ground floor surveys). The scintillator [1"x 1" NaI (Tl)] is mounted internally.
Ludlum Model-3 S/N 139168	Ludlum Model 44-9 15 cm^2 Beta/Gamma	145981	08/06/99	21.05%	Four Ranges 0-500,000	See Table 4	The instrument is used for beta/gamma surveying. The detector has an active probe area of 15 cm^2
Ludlum Model-3 S/N 143349	Ludlum Model 44-9 15 cm^2 Beta/Gamma	145967	11/08/99	21.25%	Four Ranges 0-500,000	See Table 4	The instrument is used for beta/gamma surveying. The detector has an active probe area of 15 cm^2

Table 4: Background Measurements (Obtained from Building 13)		
Ludlum Model 2221 Rate Meter s/n 84459 With Model 43-37 Probe s/n 086213 Beta Floor Monitor Background Scan Results: 434cm^2 Detector (Efficiency=21.27%)		
Background Material	Beta/Gamma Scan Range in cpm	
Concrete	1858-2036	
Sheetrock	770-937	
Wood	1061-1262	
Glass	787-917	
Metal	816-1047	
Cement Block	1174-1409	
Ludlum Model 2221 Rate Meter s/n 84734 With Model 43-37 Probe s/n 086236 Alpha Floor Monitor Background Scan Results: 434 cm^2 Detector (Efficiency 21.65%)		
Background Material	Alpha Scan Range (cpm)	
Concrete	4-24	
Sheetrock	0-20	
Ludlum Model 2221 Rate Meter s/n 86302 With Model 43-37 Probe s/n 086215 Alpha Floor Monitor Background Scan Results: 434 cm^2 Detector (Efficiency 21.70%)		
Background Material	Alpha Scan Range (cpm)	
Metal	853-1185	
Ludlum Model 2221 Rate Meter s/n 86332 With Model 43-68 Probe s/n 142540 100 cm^2 Beta Detector (Efficiency=25.29%)		
Background Material	Average of 10 Measurements 2 minutes each (cpm ±2σ)	MDA (dpm/100 cm^2)
Concrete	1059 ±37	267
Drywall	581 ±19	199
Concrete Blocks	919 ±54	249
Ludlum Model 2221 Rate Meter s/n 84423 With Model 43-68 Probe s/n 119444 100 cm^2 Beta Detector (Efficiency 27.25%)		
Background Material	Average of 10 Measurements 2 Minutes each (cpm ±2σ)	MDA (dpm/100cm^2)
Concrete	1011 ±24	212
Drywall	542 ±31	156

Table 4: Background Measurements (Obtained from Building 13)		
Metal	655 ±35	171
Concrete Blocks	803 ±32	189

Ludlum Model 3 Rate Meter s/n 138880 With Model 44-9 Probe s/n 145963 15 cm^2 Beta Detector (Efficiency=22.05%)	
Background Material	Beta/Gamma Range in cpm
Concrete	100-140
Concrete Block	80-140
Drywall	60-100
Metal	80-100
Glass	60-100

Ludlum Model 3 Rate Meter s/n 139168 With Model 44-9 Probe s/n 145981 15cm^2 Beta Detector (Efficiency=21.05%)	
Background Material	Beta/Gamma Range in cpm
Concrete	80-100
Concrete Block	60-100
Drywall	40-60
Metal	60-100
Glass	40-60

Ludlum Model 3 Rate Meter s/n 143349 With Model 44-9 Probe s/n 145967 15cm^2 Beta Detector (Efficiency=21.25%)	
Background Material	Beta/Gamma Range in cpm
Concrete	80-120
Concrete Block	60-100
Drywall	40-100
Metal	80-120
Glass	60-100

Table 5: Results of Final Surveys in Building 2 Group 11

Figure #	Location	Scan Results 15 cm² GM	Scan Results 434 cm² (Floor monitor)		# of Fixed β Measurements (with 100 cm² detector)	Maximum β Result (dpm/100 cm²)	# of Paint Samples	Paint Sample Results	
		β γ cpm	α cpm	β cpm				α dpm/100cm²	β dpm/100cm²
Lab 216: Unaffected Area									
Large Area Masslinn Cloth Wipes were taken on the floor and lower wall surfaces before surveys were conducted. Masslinn cloths measured ≤ background levels for α & β activity.									
3	Scan, Floor (10% **alpha** with 434 cm² detector)	---	<20	---	---	---	---	---	---
4,5	Scan, Floor (100% **beta** with 434 cm² detector)	---	---	1700-2000	16	<212[5] (MDA)	---	---	---
4	Scan, Walls (100% **beta** 2m up, 10% above 2 m, with 434 cm² probe)	--	--	900-1800	--	--	--	---	---
6	Paint Samples, one each wall (2 min. Fixed **beta** readings were taken before and after sampling)	---	---	---	8	<156[1] <189[3] (MDA)	4	<10	12
9	Scan, Overhead Fixtures (25% **beta** with 15 cm² detector)	<80 (<1500 dpm/100 cm²)	---	---	---	---	---	---	---
Labs 238/240: Suspect Affected Area									
Large Area Masslinn Cloth Wipes were taken on the floor and lower wall surfaces before surveys were conducted. Masslinn cloths measured ≤ background levels for α & β activity.									
10	Scan, Floor (100% **alpha** with 434 cm² detector)	---	<20	---	---	---	--	---	---

Table 5: Results of Final Surveys in Building 2 Group 11

Figure #	Location	Scan Results 15 cm² GM	Scan Results 434 cm² (Floor monitor)		# of Fixed β Measurements (with 100 cm² detector)	Maximum β Result (dpm/100 cm²)	# of Paint Samples	Paint Sample Results	
		β γ cpm	α cpm	β cpm				α dpm/100cm²	β dpm/100cm²
11	**Initial Survey** Scan, **Floor** (100% **beta** with 434 cm² detector)	---	---	1800-8800 (one area was 48,000)	---	---	---	---	---
12, 13	**Final Survey** Scan, **Floor** (100% **beta** with 434 cm² detector) and Fixed measurements	---	---	1800-2500	17	767	---	---	---
11	**Initial Survey** Scan, **Walls** with 434 cm² probe (100% **beta** up 2m)	---	--	1100 - 2800 (One spot was 30,000)	---	---	---	---	---
13	**Final Survey** Scan, **Walls** (100% **beta** decontaminated areas only with 15 cm² detector	100 (<1500 dpm/100 cm²)	---	---	---	---	---	---	---
16	Paint Samples, one each wall. (2 min. Fixed **beta** readings were taken before and after sampling)	--	--	--	8	158 <189[3] (MDA)	4	<10	25
18	**Initial Survey** Scan Overhead Fixtures(100% **beta** with 15 cm² detector)	200-800	---	---	---	---	---	---	---
19	**Final Survey** Scan, Overhead Fixtures (100% **beta** with 15 cm² detector)	200 -220 Maximum 3,646 dpm/100 cm²	---	---	---	---	---	---	---

Table 5: Results of Final Surveys in Building 2 Group 11

Figure #	Location	Scan Results 15 cm² GM	Scan Results 434 cm² (Floor monitor)		# of Fixed β Measurements (with 100 cm² detector)	Maximum β Result (dpm/100 cm²)	# of Paint Samples	Paint Sample Results	
		β γ cpm	α cpm	β cpm				α dpm/100cm²	β dpm/100cm²
Mezzanine Above Labs 238/240/242: Suspect Affected Area									
Large Area Masslinn Cloth Wipes were taken on the floor and lower wall surfaces and stairs/handrails before surveys were conducted. Masslinn cloths measured ≤ background levels for α & β activity.									
22	**Initial Survey** Scan, Floors (100% **beta** with 434 cm² detector)	---	---	1100-1500	---	---	---	---	---
22	**Initial Survey** Scan, Walls with 434 cm² probe 100% **beta** up 2m	---	---	Up 2m 1100-1700 (Two spots 3000 & 5200) above 2m -	---	---	---	---	---
23, 24	**Final Survey** Scan, Walls, two spots that required decontamination and Fixed measurements	60 (<1500 dpm/100 cm²)	---	---	16	<171[2] (MDA)	---	---	---
26	Paint Samples, one each wall. (2 min. Fixed **beta** readings were taken before and after sampling)	---	---	---	8	<156[1] <189[3] (MDA)	4	<10	13
27	Scan, I-Beams and Window Sills 100% **beta** with 15 cm² detector	<60 (<1500 dpm/100 cm²)	---	---	---	---	---		
28	**Initial Survey** Scan, Overhead Fixtures, 100% **Beta** with 15 cm² detector	60 - 600 (~15,000 dpm/100 cm²)	---	---	---	---	---	---	---

Table 5: Results of Final Surveys in Building 2 Group 11

Figure #	Location	Scan Results 15 cm² GM	Scan Results 434 cm² (Floor monitor)		# of Fixed β Measurements (with 100 cm² detector)	Maximum β Result (dpm/100 cm²)	# of Paint Samples	Paint Sample Results	
		β γ cpm	α cpm	β cpm				α dpm/100cm²	β dpm/100cm²
29	**Final Survey** Scan, Overhead Fixtures, 100% **beta** with 15 cm² detector after decontamination	100 -200 (~3780 dpm/100 cm²)	---	---	---	----	---	---	---
32	Scan, Stairs 100% **beta** with 15 cm² detector	<80 (<1500 dpm/100 cm²)	---	---	---	---	---	---	---
	Lab 242: Non-Suspect Affected Area								
	Large Area Masslinn Cloth Wipes were taken on the floor and lower wall surfaces and stairs/handrails before surveys were conducted. Masslinn cloths measured ≤ background levels for α & β activity								
33	Scan, Floors (100% **alpha** with 434 cm² detector)	---	<20	---	---	---	--	---	---
34, 35	Scan, Floors (100% **beta** with 434 cm² detector) and Fixed measurements	---	---	1800-2400	16	<212[5] (MDA)	---	---	---
34	Scan, Walls (100% **beta** up 2m and 10% above 2m, with 434 cm² probe)	---	---	Lower Walls 900-1800 Upper Walls 1100-1800	---	---	---	---	---
37	Paint Samples, one each wall. (2 min. Fixed **beta** readings were taken before and after sampling)	---	---	---	8	<189[3] <156[1] (MDA)	4	<10	44
39	Scan, Overhead Fixtures (25% **beta** with 15 cm² probe)	<80 (<1500 dpm/100 cm²)	---	---	---	---	---		

Table 5: Results of Final Surveys in Building 2 Group 11

Figure #	Location	Scan Results 15 cm² GM	Scan Results 434 cm² (Floor monitor)		# of Fixed β Measurements (with 100 cm² detector)	Maximum β Result (dpm/100 cm²)	# of Paint Samples	Paint Sample Results	
		β γ cpm	α cpm	β cpm				α dpm/100cm²	β dpm/100cm²
Lab 325: Unaffected Area									
Large Area Masslinn Cloth Wipes were taken on the floor and lower wall surfaces before surveys were conducted. Masslinn cloths measured ≤ background levels for α & β activity.									
41	Scan, Floor (100% **alpha** with 434 cm² detector)		<20						
42, 43	Scan, Floors (100% **beta** with 434 cm² detector) and Fixed measurements			1200-2200	16	<212[5] (MDA)			
42	Scan, Walls (100% **beta** up 2m and 10% above 2m, with 434 cm² probe)	---	---	900-1800 (up 2m) 1000-1600 (above 2m)	---	---	---	---	---
45	Paint Samples, one each wall. (2 min. Fixed **beta** readings were taken before and after sampling)	---	---	---	8	<189[3] <156[1] (MDA)	4	<10	13
47	Scan, Overhead Fixtures (25% **beta** with 15 cm² probe)	<80 (<1500 dpm/100 cm²)	---	---	---	---	---	---	---
49	Scan, Trench, 100% alpha in opened area. Results of 2 min. Direct beta measurements		<20		3	<212[5] MDA	---	---	---
51	Drain	----	---	---	1	<171[2] (MDA)	---	---	---

Table 5: Results of Final Surveys in Building 2 Group 11

Figure #	Location	Scan Results 15 cm² GM	Scan Results 434 cm² (Floor monitor)		# of Fixed β Measurements (with 100 cm² detector)	Maximum β Result (dpm/100 cm²)	# of Paint Samples	Paint Sample Results	
		β γ cpm	α cpm	β cpm				α dpm/100cm²	β dpm/100cm²
Labs 443/445: Suspect Affected Area									
Large Area Masslinn Cloth Wipes were taken on the floor and lower wall surfaces before surveys were conducted. Masslinn cloths measured ≤ background levels for α & β activity.									
52	Scan, Floor (100% **alpha** with 434 cm² detector)	---	100	---	---	---	---	---	---
53, 54	Scan, Floors (100% **beta** with 434 cm² detector) and Fixed measurements	---	---	1700-2400 (One spot measured 3000cpm, see Fig. 53)	17	<212[5] (MDA)	---	---	---
52	Scan, Walls (100% **alpha** up 2m with 434 cm² detector) (10% obove 2m)	---	<20	---	---	---	---	---	---
53, 54	Scan, Walls (100% **beta** up 2m with 434 cm² detector) (10% above 2m)	---	---	1000-1500	22	<156[1] <189[3] (MDA)	---	---	---
55	Drains, fixed measurements, two min. **beta** and one min. **alpha**	---	<2	---	2	<171[2] (MDA)	---	---	---
57	Paint Samples, 6 total. (2 min. Fixed **beta** readings were taken before and after sampling)	---	---	---	12	Sample #1 fixed measurement on wall 1666 dpm/100cm² before decon. <u><189[3] after decon</u> Samples 2 - 6 <156[1], <189[3] MDA	6	#1 = 51 #2-6 = <10	#1 = 572 #2-6=78

Table 5: Results of Final Surveys in Building 2 Group 11

Figure #	Location	Scan Results 15 cm² GM	Scan Results 434 cm² (Floor monitor)		# of Fixed β Measurements (with 100 cm² detector)	Maximum β Result (dpm/100 cm²)	# of Paint Samples	Paint Sample Results	
		β γ cpm	α cpm	β cpm				α dpm/100cm²	β dpm/100cm²
59	Scan, Overhead fixtures, (100% **alpha** with 50 cm² detector)	---	<25 MDA for 50 cm²	---	---	---	---	---	---
60	Scan, Overhead (50% **beta** with 434 cm² detector)	---	---	900-1500	---	---	---	---	---
Mezzanine Above Labs 443/445 : Non-Suspect Affected Area									
Large Area Masslinn Cloth Wipes were taken on the floor and lower wall surfaces before surveys were conducted. Masslinn cloths measured ≤ background levels for α & β activity.									
62	Scan, Floor (10% **alpha** with 434 cm² detector)	---	<20	---	---	---	---	---	---
63, 64	Scan, Floors (100% **beta** with 434 cm² detector) and Fixed measurements	---	---	1000-1200	16	<171[2] (MDA)	---	---	---
63	Scan, Walls (100% **beta** up 2m with 434 cm² detector) (10% above 2m)	---	---	700-1300	---	--	---	---	---
66	Paint Samples, (2 min. Fixed **beta** readings were taken before and after sampling)	---	---	---	8	<156[1] <189[3] (MDA)	4	<10	<11
67, 69	Scan, Overhead fixtures and windows, (25% **beta** with 434 cm² detector)	---	---	800-1000	---	---	---	---	---

Table 5: Results of Final Surveys in Building 2 Group 11

Figure #	Location	Scan Results 15 cm² GM	Scan Results 434 cm² (Floor monitor)		# of Fixed β Measurements (with 100 cm² detector)	Maximum β Result (dpm/100 cm²)	# of Paint Samples	Paint Sample Results	
		β γ cpm	α cpm	β cpm				α dpm/100cm²	β dpm/100cm²
Lab 615: Unaffected Area									
Large Area Masslinn Cloth Wipes were taken on the floor and lower wall surfaces before surveys were conducted. Masslinn cloths measured ≤ background levels for α & β activity.									
70	Scan, Floor (10% **alpha** with 434 cm² detector)	---	<20	---	---	---	---	---	---
71, 73	Scan, Floors (100% **beta** with 434 cm² detector) and Fixed measurements	---	---	1700-2000	16	<212[5] (MDA)	---	---	---
71	Scan, Walls (100% **beta** up 2m with 434 cm² detector) (10% above 2m)			900-2000					
72	Scan, Crack in Floor (100% **beta** with 15 cm² detector)	<80 (<1500 dpm/100 cm²)							
76	Paint Samples, (2 min. Fixed **beta** readings were taken before and after sampling)	---	---	---	6	<156[1] <189[3] (MDA)	3	<10	<12
78	Scan, Overhead (25% **beta** with 15 cm² detector)	<80 (<1500 dpm/100 cm²)	---	---	---	---	---	---	---
Lab 623: Unaffected Area									
Large Area Masslinn Cloth Wipes were taken on the floor and lower wall surfaces before surveys were conducted. Masslinn cloths measured ≤ background levels for α & β activity.									
79	Scan, Floor (100% **alpha** with 434 cm² detector)	---	<20	---	---	---	---	---	---

Table 5: Results of Final Surveys in Building 2 Group 11

Figure #	Location	Scan Results 15 cm² GM	Scan Results 434 cm² (Floor monitor)		# of Fixed β Measurements (with 100 cm² detector)	Maximum β Result (dpm/100 cm²)	# of Paint Samples	Paint Sample Results	
		β γ cpm	α cpm	β cpm				α dpm/100cm²	β dpm/100cm²
80, 81	Scan, Floors (100% **beta** with 434 cm² detector) and Fixed measurements	---	---	1700-2000	12	554	---	---	---
80, 81	Scan, Walls (100% **beta** up 2m with 434 cm² detector) (10% above 2m)	---	---	900-1700	---	---	---	---	---
83	Paint Samples, (2 min. Fixed **beta** readings were taken before and after sampling)				8	<199[4] <249[6] (MDA)	4	<10	<10
85	Scan, Overhead Fixtures (25% **beta** 15 cm² detector)	<80 (<1500 dpm/100 cm²)	---	---	---	---	---	---	---
Supplemental Survey in Labs 238/240, Mezzanine Above Labs 238/240/242, and Labs 443/445									
86	Scan walls above 2m with 434 cm² detector 25% on suspect affected walls			See Figure 86 for results.					

1. 156 dpm/100 cm² = the MDA of Drywall
2. 171 dpm/100 cm² = the MDA of Metal
3. 189 dpm/100 cm² = the MDA of Cement Block
4. 199 dpm/100 cm² = the MDA of Drywall
5. 212 dpm/100 cm² = the MDA of Concrete
6. 249 dpm/100 cm² = the MDA of Cement Block
7. 220 dpm/100 cm² = the MDA of Concrete

Table 6: Exposure Rate Measurements in Group 11 Labs			
Location	Figure #	Number of Measurements	Range of Exposure Rate Measurements (μR/hr) at 1 Meter From the Surface
Lab 216	8	6	11-13
Lab 238/240 **Initial Survey**	17	9	12-16
Lab 238/240 **Final Survey**	17A	8	14-16
Mezzanine above Labs 238/240/242	--*	15	9-12
Lab 242	38	8	12-15
Lab 325	46	6	12
Lab 443/445	58	7	10-12
Lab 443/445 Additional measurements	--*	16	10-13
Mezzanine above Labs 443/445	--*	4	7-8
Lab 615	77	8	14-17
Lab 623	84	8	12-15

*Measurements taken ~ 1/4 m^2

Table 7: Results of Removable Contamination Survey Group 11				
Figure #	Number of Smears on each Surface	Removable Activity Measurements		
		Total Number of Smears	Maximum Activity (dpm/100 cm²)	
			Alpha	Beta
Lab 216				
7 7 9	8 Floor 8 Walls 4 Overhead Fixtures	20	<10	<15
Lab 238/240 (Initial Survey)				
14 15 32 20	49 Floor 8 Walls 13 Stairs 17 Overhead Fixtures	87	<15	<40
Lab 238/240 (Final Survey)				
14A 21	15 Floor 20 Overhead Fixtures	35	<20	<35
Mezzanine above Labs 238/240/242 (Initial Survey)				
25 25 30	10 Floor 6 Walls 20 Overhead Fixtures	36	<10	<15
Mezzanine above Labs 238/240/242 (Final Survey)				
31	28 Overhead Fixtures	28	<10	<20
Lab 242				
36 36 40	10 Floor 6 Walls 7 Overhead Fixtures	23	<10	<45
Lab 325				

Table 7: Results of Removable Contamination Survey Group 11				
Figure #	Number of Smears on each Surface	Removable Activity Measurements		
		Total Number of Smears	Maximum Activity (dpm/100 cm²)	
			Alpha	Beta
44 51 44 47 50	10 Floor 1 Floor drain 6 Walls 5 Overhead Fixtures 3 Trench	25	<10	<10
Lab 443/445				
56 56 61	19 Floor 19 Walls 10 Overhead Fixtures	48	< 15	<15
Mezzanine above Labs 443/445				
65 65 68	10 Floor 6 Walls 13 Overhead Fixtures	29	<10	<15
Lab 615				
74 75 78	16 Floor 8 Walls 2 Overhead Fixtures	26	<10	<10
Lab 623				
82 82 85	10 floor 4 Walls 6 Overhead Fixtures	20	<10	<15
Total Smears		377		

Table 8: Comparison of the Site Decommissioning Plan (SDP) with Surveys Performed

Lab	Scans						Measurements		Paint Samples		Exposure Rate Measurements	
	Floors and Walls below 2m		Walls above 2m		Overhead Fixtures							
	SDP	Survey	SDP	Survey	SDP	Survey	SDP	Survey	SDP	Survey	SDP	Survey
Unaffected Areas												
Lab 216 (31 m^2)	10%	10% α 100% β	None	10% β	0	25%	30	44 24 Fixed 20 Smears	0	4	3 1/10 m^2	6
Lab 325 (50 m^2)	10%	100% α 100% β	None	10% β	0	25%	30	49 24 Fixed 25 Smears	0	4	5 1/10 m^2	6
Lab 615 (41 m^2)	10%	10% α 100% β	None	10% β	0	25%	30	48 22 Fixed 26 Smears	0	3	4 1/10 m^2	8
Non-Suspect Affected Area												
Lab 623 (31 m^2)	10%	100% α 100% β	None	10% β	0	25%	30	40 20 Fixed 20 Smears	0	4	3 1/10 m^2	8
Lab 242 (41 m^2)	10%	100% α 100% β	None	10% β	0	25%	30	47 24 Fixed 23 Smears	0	4	4 1/10 m^2	8
Mezzanine above Labs 443/445 (41 m^2)	10%	10% α 100% β	None	10% β	0	25%	30	53 24 Fixed 29 Smears	0	4	4 1/10 m^2	4

Table 8: Comparison of the Site Decommissioning Plan (SDP) with Surveys Performed

Lab	Scans						Measurements		Paint Samples		Exposure Rate Measurements	
	Floors and Walls below 2m		Walls above 2m		Overhead Fixtures							
	SDP	Survey	SDP	Survey	SDP	Survey	SDP	Survey	SDP	Survey	SDP	Survey
Suspect Affected Areas												
Lab 238/240 (50 m^2)	100%	100% α 100% β	25% of suspect upper walls	25% of 2 suspect upper walls* 10% β of other 2 walls	25	100% β	30	147 25 Fixed 122 Smears	0	4	13 1/ 4 m^2	17
238/240/242 Mezzanine (60 m^2)	100%	100% α 100% β	25% of suspect upper walls	25% of 1 suspect upper wall* 10% β of other 3 walls	25	100% β	30	88 24 Fixed 64 Smears	0	4	15 1/4 m^2	15
Lab 443/445 (61 m^2)	100%	100% α 100% β	25% of suspect upper walls	25% of 1 suspect upper wall* 10% β of other 3 walls	25	100% α 50 % β	30	101 53 Fixed 48 Smears	0	6	15 1/ 4 m^2	23

* If contamination was detected on a lower wall (< 2m) , the upper wall of this wall was suspect and 25% of the wall was then scanned. If no contamination was detected on a lower wall (< 2 m), then 10% of the upper wall of this wall was scanned.

FIGURES

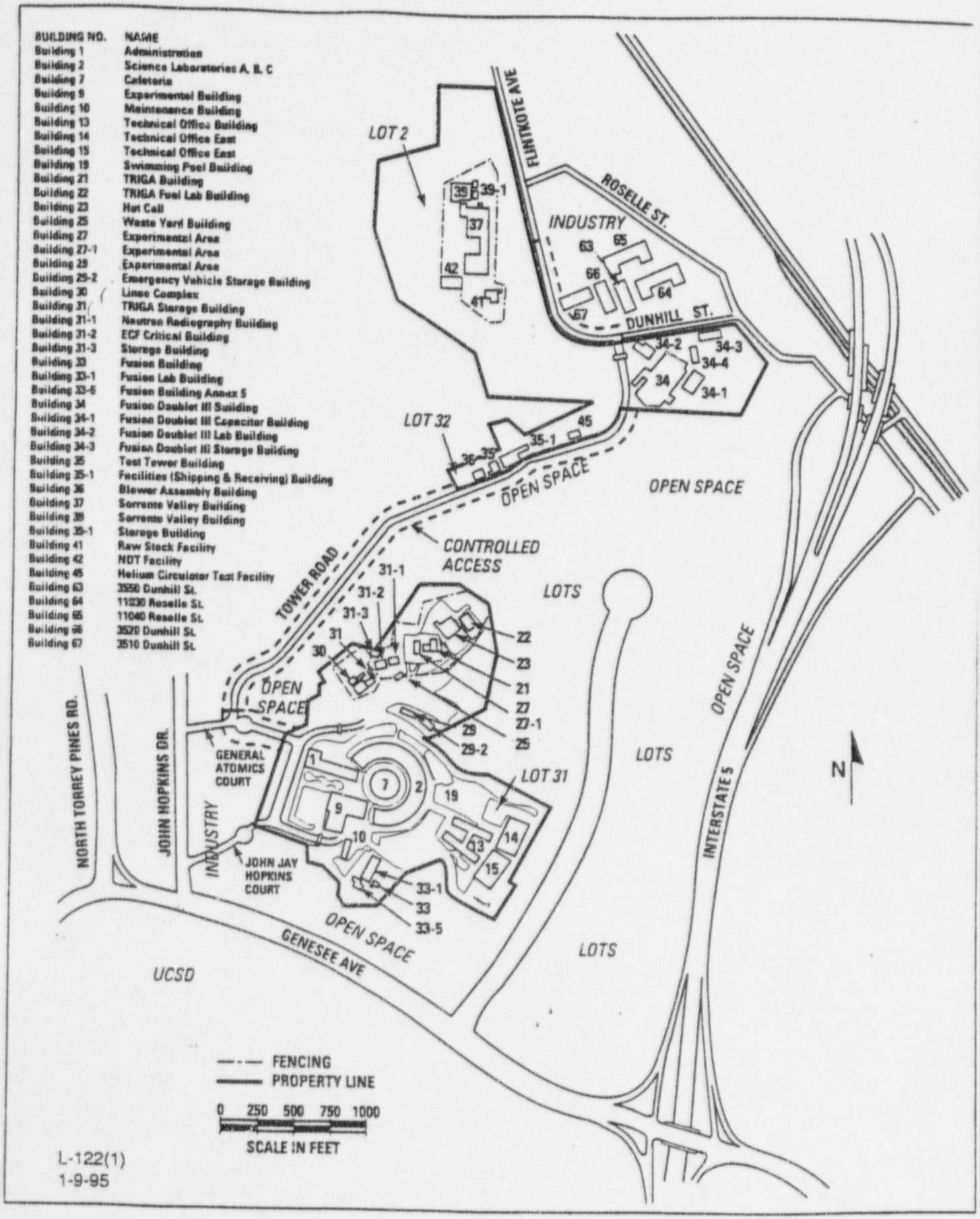


Figure 1. General Atomics Site

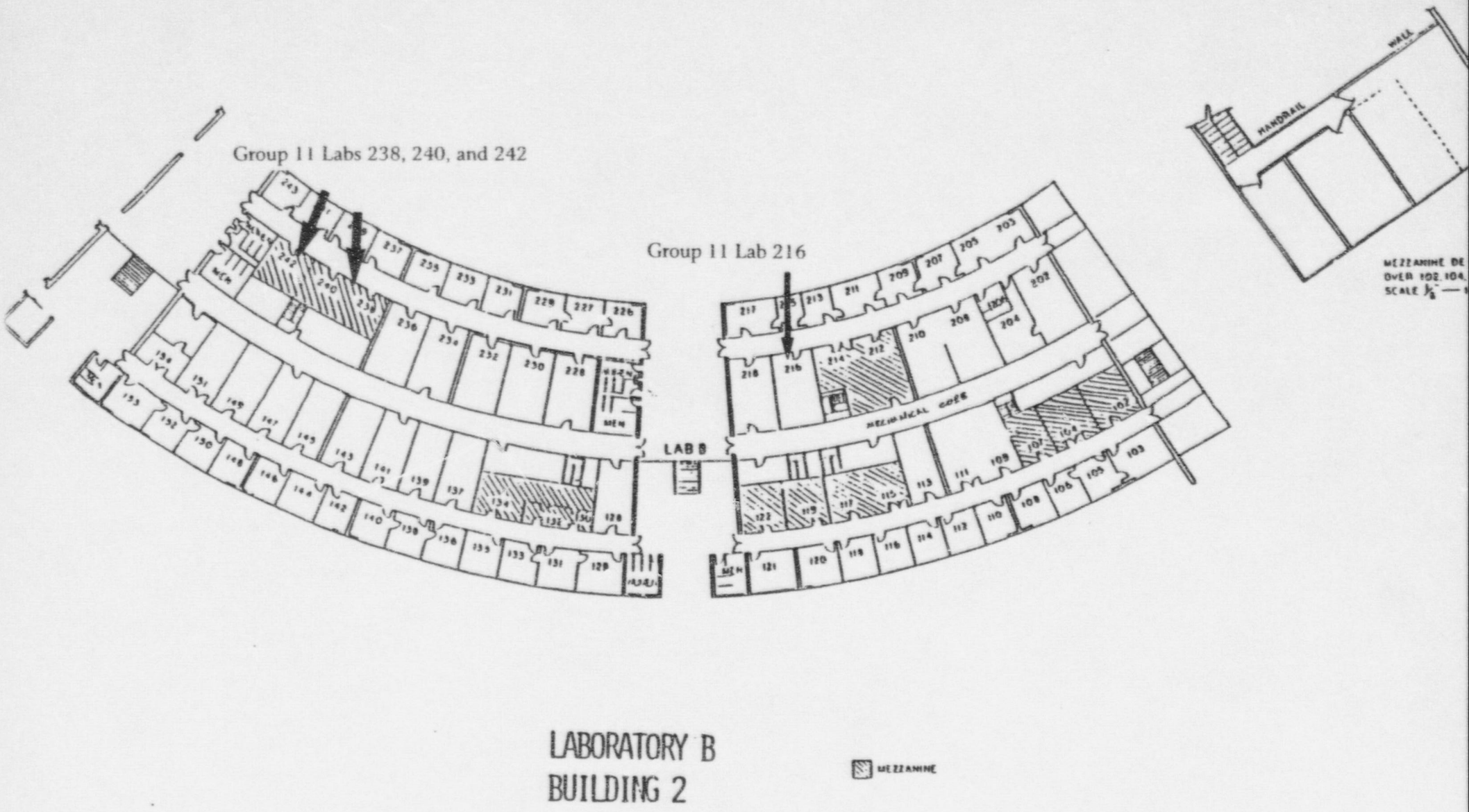
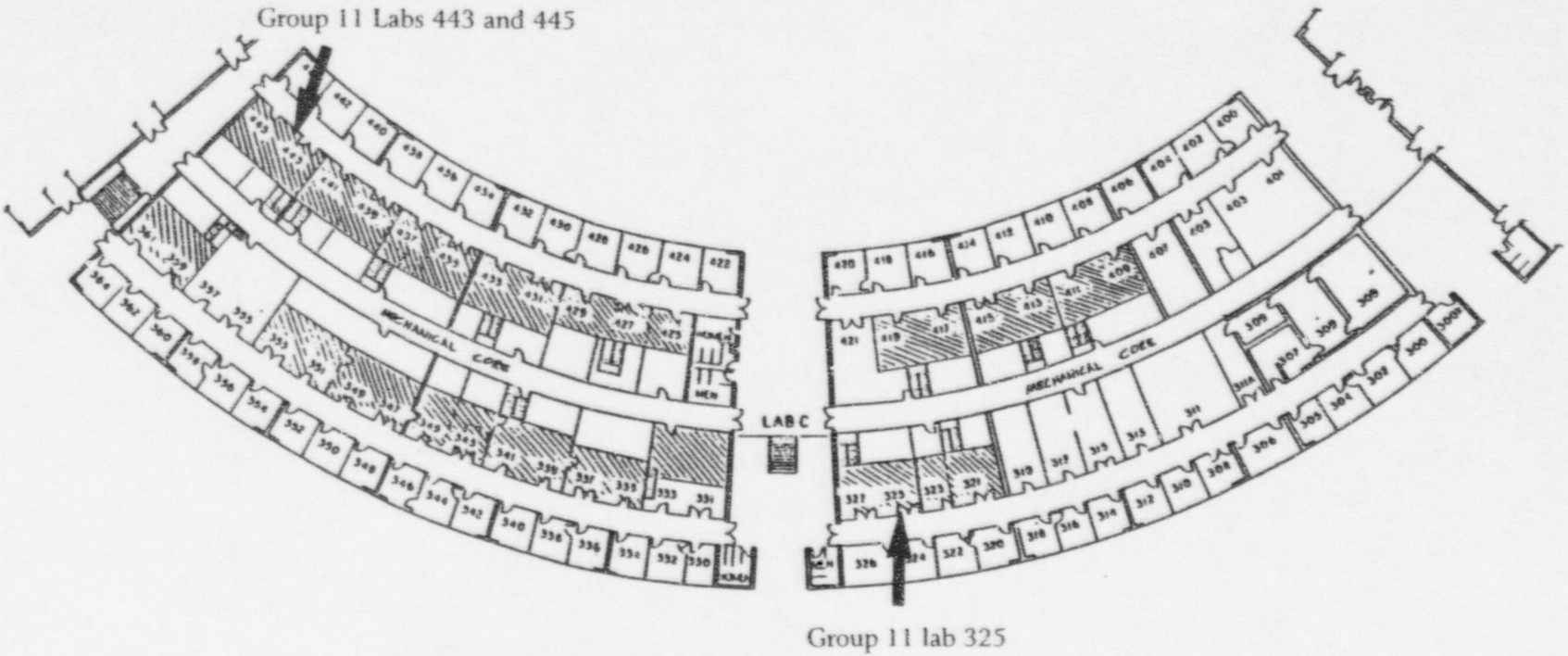
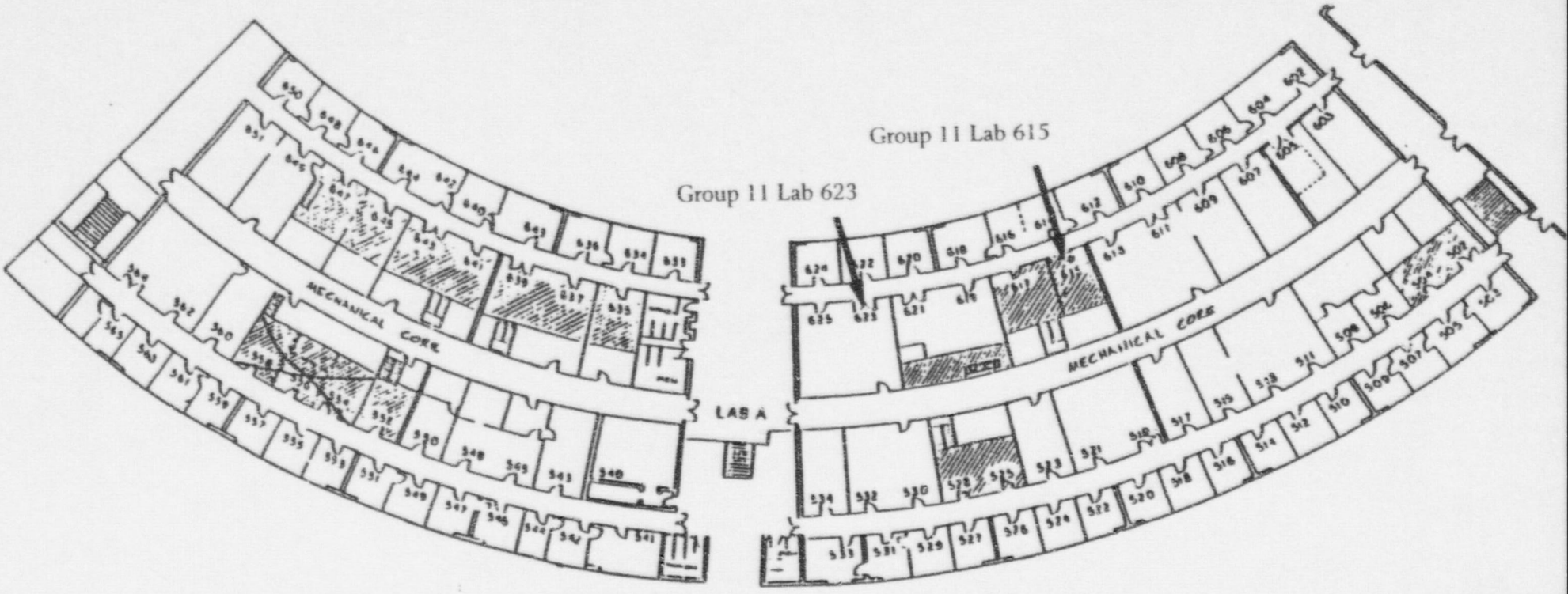


Figure 2A Building 2 Laboratory Locations



LABORATORY C BUILDING 2

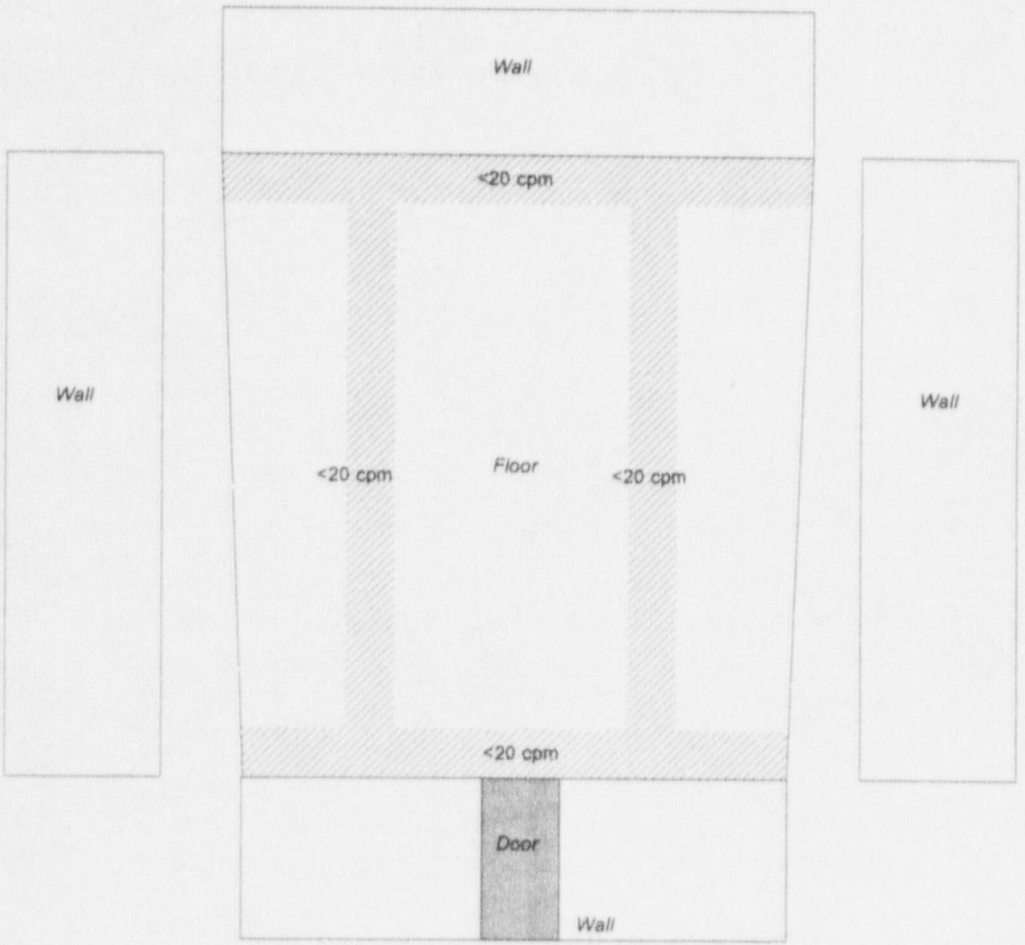
Figure 2B Building 2 Laboratory Locations



LABORATORY A BUILDING 2

Figure 2C Building 2 Laboratory Locations

Figure 3: Lab 216: Alpha Scan



Notes:

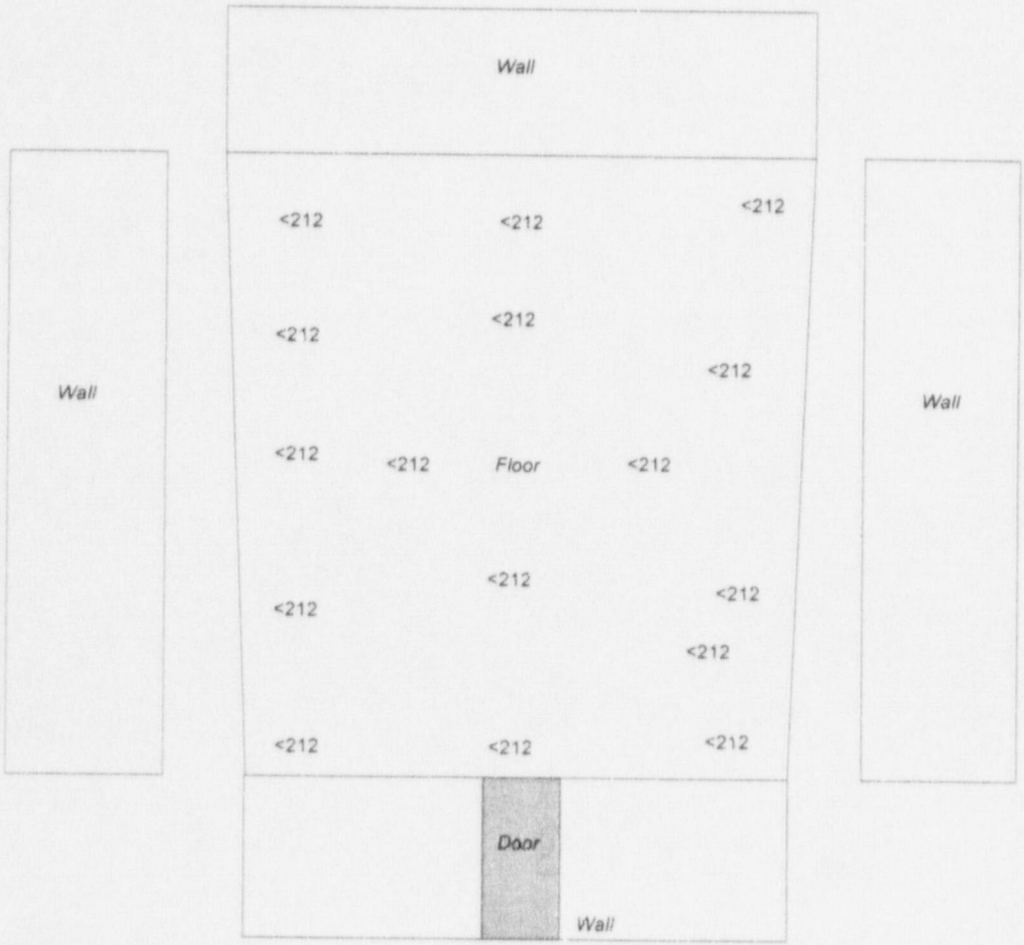
1. Survey results are provided in Table 5.
2. ~10% of the floor was scanned for Alpha. Scan results in cross hatched area.
3. All concrete surface.

Figure 4: Lab 216: Beta Scan

Notes:

1. Survey results are provided in Table 5.
2. ~100% of the Floor and Walls (2m up) were scanned for Beta. Scan results in cross hatched area. ~10% of the walls (above 2m) were scanned for Beta.
3. All concrete, cement block, sheetrock, and drywall surfaces.

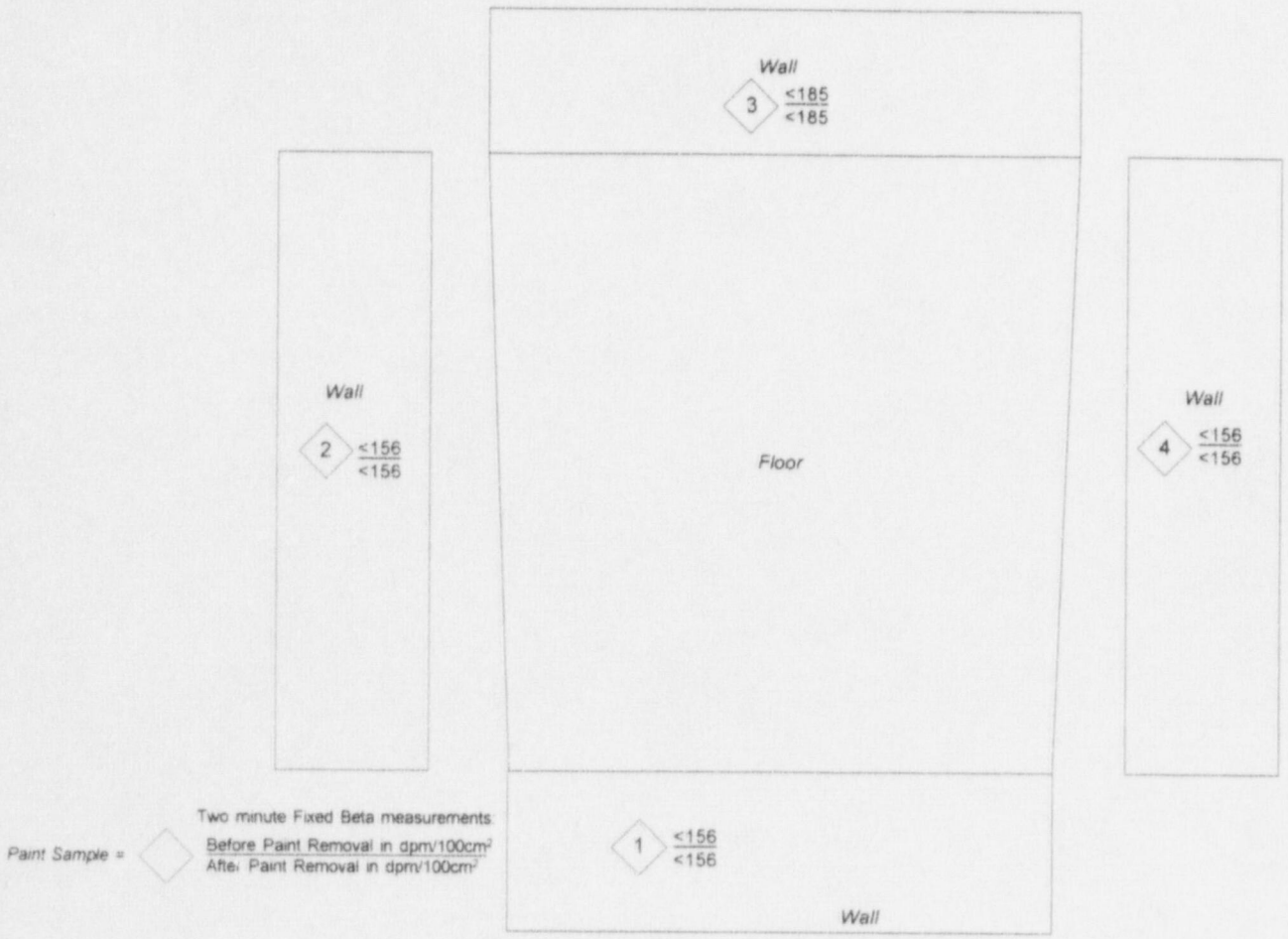
Figure 5: Lab 216: Locations and Results of Fixed Beta Measurements on Floor



Notes:

1. Survey results are provided in Tables 5.
2. The values are in dpm/100cm^2 and indicate the approximate locations of measurements taken. Two minute (cp2m) fixed Beta readings were taken.
3. All concrete surface.

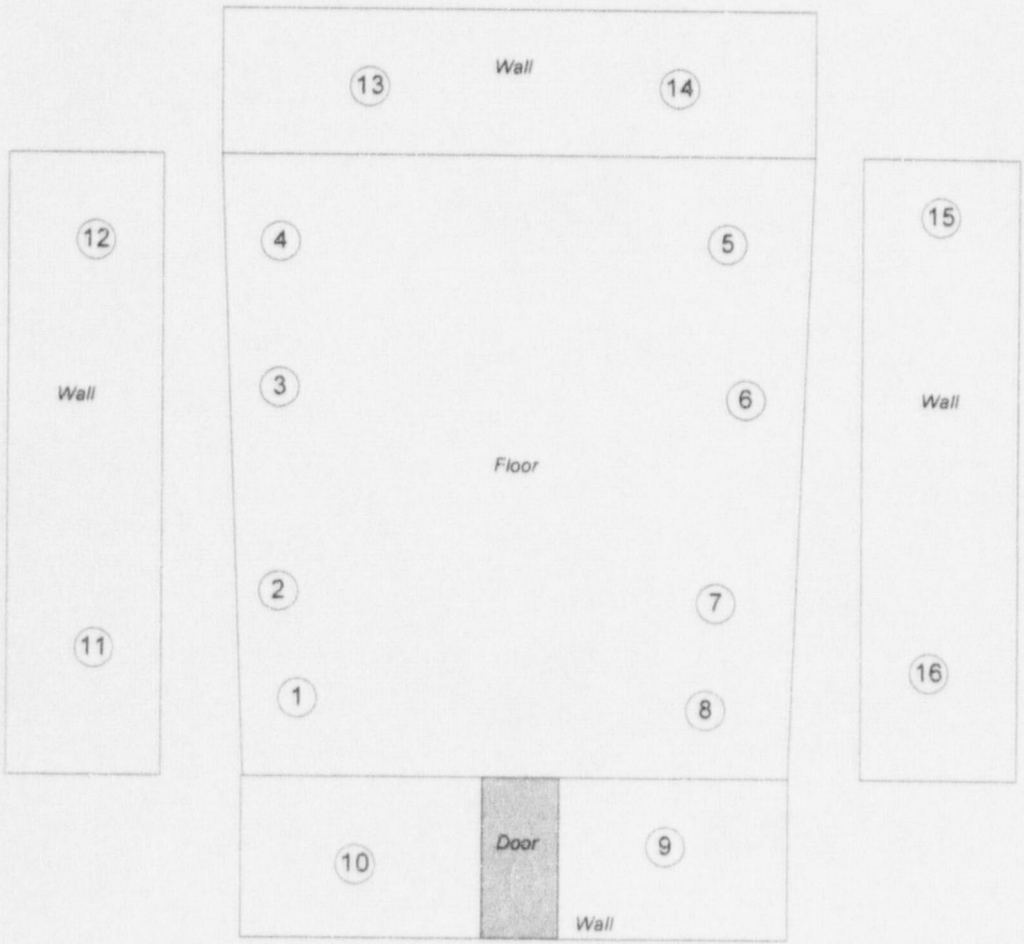
Figure 6: Lab 216: Locations and Results of Fixed Beta Measurements at Paint Sample Locations



Notes:

1. Survey results are provided in Table 5.
2. The values are in dpm/100cm^2 and the diamonds indicate the approximate locations of paint samples taken. Two Minute fixed beta readings were taken before and after paint samples were removed.
3. All cement block and drywall surfaces.

Figure 7: Lab 216: Locations of Removable Contamination Survey



Notes:

1. Survey results are provided in Tables 7.
2. The Numbers circled are the approximate locations of wipes taken.
3. All concrete, cement block and drywall surfaces.

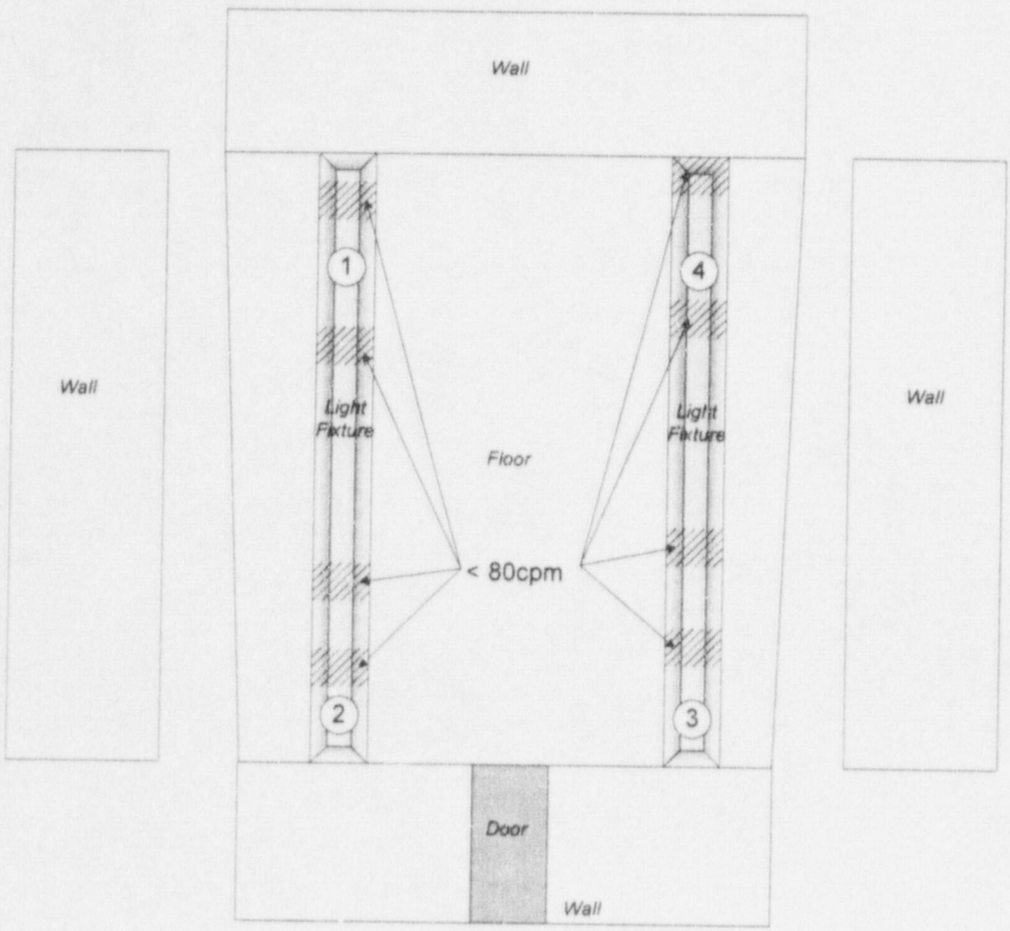
Figure 8: Lab 216: Locations and results of Exposure Rate Measurements

Notes:

1. The values are exposure rate measurements in μR/hr at the approximate locations indicated. Each measurement was taken ~1m above ground surface.

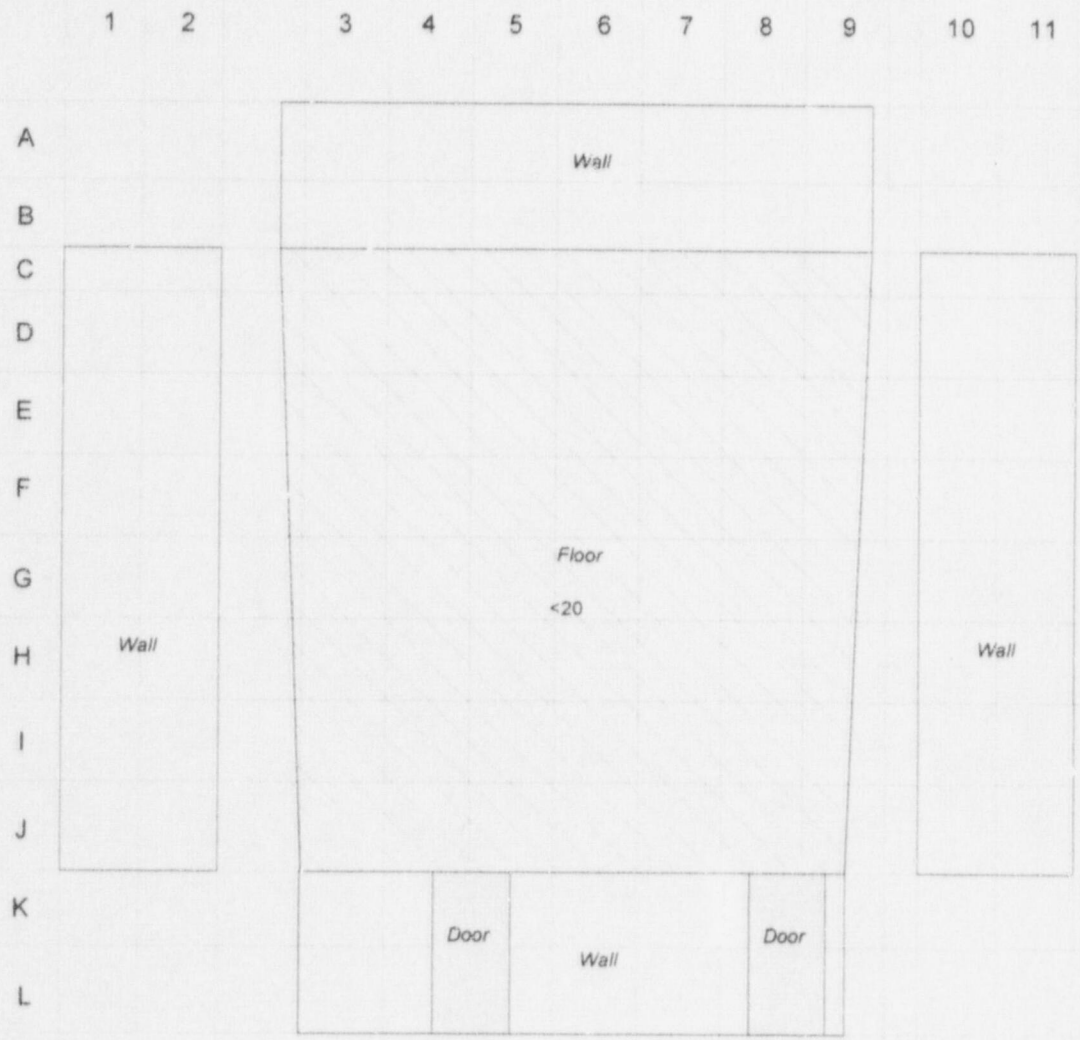
2. All concrete surface.

Figure 9: Lab 216: Overhead Light Fixture Survey



1. Survey results are provided in Table 5.
2. ~25% of Overhead was scanned for Beta. Scan results in cross hatched area.
3. The Numbers circled are the approximate locations of wipes taken. Wipe results are in Table 7.
4. All metal surface.

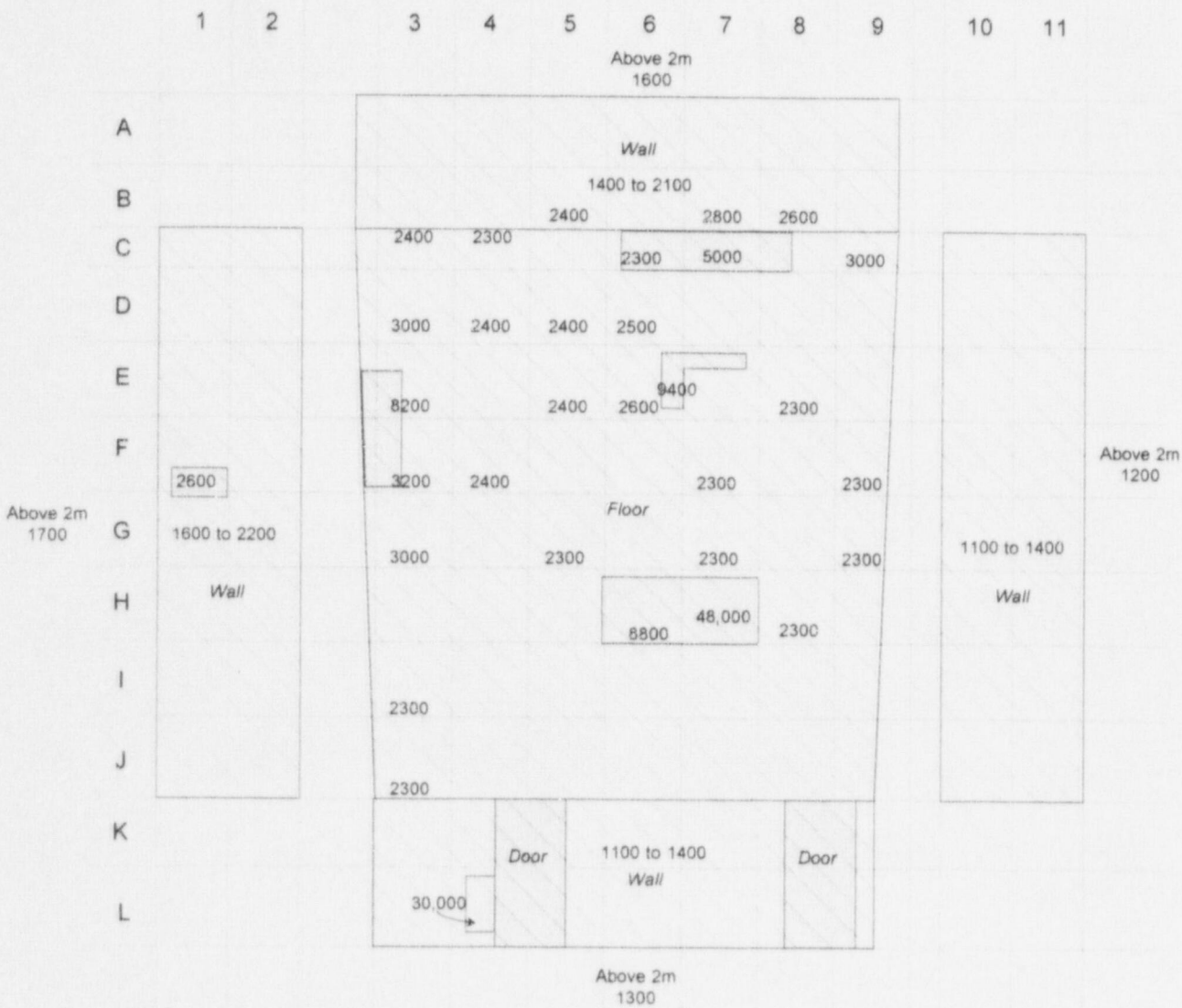
Figure 10: Labs 238/240: Initial Alpha Floor Scan



Notes:

1. Survey results are provided in Table 5.
2. ~100% of the floor was scanned for Alpha with a 434cm^2 Alpha detector. Scan results in cross hatched area are in cpm.
3. All concrete surface.

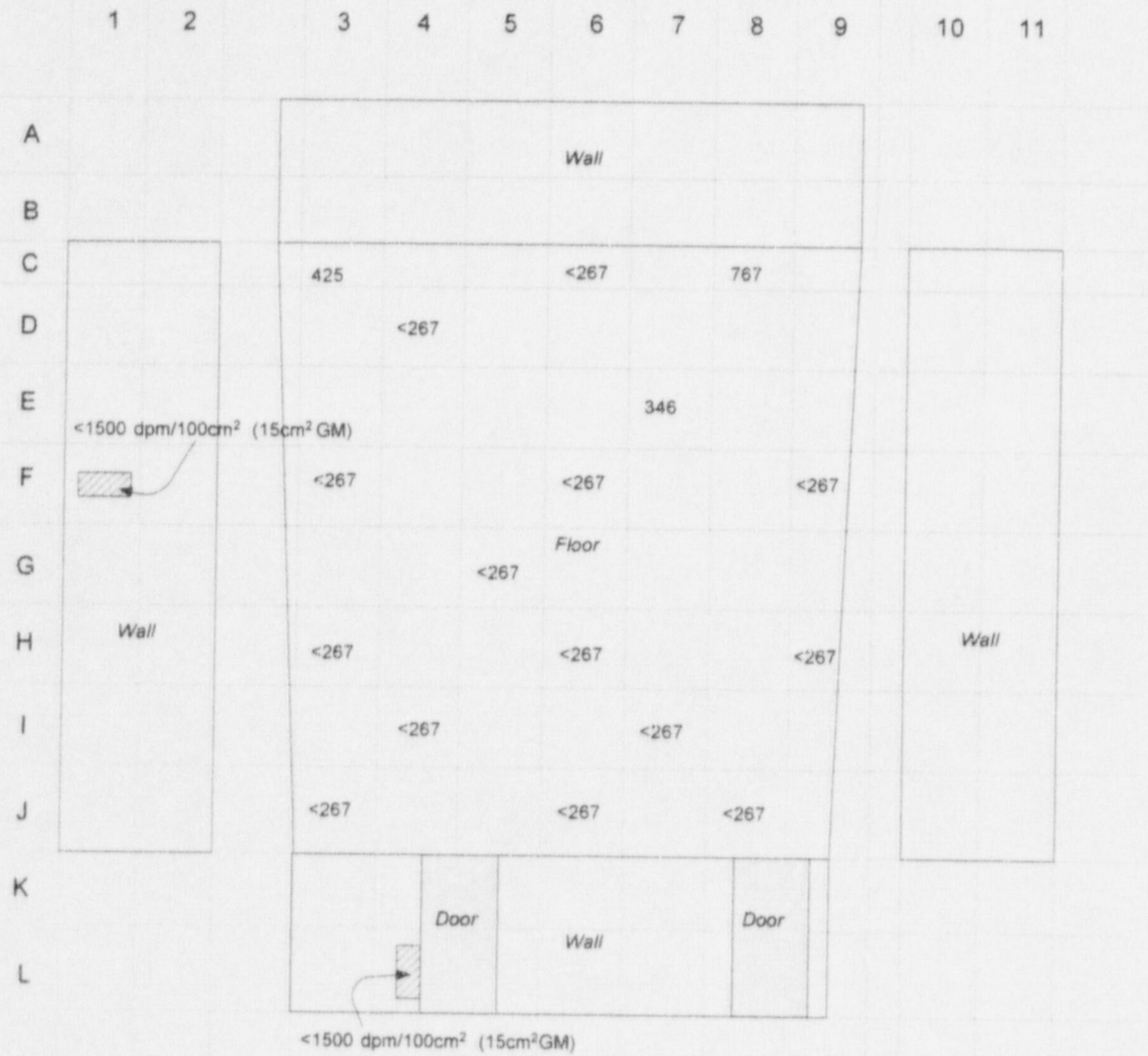
Figure 11: Labs 238/240: Locations of Beta Scan Measurements on Walls and Floor



Notes:

1. Survey results are provided in Table 5.
2. Values indicated are locations of measurements that were above the alert levels on the walls and floors.
3. ~100% of the floor and walls (2m up) were scanned for Beta. Scan results in cross hatched area. The values (in cpm) indicate the approximate locations of elevated readings.
4. ~10% of the N & E upper walls (above 2m) were scanned for Beta.
5. All concrete, cement block and sheetrock surfaces.

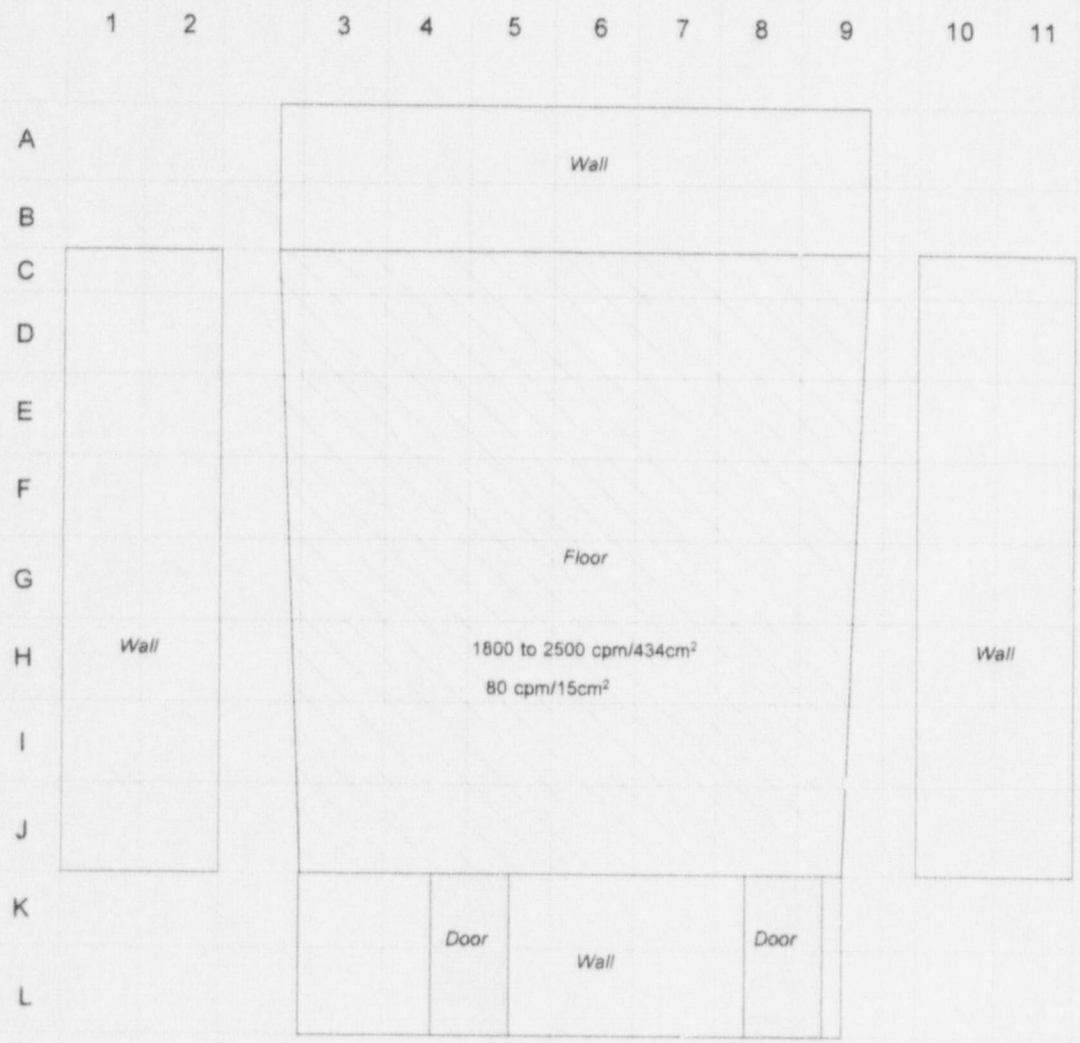
Figure 12: Labs 238/240: Location and Results of **Final** Fixed Beta Measurements after Decontamination



Notes:

1. Final survey results are provided in Tables 5.
2. The values are in dpm/100cm² and indicate the approximate locations of measurements taken using a 100cm² Beta detector except where noted. Two minute (cp2m) fixed Beta readings were taken.
3. All concrete surface.

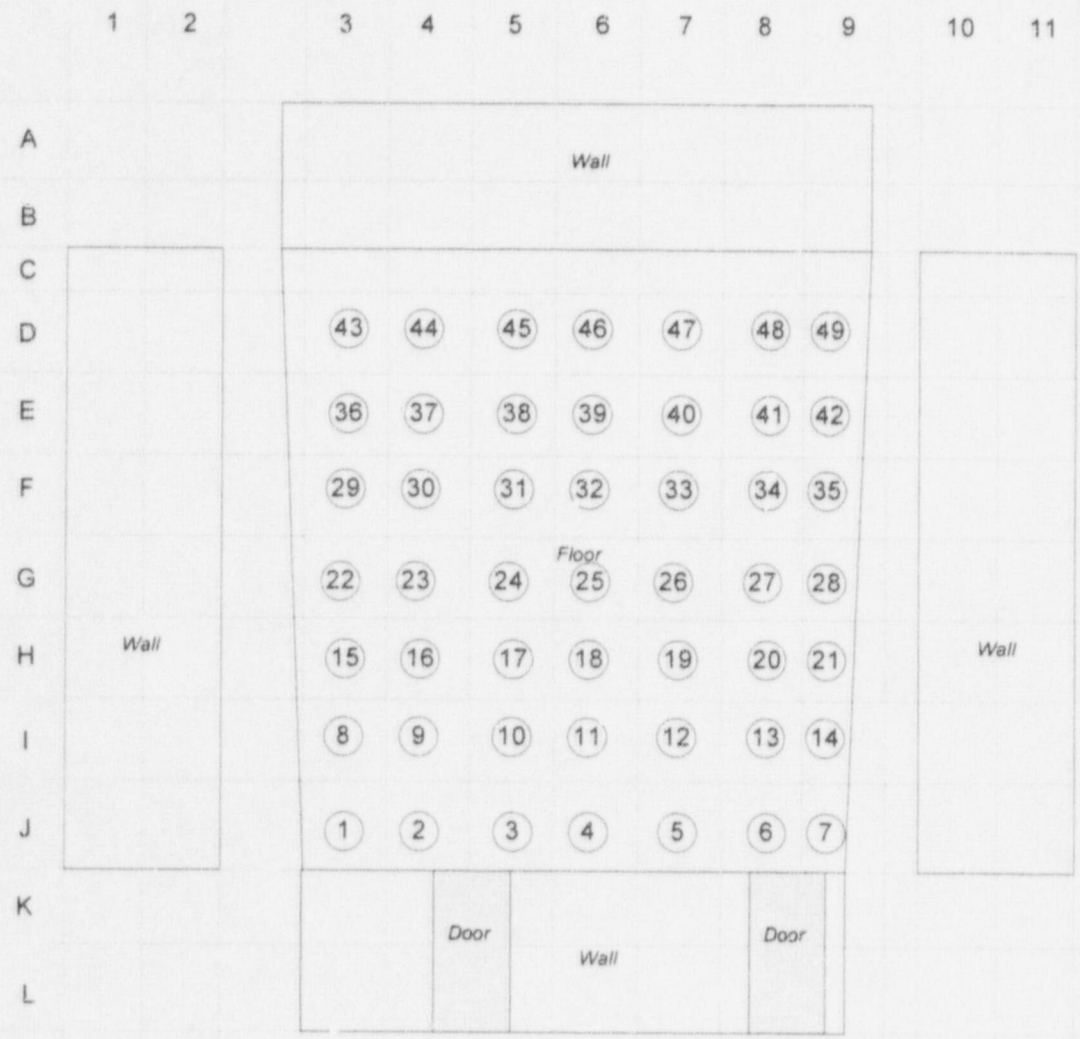
Figure 13: Labs 238/240: **Final** Beta Floor Scan Survey After Decontamination



Notes:

1. Final survey results are provided in Table 5.
2. ~100% of the Floor was post scanned for Beta. Scan results in cross hatched area. ~100% of the West and East walls (decontaminated areas only) was scanned for Beta. Scan results in cross hatched area.
3. All concrete, cement block and sheetrock surfaces.

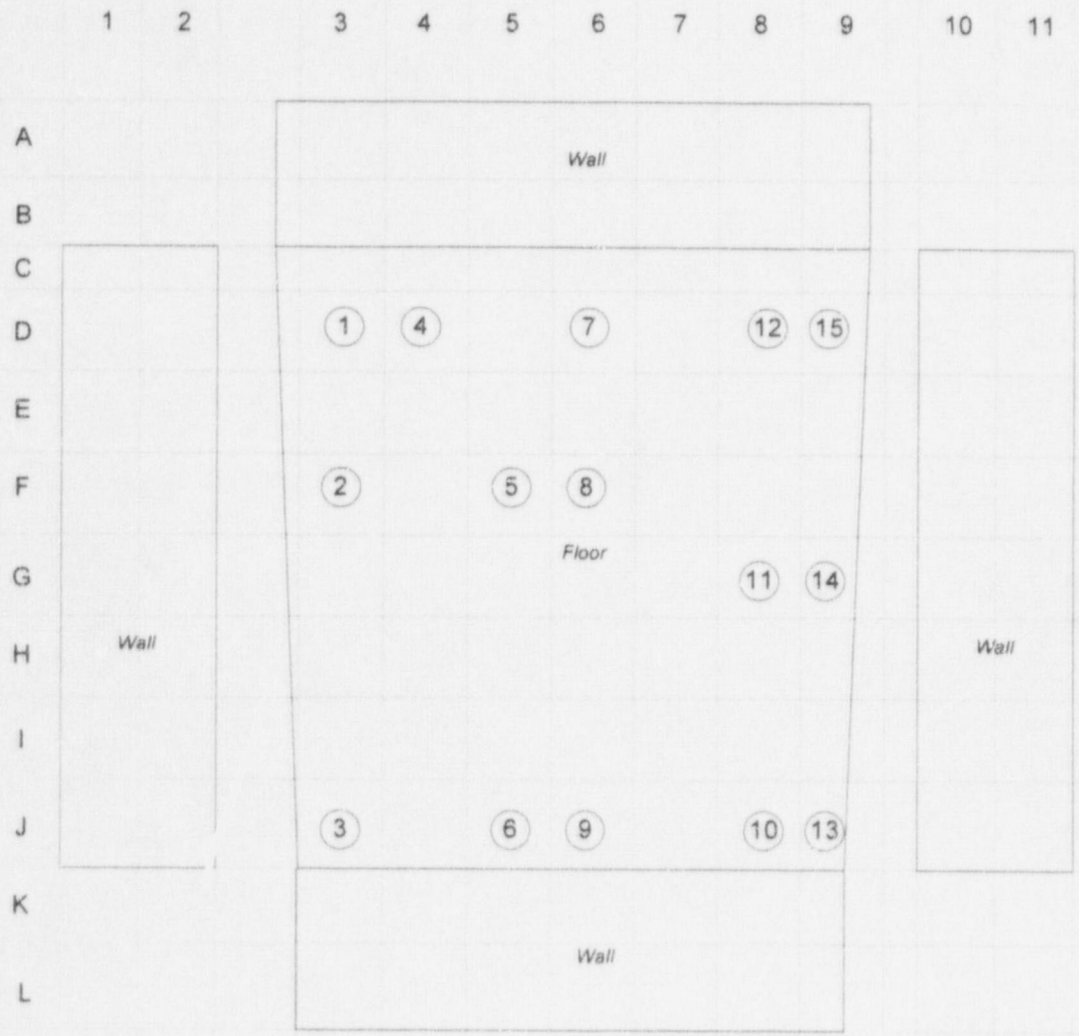
Figure 14: Labs 238/240: Locations of Removable Contamination Floor Survey



Notes:

1. Survey results are provided in Tables 7.
2. The Numbers circled are the approximate locations of wipes taken.
3. All concrete surface.

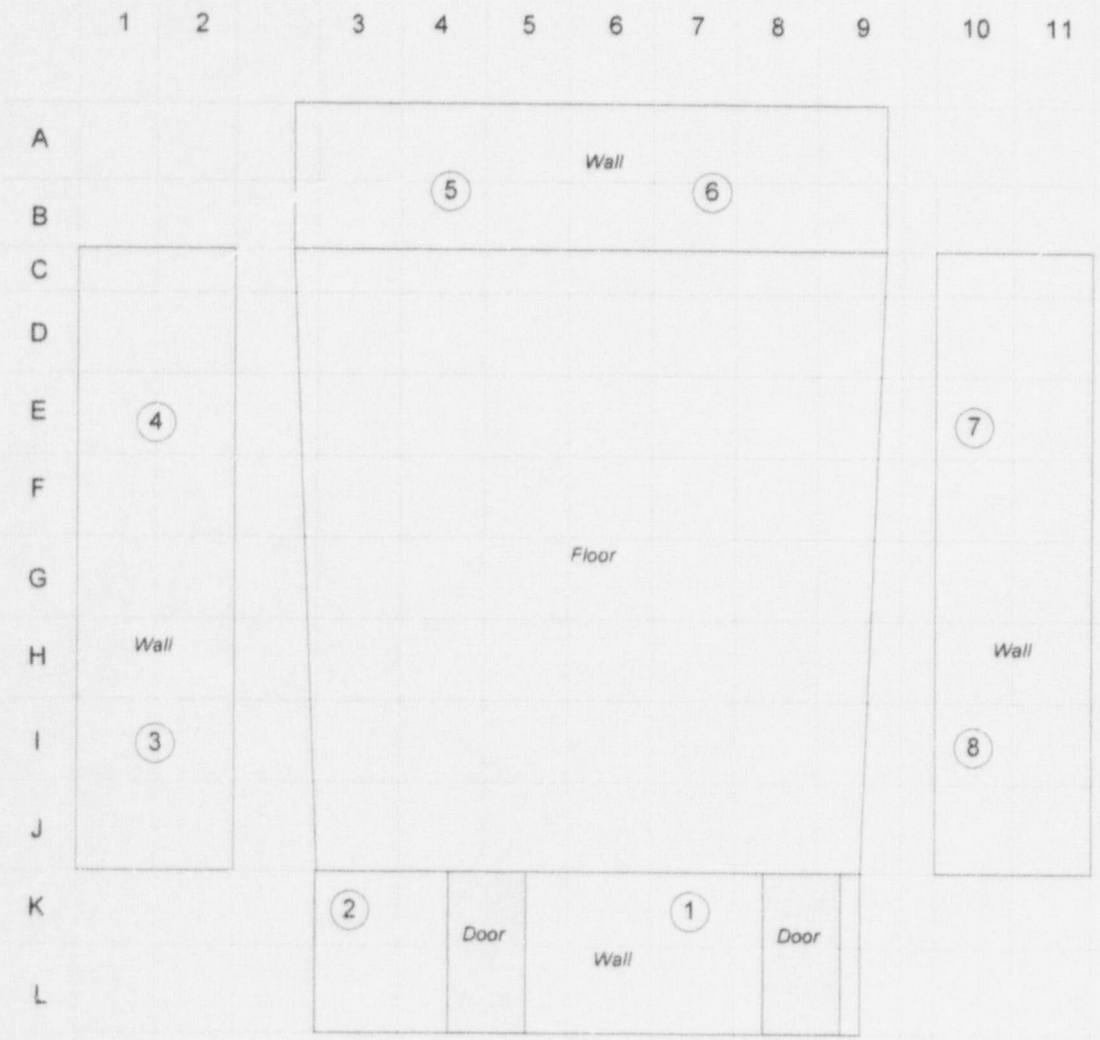
Figure 14A: Labs 238/240: Locations of Final Removable Contamination Floor Survey



Notes:

1. Final survey results are provided in Tables 7.
2. The Numbers circled are the approximate locations of wipes taken.
3. All concrete surface.

Figure 15: Labs 238/240: Locations of Removable Contamination Wall Survey



Notes:

1. Survey results are provided in Tables 7.
2. The Numbers circled are the approximate locations of wipes taken.
3. All cement block and drywall surfaces.

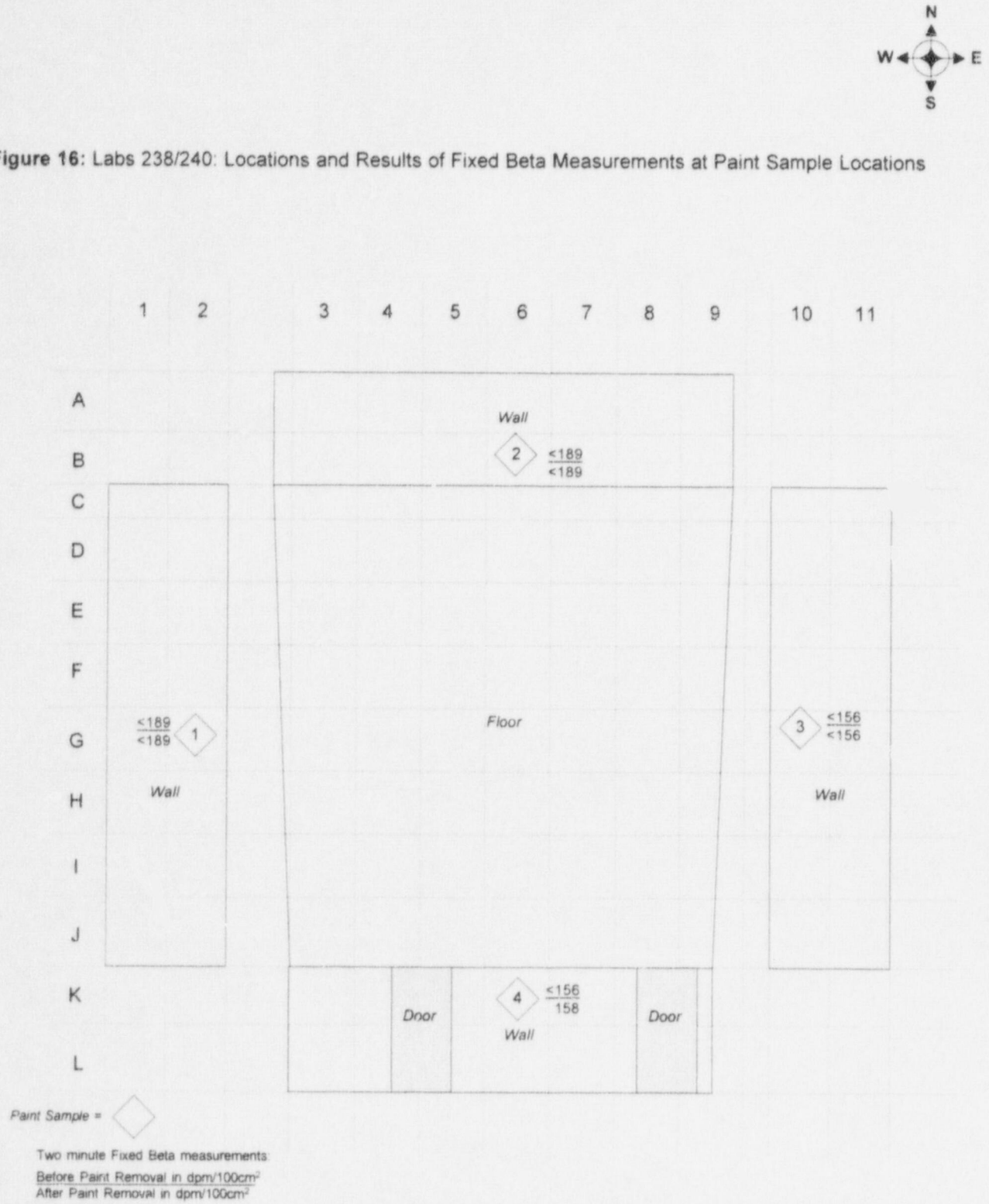
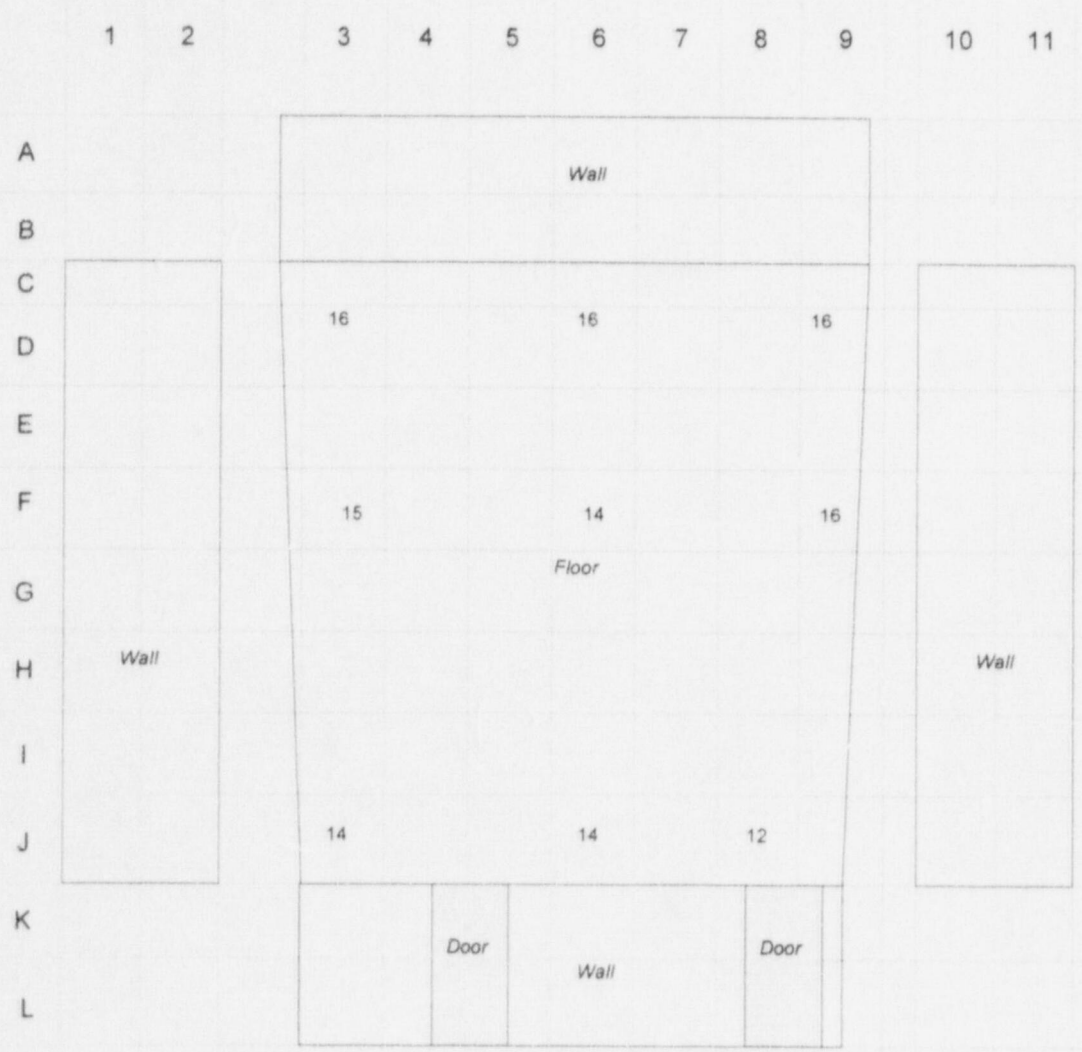


Figure 16: Labs 238/240: Locations and Results of Fixed Beta Measurements at Paint Sample Locations

Notes:

1. Survey results are provided in Table 5.
2. The values are in dpm/100cm^2 and the diamonds indicate the approximate locations of paint samples taken. Two Minute fixed beta readings were taken before and after paint samples were removed.
3. All cement block and drywall surfaces.

Figure 17: Labs 238/240: Locations and Results of Exposure Rate Measurements

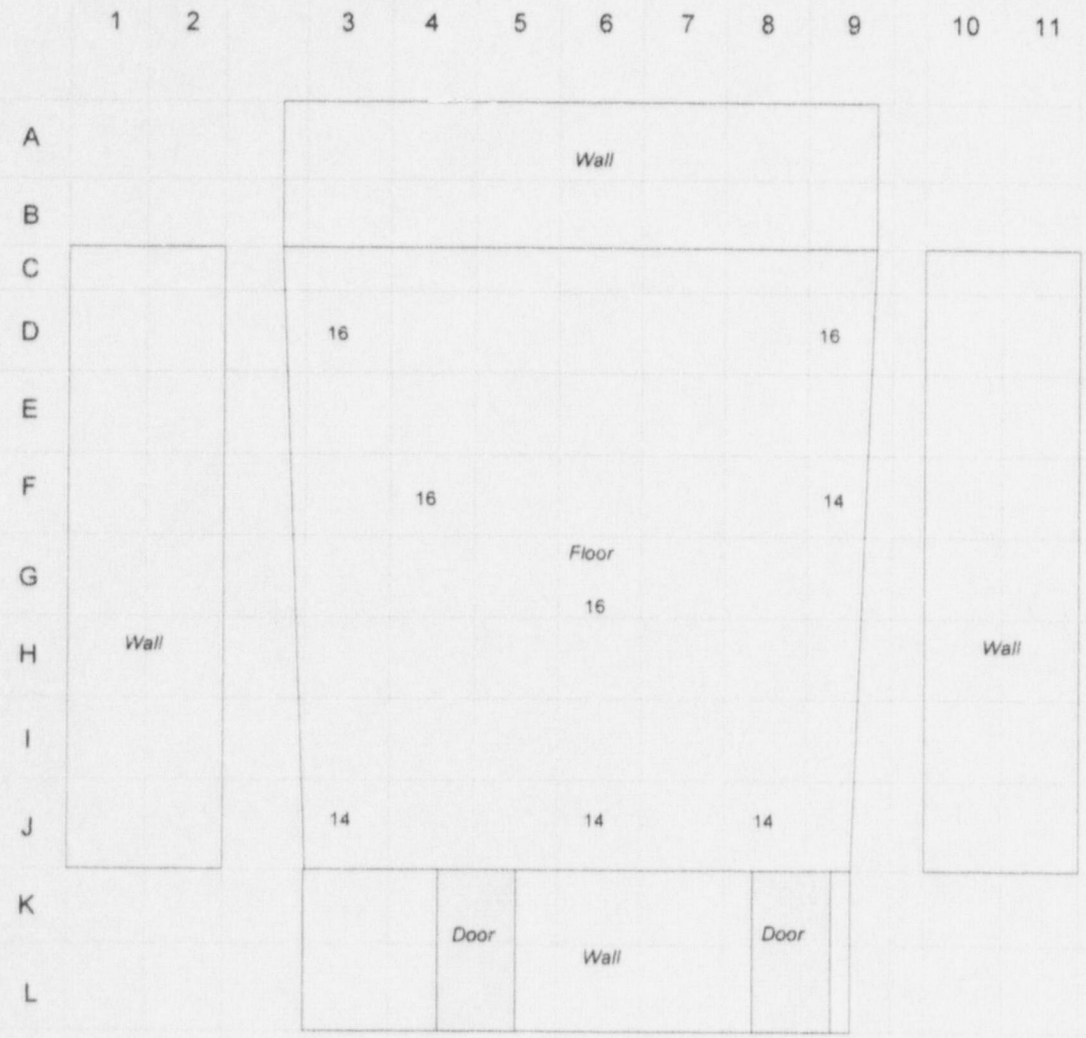


Notes:

1. The values are exposure rate measurements in μR/hr at the approximate locations indicated. Each measurement was taken ~1m above ground surface.

2. All concrete surface.

Figure 17A: Labs 238/240: Locations and Results of **Final** Exposure Rate Measurements

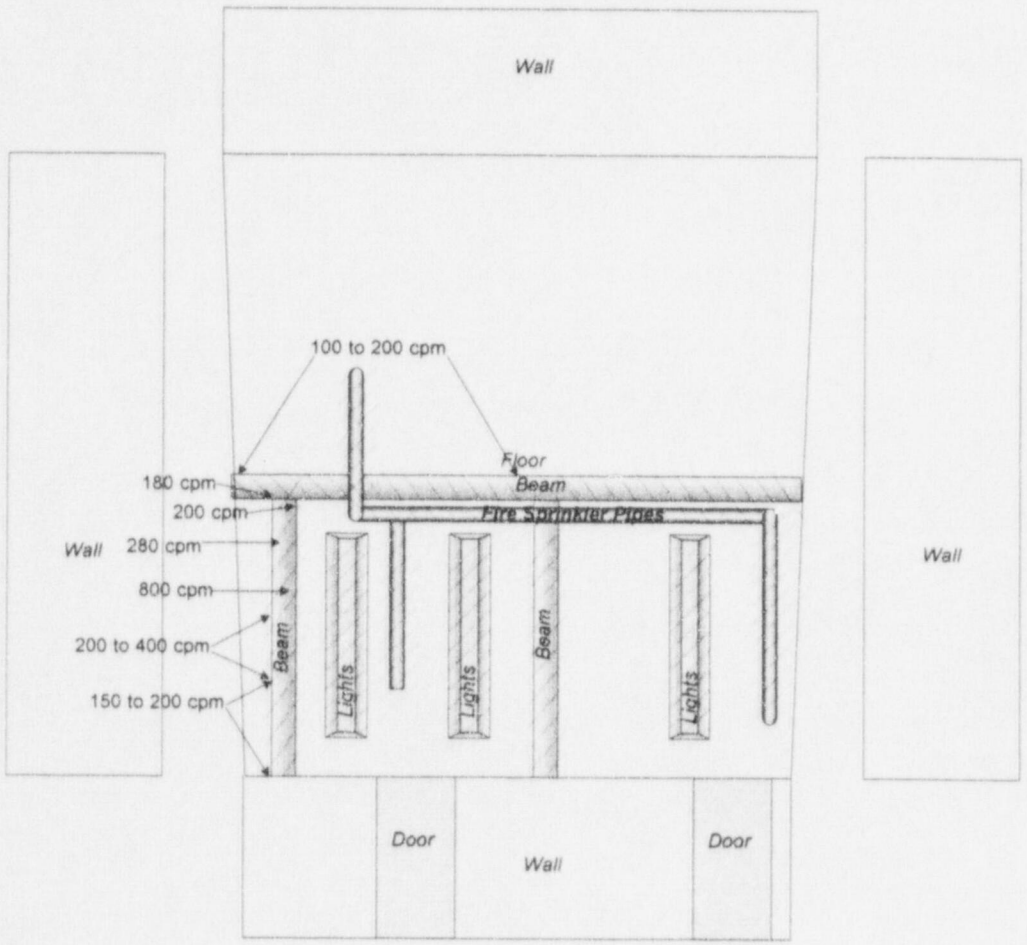


Notes:

1. The values are exposure rate measurements in μR/hr at the approximate locations indicated. Each measurement was taken ~1m above ground surface.

2. All concrete surface.

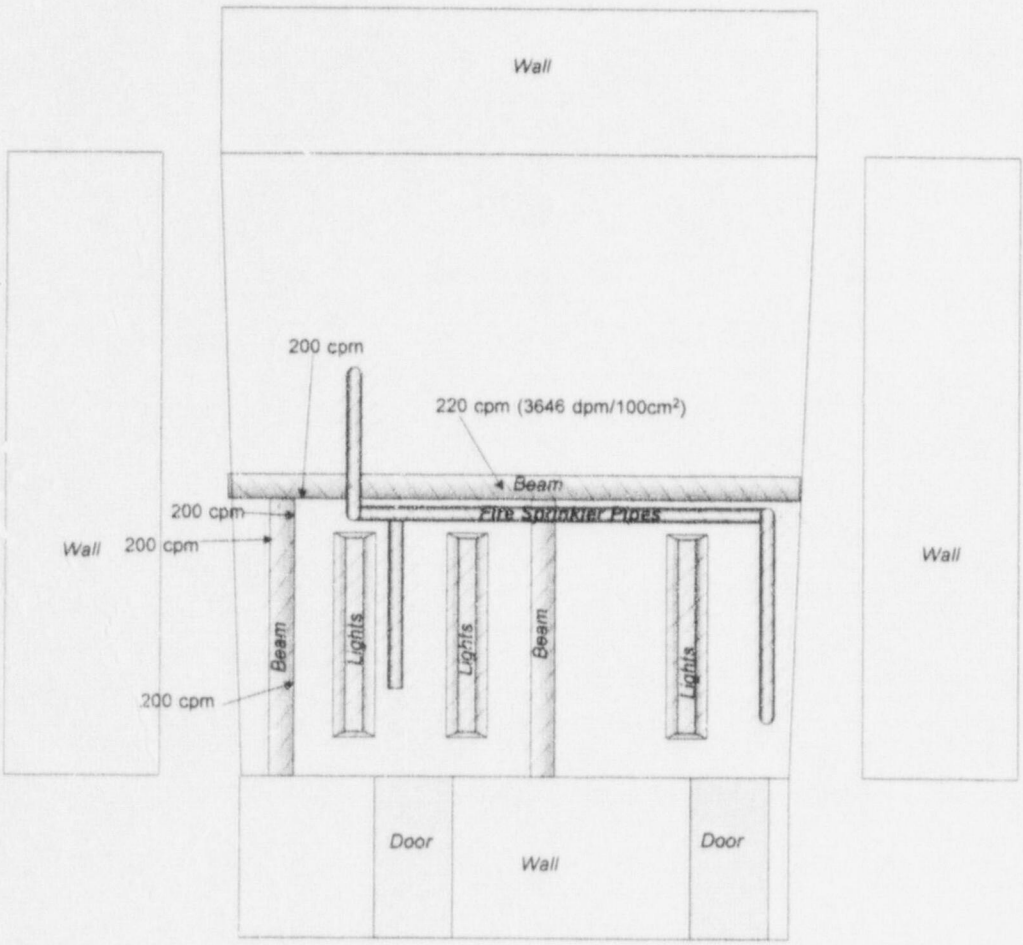
Figure 18: Labs 238/240: 100% Initial Beta Scan on Overhead Fixtures



Notes:

1. Survey results are provided in Table 5.
2. ~100% of Overhead Fixtures was scanned for Beta using a 15cm^2 probe detector. Scan results in cross hatched area.
3. All metal surface.

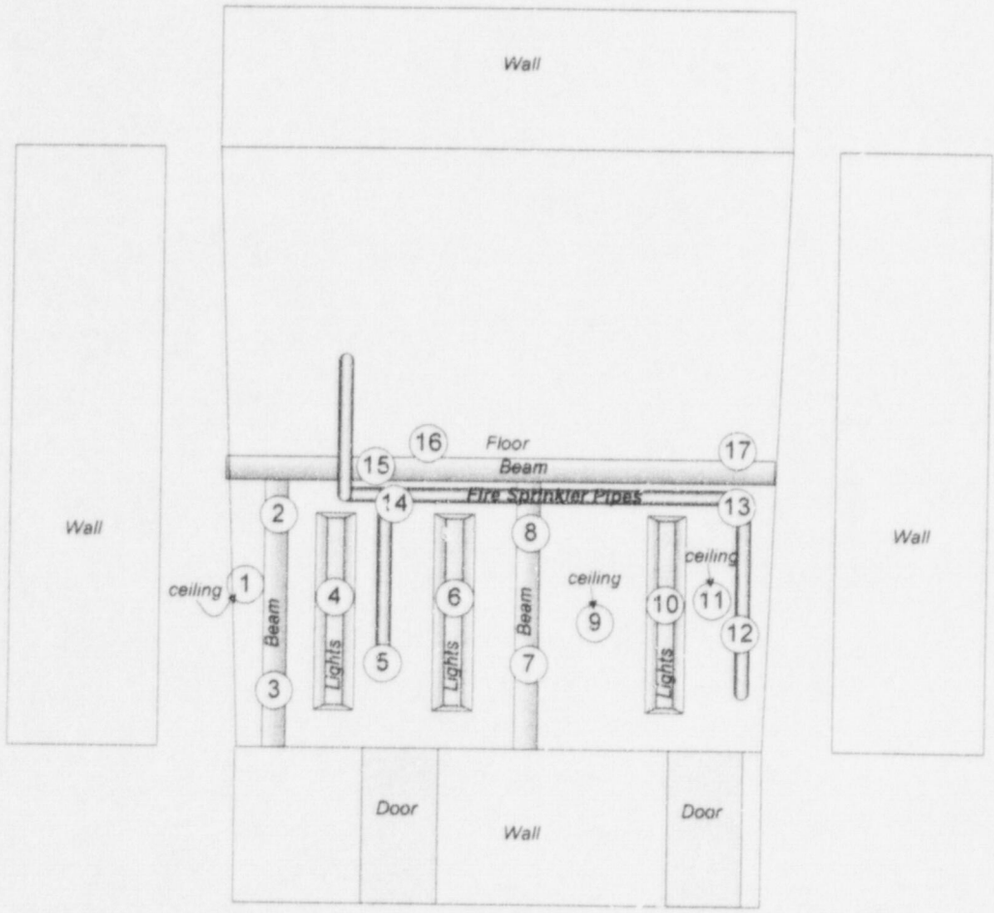
Figure 19: Labs 238/240: **Final** Beta Scan on Overhead Fixtures



Notes:

1. Final survey results are provided in Table 5.
2. ~100% of Overhead fixtures was scanned for Beta using a 15cm² probe detector. Scan results in cross hatched area.
3. All metal surface.

Figure 20: Labs 238/240: Locations of Initial Removable Contamination Survey on the Overhead Fixtures

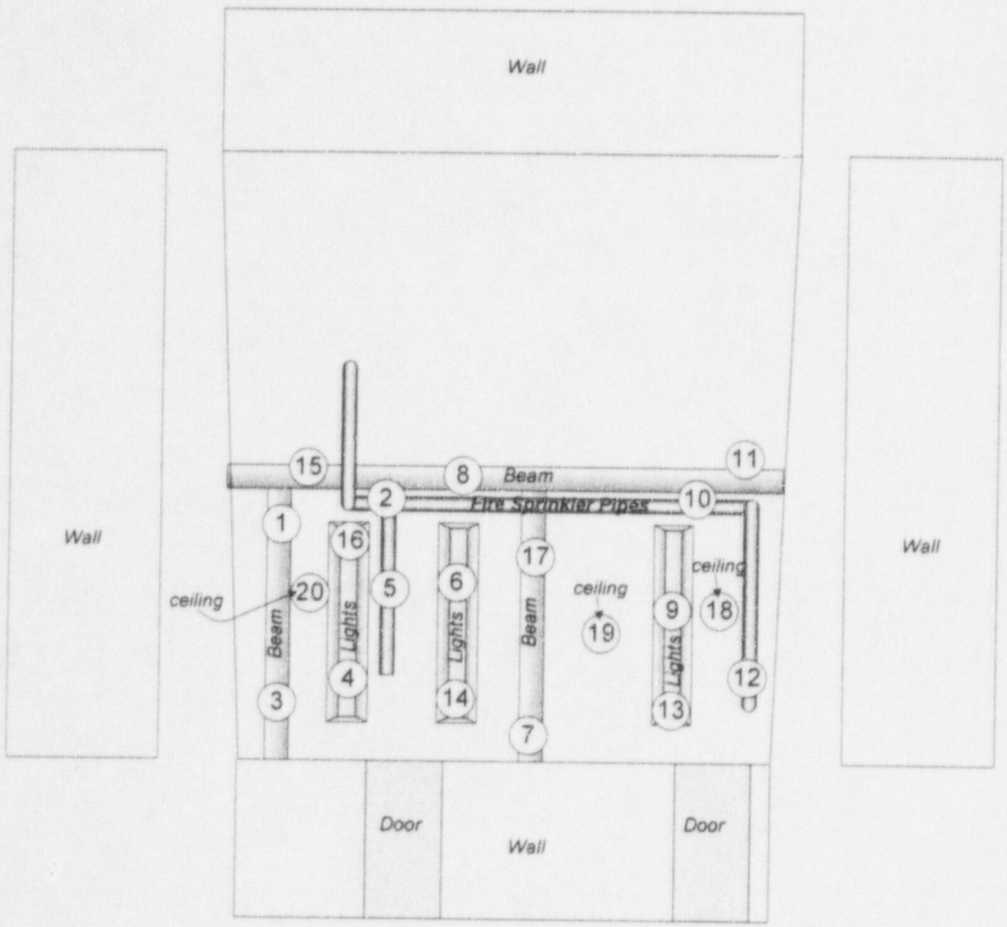


Notes:

1. The Numbers circled are the approximate locations of wipes taken. Wipe results are provided in Table 7. Survey results are provided in Tables 5.

2. All metal surface.

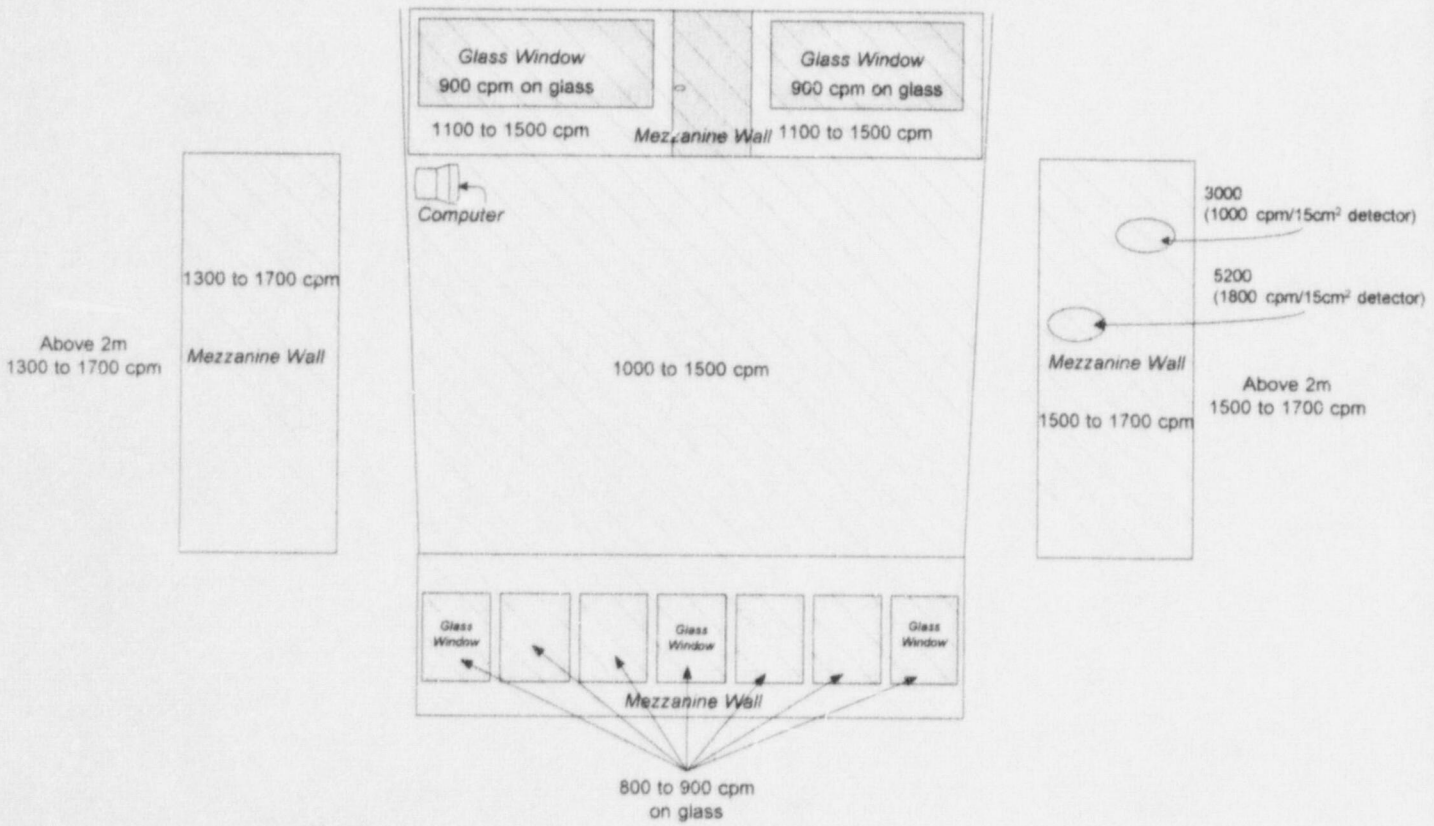
Figure 21: Labs 238/240: Locations of **Final** Removable Contamination on the Overhead Fixtures



Notes:

1. Final survey results are provided in Tables 7.
2. The Numbers circled are the approximate locations of wipes taken.
3. All metal surface.

Figure 22: Labs 238/240/242 Mezzanine: Initial Beta Scan, Floor and Walls



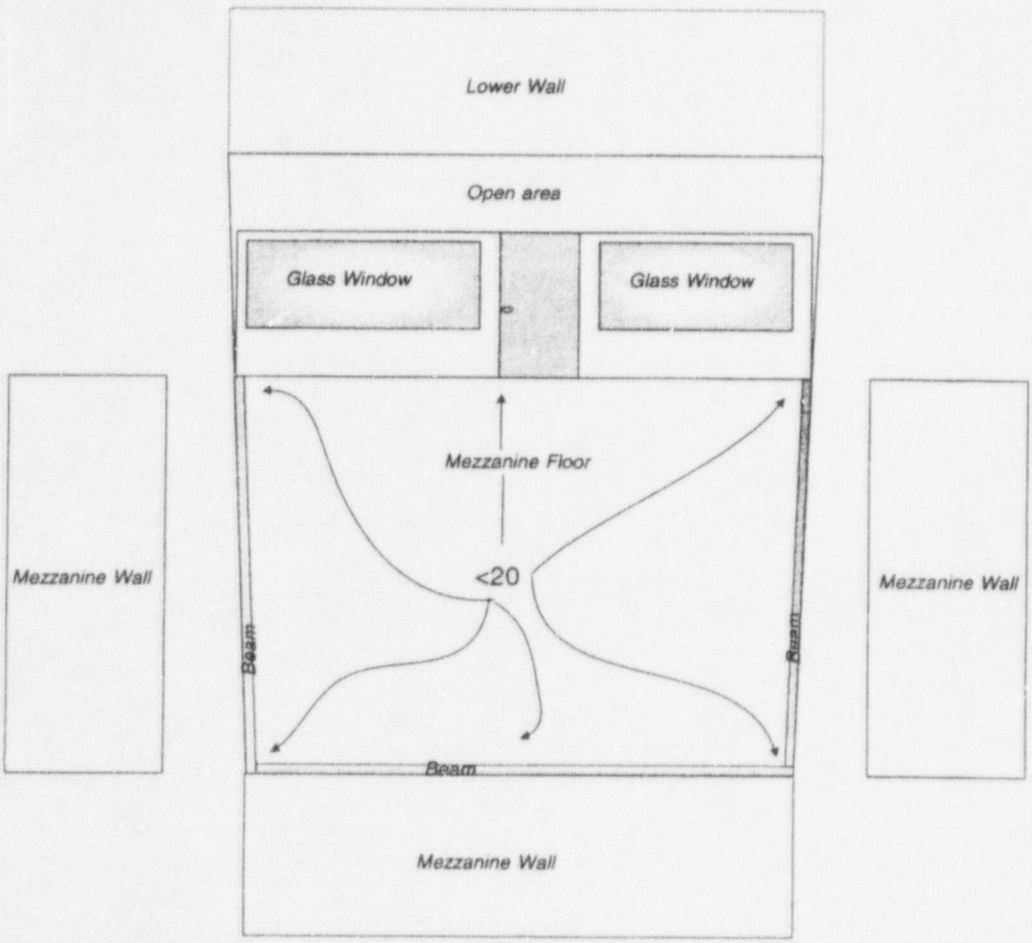
Notes:

1. Survey results are provided in Table 5.
2. ~100% of the floor and walls (2m up) were scanned for Beta. Scan results in cross hatched area.
   ~10% of the North, South & West Upper Walls (above 2m) were scanned for Beta.
3. Two spots on the East wall were surveyed with a 15cm² GM detector.
4. All metal surface.

Figure 22A **Building 2: Lab 238/240 Mezzanine**

100% 434cm^2 Alpha Floor Scan

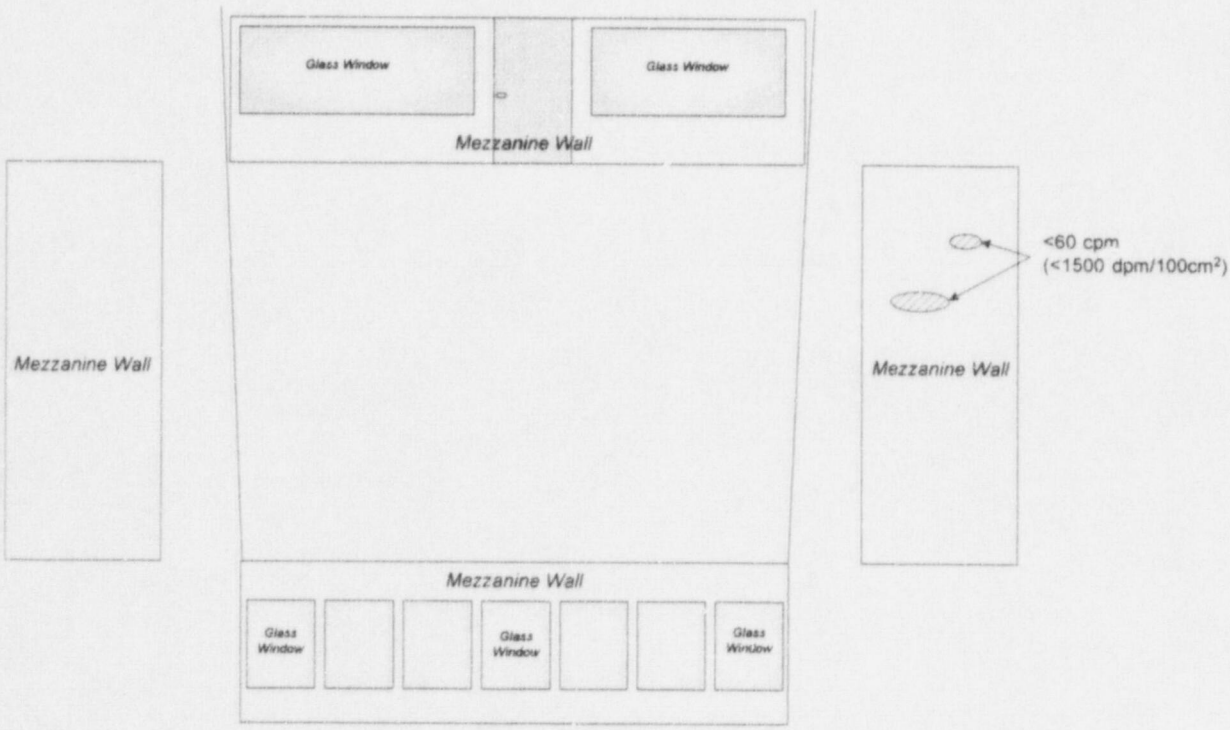
07/29/99



	Building 2 Lab 238/240 Mezzanine			
Instrument(s)	Model-2221	N/A	N/A	N/A
Serial Number	84734	N/A	N/A	N/A
Calibration Due	01/26/00	N/A	N/A	N/A
Efficiency	21.43%	N/A	N/A	N/A
α β γ	α	N/A	N/A	N/A
Probe Number	093599	N/A	N/A	N/A
Probe Size	434cm^2	N/A	N/A	N/A
Comments: 100% 434cm^2 α Scan on floor.				

Signature: B Lyons Date 07/29/99

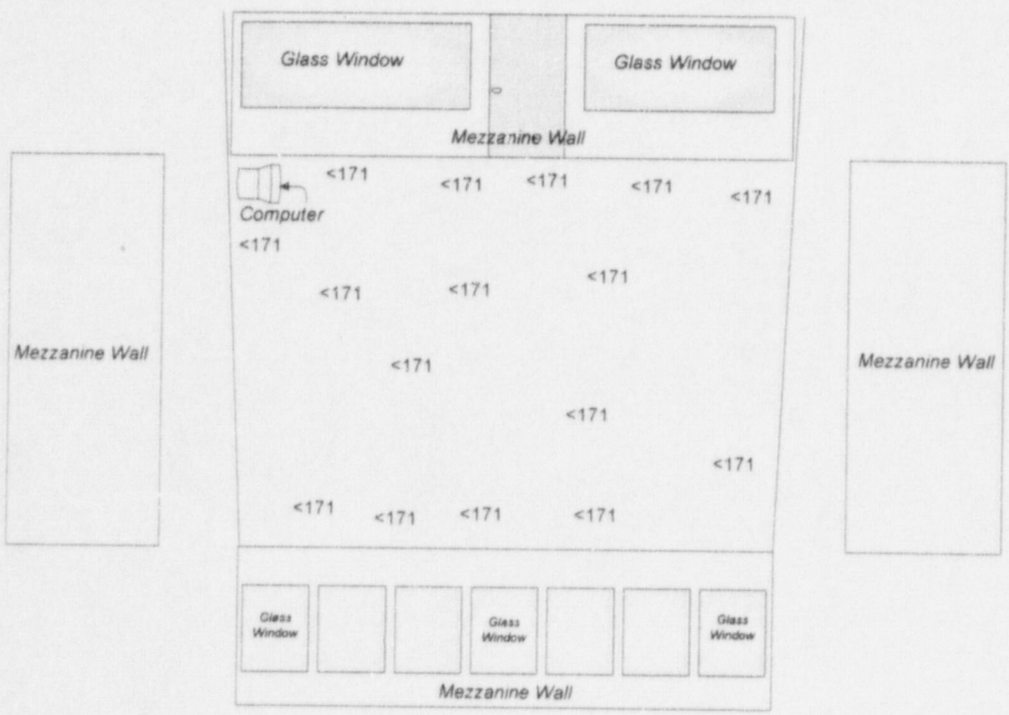
Figure 23: Labs 238/240: Mezzanine **Final** Beta Wall Scan



Notes:

1. Final survey results are provided in Table 5.
2. Beta scan was taken on the East wall (decontaminated area's only) was scanned for Beta with a 15cm^2 detector. Scan results in cross hatched area.
3. All concrete surface.

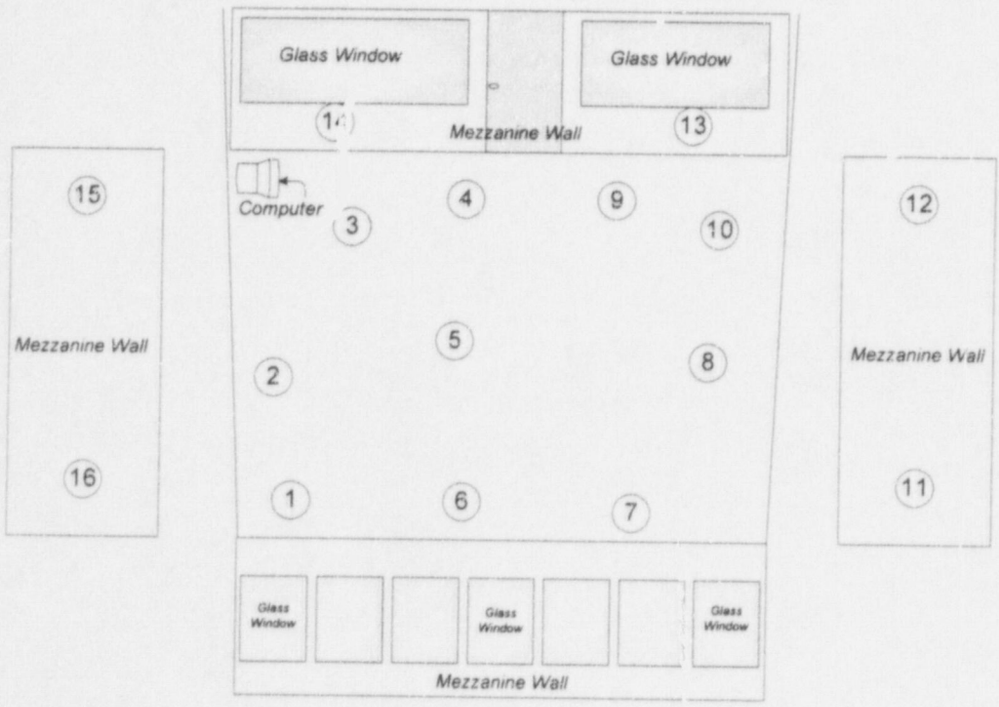
Figure 24: Labs 238/240/242 Mezzanine: Locations of Fixed Beta Measurements



Notes:

1. Survey results are provided in Tables 5.
2. The values are in dpm/100cm^2 and indicate the approximate locations of measurements taken. Two minute (cp2m) fixed Beta readings were taken.
3. All metal surface.

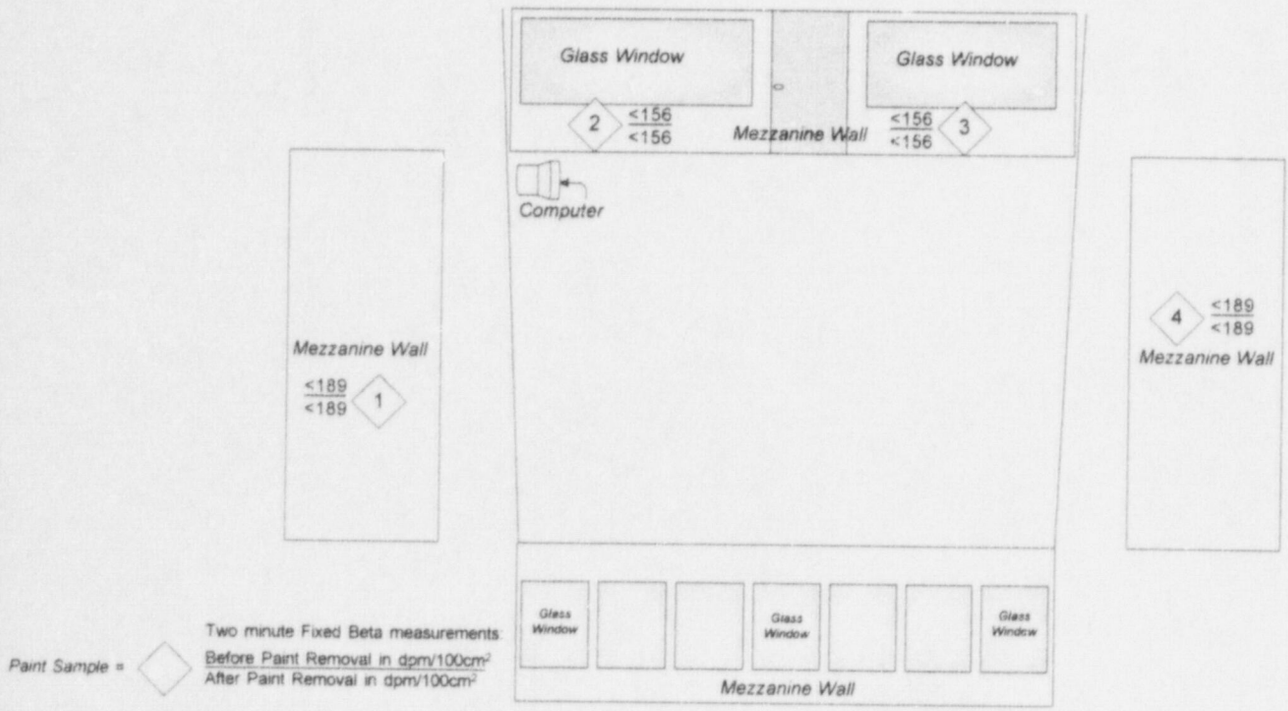
Figure 25: Labs 238/240/242 Mezzanine: Locations of Removable Contamination Floor Survey



Notes:

1. The Numbers circled are the approximate locations of wipes taken. Wipe results are provided in Table 7.
2. All metal and drywall surfaces.

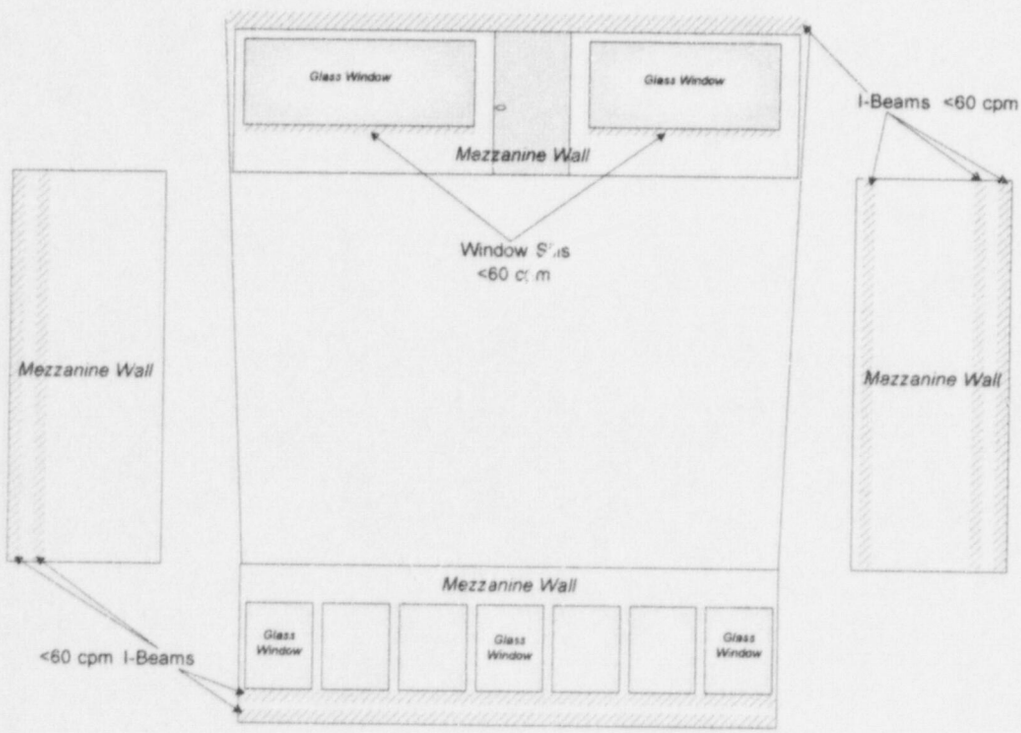
Figure 26: Labs 238/240/242 Mezzanine: Locations and Results of Fixed Beta Measurements Paint Sample Locations



Notes:

1. Survey results are provided in Table 5.
2. The values are in dpm/100cm² and the diamonds indicate the approximate locations of paint samples taken. Two Minute fixed beta readings were taken before and after paint samples were removed.
3. All cement block and drywall surfaces.

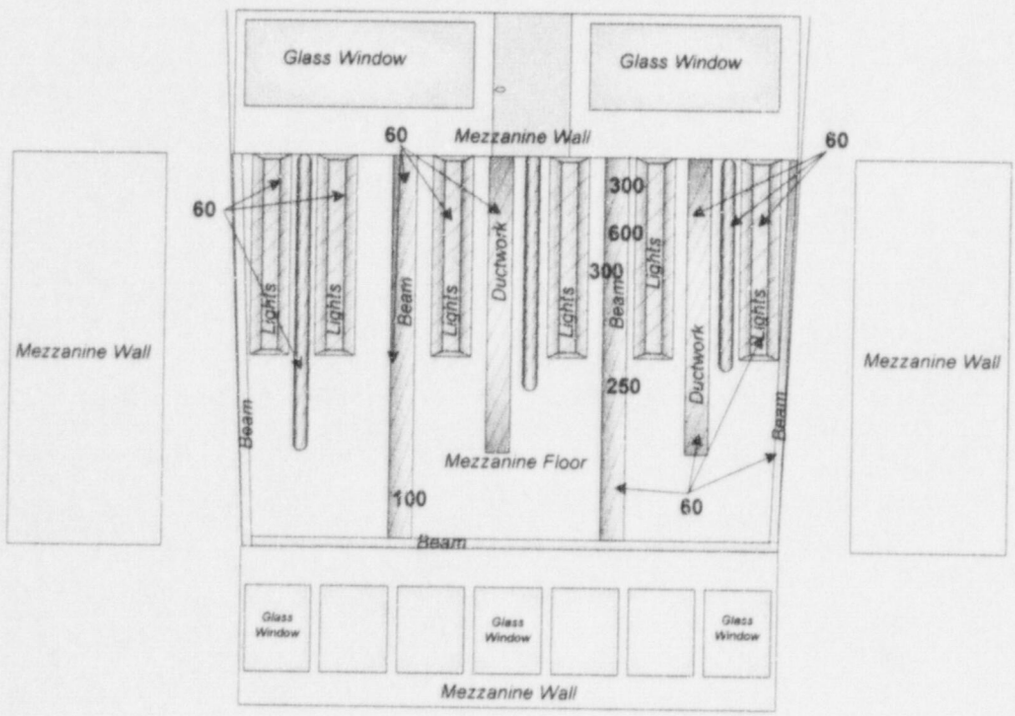
Figure 27: Labs 238/240/242 Mezzanine: I-Beam and Window Sill Beta Scan



Notes:

1. Final survey results are provided in Table 5.
2. ~100% of the I-Beams and Window Sills (North side wall) were scanned for Beta with a 15cm^2 detector in cross hatched areas.
3. All metal surfaces.

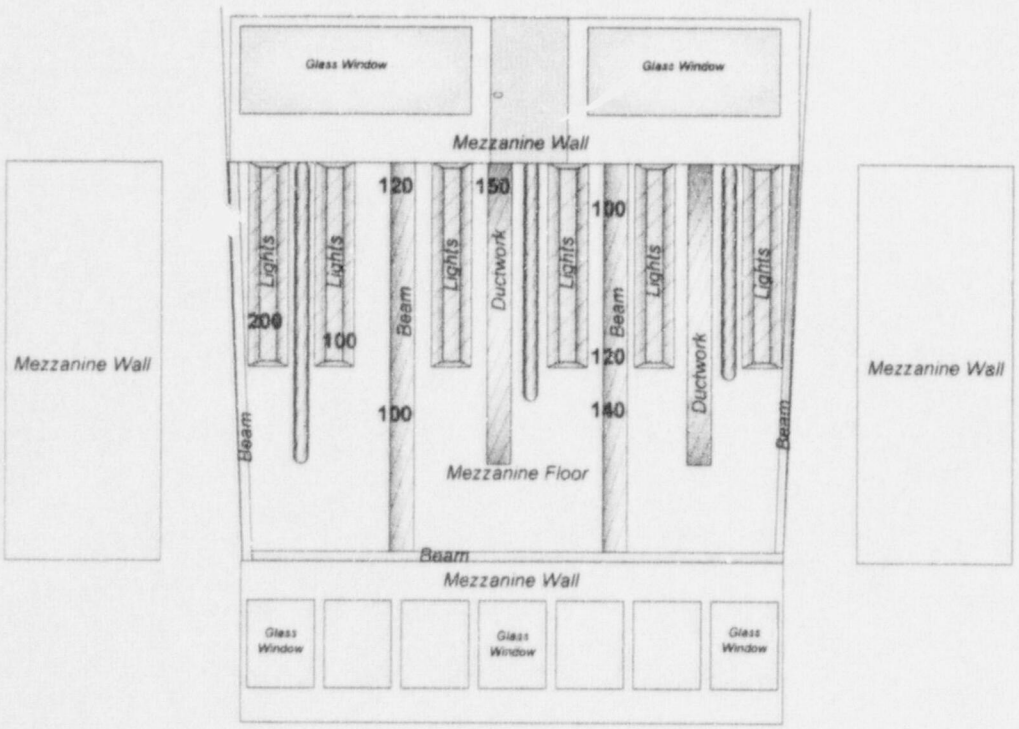
Figure 28: Labs 238/240/242 Mezzanine: Intial Beta Scan Results on Overhead Fixtures



Notes:

1. Survey results are provided in Table 5.
2. ~100% of Overhead fixtures were scanned with a 15cm^2 probe detector for Beta. Scan results in cross hatched area. The values are given in cpm.
3. All metal surface.

Figure 29: Labs 238/240/242 Mezzanine: **Final** Beta Scans on Overhead Fixtures



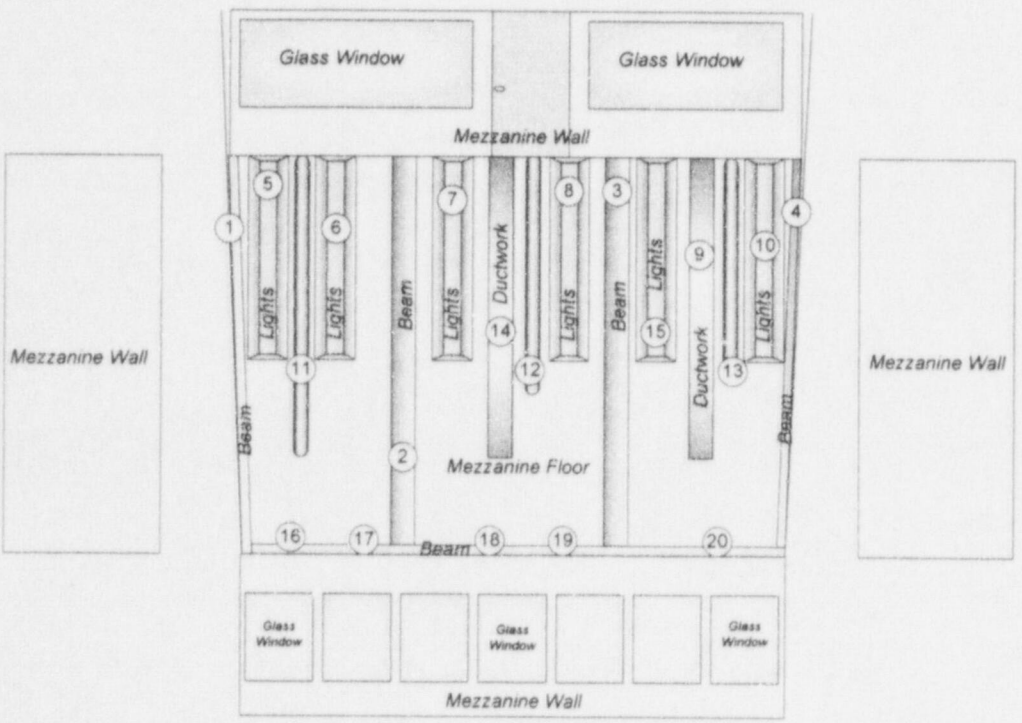
Notes:

1. Final survey results are provided in Table 5.

2. ~100% of Overhead fixtures were scanned for Beta with a 15cm^2 detector. Scan results in cross hatched area. The values are given in cpm.

3. All metal surface.

Figure 30: Labs 238/240/242 Mezzanine: Locations of Initial Removable Contamination Survey on Overhead Fixtures



Notes:

1. The Numbers circled are the approximate locations of wipes taken. Wipe results are provided in Table 7.
2. All concrete surface.

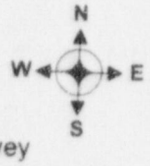
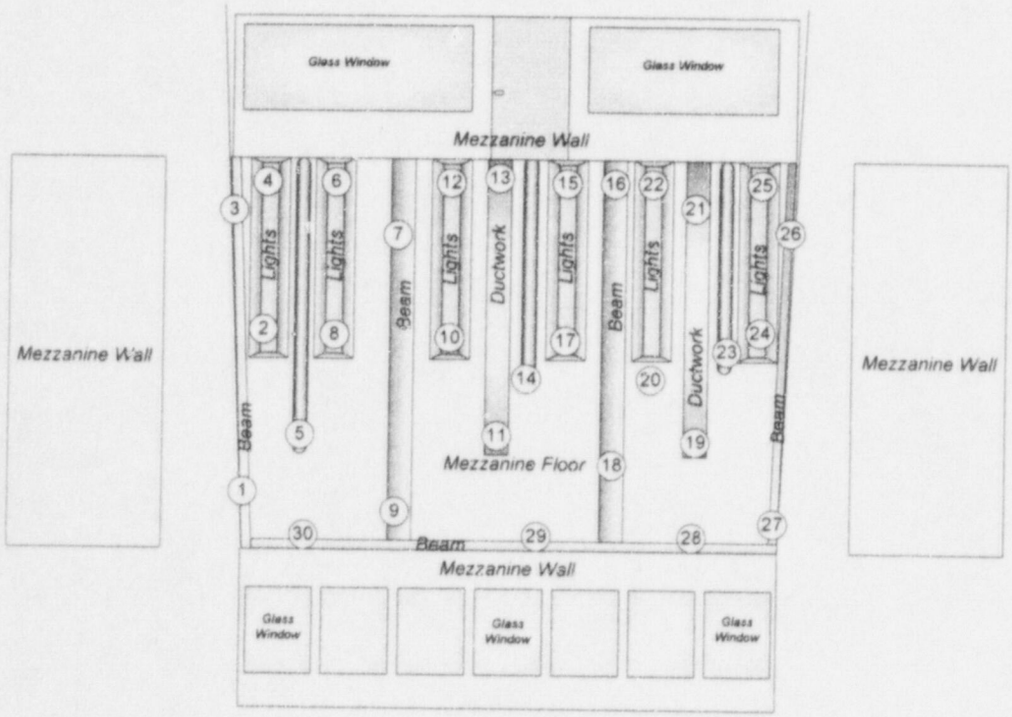


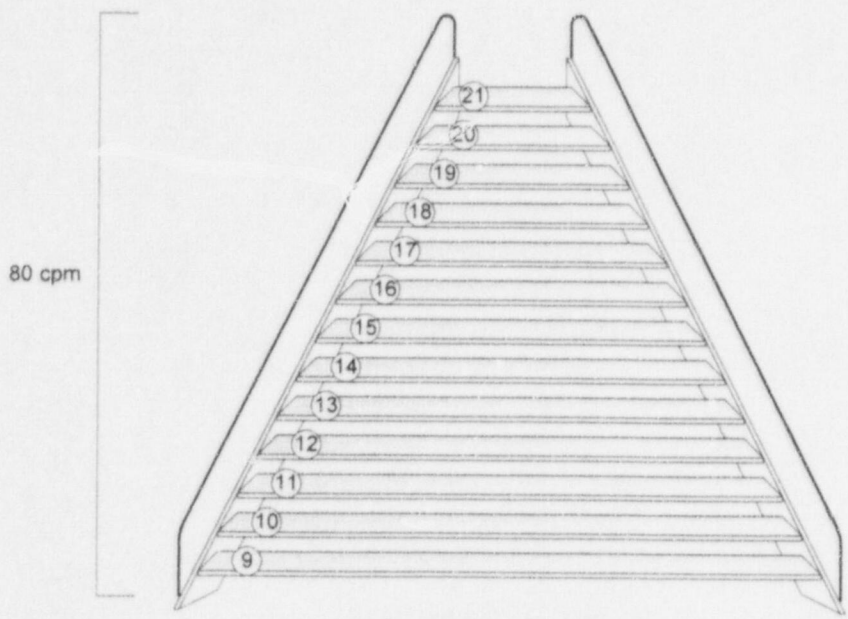
Figure 31: Labs 238/240/242 Mezzanine: Locations of Final Removable Contamination Survey



Notes:

1. Final survey results are provided in Table 7.
2. The Numbers circled are the approximate locations of wipes taken.
3. All metal surface.

Figure 32: Lab 238/240 Stairs: Beta Scan Results and Locations of Removable Contamination Survey



Stairs to the Mezzanine
Not to Scale

Notes:

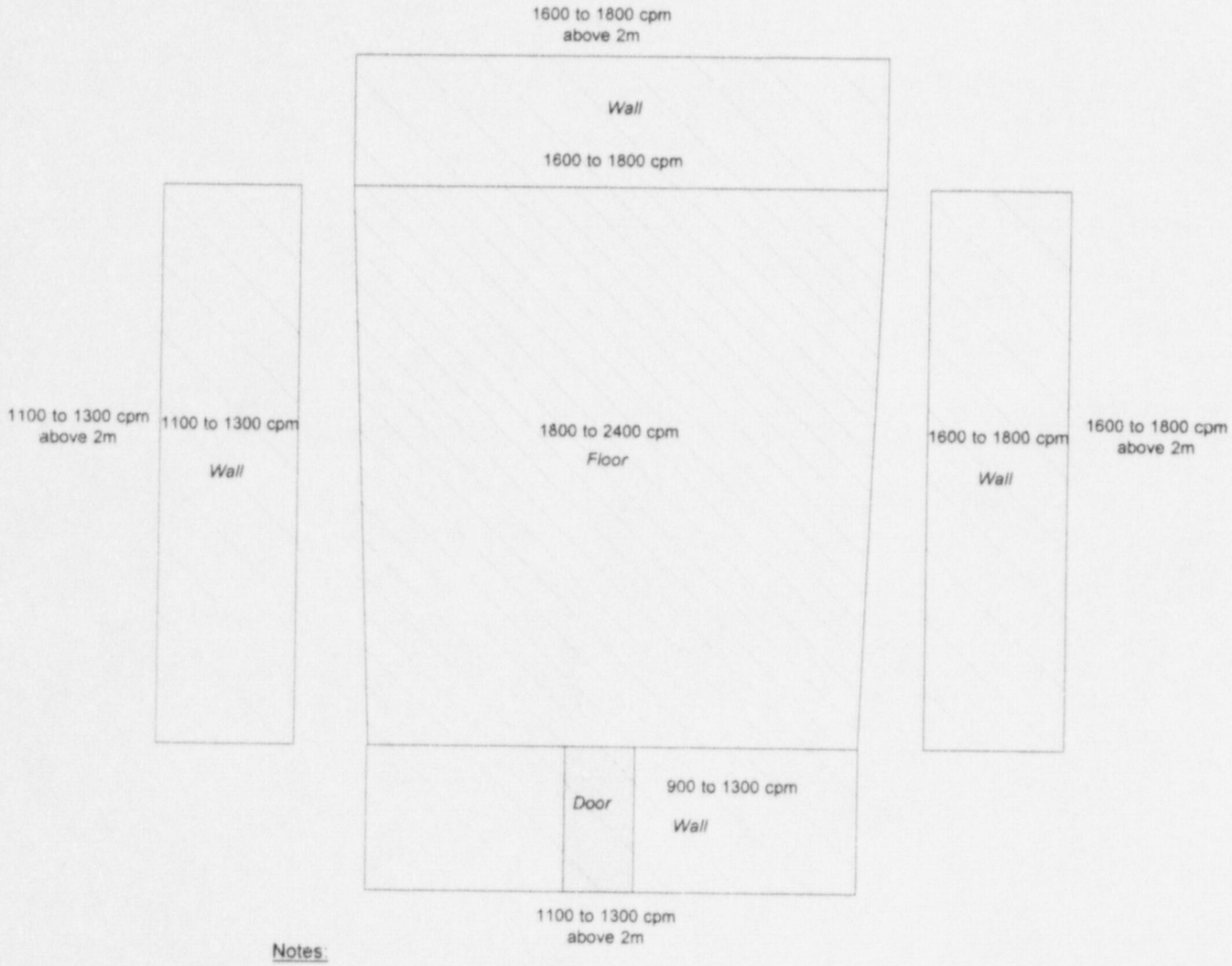
1. Survey results are provided in Tables 5.
2. ~100% of the Stairs (steps) and Handrails were scanned for Beta with 15cm^2 GM.
3. The Numbers circled are the approximate locations of wipes taken. Wipe results are provided in Table 7.
4. Painted over metal handrails and partial non-slip pads over painted metal steps.

Figure 33: Lab 242: Alpha Floor Scan

Notes:

1. Survey results are provided in Table 5.
2. ~100% of the floor was scanned for Alpha with a 434cm^2 Alpha detector. Scan results in cross hatched area are in cpm.
3. All concrete surface.

Figure 34 : Lab 242: Beta Scans of Floor and Walls



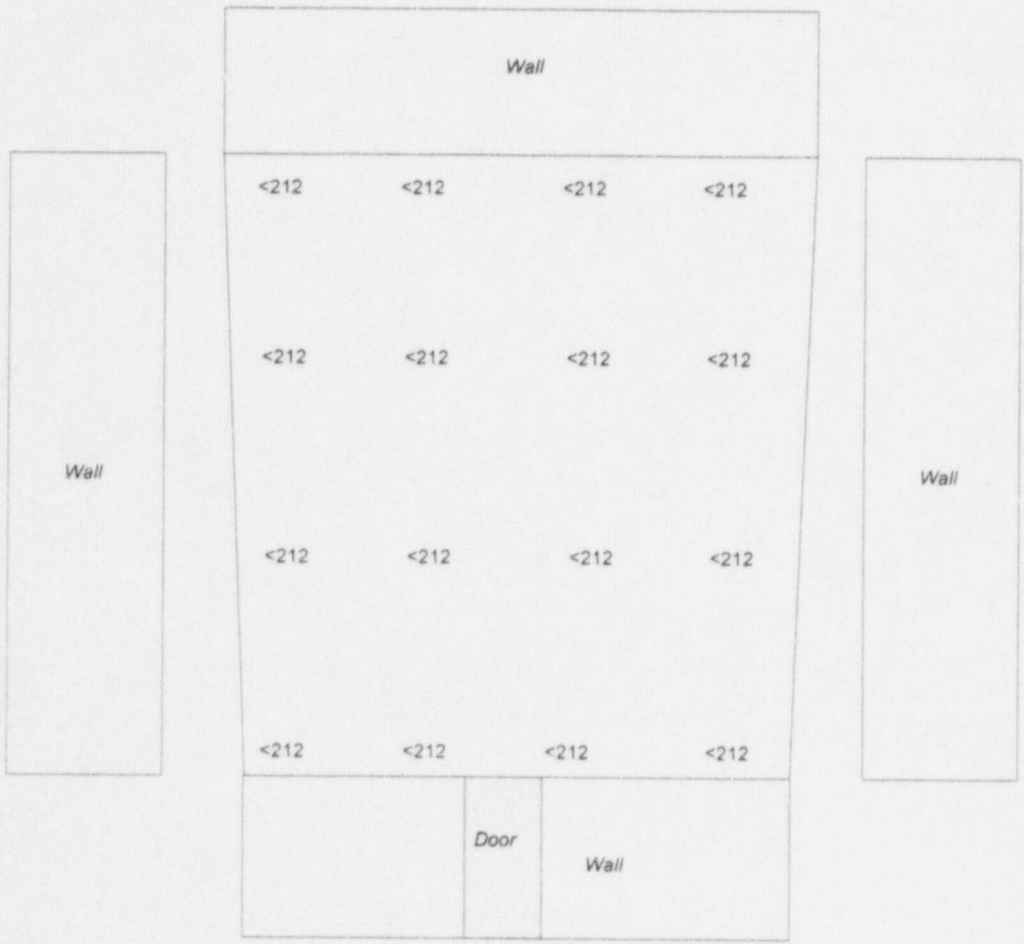
Notes:

1. Survey results are provided in Table 5.

2. ~100% of the floor and walls (2m up) were scanned for Beta. Scan results in cross hatched area. ~10% of the walls (above 2m) were scanned for Beta.

3. All concrete, cement block and sheetrock surfaces.

Figure 35: Lab 242: Fixed Beta Measurements



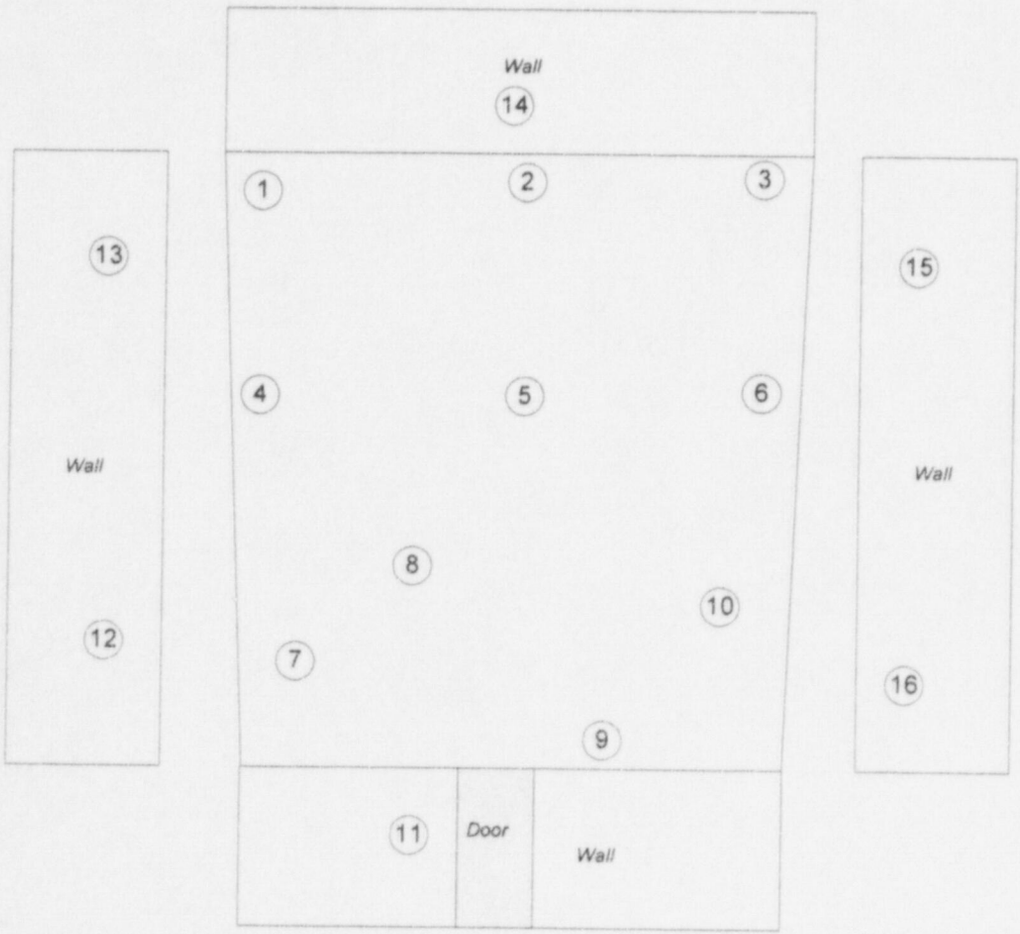
Notes:

1. Survey results are provided in Tables 5.

2. The values are in dpm/100cm2 and indicate the approximate locations of measurements taken. Two minute (cp2m) fixed Beta readings were taken.

3. All concrete surface.

Figure 36: Lab 242: Locations of Removable Contamination Survey



Notes:

1. Survey results are provided in Tables 7.
2. The Numbers circled are the approximate locations of wipes taken.
3. All cement block and drywall surfaces.

Figure 37: Lab 242: Locations and Results of Fixed Beta Measurements at Paint Sample Locations

Notes:

1. Survey results are provided in Table 5.
2. The values are in dpm/100cm^2 and the diamonds indicate the approximate locations of paint samples taken. Two Minute fixed beta readings were taken before and after paint samples were removed.
3. All cement block and drywall surfaces.

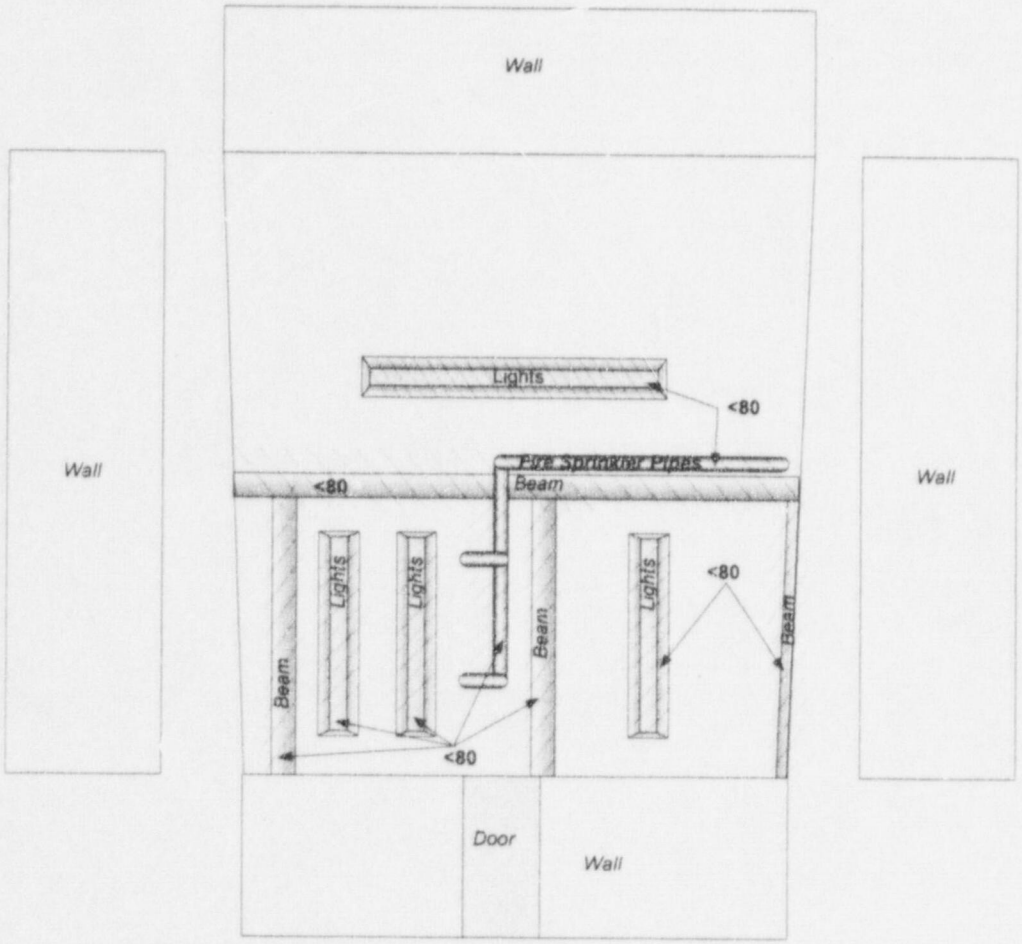
Figure 38: Lab 242: Locations and Results of Exposure Rate Measurements

Notes:

1. The values are exposure rate measurements in μR/hr at the approximate locations indicated. Each measurement was taken ~1m above ground surface.

2. All concrete surface.

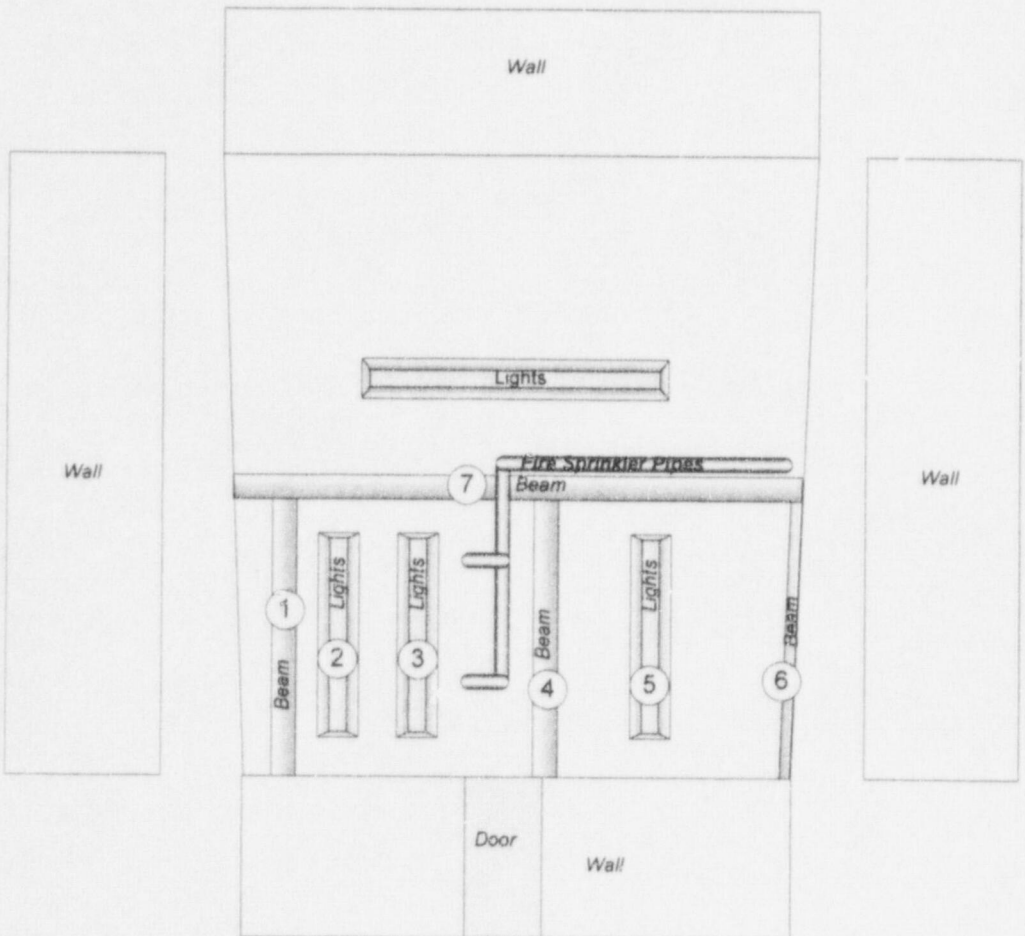
Figure 39: Lab 242: Beta Scan on Overhead Fixtures



Notes:

1. Survey results are provided in Table 5.
2. ~100% of the Overhead Fixtures were scanned for Beta using a 15cm² GM. Scan results in cross hatched area are in cpm.
3. All concrete surface.

Figure 40: Lab 242: Locations of Removable Contamination Survey on the Overhead Fixture



Notes:

1. Survey results are provided in Tables 7.
2. The Numbers circled are the approximate locations of wipes taken.
3. All metal surface.

Figure 41: Lab 325: Alpha Floor Scan

Notes:

1. Survey results are provided in Table 5.
2. ~100% of the floor was scanned for Alpha. Scan results in cross hatched area.
3. All metal and concrete surfaces.

Figure 42: Lab 325: Beta Scans of Floor and Walls

Notes:

1. Survey results are provided in Table 5.
2. ~100% Beta scan on the Floor and Walls (up 2 meters) were scanned for Beta. Scan results in cross hatched area.
3. ~10% above 2m on the walls were scanned for Beta. As noted, Scan results above 2m of walls.
4. All metal and concrete surface.

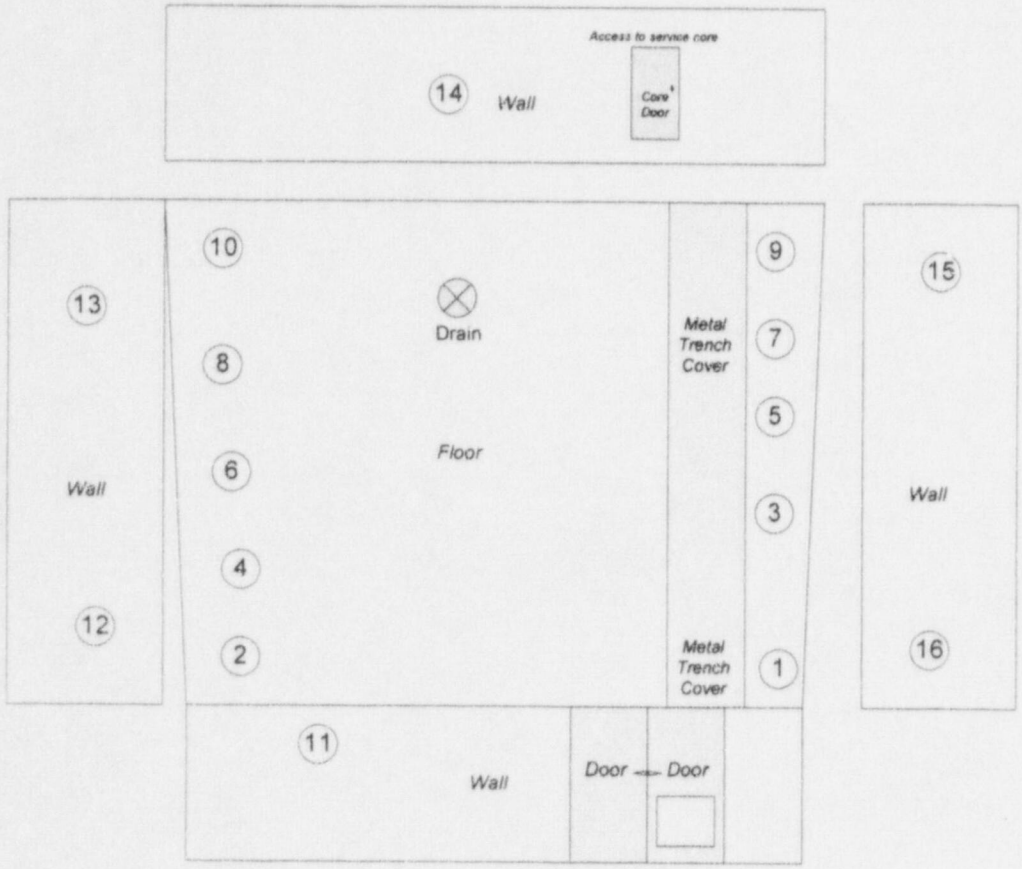
Figure 43: Lab 325: Locations and Results of Two Minute Fixed Beta Measurements

Notes:

1. The values are in dpm/100cm2 and indicate the approximate locations of measurements taken. Two minute (cp2m) fixed Beta readings were taken. Survey results are provided in Tables 5.

2. All metal and concrete surface.

Figure 44: Lab 325: Locations of Removable Contamination Survey on Floor and Walls



Notes:

1. The Numbers circled are the approximate locations of wipes taken. Wipe results are provided in Table 7.
2. All concrete, cement block and drywall surfaces.

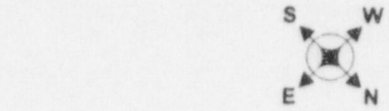
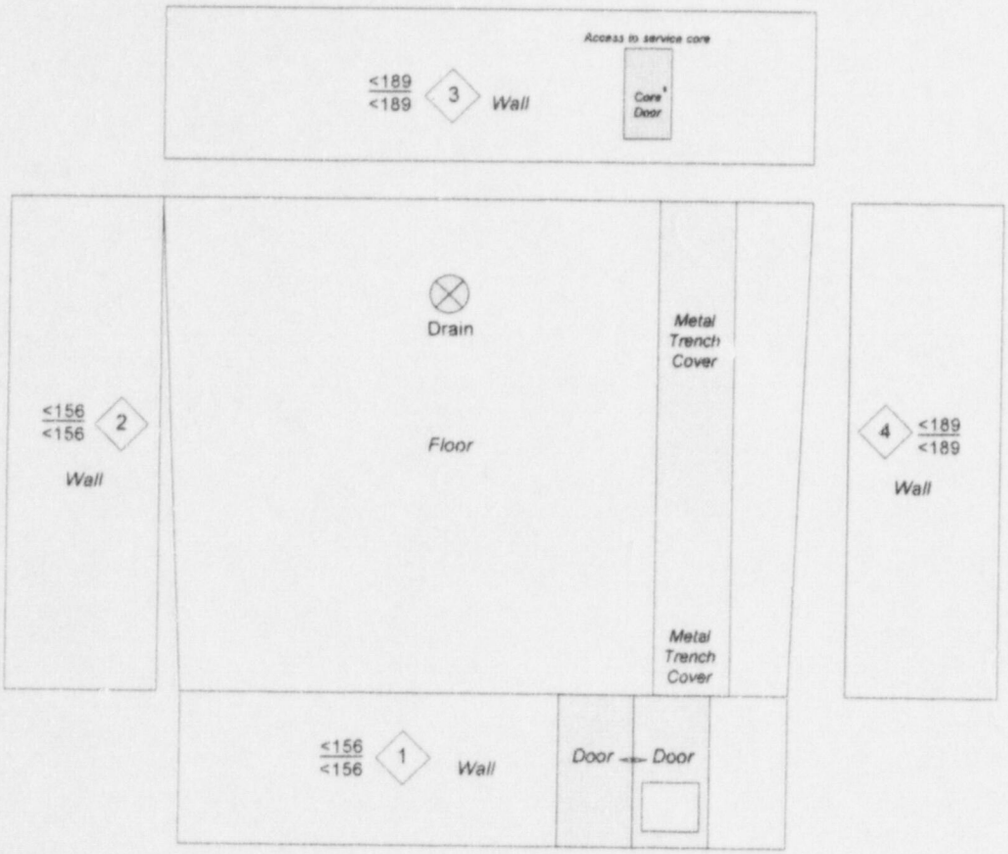


Figure 45: Lab 325: Locations and Results of Fixed Beta Measurements at Paint Sample Locations



Paint Sample = Two minute Fixed Beta measurements: Before Paint Removal in dpm/100cm² / After Paint Removal in dpm/100cm²

Notes:

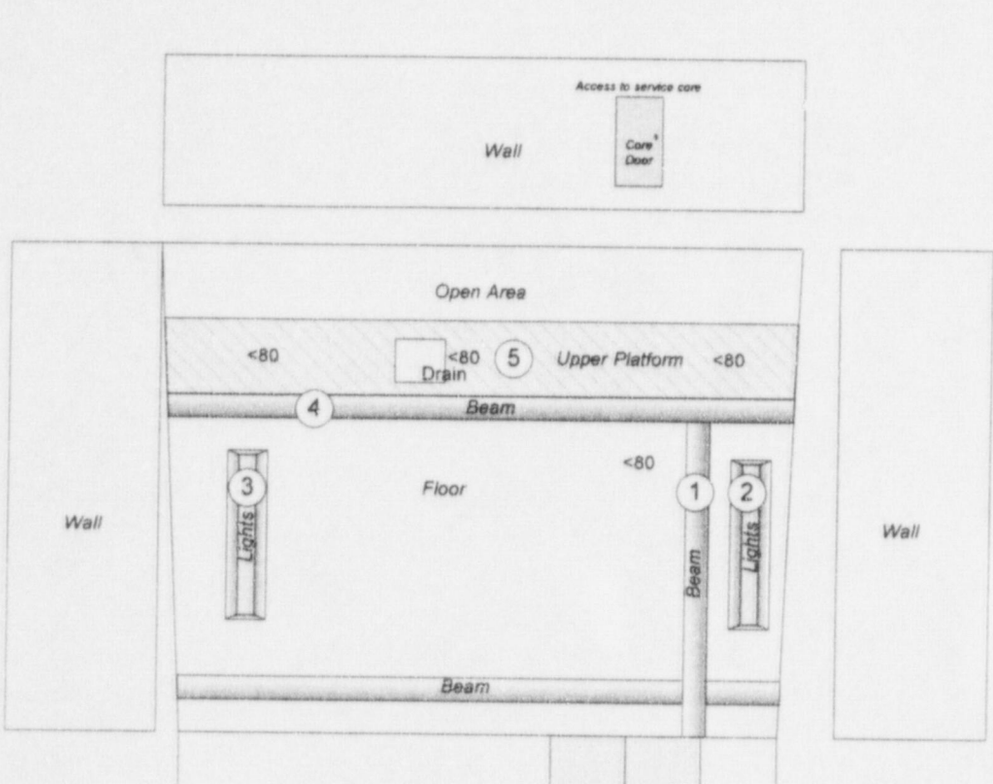
1. Survey results are provided in Table 5.
2. The values are in dpm/100cm² and the diamonds indicate the approximate locations of paint samples taken. Two Minute fixed beta readings were taken before and after paint samples were removed.
3. All cement block and drywall surfaces.

Figure 46: Lab 325: Locations and results of Exposure Rate Measurements

Notes:

1. Survey results are provided in Table 6.
2. The values are μR/hr and indicate the approximate location of Exposure Rate measurements taken ~1m above ground surface.
3. All concrete surface.

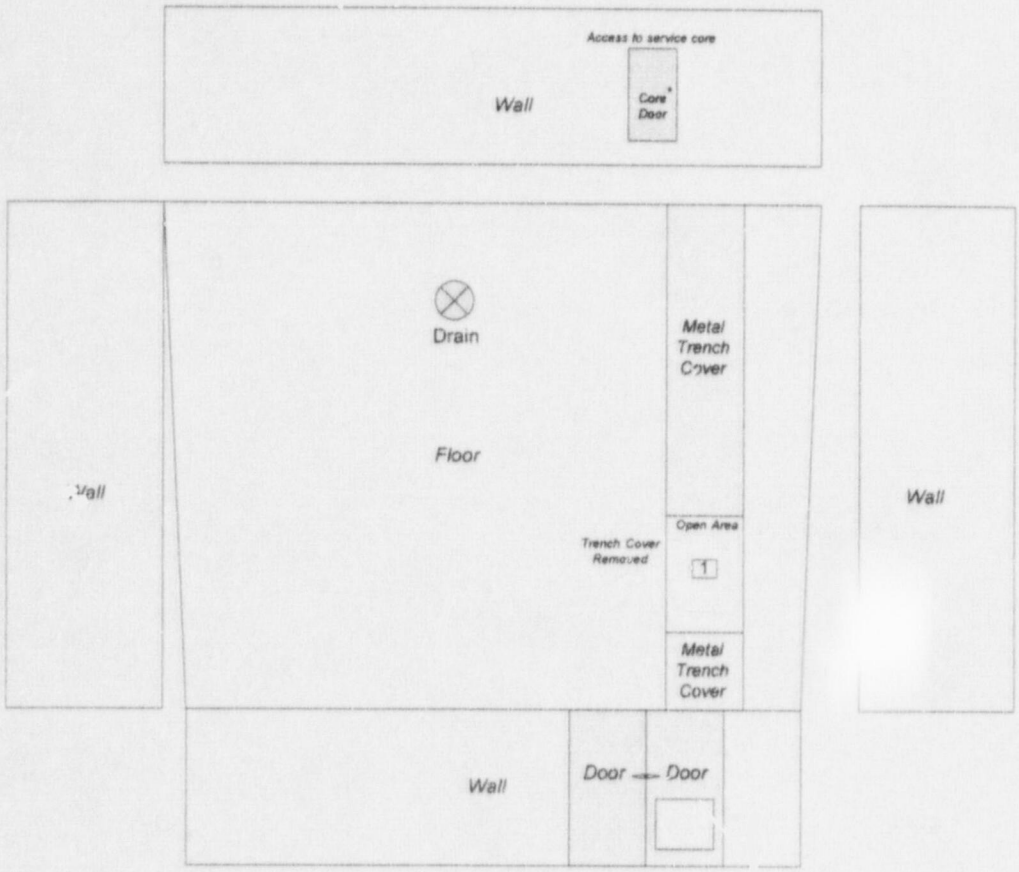
Figure 47: Lab 325 Beta Scan and Removable Contamination Survey on Overhead Fixtures



Notes:

1. Survey results are provided in Table 7.
2. ~25% of Overhead was scanned for Beta using a 15cm^2 GM. Scan results in cross hatched area are in cpm.
3. The Numbers circled are the approximate locations of wipes taken.
4. All concrete surface.

Figure 48: Lab 325: Large Area Masslinn Wipe Trench Survey



Notes:

1. The numbered square shows the approximate location of large area masslinn wipe taken in the trench.
2. No activity above background was found.
3. All concrete surface.

Figure 49: Lab 325: Scan open trench, 100% Alpha.
Locations and Results of Two minute Beta Fixed Measurements

Notes:

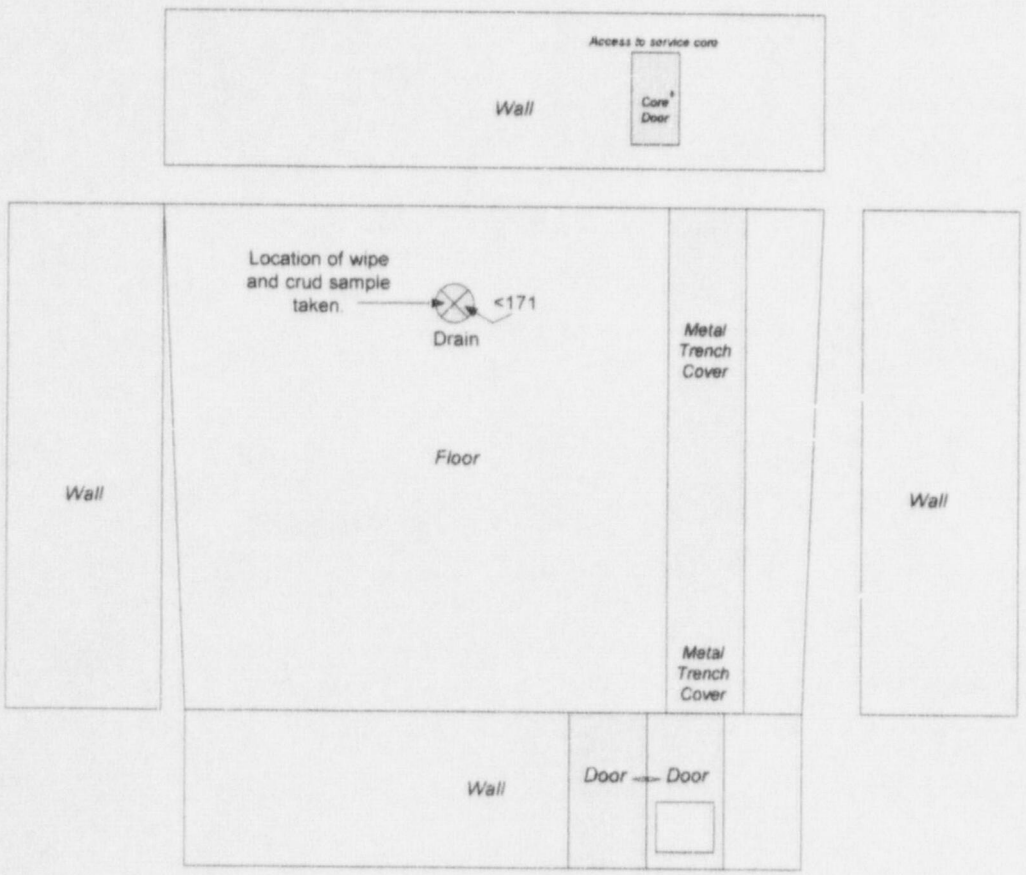
1. Survey results are provided in Tables 5.
2. 100% of Open Trench area was scanned for Alpha.
3. The values are in dpm/100cm^2 and indicate the approximate locations of measurements taken. Two minute (cp2m) fixed Beta readings were taken in the open trench.
4. All concrete surface.

Figure 50: Lab 325: Locations of Removable Contamination Survey

Notes:

1. The Numbers circled are the approximate locations of wipes taken inside the trench. Wipe results are provided in Table 7.
2. All concrete surface.

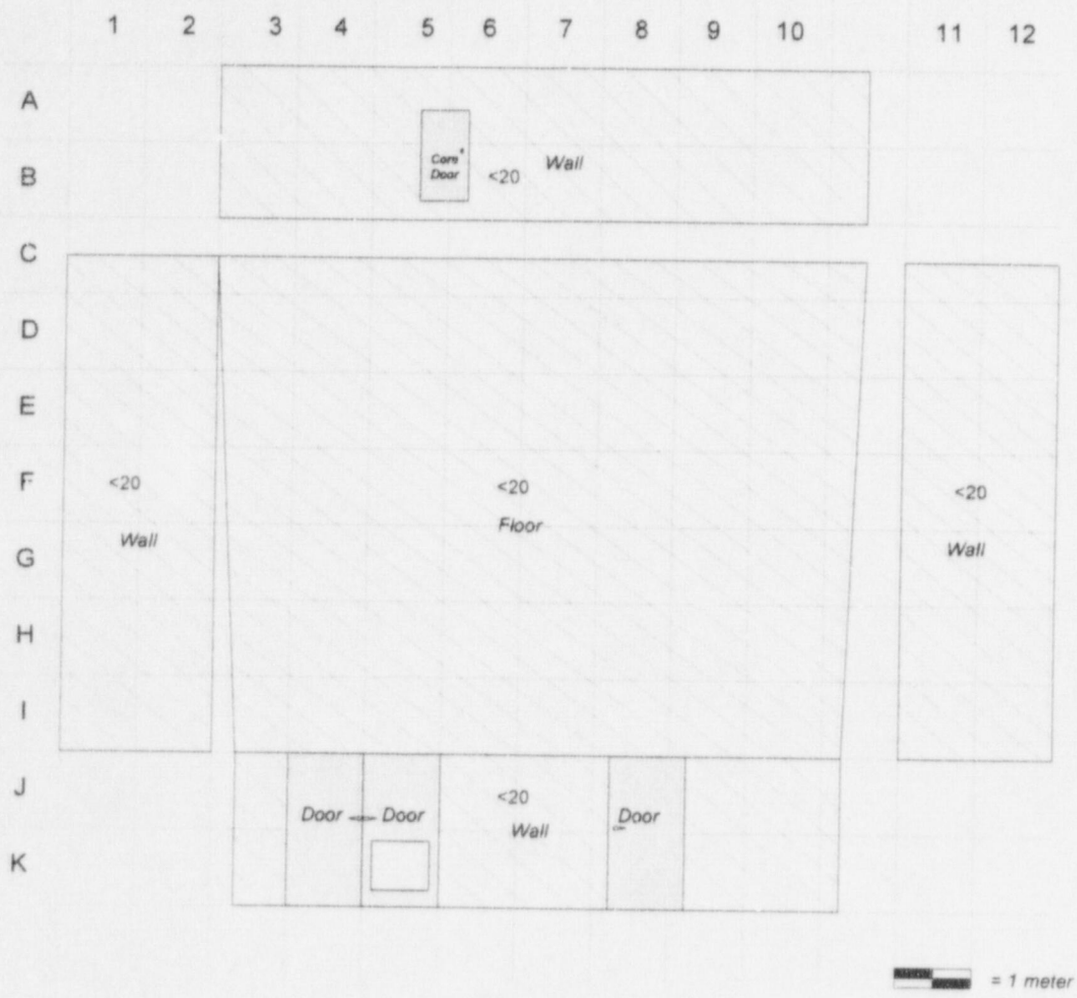
Figure 51: Lab 325: Beta and Exposure Rate Measurement Drain Survey



Notes:

1. Drain survey results are provided in Table 5.
2. The value is in dpm/100cm^2. A Two minute (cp2m) fixed Beta reading was taken.
3. One wipe and one crud sample was taken for isotopic analysis. Wipe and sample results are provided in Table 7.
4. One Exposure Rate Measurement (micro-R) was taken on the drain (contact). The result was 10μR/hr.
5. All concrete surface.

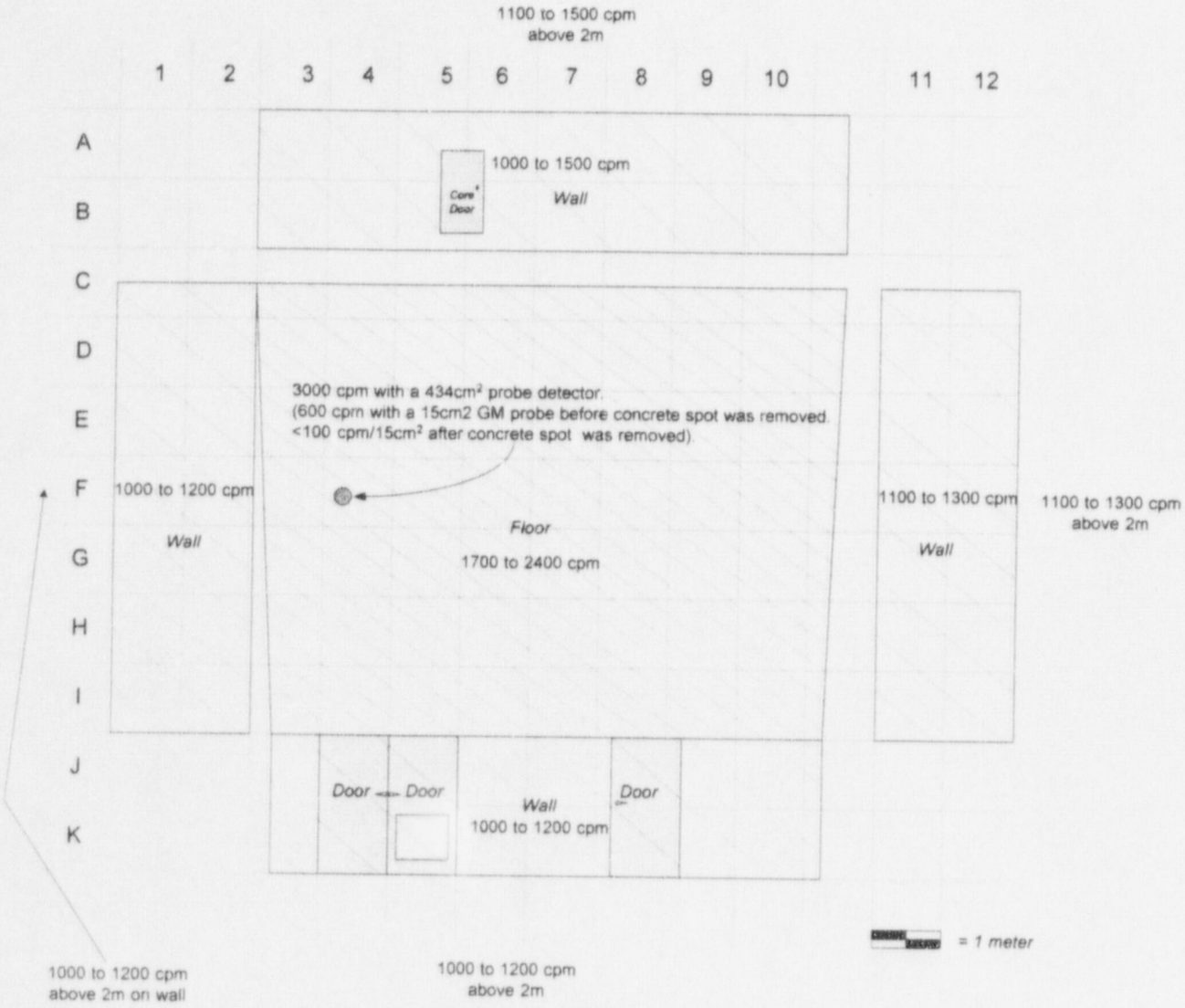
Figure 52: Labs 443/445: Alpha Floor Scan



Notes:

1. Survey results are provided in Table 5.
2. ~100% of the floor and walls was scanned for Alpha. Scan results in cross hatched area are in cpm.
3. All concrete surface.

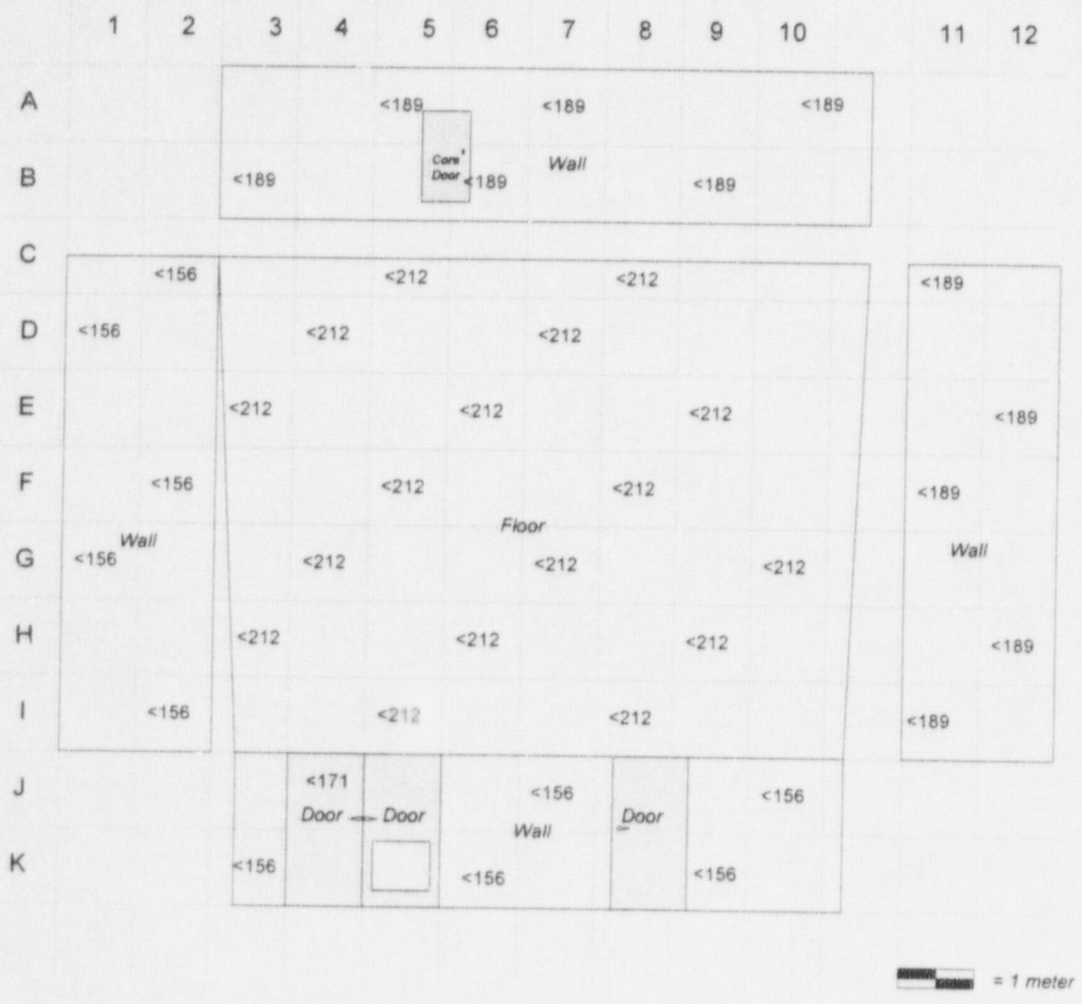
Figure 53: Labs 443/455: Beta Scans of Floor and Walls



Notes:

1. Survey results are provided in Table 5.
2. ~100% of the floor and walls (up 2 meters) were scanned for Beta. Scan results in cross hatched area.
   ~10% of the North, South & West Upper Walls (above 2m) were scanned for Beta.
3. All concrete, cement block and sheetrock surfaces.

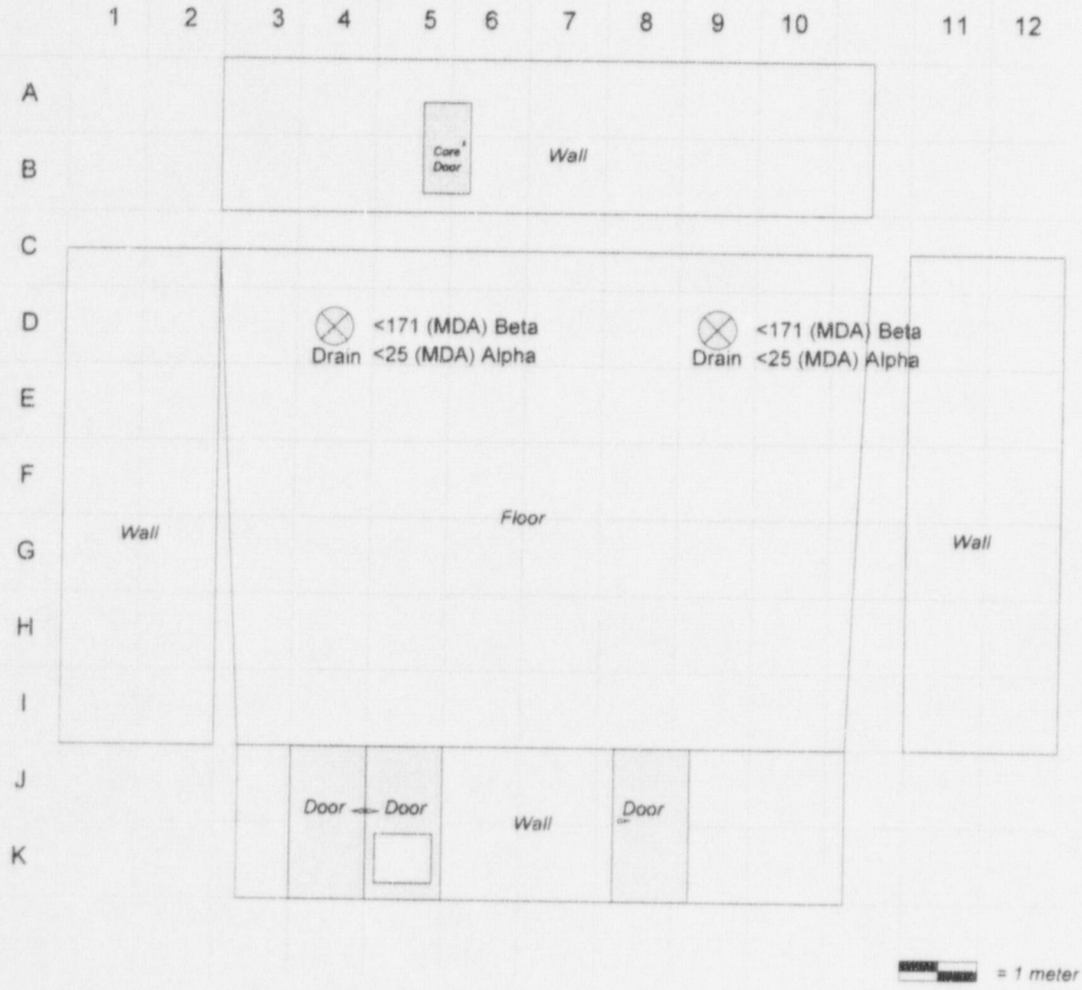
Figure 54: Labs 443/445: Locations and Results of Two Minute Fixed Beta Measurements



Notes:

1. Survey results are provided in Tables 5.
2. The values are in dpm/100cm^2 and indicate the approximate locations of measurements taken. Two minute (cp2m) fixed Beta readings were taken.
3. All concrete, cement block, sheetrock and metal surfaces.

Figure 55: Labs 443/445: Alpha and Beta Drain Survey



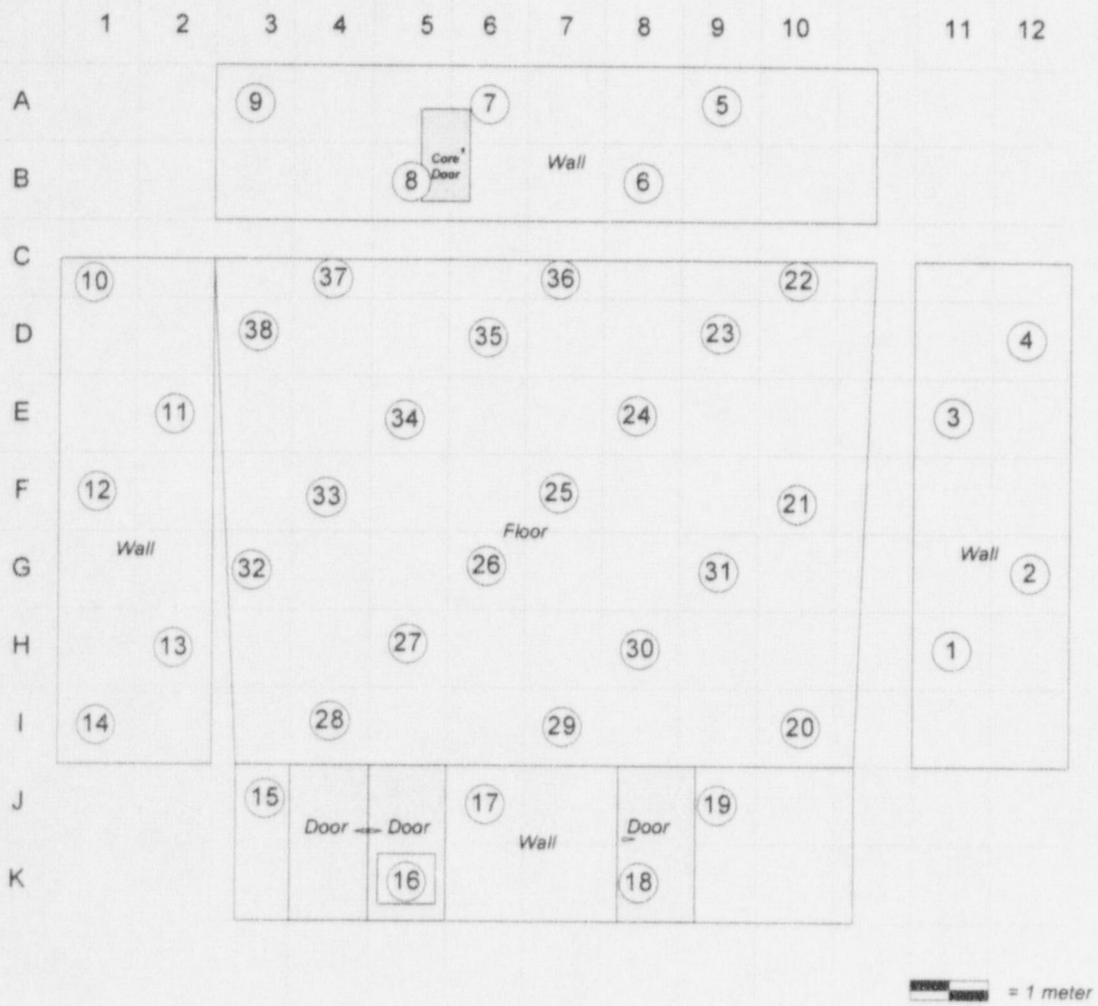
Notes:

1. Survey results are provided in Table 5.

2. Shaded circles with an X are the approximate locations of the Surveyed Drains.
   A two minute Beta reading was taken at each drain. Values are in dpm/100cm^2.
   A one minute Alpha reading was taken from each drain. Values are in dpm/100cm^2.
   No activity was detected.

3. Metal and concrete surface.

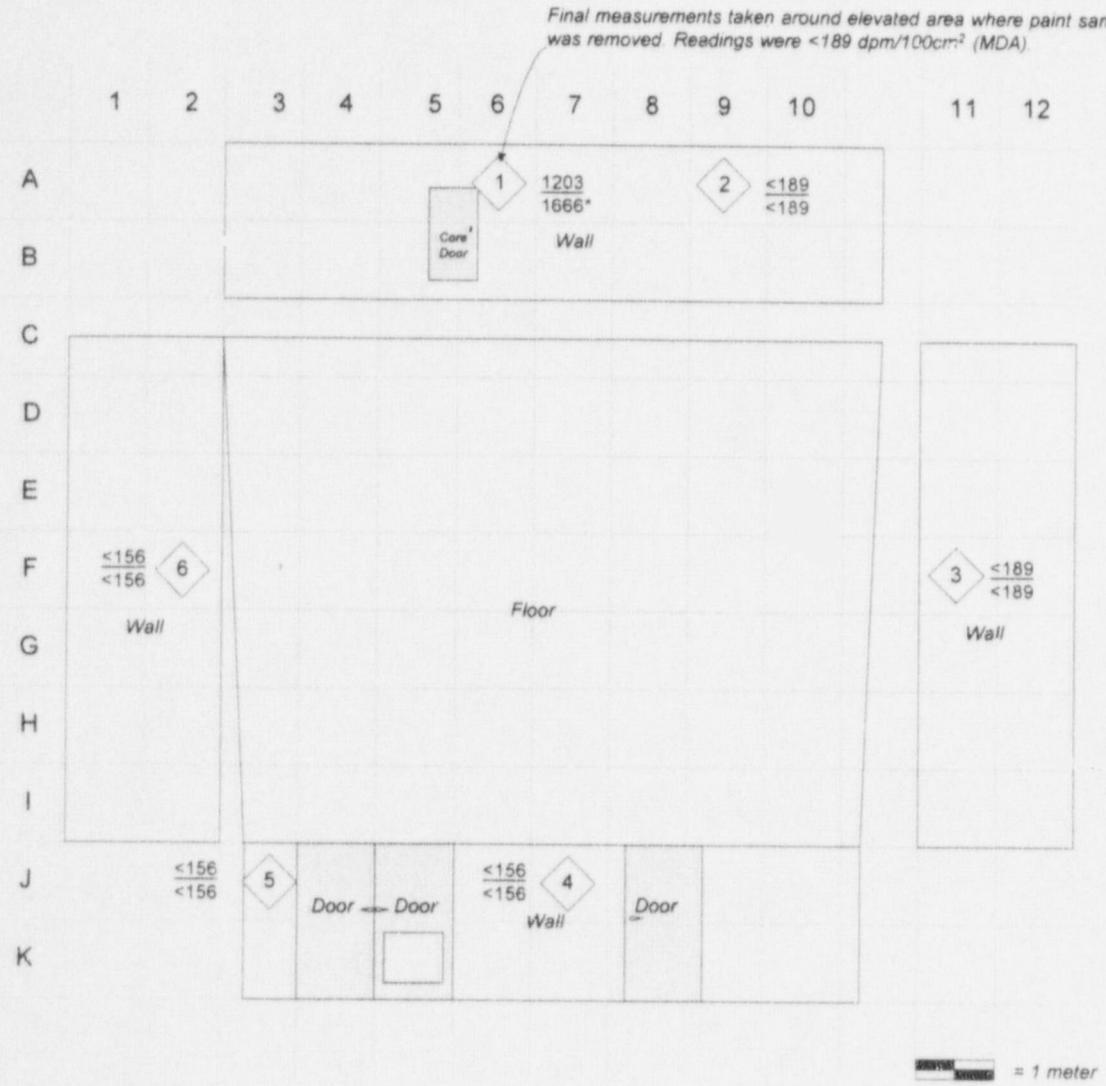
Figure 56: Labs 443/445: Locations of Removable Contamination Survey on Floor and Walls Survey



Notes:

1. Survey results are provided in Tables 7.
2. The Numbers circled are the approximate locations of wipes taken.
3. All concrete, cement block and drywall surfaces.

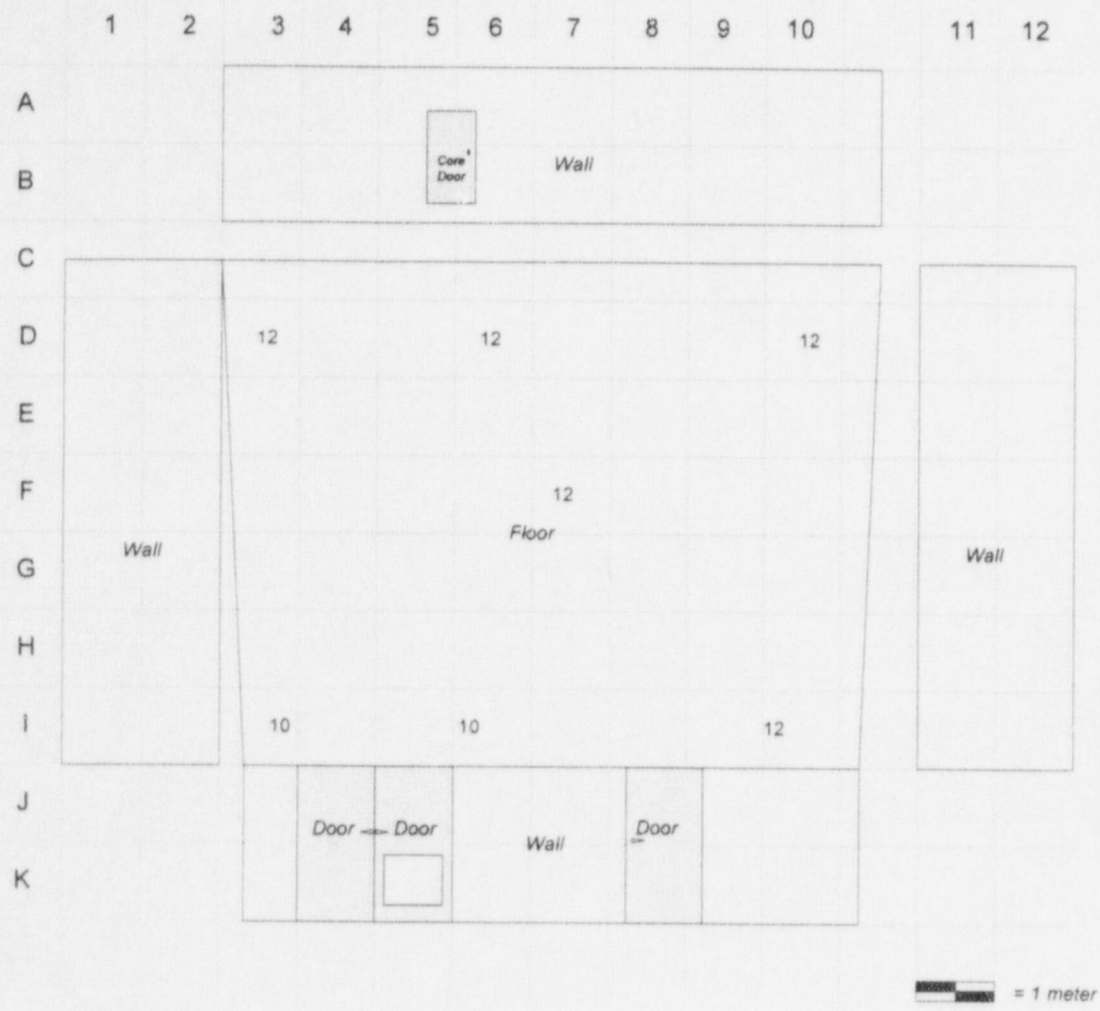
Figure 57: Labs 443/445: Locations and Results of Fixed Beta Measurements at Paint Sample Locations



Notes:

1. Survey results are provided in Table 5.
2. The values are in dpm/100cm² and the diamonds indicate the approximate locations of paint samples taken. Two Minute fixed beta readings were taken before and after paint samples were removed.
3. All cement block and drywall surfaces.
4. * The concrete surface under the paint measured 1666 dpm/100cm². The concrete was chiseled off until direct measurements were <189 dpm/100cm².

Figure 58: Labs 443/445: Locations and results of Exposure Rate Measurements

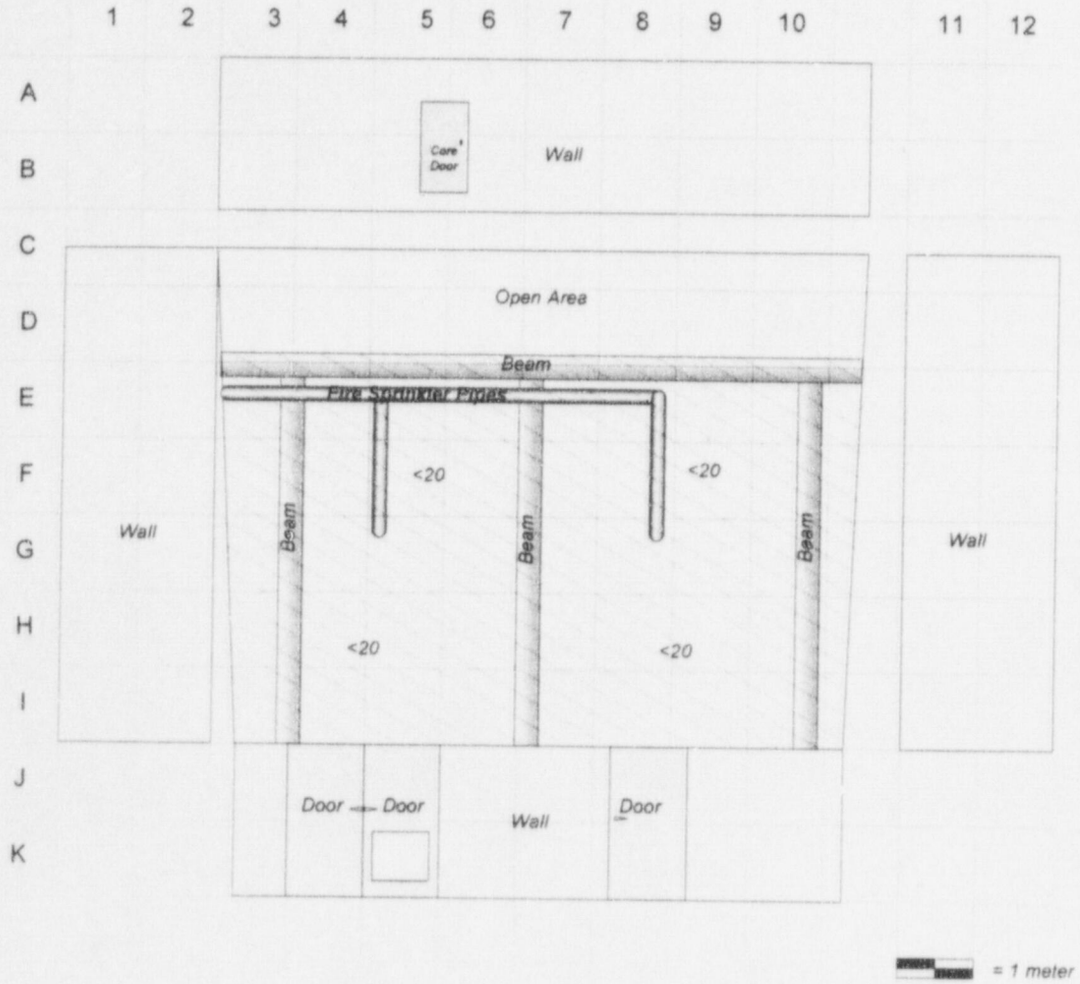


Notes:

1. The values are exposure rate measurements in μR/hr at the approximate locations indicated. Each measurement was taken ~1m above ground surface.

2. All concrete surface.

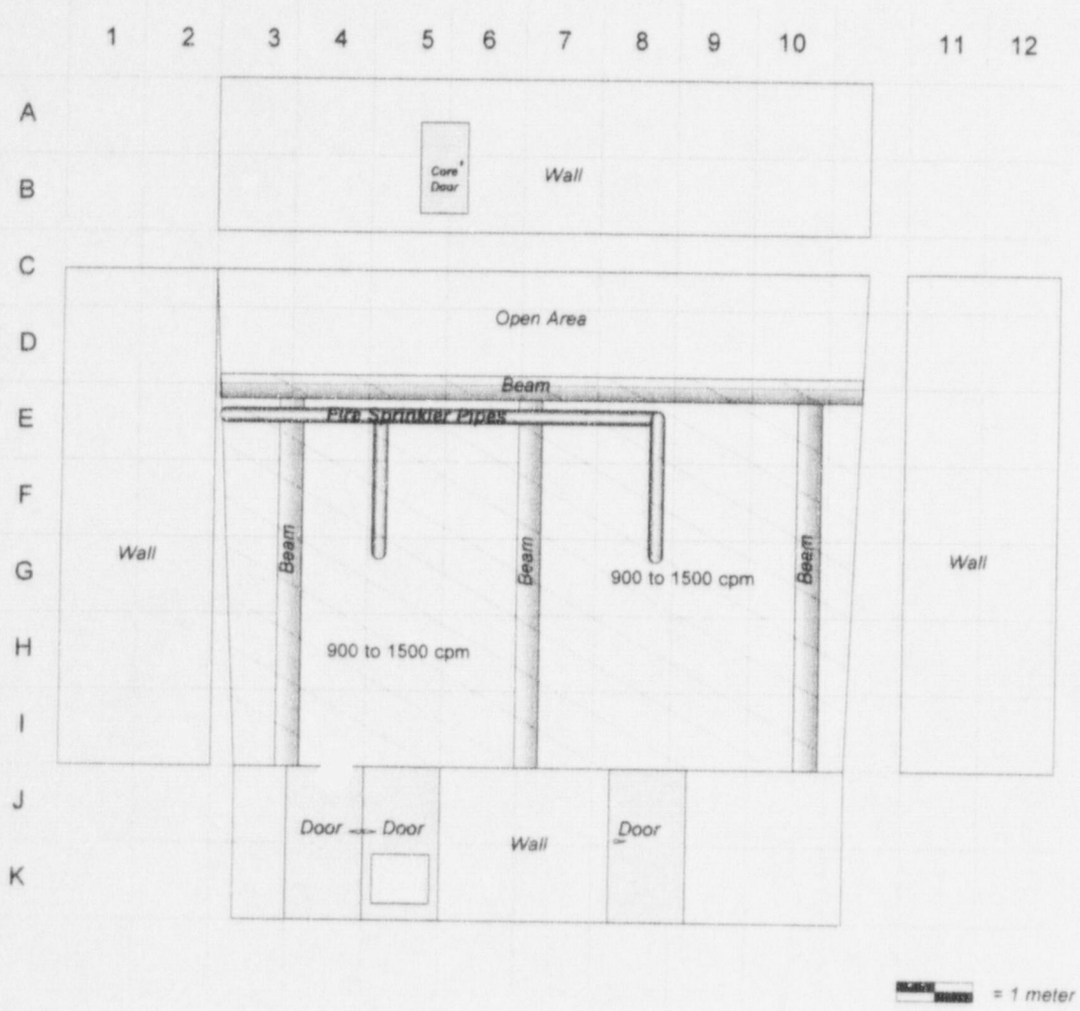
Figure 59: Labs 443/445 Alpha Scan on Overhead Fixtures



Notes:

1. Survey results are provided in Table 5.
2. ~100% of Overhead was scanned for Alpha (50cm^2 detector). Scan results in cross hatched area are in cpm.
3. All metal surface.

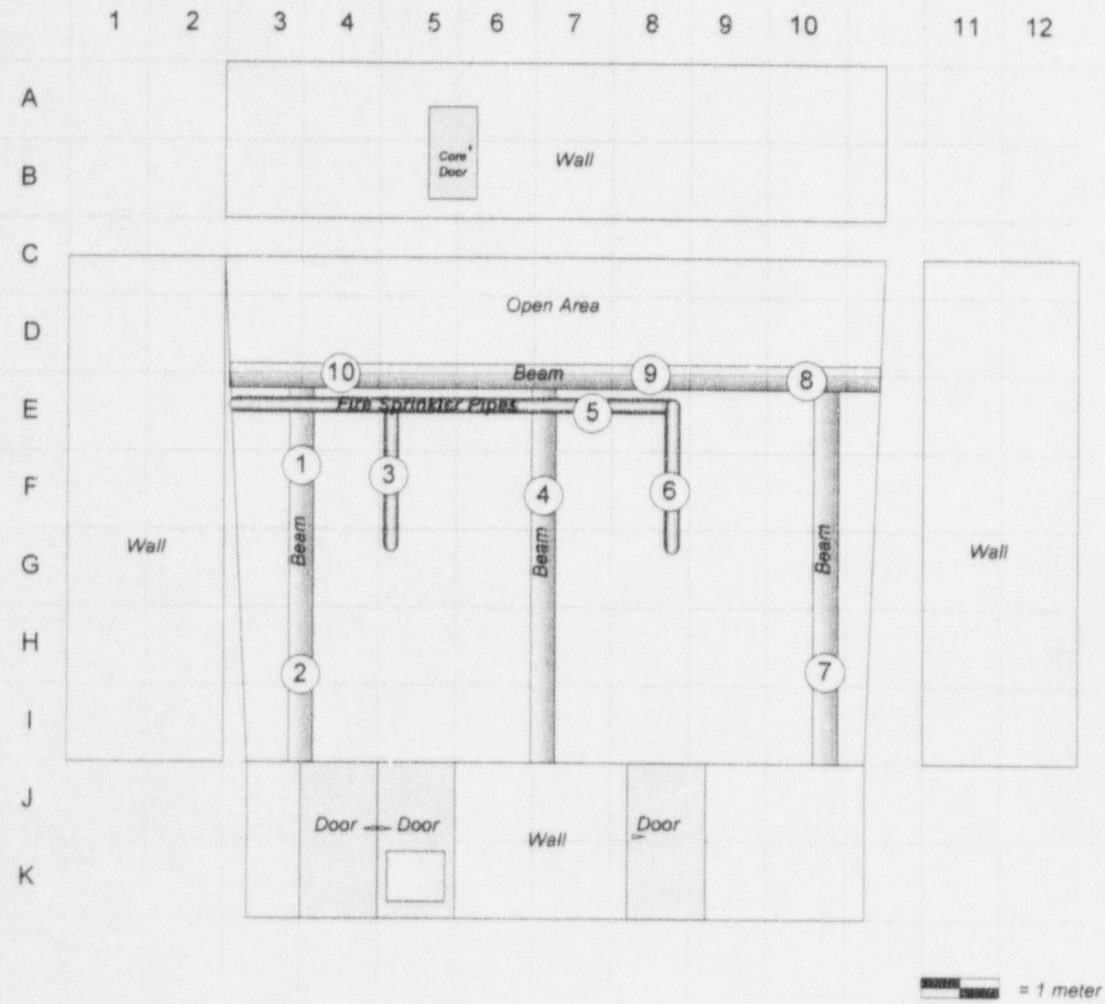
Figure 60: Labs 443/445: Beta Scans on the Overhead Fixtures and Ceiling



Notes:

1. Survey results are provided in Table 5.
2. ~50% of the overhead was scanned for Beta. Scan results in cross hatched area.
3. All concrete surface.

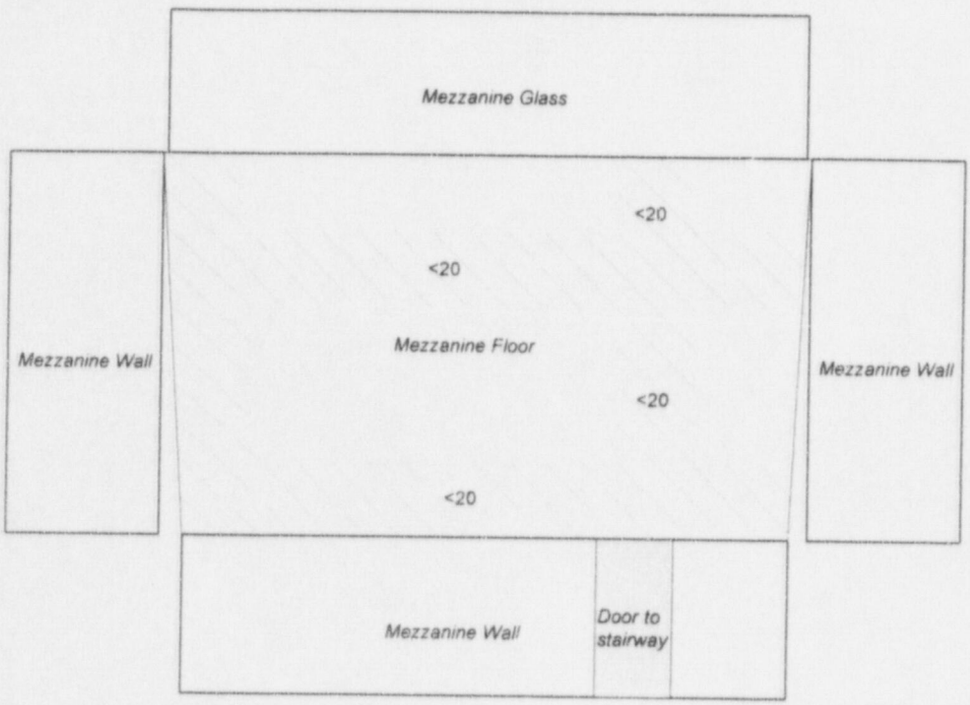
Figure 61: Labs 443/445: Locations of Removable Contamination Survey on the Overhead Fixture



Notes:

1. Survey results are provided in Tables 7.
2. The Numbers circled are the approximate locations of wipes taken.
3. All metal surface.

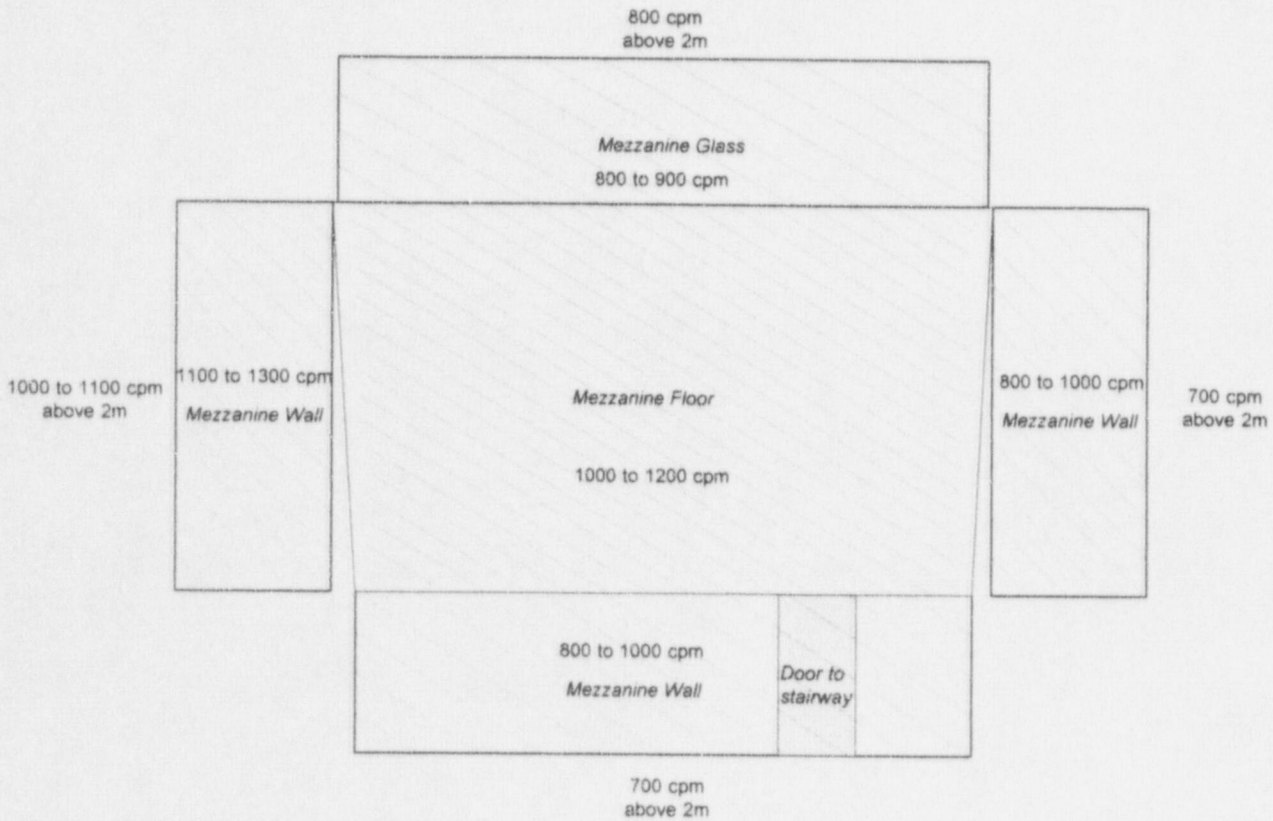
Figure 62: Labs 443/445 Mezzanine: Alpha Floor Scan



Notes:

1. Survey results are provided in Table 5.
2. ~10% of the floor was scanned for Alpha. Scan results in cross hatched area.
3. All metal surface.

Figure 63: Labs 443/445 Mezzanine: Beta Scans of Floor and Walls



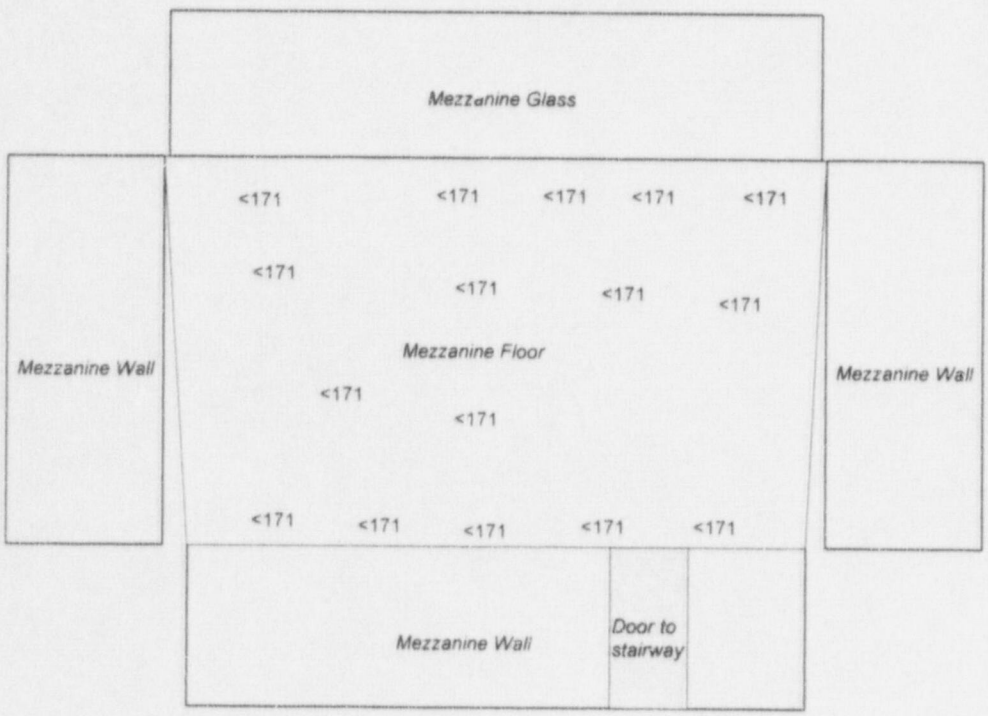
Notes:

1. Survey results are provided in Table 5.

2. ~100% of the floor and walls (2m up) were scanned for Beta. Scan results in cross hatched area.
   ~10% of the walls (above 2m) were scanned for Beta.

3. All concrete, cement block, sheetrock and glass surfaces.

Figure 64: Labs 443/445: Locations and Results of Fixed Beta Measurements



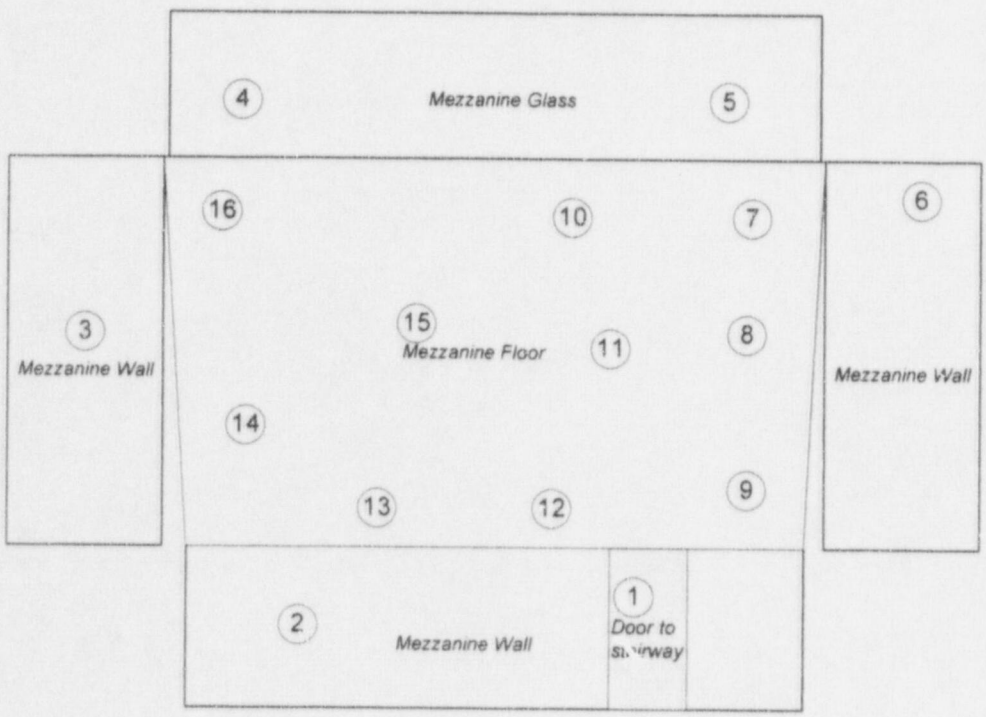
Notes:

1. Survey results are provided in Tables 5.

2. The values are in dpm/100cm^2 and indicate the approximate locations of measurements taken. Two minute (cp2m) fixed Beta readings were taken.

3. All concrete surface.

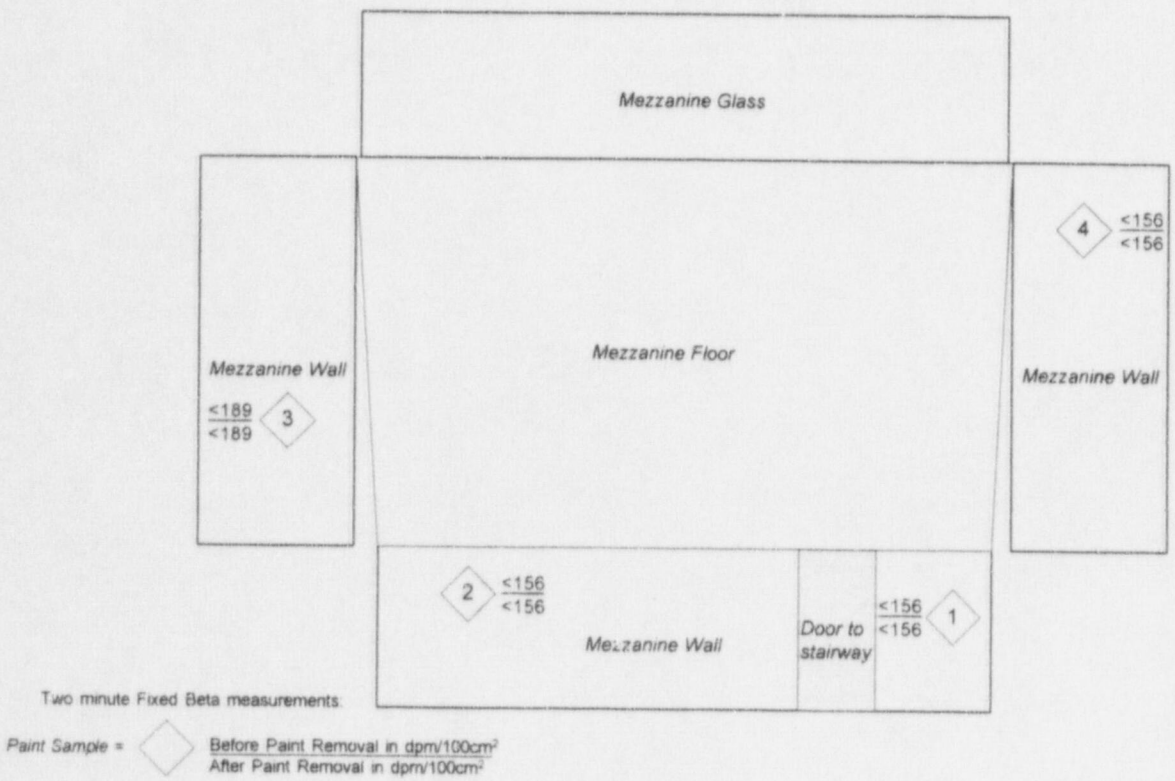
Figure 65: Labs 443/445 Mezzanine: Locations of Removable Contamination Survey on Floor and Walls



Notes:

1. The Numbers circled are the approximate locations of wipes taken. Wipe results are provided in Table 7.
2. All concrete, cement block, sheetrock and glass surfaces.

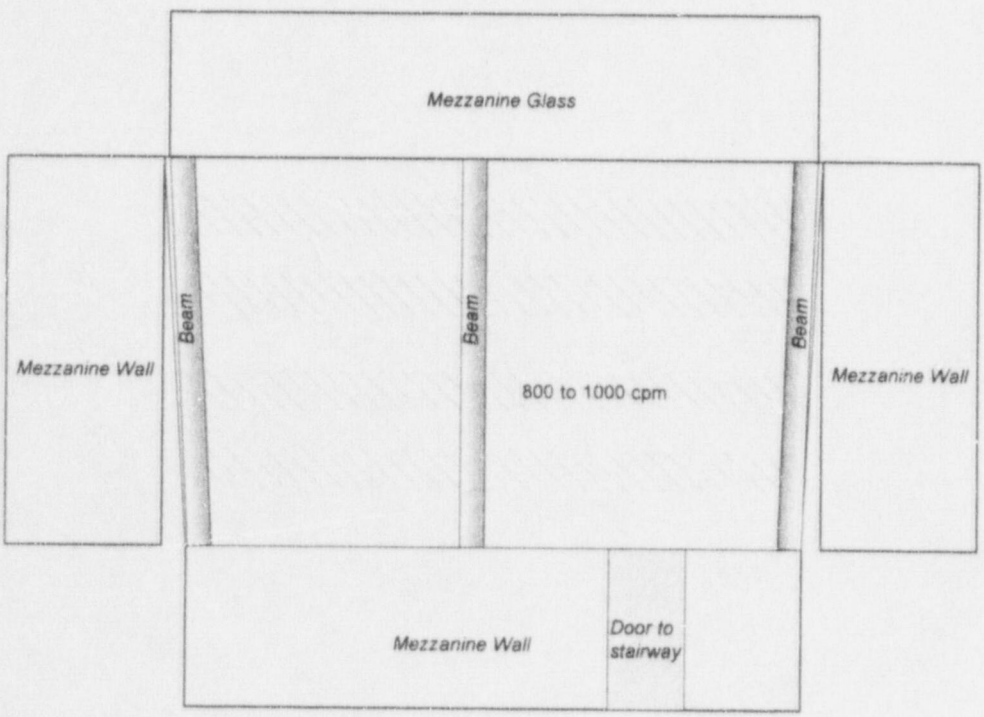
Figure 66: Labs 443/445 Mezzanine: Locations and Results of Fixed Beta Measurements at Paint Sample Locations



Notes:

1. Survey results are provided in Table 5.
2. The values are in dpm/100cm^2 and the diamonds indicate the approximate locations of paint samples taken. Two Minute fixed beta readings were taken before and after paint samples were removed.
3. All cement block and drywall surfaces.

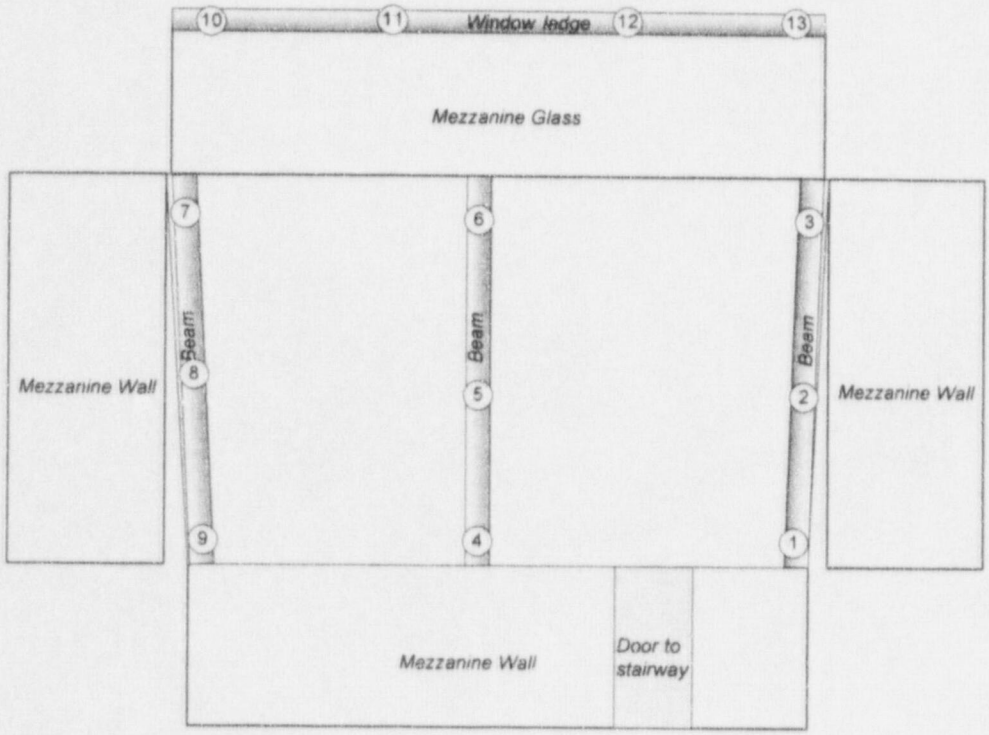
Figure 67: Labs 443/445 Mezzenine: Overhead Beta Scan



Notes:

1. Survey results are provided in Table 5.
2. ~25% of the overhead was scanned for Beta. Scan results in cross hatched area.
3. All metal surface.

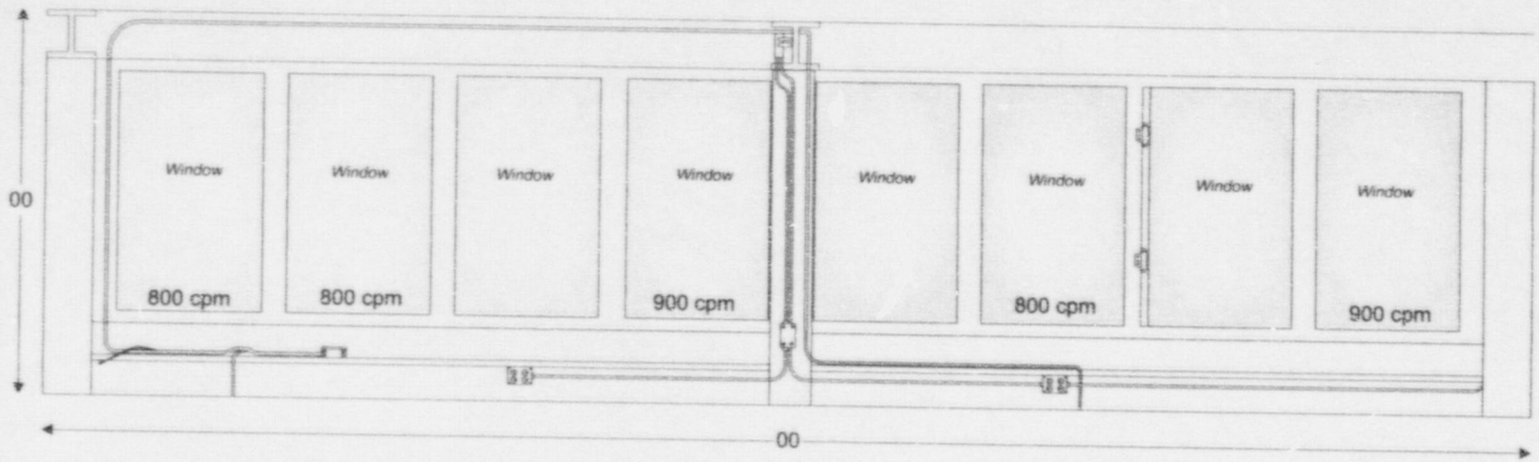
Figure 68: Labs 443/445: Overhead Fixtures Locations of Removable Contamination Survey



Notes:

1. Survey results are provided in Tables 7.
2. The Numbers circled are the approximate locations of wipes taken.
3. All metal surface.

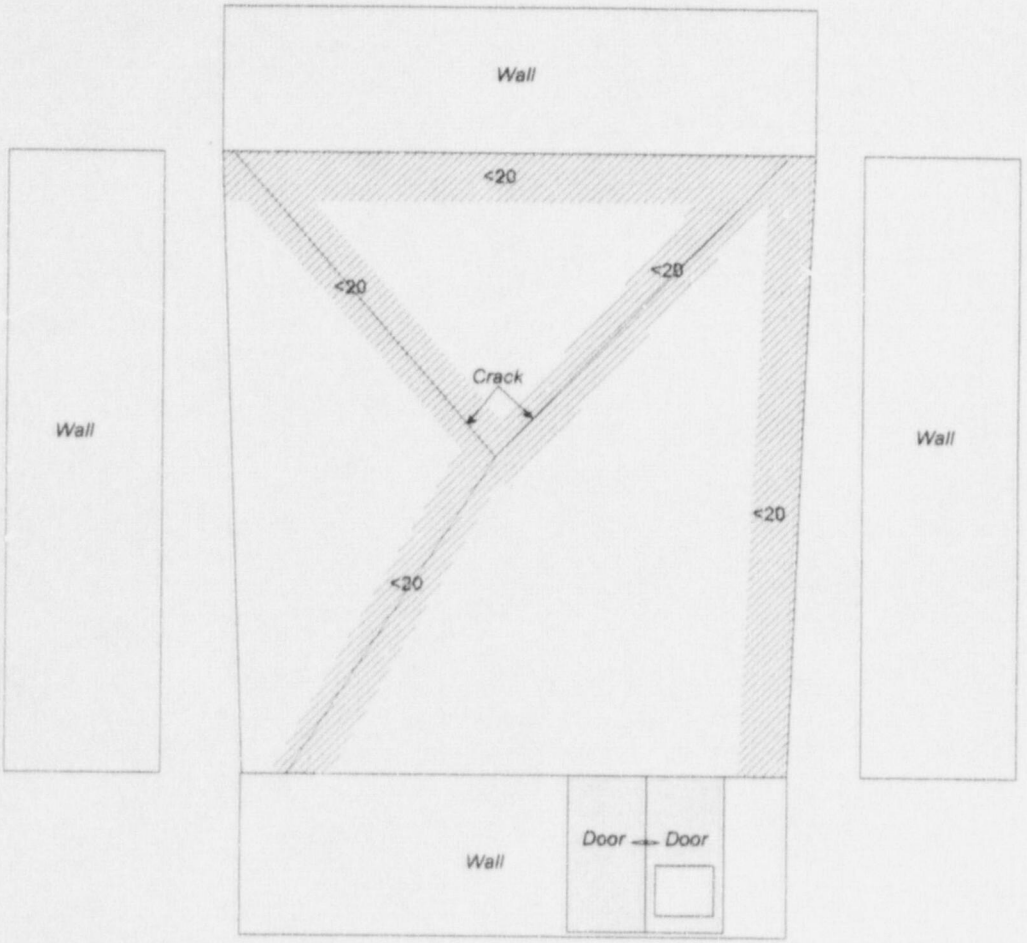
Figure 69: Labs 443/445 Mezanine West Window Ledges



Notes:

1. Survey results are provided in Table 5.
2. ~25% of the windows were scanned for Beta with a 434cm^2 detector.
3. All metal and concrete surfaces.

Figure 70: Lab 615: Alpha Floor Scans



Notes:

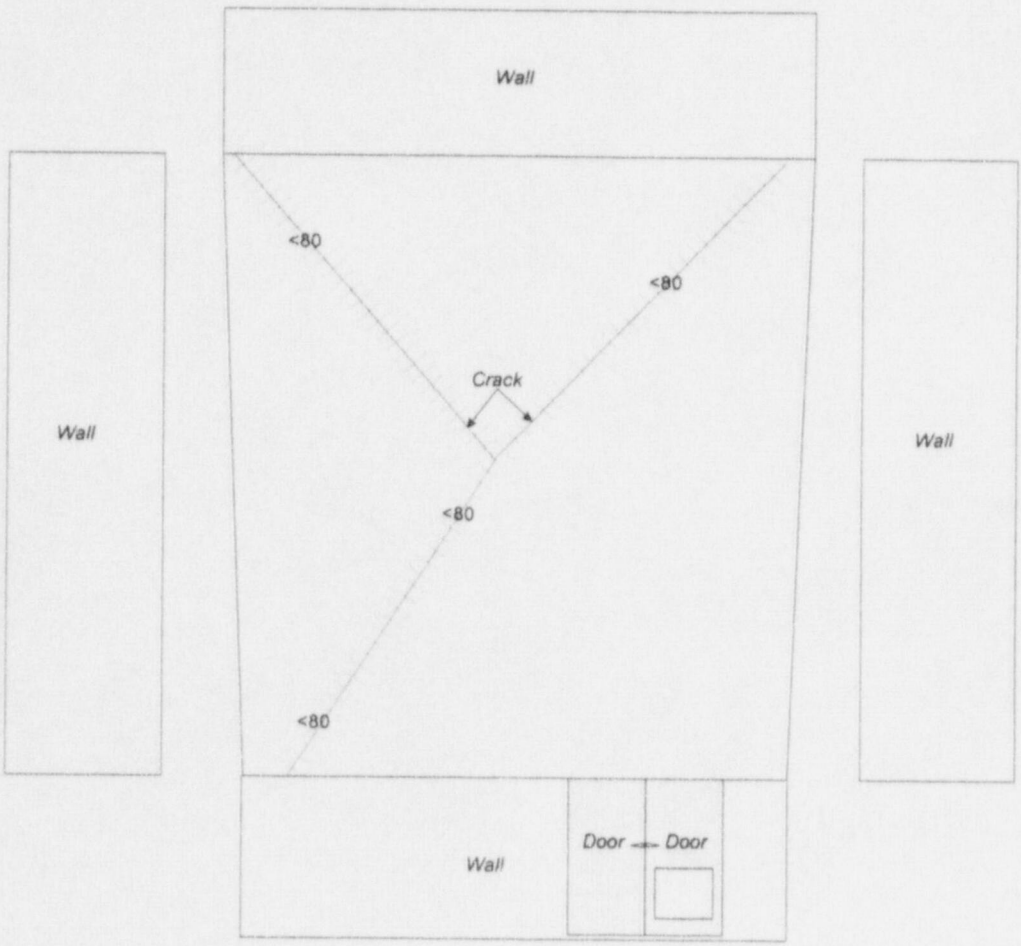
1. Survey results are provided in Table 5.
2. ~10% of the floor was scanned for Alpha. Scan results in cross hatched area are in cpm.
3. All concrete surface.

Figure 71: Lab 615: Beta Scans of Floor and Walls

Notes:

1. Survey results are provided in Table 5.
2. ~100% of the floor and walls (2m up) were scanned for Beta. Scan results in cross hatched area. ~10% of the walls (above 2m) were scanned for Beta.
3. All concrete, cement block and sheetrock surfaces.

Figure 72: Lab 615: Beta Scan, Crack on Floor



Notes:

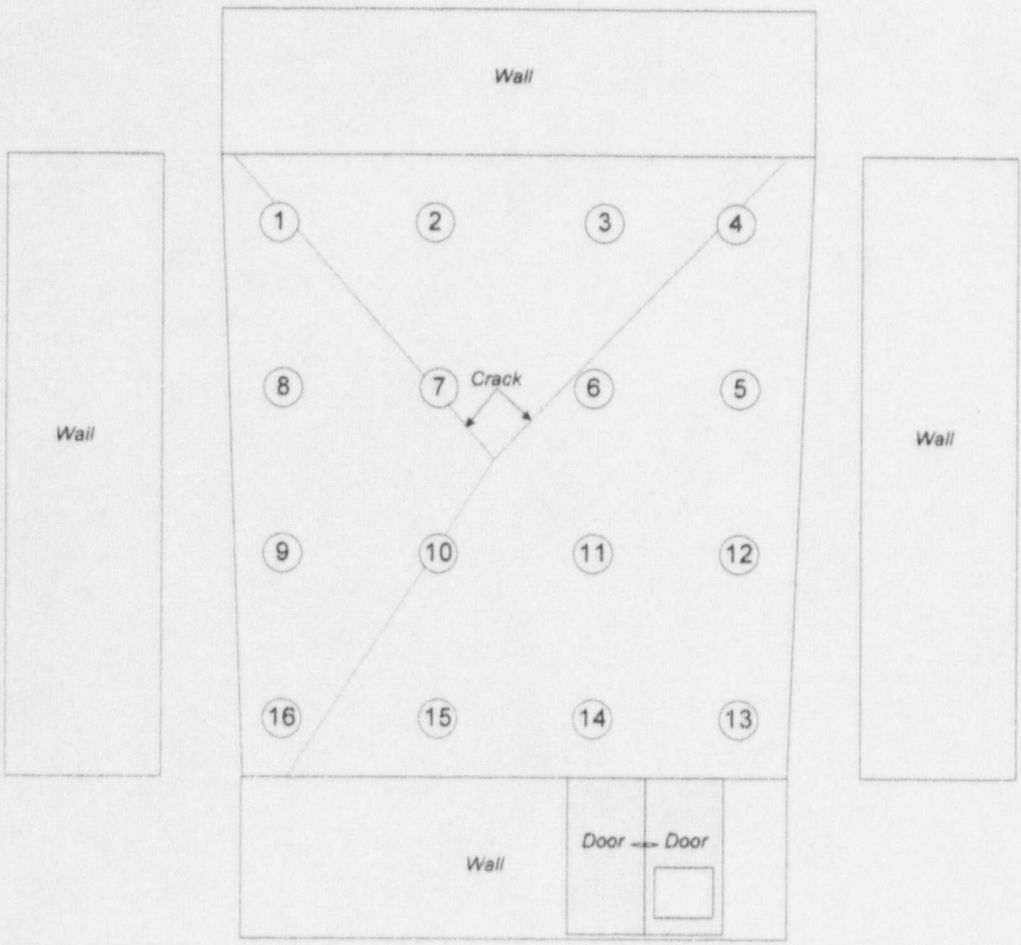
1. Survey results are provided in Table 5.
2. ~100% of crack in the floor was scanned for Beta with a 15cm^2 GM. Scan results in cross hatched area are in cpm.
3. All concrete surface.

Figure 73: Lab 615: Fixed Beta Measurements

Notes:

1. Survey results are provided in Tables 5.
2. The values are dpm/100cm^2 and indicate the approximate locations of measurements taken. Two minute (cp2m) fixed Beta readings were taken.
3. All concrete surface.

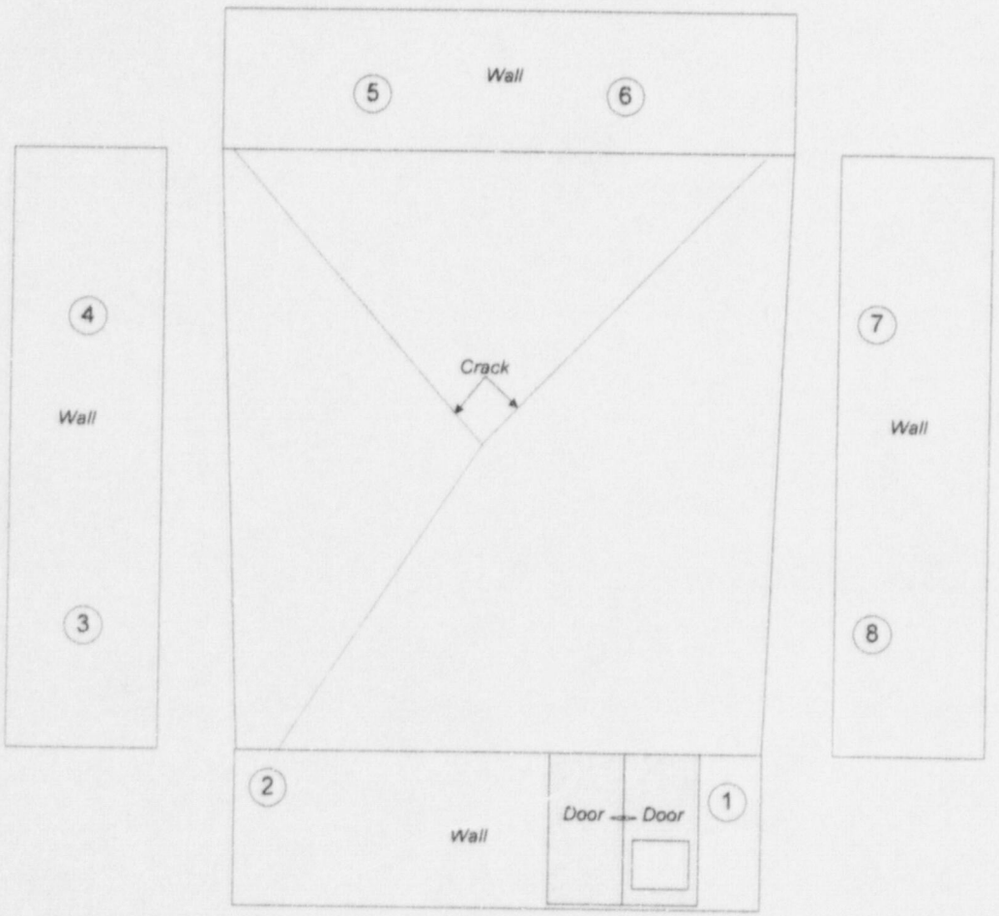
Figure 74: Lab 615: Locations of Removable Contamination Survey



Notes:

1. Survey results are provided in Tables 7.
2. The Numbers circled are the approximate locations of wipes taken.
3. All concrete surface.

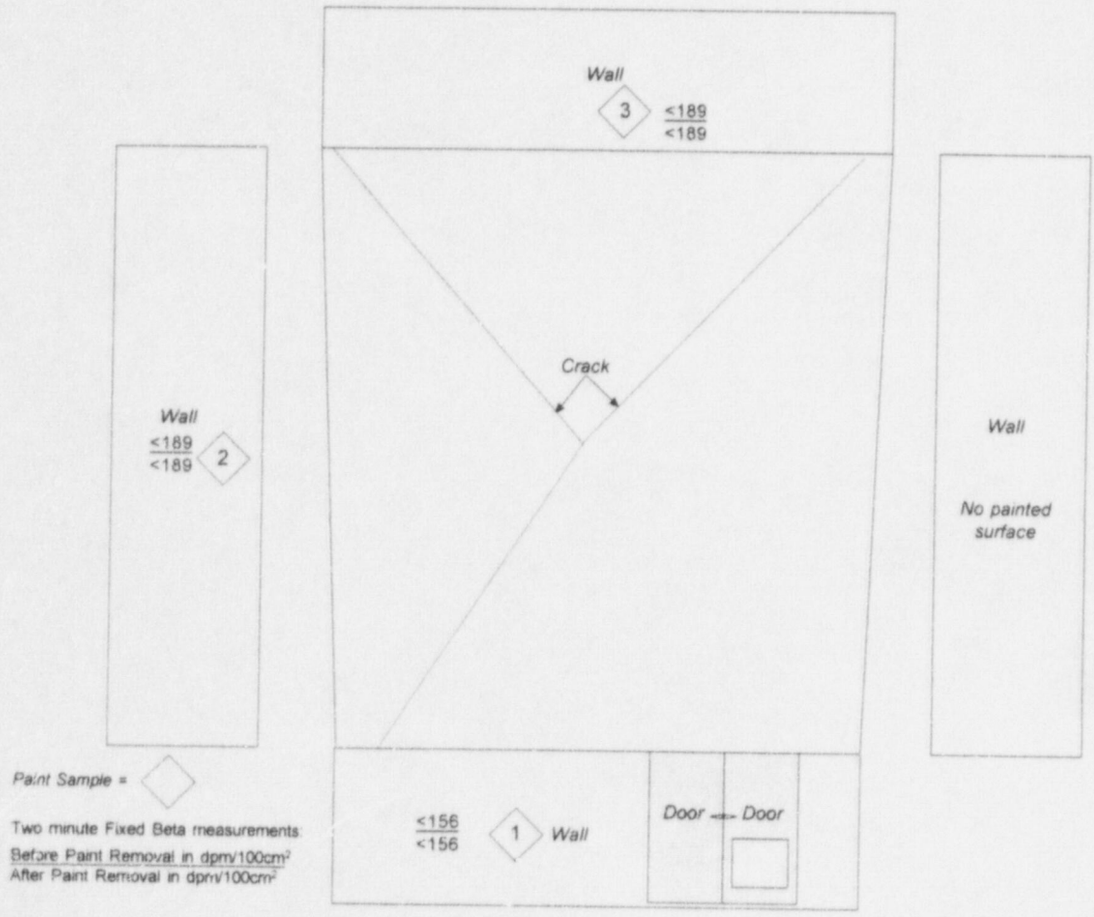
Figure 75: Lab 615: Locations of Removable Contamination Wall Survey



Notes:

1. Survey results are provided in Tables 7.
2. The Numbers circled are the approximate locations of wipes taken.
3. All concrete surface.

Figure 76: Lab 615: Locations and Results of Fixed Beta Measurements at Paint Sample Locations



Notes:

1. Survey results are provided in Table 5.
2. The values are in dpm/100cm² and the diamonds indicate the approximate locations of paint samples taken. Two Minute fixed beta readings were taken before and after paint samples were removed.
3. All cement block and drywall surfaces.

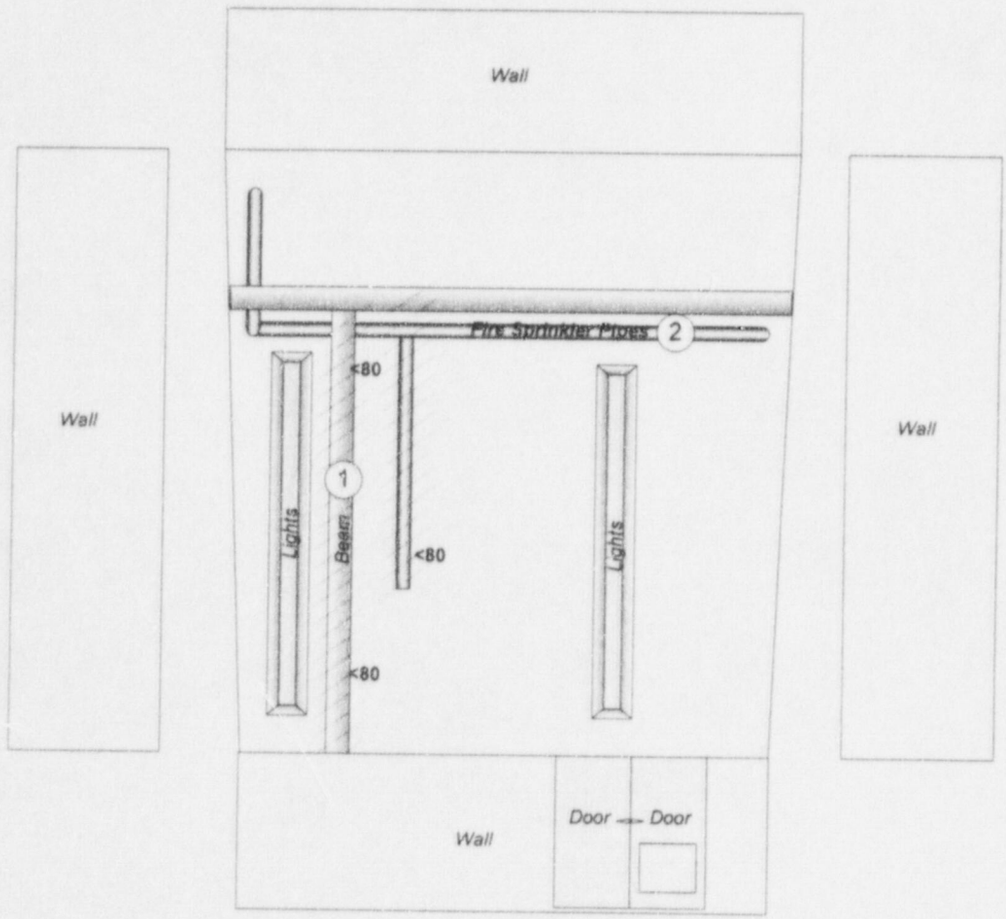
Figure 77: Lab 615: Locations and results of Exposure Rate Measurements

Notes:

1. The values are exposure rate measurements in μR/hr at the approximate locations indicated. Each measurement was taken ~1m above ground surface.

2. All concrete surface.

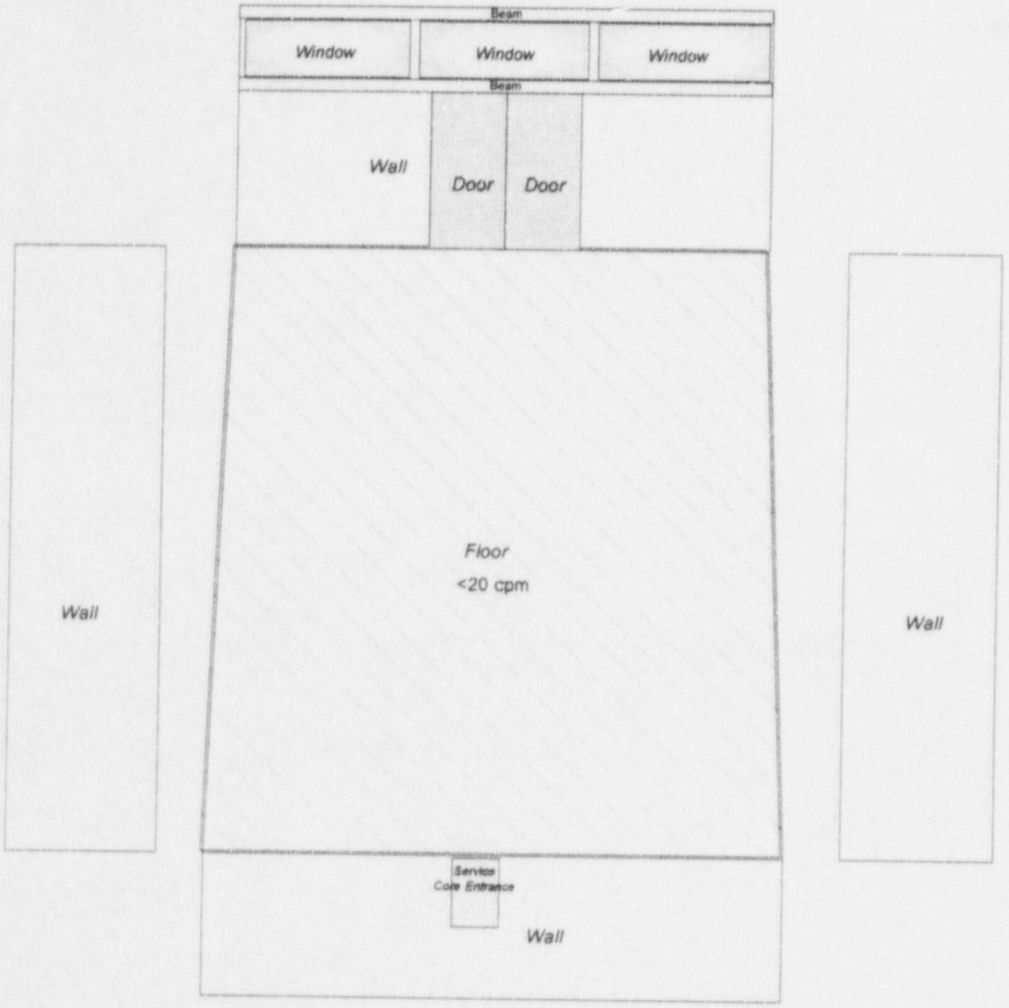
Figure 78: Lab 615: Beta Scan and Removable Contamination Survey on Overhead Fixtures



Notes.

1. Survey results are provided in Table 5.
2. ~25% of Overhead was scanned for Beta with a 15cm^2 GM. Scan results in cross hatched area are in cpm.
3. The Numbers circled are the approximate locations of wipes taken. Results are provided in Table 7.
4. All metal surface.

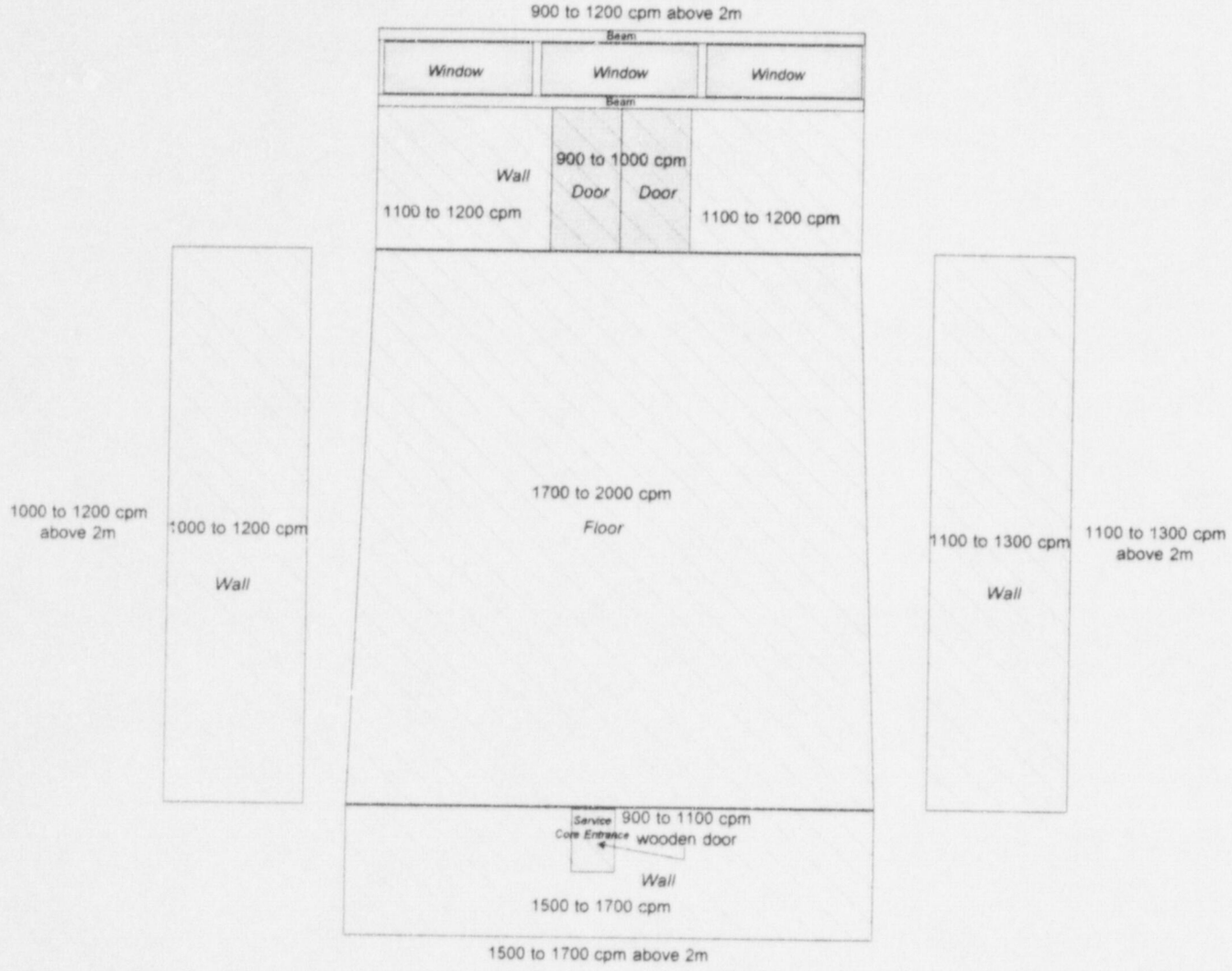
Figure 79: Lab 623: Alpha Scan



Notes:

1. Survey results are provided in Table 5.
2. ~100% of the floor was scanned for Alpha with a 434cm^2 Alpha detector. Scan results in cross hatched area are in cpm.
3. All concrete surface.

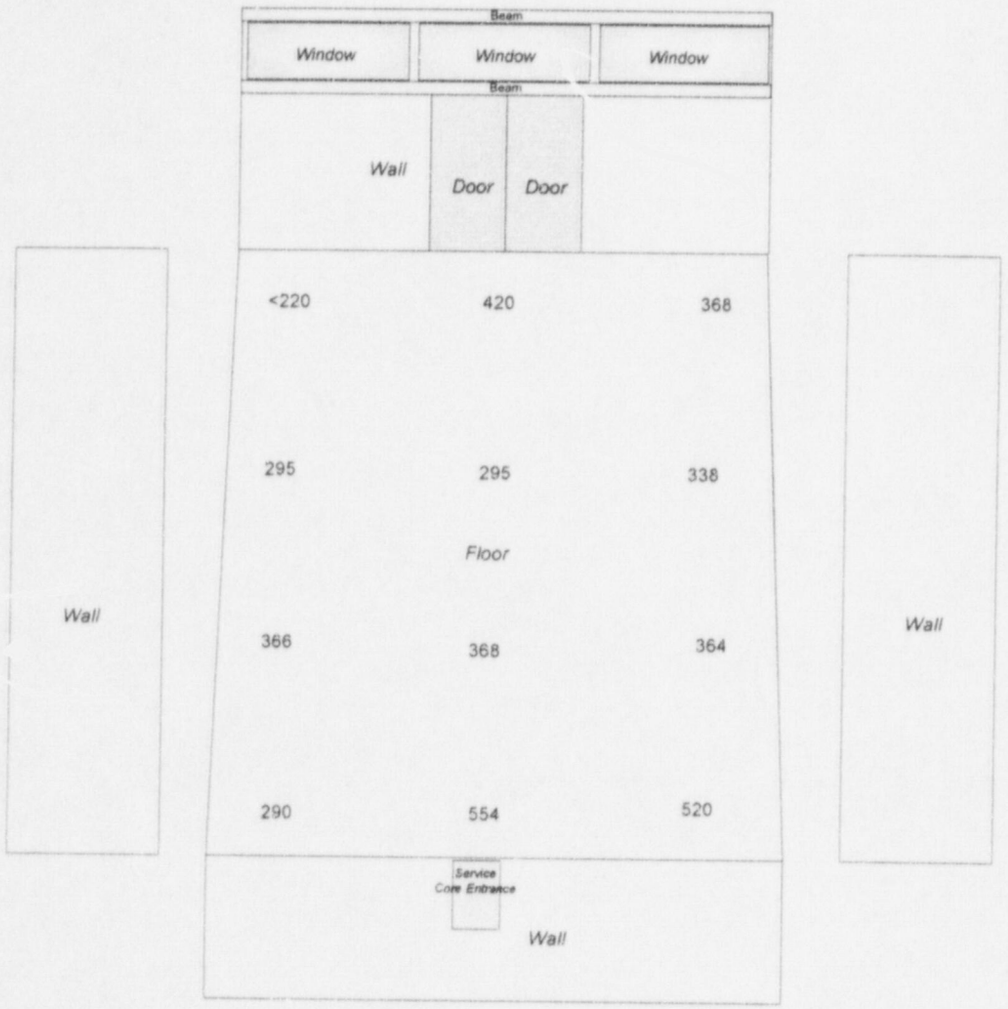
Figure 80: Lab 623: Beta Scan



Notes:

1. Survey results are provided in Table 5.
2. ~100% of the Floor and Walls (2m up) were scanned for Beta. Scan results in cross hatched area. ~10% of the walls (above 2m) were scanned for Beta.
3. All concrete, cement block, plaster, and drywall surfaces.

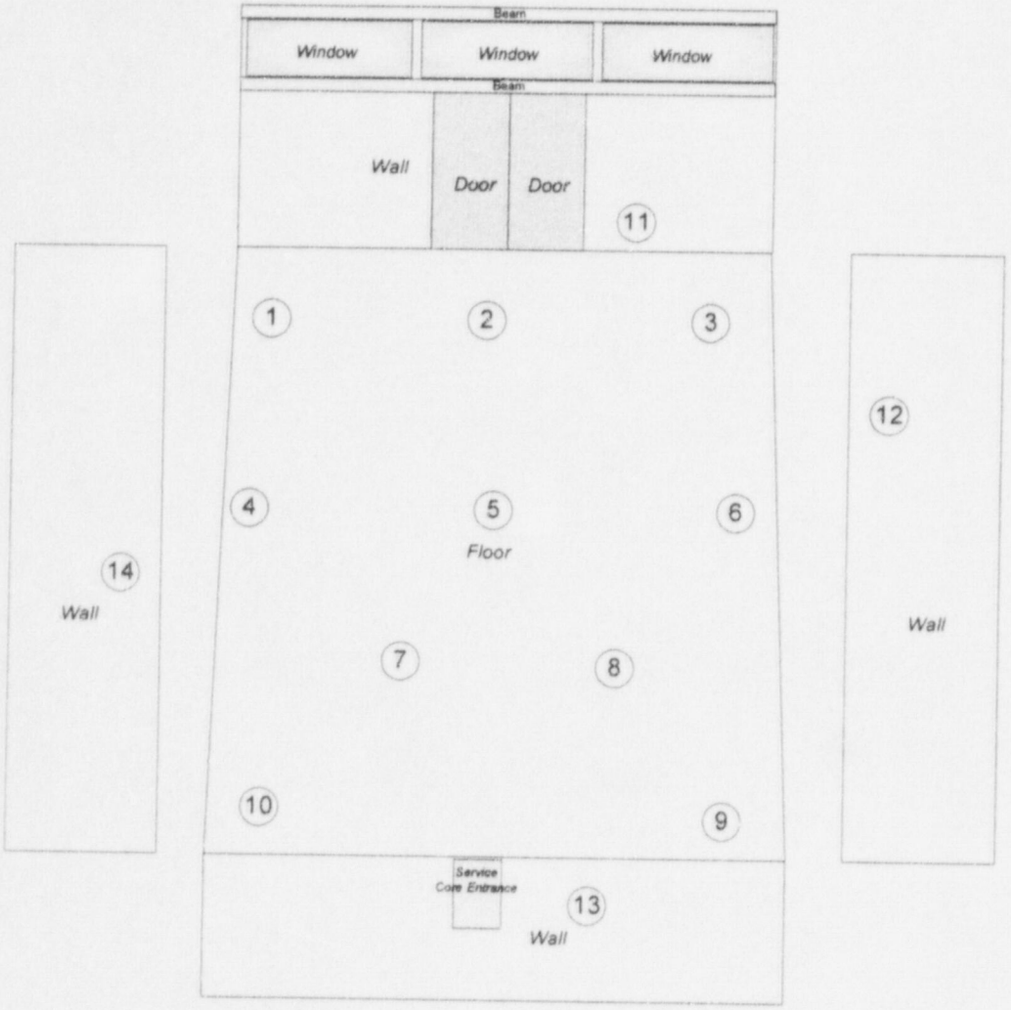
Figure 81: Lab 623: Locations and Results of Fixed Beta Measurements on Floor



Notes:

1. Survey results are provided in Tables 5.
2. The values are in dpm/100cm^2 and indicate the approximate locations of measurements taken. Two minute (cp2m) fixed Beta readings were taken.
3. All concrete surface.

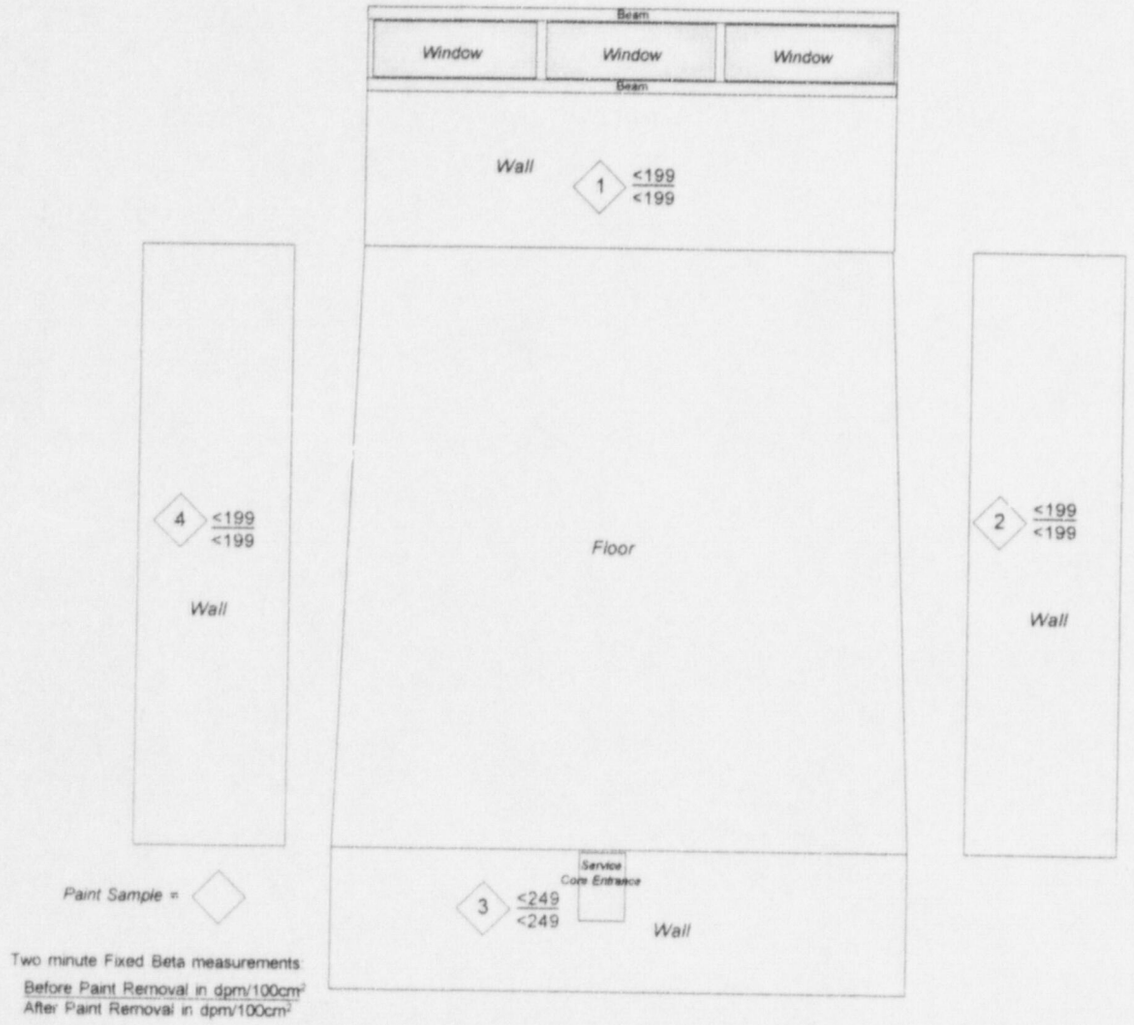
Figure 82: Lab 623: Locations of Removable Contamination Survey



Notes:

1. Survey results are provided in Tables 7.
2. The Numbers circled are the approximate locations of wipes taken.
3. All concrete, cement block, drywall and plaster surfaces.

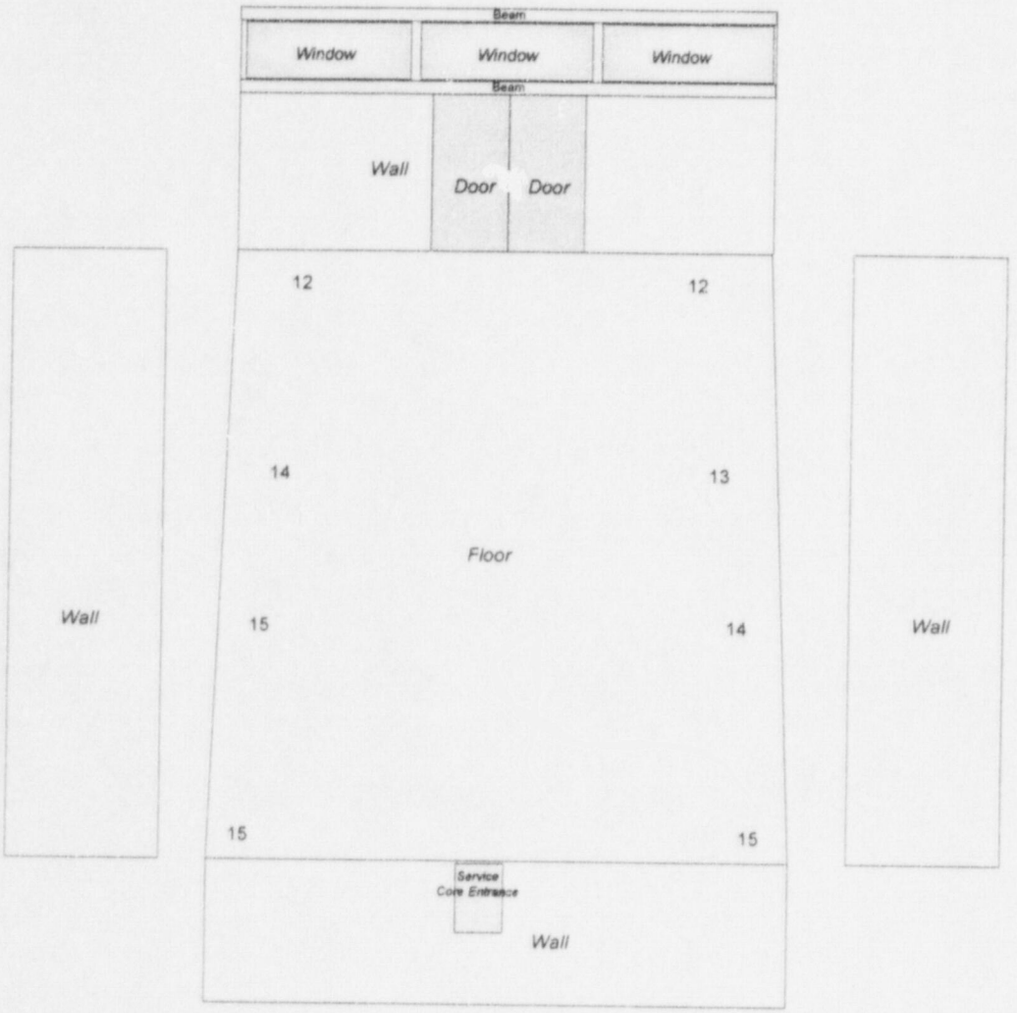
Figure 83: Lab 623: Locations and Results of Fixed Beta Measurements at Paint Sample Locations



Notes:

1. Survey results are provided in Table 5.
2. The values are in dpm/100cm² and the diamonds indicate the approximate locations of paint samples taken. Two Minute fixed beta readings were taken before and after paint samples were removed.
3. All cement block drywall and plaster surfaces.

Figure 84: Lab 623: Locations and results of Exposure Rate Measurements

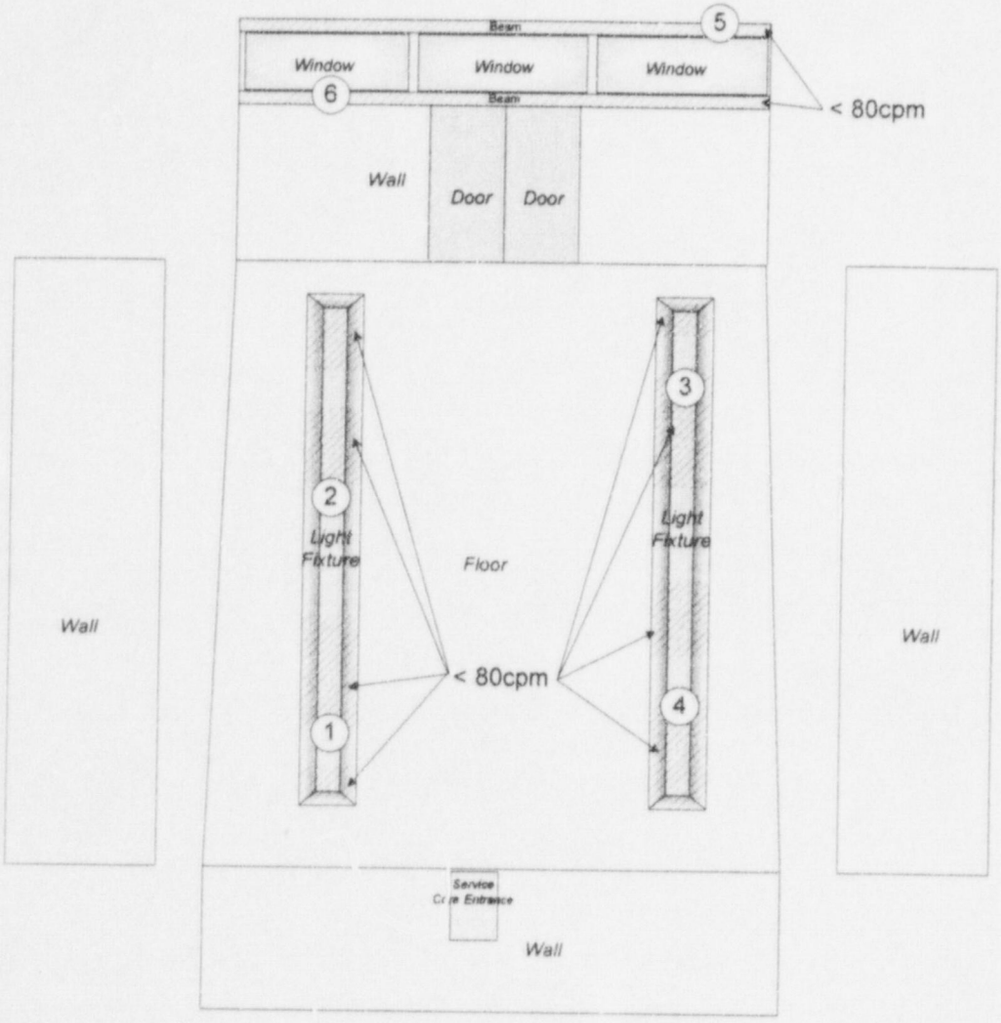


Notes:

1. The values are exposure rate measurements in μR/hr at the approximate locations indicated. Each measurement was taken ~1m above ground surface.

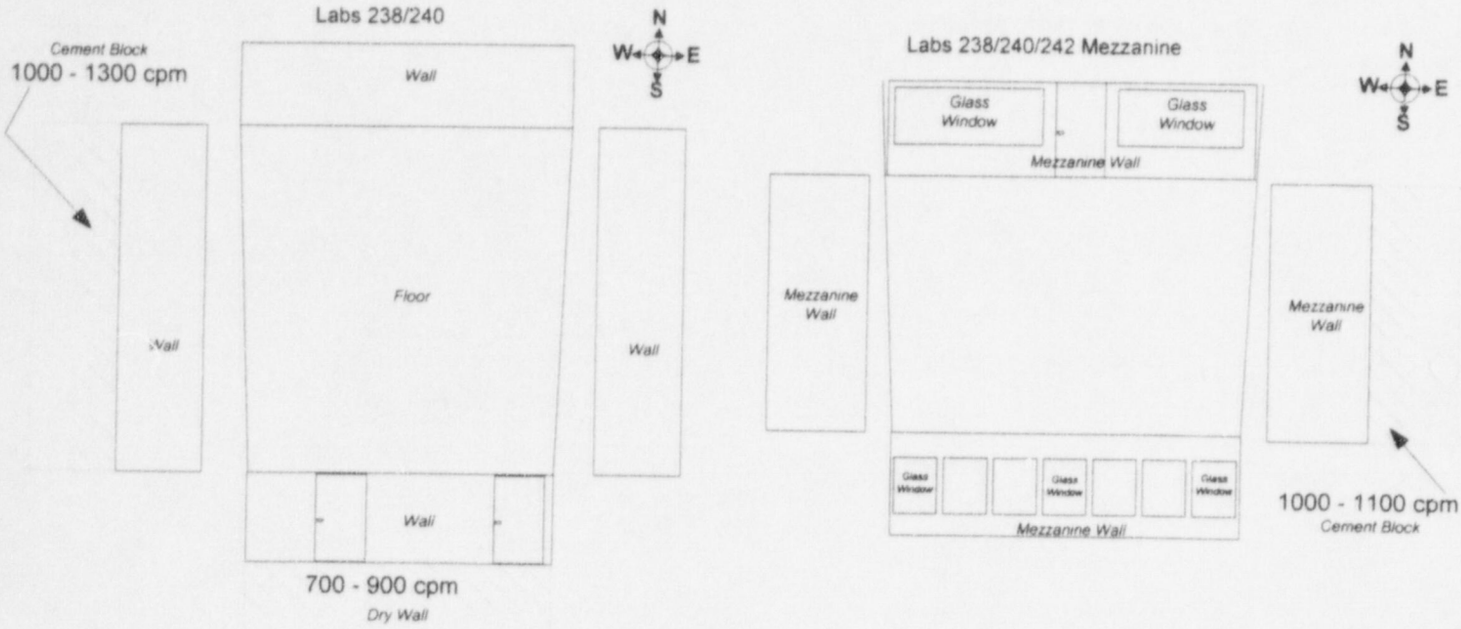
2. All concrete surface.

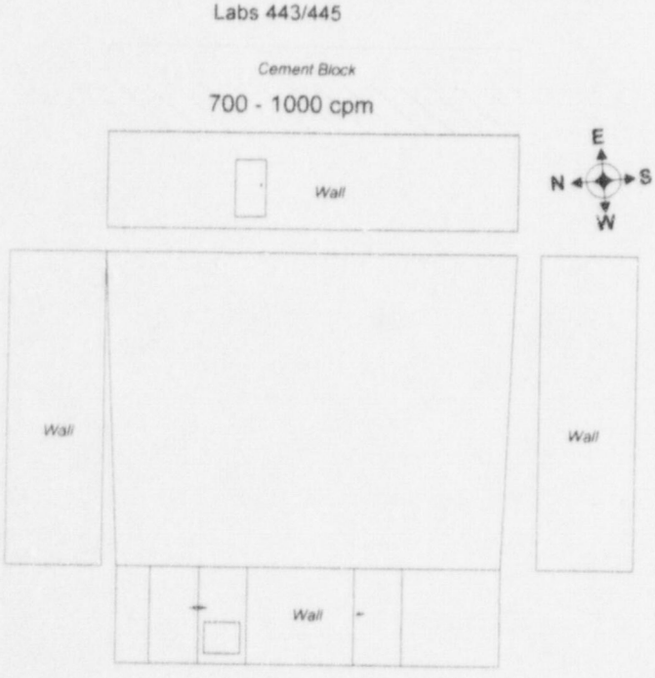
Figure 85: Lab 623: Overhead Light Fixture Survey



1. Survey results are provided in Table 5.
2. ~25% of Overhead was scanned for Beta with a 15cm^2 GM. Scan results in cross hatched area are in cpm.
3. The Numbers circled are the approximate locations of wipes taken. Results provided in Table 7.
4. All metal surface.

Figure 86: Supplemental Survey in Labs 238/240/242 and 443/445





Meter Data	
Manufacture	Ludlum
Model	2221
Serial Number	86302
Efficiency	21.70%
Cal. Due	01/24/99
Probe Number	086215
Probe Size	434cm²
α β γ	β

Background Measurements Obtained from Building 13 As of 07/30/98	
Floor Monitor Background Scan Results: Ludlum 2221	
Surface	Beta/Gamma Scan Range in cpm
Cement Block	1253-1536
Dry Wall	693-951

Notes

1. 25% of West & South Upper Walls (above 2m) in Labs 238/240 were scanned for Beta.
2. 25% of East Upper Wall (above 2m) in Labs 238/240/242 Mezzanine was scanned for Beta.
3. 25% of East Upper Wall (above 2m) in Labs 443/445 was scanned for Beta.
4. All scans are in cross hatched areas.

APPENDIX A

Results of Supplemental and Confirmatory Surveys Performed

to

Final Radiological Survey Report Performed at General Atomics' Selected Building 2 Laboratories for Release to Unrestricted Use "Group 11"

APPENDIX A: Results of Supplemental and Internal Confirmatory Surveys Performed in the "Group 11" Laboratories of Building 2

Summary

After all final surveys were completed, spot check "confirmatory" surveys were conducted by two (2) Health Physics Technicians who were not responsible for conducting any of the final surveys. These confirmatory surveys included scans and spot checks of the floors, walls and overhead structures (I-beams, lights and fire sprinkler systems) using a floor monitor, a Geiger counter and a hand-held alpha counter. In addition, smears were collected in random locations.

During the conduct of these surveys, small areas of additional contamination were detected on the floor and overhead structures of labs 238/240 and on the overhead structures of the mezzanine above labs 238/240/242. This appendix summarizes the levels detected before and after decontamination, the supplemental surveys conducted to ensure that all the contamination was found and remediated, and the results of the confirmatory surveys performed in accordance with the written confirmatory survey plan.

Additional Surveys

The contaminant had been identified in earlier surveys as Cs-137. The release criteria is:

5,000 dpm/100 cm^2 (averaged over a 1 m^2 area)
15,000 dpm/100 cm^2 (maximum in a 100 cm^2 area if the average over 1 m^2 is met)
1000 dpm/100 cm^2 (removable activity)

The contamination on the floor of labs 238/240 was detected (using a 15 cm^2 geiger counter) along the floor/wall seam in two locations, both of which had been previously decontaminated. In one location ~1000 cpm was detected along the seam (~ 28,400 dpm/100 cm^2) and in the other location, levels up to 500 cpm were detected (~14,200 dpm/100 cm^2). These locations are shown in Figure 1. Each location was decontaminated to levels of 100 cpm (< 1,500 dpm/100 cm^2).

Contamination was also detected in the overhead structures of labs 238/240 and the mezzanine above labs 238/240/242. The maximum contamination found was ~300 cpm (~6,400 dpm/100 cm^2). The areas were decontaminated to levels reading 100 cpm (< 1,500 dpm/100 cm^2).

As a result, the following additional surveys were performed:

1. Additional scanning along the floor/wall seams (no contamination detected).
2. 100% scan of overhead area of labs 238/240 for beta contamination and 10% scan of overhead area of labs 238/240 for alpha contamination (Figure 2).
3. 100% beta scan of the metal floor in the mezzanine above labs 238/240/242 (Figure 3). All results were at or near background levels).
4. 100% beta scan of the overhead structures above labs 238/240 (Figure 4). All readings were at or near background levels $\leq$100 cpm (< 1,500 dpm/100 cm^2).

5. 10% alpha scan of the overhead structures of the mezzanine above labs 238/240/242 (Figure 5). All readings were < 10 cpm (< 121 dpm/100 cm^2) alpha using a 50 cm^2 alpha detector.
6. A removable contamination survey for tritium was also performed on the floor, the mezzanine and the overhead structures. Tritium had been authorized to be used in these labs in the 1960's and 1970's. The location of the smears are shown in Figures 6, 7, 8 and 9. The results showed tritium levels to be < 105 dpm/100 cm^2 (background not subtracted); well below the release criteria.
7. A concrete sample was also collected in labs 443/445 (next to the spot on the floor which had been decontaminated). The contaminant in labs 443/445 had been identified as enriched uranium. The U-235 concentration in the concrete sample was 0.35 ± 0.17 pCi/g U-235.

The types of instruments used for this survey are provided in Table 2A along with the manufacturer, the calibration due date, the efficiency, the range and the typical background count rate.

Internal Confirmatory Survey

Summary

In addition to the "additional surveys" discussed above, the internal confirmatory survey was performed in accordance with a written plan provided below.

A total of 40 beta fixed measurements, 36 alpha fixed measurements, 60 smears and 88 exposure rate measurements were taken. The results of these measurements are summarized in Table 1A. The results confirm that radiation and contamination levels are well below the release criteria.

Survey Plan

Objective

To perform spot check "confirmatory" surveys in the 9 Group 11 labs (labs 216, 238/240, 242, 325, 443/445, 615 and 623). Combined labs 238/240 are considered 2 labs as are labs 443/445.

The surveys will be conducted by an HP Technician(s) who was not responsible for conducting any of the final surveys. These surveys will include scans and spot checks on the floors and walls using a floor monitor, a geiger counter and a hand-held alpha counter. In addition, smears will be collected in random locations.

Beta Scans

Scan ~10% of the floor surface using the 434 cm^2 beta gas flow proportional counter in labs 216, 238/240, 242, 325, 615 and 623.

Scan ~25% of the floor surface using the 434 cm^2 beta gas flow proportional counter in labs 238/240 and labs 443/445. Scan only 10% of the floor surface in the 238/240 mezzanine and in the 443/445 mezzanine.

Perform spot check scans on the walls along the floor (the bottom portion of the walls) and scan along any cracks in the floor.

Direct Measurements

Using the 100 cm^2 beta floor monitor and a hand held alpha counters (50 cm^2) , take 2 readings in each lab *with each instrument* on the floor. All readings shall be 1 minute long.

Removable Contamination Surveys

Collect ~ 5 smears in each lab in random locations including the floors, ducts, light fixtures and I-beams and count on a low-level alpha/beta proportional counter.

Exposure Rate Measurements

Scan about 25% of the surface (~6" off the floor surface) in each lab.
Take 2 measurements in each lab at 1 m and record readings.

Alert Levels:

434 cm^2 beta detector:	> 300 cpm above background
100 cm^2 beta detector:	> 200 cpm above background
50 cm^2 alpha detector:	> 60 cpm above background
15 cm^2 GM detector:	> 100 cpm above background
MicroR meter:	> 25 μR/hr on surface and 20 μR/hr at 1 m from surface

Table 1A: Results of Internal Confirmatory Survey Building 2 "Group 11" Labs

Lab	# of fixed β Measurements (100 cm² detector)	Maximum β Result (dpm/100cm²)	# of fixed α Measurements (50 cm² detector)	Maximum α Result (dpm/100cm²)	Scan Results 434 cm² β (cpm)	# of Smears	Maximum Result (dpm/100 cm²) α	Maximum Result (dpm/100 cm²) β	Contact Exposure Rate 25% scan Range in μR/hr	# of Exposure Rate Measurements	Exposure Rate Range at 1m (μR/hr)
216	2	< 301 (MDA concrete)	2	< 121 (MDA)	1400-1600 floor 1000-1410 walls	5	<10	<10	14-16	8	12-14
238	2	351	2	< 121 (MDA)	*1600-2200 floor 1300-1800 walls	7	<10	10	16-19	8	14-17
*Areas above 1800 cpm were rechecked with 15 cm² GM detector. Results range from 60-140 cpm.											
240	2	373	2	< 121 (MDA)	*1600-2000 floor 1100-1400 walls	6	<10	<10	15-17	8	14-16
* Floor seam was 1700-2000 cpm. Areas above 1800 cpm were rechecked with 15 cm² GM detector. Results range from 60-120 cpm.											
242	6	923	2	< 121 (MDA)	1400-1800 floor 1200-1600 walls	5	<10	10	14-18	8	14-17
238/240 Mezzanine	2	< 289 (MDA metal)	2	< 121 (MDA)	800-1000 floor 800-1300 walls	7	<10	<10	9-13	8	10-12
325	2	<301 (MDA concrete) <289 (MDA metal)	2	< 121 (MDA)	900-1600 floor 1000-1200 walls	5	<10	<10	10-15	8	11-13
443	12	400	12	324	1200-1400 floor 1000-1200 walls	5	<10	<10	10-13	8	11-12
445	6	1201	6	880	1000-1700 floor 900-1200 walls	5	<10	<10	12-14	8	11-13
443/445 Mezzanine	2	< 289 (MDA metal)	2	< 121 (MDA)	600-900 floor 800-1000 walls	5	<10	17	7-9	8	7-8
623	2	<301 (MDA concrete)	2	< 121 (MDA)	1400-1700 floor 1200-1500 walls	5	<10	<10	15-18	8	14-16
615	2	< 301 (MDA concrete)	2	139	1400-1700 floor 1100-1600 walls	5	<10	<10	14-19	8	14-17
Totals	40		36			60				88	

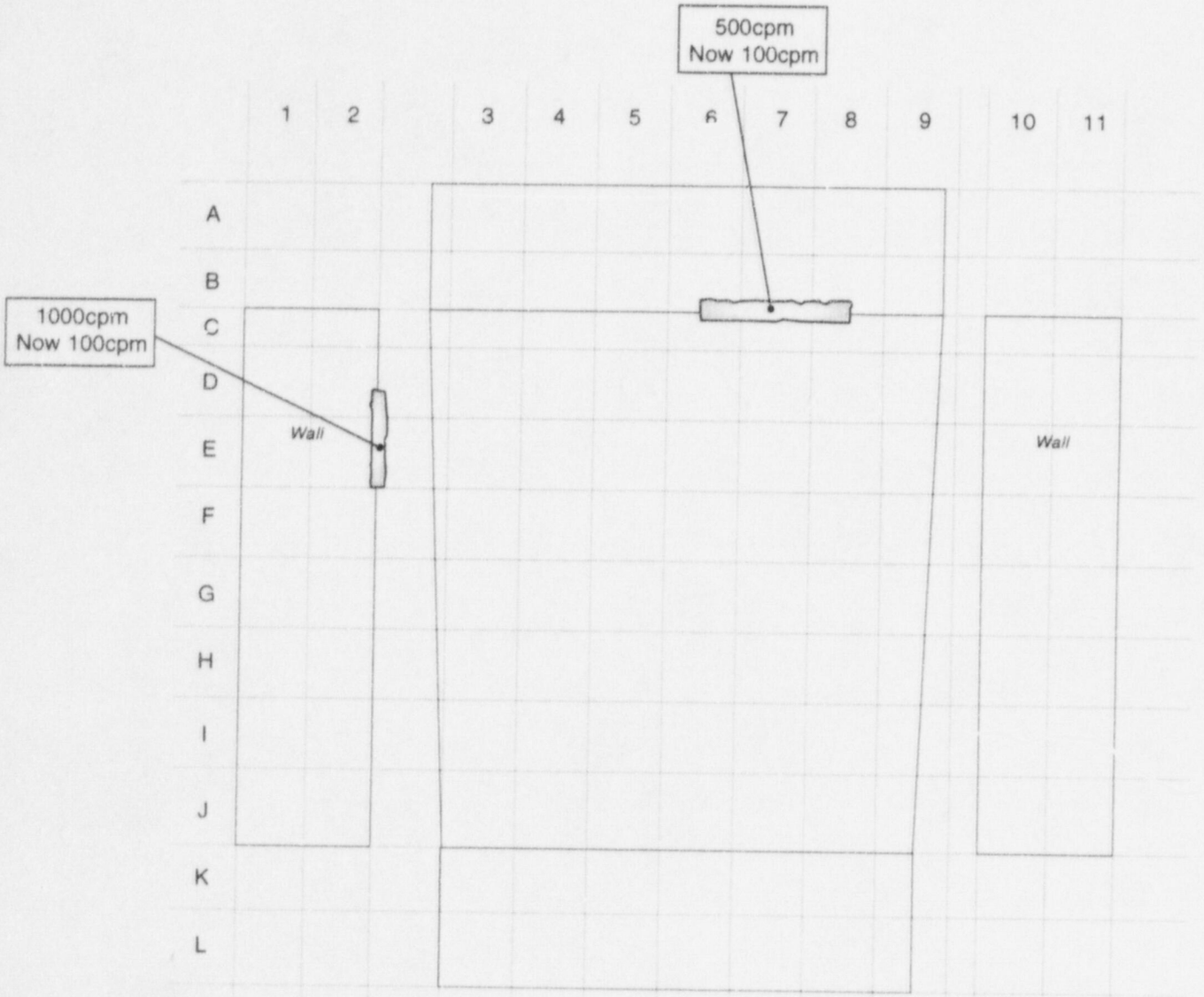
Table 2A: List of Instruments Used for the Supplemental Survey

Meter S/N	Detector	Detector S/N	Calibration Due Date	Efficiency	Range (cpm)	Typical Background (cpm)	Description
Ludlum Rate Meter Model 2221 S/N 86302	Ludlum Model 43-37 434cm² Alpha	86215	01/24/00	21.70%	Four Linear Ranges 0-500,000 & One Log 50-500,000	See Table 4	The instrument is a gas-flow proportional counter with an active probe area of 434 cm². The detector and rate meter are combined and mounted on a roll around cart. The instrument features a static-flow system, quick connects, a portable gas bottle and a means to adjust the height of the detector from the floor for optimum performance.
Ludlum Model 12 S/N 138739	Ludlum Model 43-65 50 cm² Alpha	145699	01/13/00	21.58%	Four Ranges 0-500,000	0-5	Alpha Scintillator ZnS(Ag) with an active probe area of 50 cm².
Ludlum Model-3 S/N 143349	Ludlum Model 44-9 15 cm² Beta/Gamma	145967	11/08/99	21.25%	Four Ranges 0-500,000	See Table 4	The instrument is used for beta/gamma surveying. The detector has an active probe area of 15 cm²
Ludlum Model 12 S/N 138801	Ludlum Model 43-65 50 cm² Alpha	145696	01/13/00	21.58%	Four Ranges 0-500,000	0-5	Alpha Scintillator ZnS(Ag) with an active probe area of 50 cm².
Ludlum Model 3 S/N 61488	Ludlum Model 44-9 15 cm² Beta/Gamma	117851	01/13/00	21	Four Ranges 0-500,000	60-100 cpm	The instrument is used for beta/gamma surveying. The detector has an active probe area of 15 cm²
Ludlum Model 12 S/N 91051	Ludlum Model 43-65 50 cm² Alpha	94053	09/29/99	21.58%	Four Ranges 0-500,000	0-5	Alpha Scintillator ZnS(Ag) with an active probe area of 50 cm².

FIGURE 1
BUILDING 2 LAB 238/240

07/29/99

REMEDIATION OF ELEVATED AREAS



Background for the Model-3 used for the survey was 80cpm.

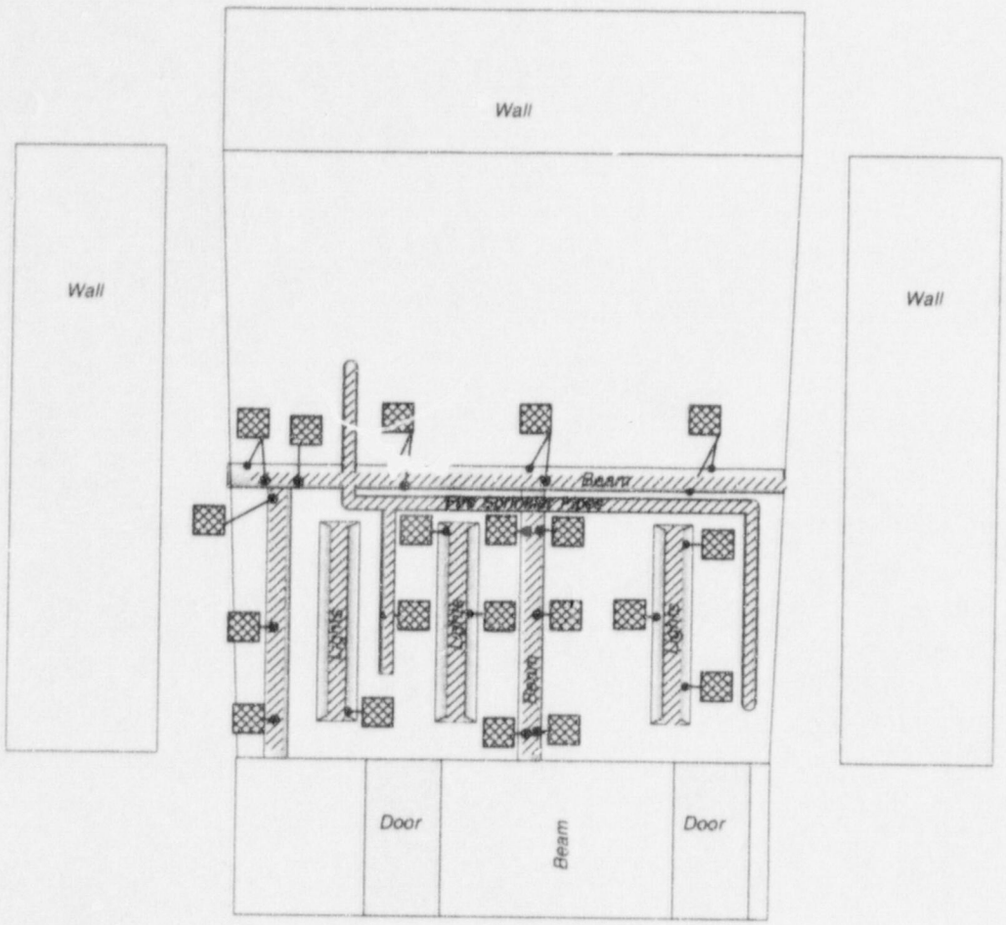
Location	Building 2 Lab 238/240			
Instrument(s)	Model-3	N/A	N/A	N/A
Serial Number	143349	N/A	N/A	N/A
Calibration Due	11/08/99	N/A	N/A	N/A
Efficiency	21.25%	N/A	N/A	N/A
α β γ	β	N/A	N/A	N/A
Probe Number	145967	N/A	N/A	N/A
Probe Size	15cm²	N/A	N/A	N/A
Comments: All readings recorded in counts per minute.				

Signature B. Lyons & C. Stanley Date 07/29/99

FIGURE 2
BUILDING 2 LAB 238/240

100% Direct Frisk Beta of Overhead Area
10% Direct Frisk Alpha of Overhead Area

07/29/99



▨ = All areas direct frisked for Beta found to be < or = to Background listed below.

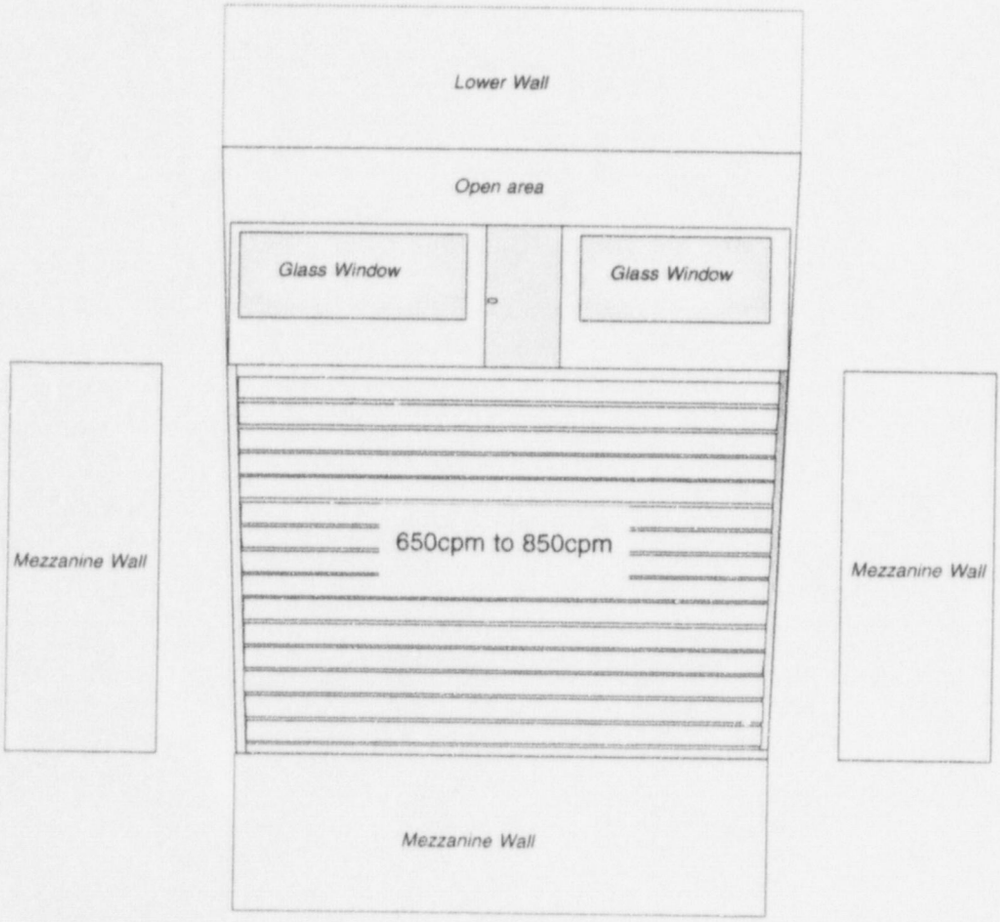
▩ = All areas direct frisked for Alpha found to be none detectable.

Location	Building 2 Lab 238/240 Overhead			
Instrument(s)	Model-3	Model-12	N/A	N/A
Serial Number	143349	138801	N/A	N/A
Calibration Due	11/08/99	01/13/00	N/A	N/A
Efficiency	21.25%	21.58%	N/A	N/A
α β γ	β	α	N/A	N/A
Probe Number	145967	145696	N/A	N/A
Probe Size	15cm²	50cm²	N/A	N/A
Comments: All readings are recorded in counts per minute. Background for the M-3 was 80cpm to 100cpm β . The background for the M-12 was 0cpm α .				
Signature: C. Stanley _____ Date: 07/29/99				

FIGURE 3
BUILDING 2: LAB 238/240/242 MEZZANINE

07/29/99

434cm^2 Beta Floor Scan
Floor composed of Metal



Location	Building 2 Lab 238/240			
Instrument(s)	Model-2221	N/A	N/A	N/A
Serial Number	86302	N/A	N/A	N/A
Calibration Due	01/24/00	N/A	N/A	N/A
Efficiency	21.70%	N/A	N/A	N/A
α β γ	β	N/A	N/A	N/A
Probe Number	086215	N/A	N/A	N/A
Probe Size	434cm^2	N/A	N/A	N/A
Comments: 100% of the floor surface scanned for Beta.				

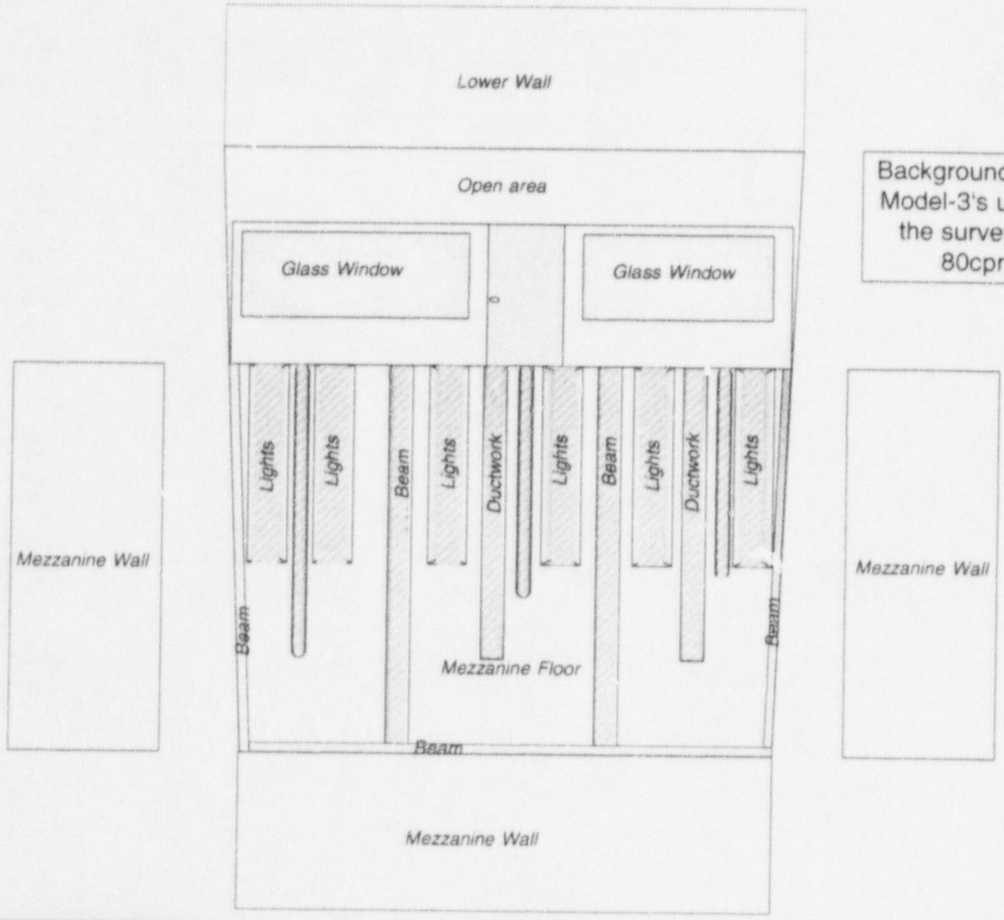
Signature: B Lyons Date 07/29/99

FIGURE 4
BUILDING 2: LAB 238/240/242 MEZZANINE

100% Beta direct frisk of Overhead

07/29/99

All areas were found to be less than or equal to Background listed below.



Background for the Model-3's used for the survey was 80cpm.

Location	Building 2 Lab 238/240 Mezzanine Overhead			
Instrument(s)	Model-3	Model-3	N/A	N/A
Serial Number	61488	143349	N/A	N/A
Calibration Due	01/13/00	11/08/99	N/A	N/A
Efficiency	21.35%	21.25%	N/A	N/A
α β γ	β	β	N/A	N/A
Probe Number	117851	145967	N/A	N/A
Probe Size	15cm²	15cm²	N/A	N/A
Comments: All readings recorded in counts per minute.				

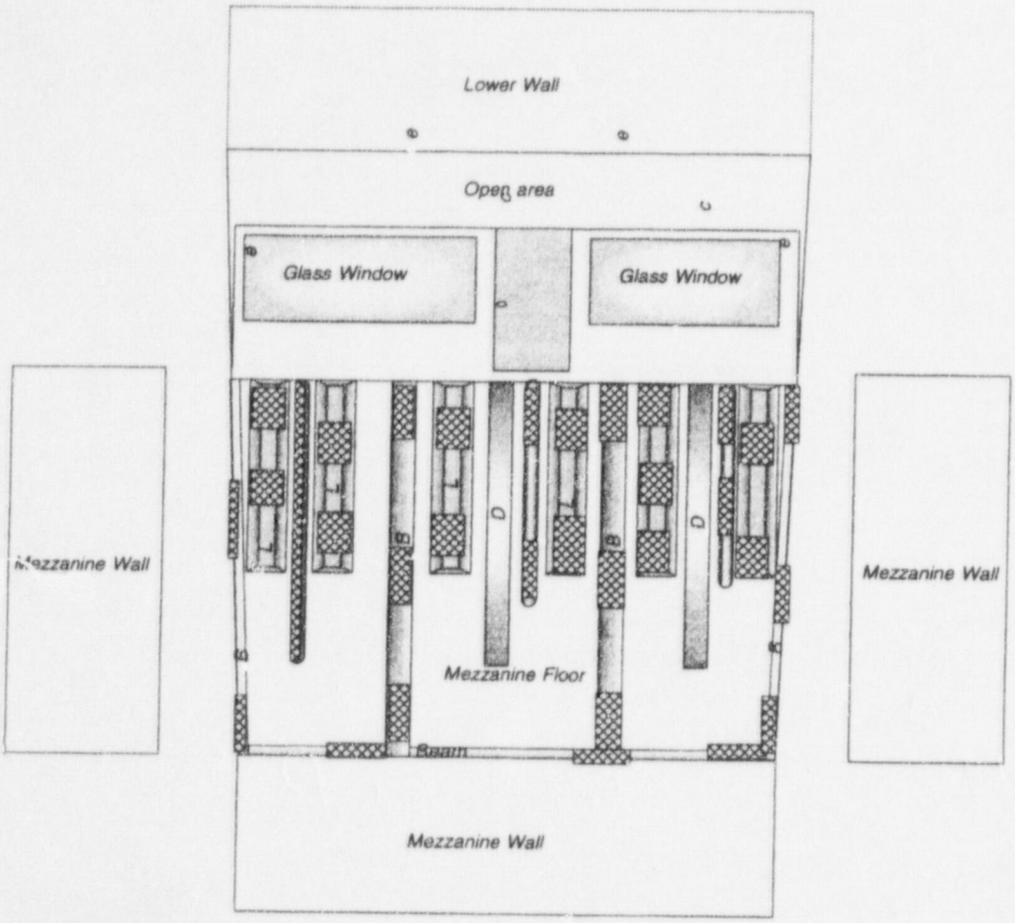
Barbara Lyons Carl Stanley

Signature: B. Lyons E. Ramirez & C. Stanley Date: 07/29/99

FIGURE 5
BUILDING 2: LAB 238/240/242 MEZZANINE

10% 50cm^2 Direct Alpha Overhead Frisk

07/29/99



	Building 2 Lab 238/240 Mezzanine			
Instrument(s)	Ludlum 12	Ludlum 12	N/A	N/A
Serial Number	138739	91051	N/A	N/A
Calibration Due	1-13-00	9-29-99	N/A	N/A
Efficiency	21.58	21.58	N/A	N/A
α β γ	α	α	N/A	N/A
Probe Number	145699	94053	N/A	N/A
Probe Size	50 cm^2	50 cm^2	N/A	N/A

Comments: 10% 50 cm^2 α Direct frisk in overhead of Mezzanine.

All readings were < 10 cpm. ▨ = Area scanned.

Signature: R Stowell R Stowell Date 07/29/99

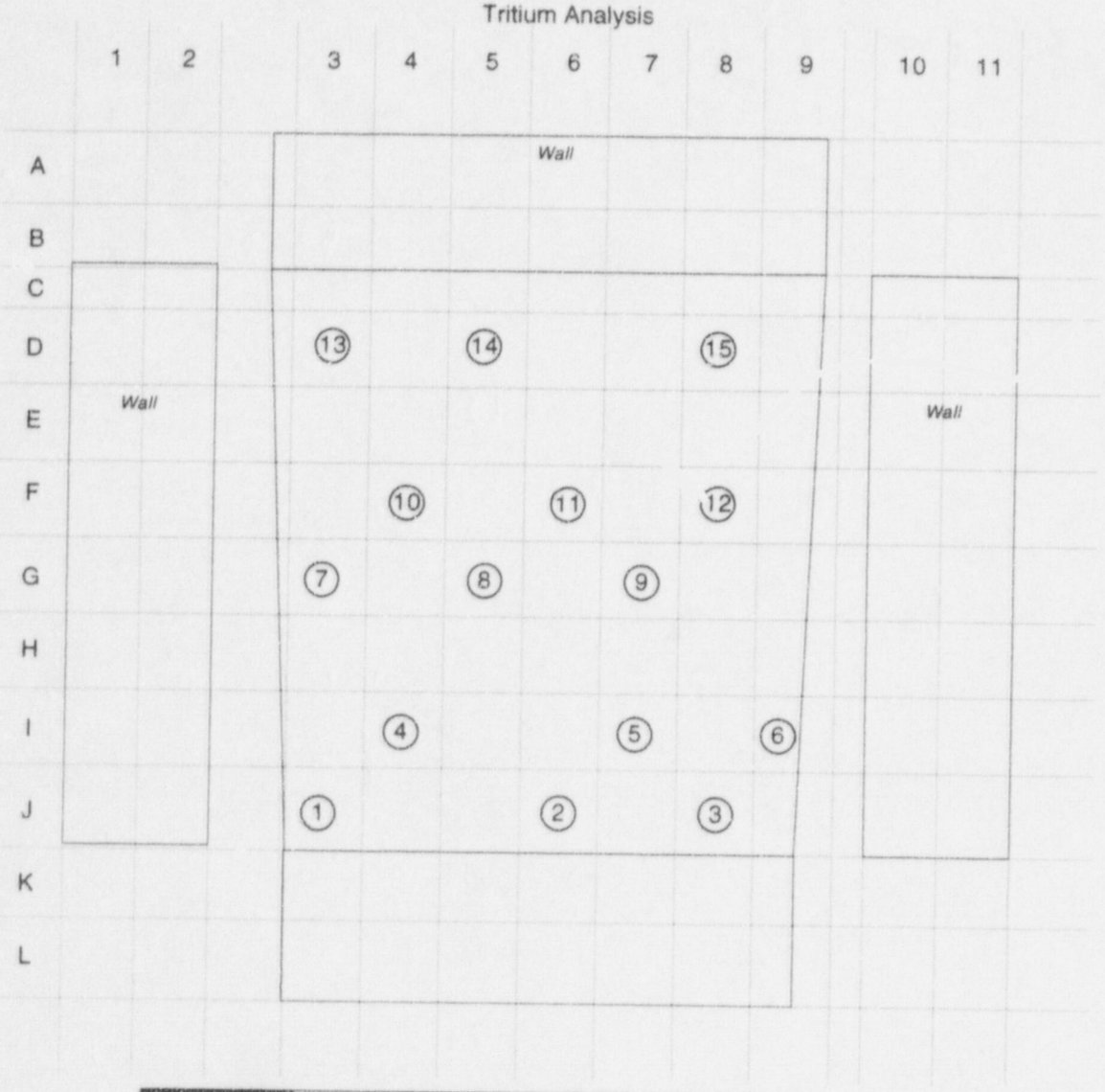
FIGURE 6
BUILDING 2: LAB 238/240

Smear Survey for Tritium Analysis

07/29/99

(n) = Denotes smear location

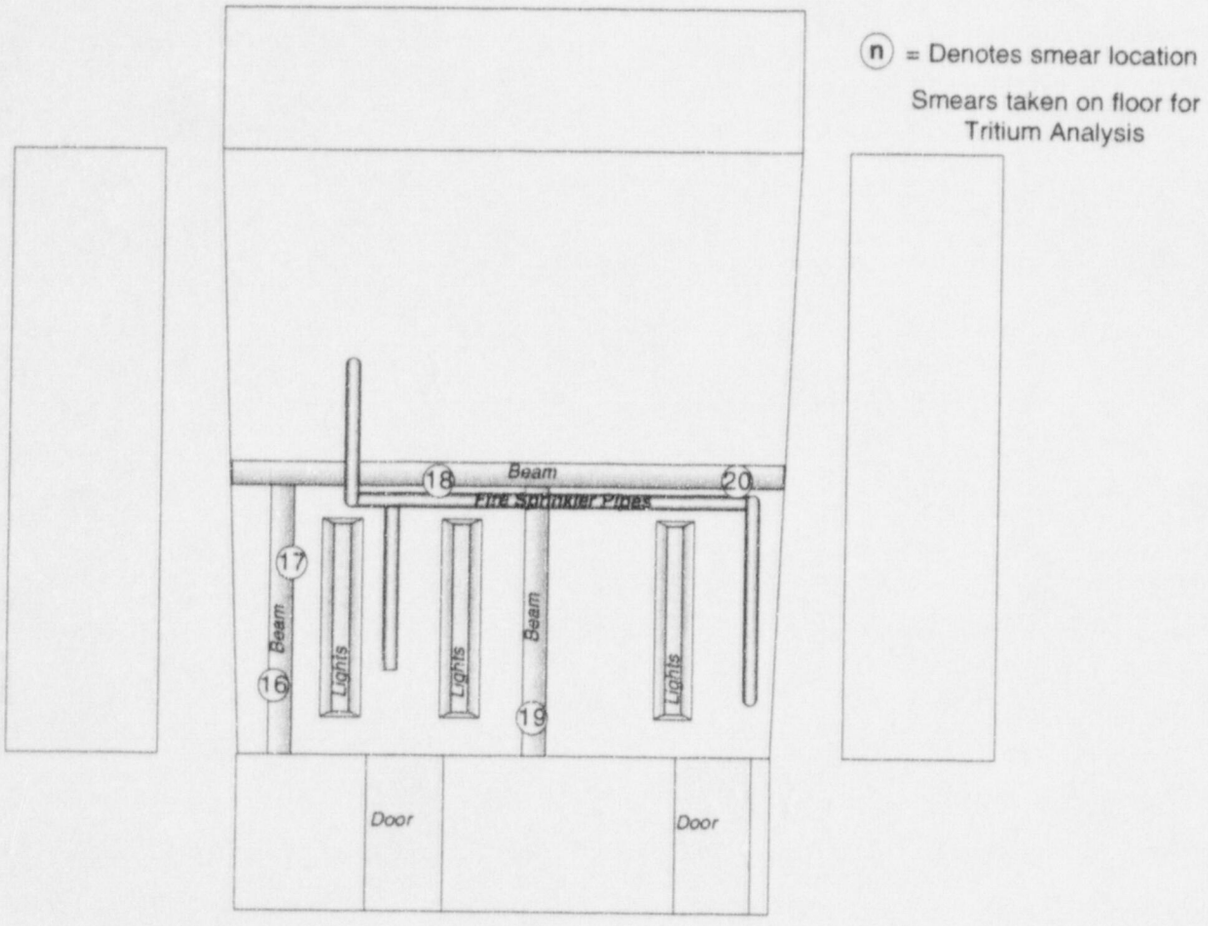
Smears taken on floor for Tritium Analysis



Location	Building 2 Lab 238/240			
Instrument(s)	N/A	N/A	N/A	N/A
Serial Number	N/A	N/A	N/A	N/A
Calibration Due	N/A	N/A	N/A	N/A
Efficiency	N/A	N/A	N/A	N/A
α β γ	N/A	N/A	N/A	N/A
Probe Number	N/A	N/A	N/A	N/A
Probe Size	N/A	N/A	N/A	N/A
Comments: Tritium Smears taken in overhead.				

Signature: B. Lyons Date 07/29/99

FIGURE 7
BUILDING 2: LAB 238/240
Smear Survey for Tritium Analysis



Location	Building 2 Lab 238/240			
Instrument(s)	N/A	N/A	N/A	N/A
Serial Number	N/A	N/A	N/A	N/A
Calibration Due	N/A	N/A	N/A	N/A
Efficiency	N/A	N/A	N/A	N/A
α β γ	N/A	N/A	N/A	N/A
Probe Number	N/A	N/A	N/A	N/A
Probe Size	N/A	N/A	N/A	N/A
Comments: Tritium Smears taken in overhead.				
Barbara Lyons Signature: B. Lyons				Date 07/29/99

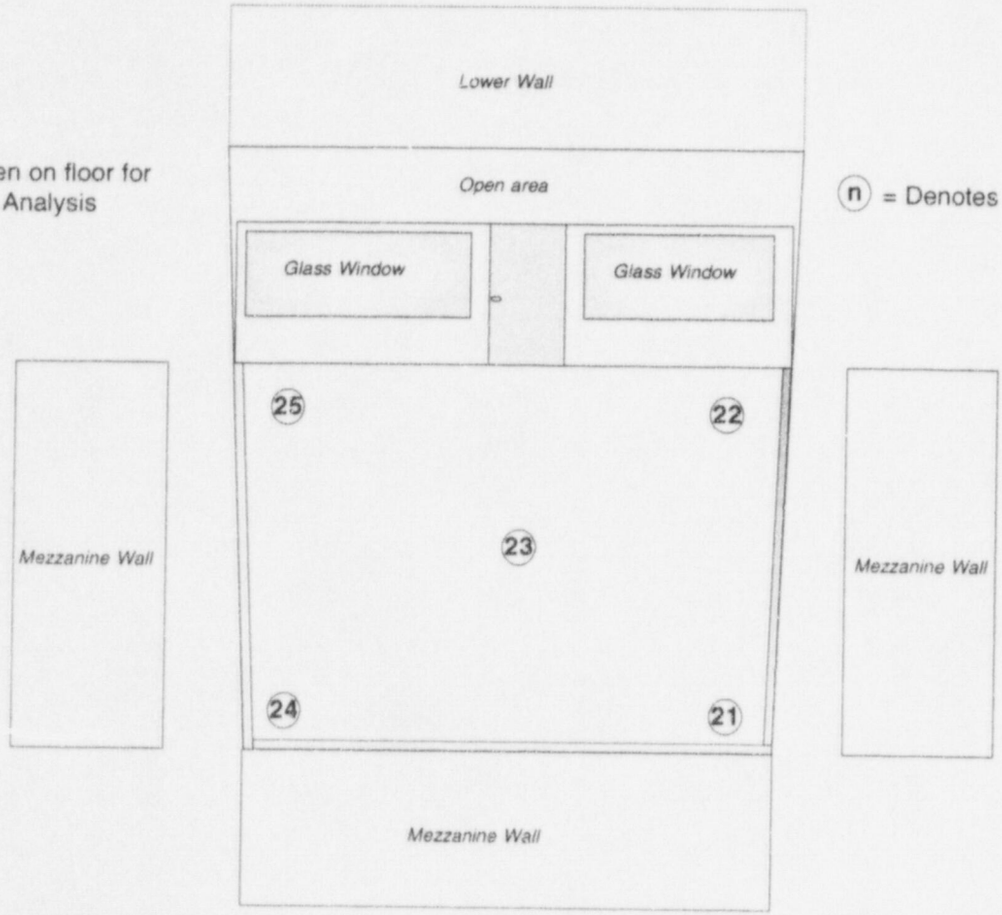
FIGURE 8
BUILDING 2: LAB 238/240/242 MEZZANINE

07/29/99

Floor composed of Metal

Smears taken on floor for Tritium Analysis

(n) = Denotes smear location



Location	Building 2 Lab 238/240			
Instrument(s)	N/A	N/A	N/A	N/A
Serial Number	N/A	N/A	N/A	N/A
Calibration Due	N/A	N/A	N/A	N/A
Efficiency	N/A	N/A	N/A	N/A
α β γ	N/A	N/A	N/A	N/A
Probe Number	N/A	N/A	N/A	N/A
Probe Size	N/A	N/A	N/A	N/A

Comments: Tritium Smears taken on floor.

Barbara Lyons

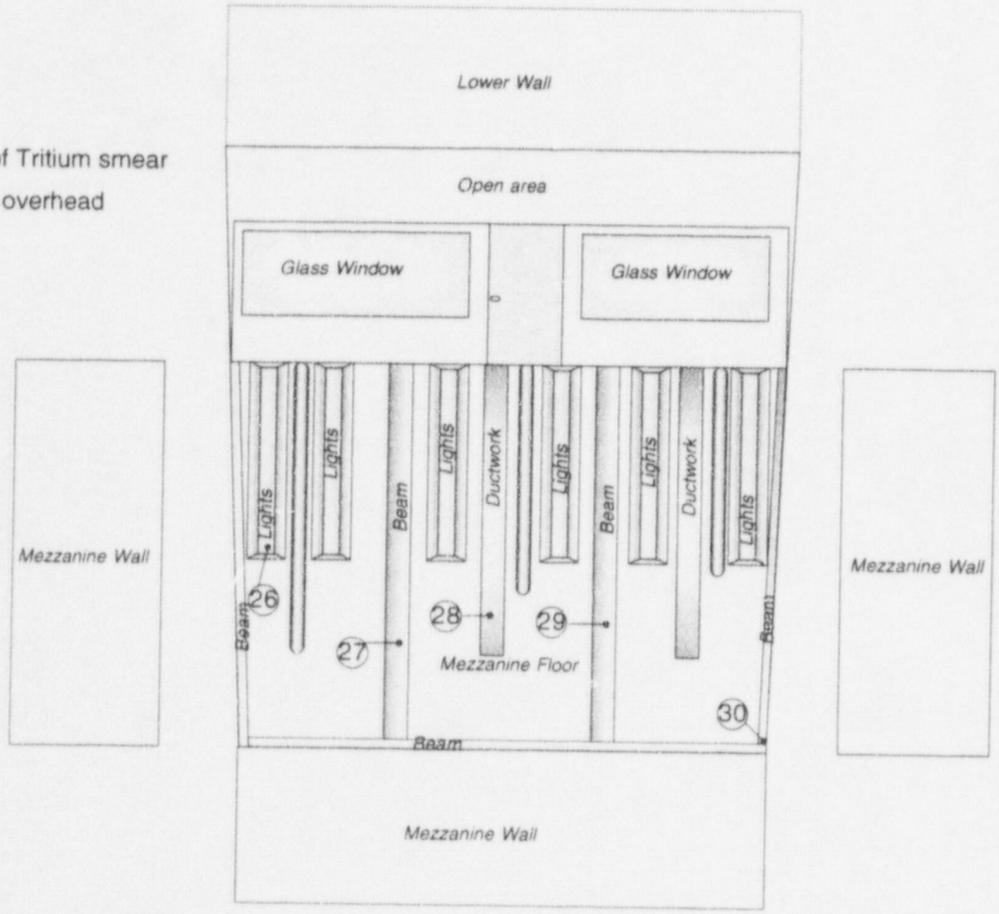
Signature: B J yons Date 07/29/99

FIGURE 9
BUILDING 2: LAB 238/240/242 MEZZANINE

N
W E
S

07/29/99

○ = Denotes location of Tritium smear
smears taken in overhead



Location	Building 2 Lab 238/240			
Instrument(s)	N/A	N/A	N/A	N/A
Serial Number	N/A	N/A	N/A	N/A
Calibration Due	N/A	N/A	N/A	N/A
Efficiency	N/A	N/A	N/A	N/A
α β γ	N/A	N/A	N/A	N/A
Probe Number	N/A	N/A	N/A	N/A
Probe Size	N/A	N/A	N/A	N/A
Comments:				
Barbara Lyons Signature: R Lyons				Date 07/29/99