

Rocky Flats Environmental Technology Site

Building 776/777

2nd Floor

Final Survey

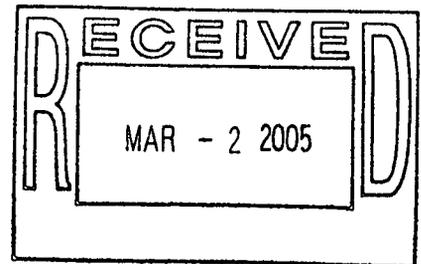
Report

Survey Unit:

776028

776033

776034

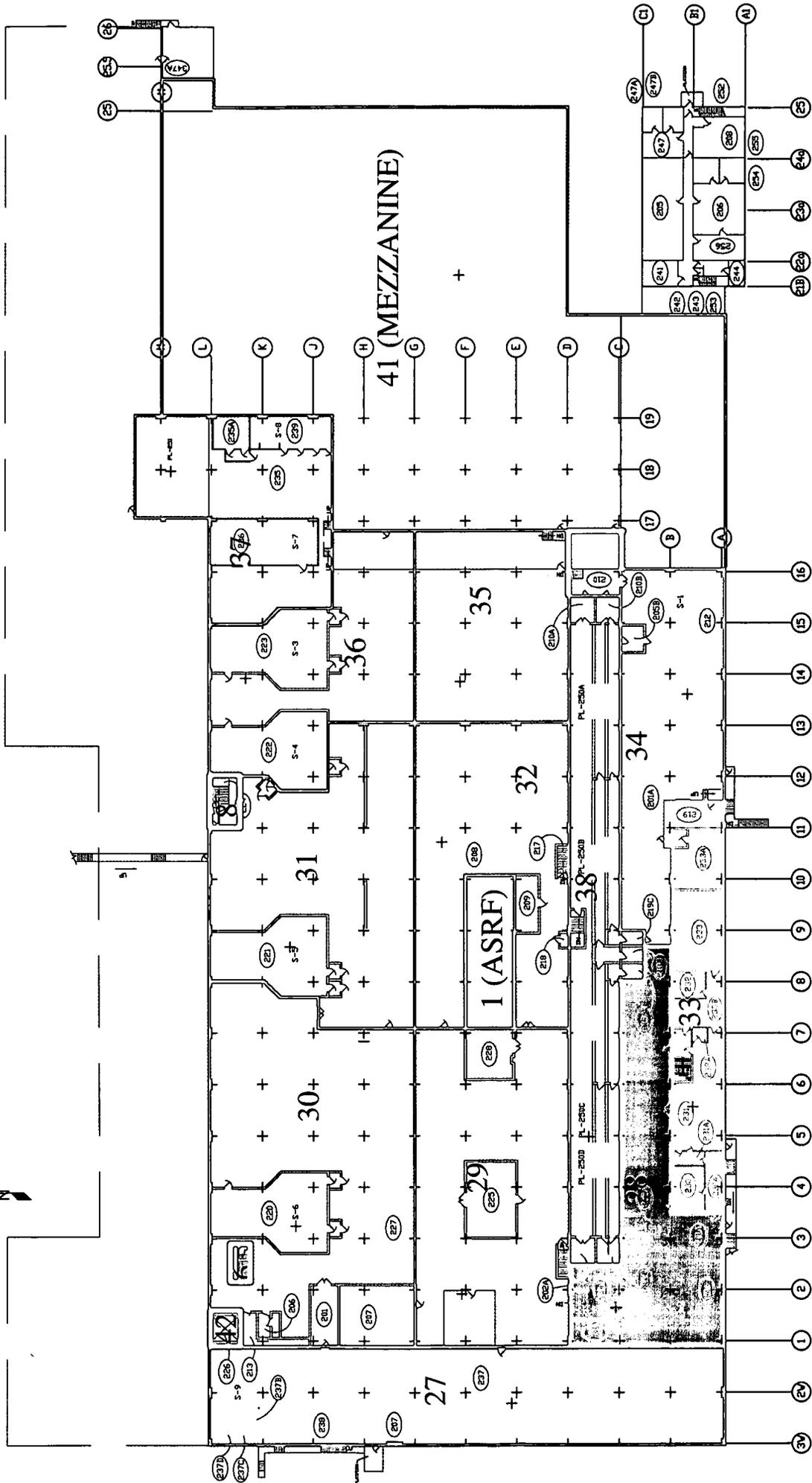


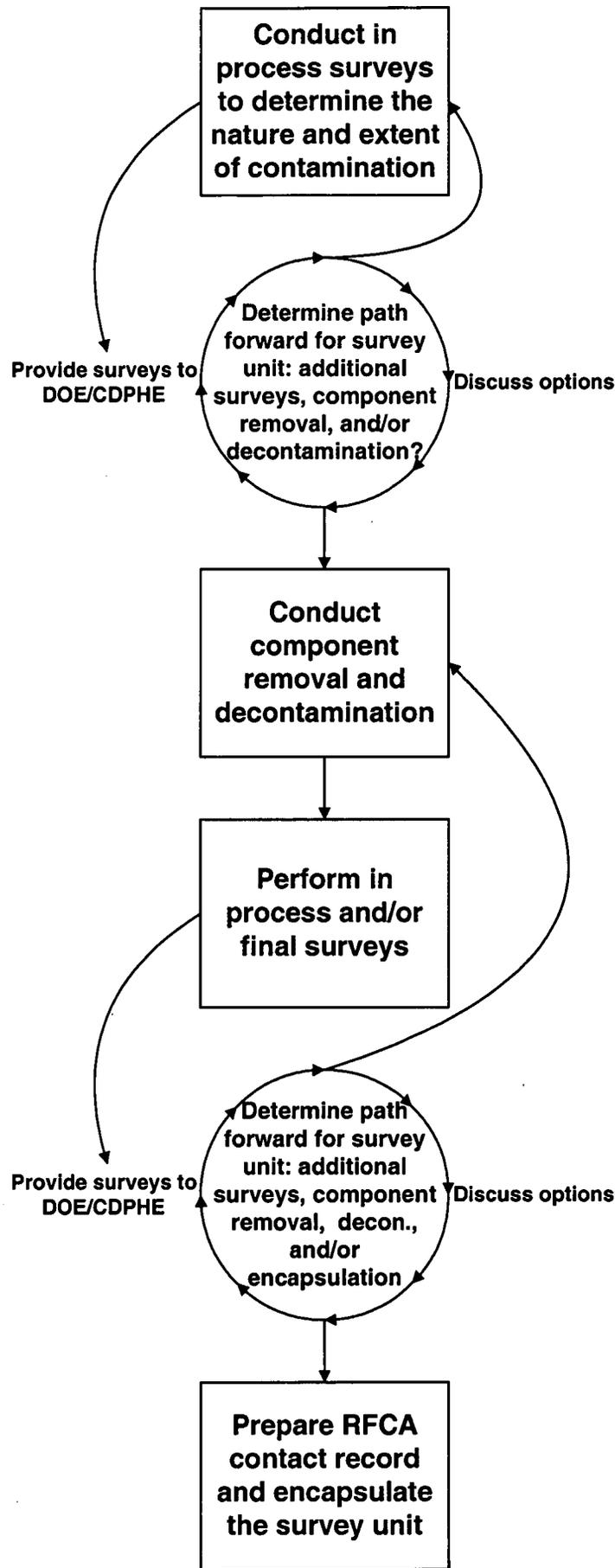
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ADMIN RECORD

January 2005

B776/777 INITIAL SURVEY UNITS
2nd FLOOR





Survey Instructions
Building 776 2nd Floor
Survey Unit 776028

Purpose:

This instruction provides guidance for collecting gross gamma and removable contamination data to quantify the amount of residual contamination in Survey Unit 776028 prior to demolition. NaI measurements are performed in accordance with "INS-535-Ludlum2350-1 with Sodium Iodide Detector".

Equipment and materials:

1. A Ludlum 44-17 attached to a Ludlum 2350-1 set to collect five-minute counts that will be displayed on its LCD window.
2. A Bicon G-5 attached to a Ludlum 2350-1 set to collect five-minute counts that will be displayed on its LCD window.
3. One Electra with attached DP-6, calibrated and daily response checked.
4. Two probe holders, one for the G-5 and one for the 44-17 with tin shielding.
5. Calibrated and daily response checked SAC-4.
6. Measuring tape or laser range finder.

Note: The NE Electra with DP-6 probe and the Eberline SAC-4 shall be used in accordance with RSP- 7.01 and 7.02

Procedure:

1. Inspect instrument for obvious damage and ensure battery voltage is equal to or greater than 4.6 volts. If battery voltage is less than 4.6 volts change the batteries.
2. Complete daily performance checks for Sodium Iodide detectors to ensure the instrument is functioning properly by using Americium-241 source TS-912. Record results on Sodium Iodide Data Sheet.
3. For floor and concrete wall background measurements, perform a 300-second background count with a Bicon G-5 for floors or Ludlum 44-17 for walls at background location in room 201-A near column B-13. Record background counts next to "Bkg Floor" or "Bkg Concrete Wall" in background column of attached "Sodium Iodide Data Collection" sheets as needed.
4. For block wall background measurements, perform a 300-second background count with a Ludlum 44-17 at the background location in room 219. Record background counts next to "Bkg Block Wall" in background column of attached Sodium Iodide data collection sheets as needed.
5. For ceiling and metal floor background measurements, perform a 300-second background count with a Ludlum 44-17 or Bicon G-5 at background location in room 201-A near column B-13. Hold the probe waist high, pointed toward ceiling using a sheet metal plate in front of the detector (take background measurement in this configuration). Record background counts next to "Bkg Metal Floor" for the G-5 and " Bkg Metal Ceiling" for the 44-17 on the attached Sodium Iodide data collection sheets as needed.
6. Mark the sample locations on the surfaces to be measured. Take all measurements on contact with the marked surface using tin side shields on the Bicon G-5 and tin side and back shields on the Ludlum 44-17. All Sodium Iodide readings shall have 300 second count times.
7. Collect sodium Iodide, total surface activity and removable surface activity measurements at all locations marked on the attached map.
8. Record the NaI and NE Electra measurements on the attached sheet. Note any items or conditions that may have affected the measurement in the "remarks" section.
9. Count swipes for 60 seconds with a SAC-4, record result on attached sheet for removable contamination.

Survey Instructions
 Building 776 2nd Floor
 Survey Unit 776028

Table 776028-1: Survey Requirements

Surface	Type of Survey	Probe	Placement	Count Time
Floor	Total Alpha Activity	Bicron G-5	On contact	300 seconds
All Surfaces	Total Alpha Activity	Electra with DP-6	On contact	60 seconds
Block walls	Total Alpha Activity	Bicron G-5 or Ludlum 44-17	On contact	300 seconds
All Surfaces	Removable Alpha	SAC-4	Swipe in placed in tray	60 seconds
Ceiling	Total Alpha Activity	Ludlum 44-17	On Contact	300 seconds
Block Walls	Background measurement	Bicron G-5 or Ludlum 44-17	On contact with east wall outside room 219	300 seconds
Metal Floors	Background measurement	Bicron G-5 or Ludlum 44-17	Probe waist high, pointed toward ceiling with sheet metal plate on end in room 201-A near column B-13	300 seconds
Floors and cement walls	Background measurement	Bicron G-5 or Ludlum 44-17	On contact with floor in room 201-A near column B-13	300 seconds
Metal ceilings	Background measurement	Ludlum 44-17	Probe waist high, pointed toward ceiling with sheet metal plate on end in room 201 near column B-13	300 seconds

FINAL SURVEY REPORT

Survey Unit 776028

Introduction and Scope

A pre-demolition radiological survey (PDS) is performed prior to building demolition to define the radiological conditions of a facility. A PDS survey for survey unit 776028 has been completed in accordance with guidelines outlined in the "Radiological Pre-Demolition Survey Plan Building 776/777". Based on the results it is recommended that no further remediation is needed, and that the survey unit may be prepared for demolition. Isolation controls shall be put in place to prevent re-contamination of the area. This report has been prepared in accordance with sections 3 and 8 of the "Radiological Pre-Demolition Survey Plan Building 776/777".

Survey Unit 28 consists of Rooms 201A, 202, 205A, 211 and 214.

PDS Methods and Techniques

The PDS survey results determine the Average Surface Contamination Value (ASCV_u) and source term for the survey unit. These parameters are used to determine whether the building may be demolished within the limits outlined in the "Radiological Pre-Demolition Survey Plan Building 776/777".

To comply with the "Radiological Pre-Demolition Survey Plan Building 776/777", a minimum of 30 survey points were selected per survey unit. A random start, systematic grid method was used to identify the survey point locations. Three types of surveys are performed at each survey point as follows:

- Painted surfaces are evaluated for potential contamination under coatings using sodium iodide (NaI) gamma detectors attached to a single channel analyzer windowed for the 59 keV gamma-ray (Am²⁴¹).
- Direct alpha surface contamination measurements are performed using a NE Electra survey instrument with attached DP-6 probe. This data may be compared to the NaI survey data to show the fraction of contamination that is directly on the surface versus imbedded in the material matrix.
- Removable surface alpha contamination surveys were performed by swiping the survey point with a 47mm filter paper then counting the filter paper on a SAC-4 alpha counter.

To conservatively determine the final Average Surface Contamination Value (ASCV_u) for the survey unit, the source term associated with inaccessible areas of the survey unit (there were no inaccessible areas identified in this survey unit) is added to the source term calculated by the PDS survey.

Results

A final survey has been performed in the area. A total of 30 survey points were selected using a random start grid method in accordance with the "Radiological Pre-Demolition Survey Plan Building 776/777". Additional measurements were performed to ensure the most contaminated portions of the survey unit were adequately represented.

FINAL SURVEY REPORT

Survey Unit 776028

Walls

The average contamination level from the in-process survey for the walls was 51,571 dpm/100 cm². See Table 2.0 below. No remediation effort was identified as required on the walls for this survey unit. Final survey points were taken on the walls per the random sampling criteria.

Table 1.0 B776/777 Survey Unit 776028 - Wall Summary

Wall	Section	Structural	Initial Characterization:		
			Type I	Type II	Type III
776028-2	A		3,555		
776028-2	B		45,512		
776028-3	A		37,034		
776028-5	A		46,882		
776028-6	A		43,028		
776028-7	A		43,028		
776028-10	A		84,772		
776028-12	A		42,312		
776028-13	A		36,853		
776028-14	A		34,152		
776028-16	A		69,431		
776028-17	AB		92,051		
776028-18	A		82,418		
776028-19	A		3,873		
776028-20	AB		52,748		
776028-20	CD		53,518		
776028-20	E		54,588		
776028-21	AB		70,468		
776028-21	CD		59,869		
776028-21	E		57,300		
776028-22	A		46,239		
776028-23	A		67,433		
	Type 1:	<100,000 dpm/100 cm²			
	Type 2:	>100,000 dpm/100cm² to <1,000,000 dpm/100cm²			
	Type 3:	>1,000,000 dpm/100cm²			

FINAL SURVEY REPORT Survey Unit 776028

Table 2.0 B776/777 Survey Unit 776028 - Wall Source Term

Wall Designation	Wall Type	Area (ft2)	Area (m2)	Average dpm/100cm2	Total Activity (uCi)	Comments
776028-2A	I	294.82	27.4	3,555	4.4	
776028-2B	I	358.31	33.3	45,512	68.3	
776028-3A	I	398.12	37.0	37,034	61.7	
776028-5A	I	72.092	6.7	46,882	14.1	
776028-6A	I	41.964	3.9	43,028	7.6	
776028-7A	I	72.092	6.7	43,028	13.0	
776028-10A	I	72.092	6.7	84,772	25.6	
776028-12A	I	139.88	13.0	42,312	24.8	
776028-13A	I	400.27	37.2	36,853	61.8	
776028-14A	I	119.44	11.1	34,152	17.1	
776028-17AB	I	86.08	8.0	92,051	33.2	
776028-18A	I	358.31	33.3	82,418	123.6	
776028-19A	I	293.75	27.3	3,873	4.8	
776028-20AB	I	559.52	52.0	52,448	122.9	
776028-20CD	I	743.52	69.1	53,518	166.6	
776028-20E	I	392.74	36.5	54,588	89.8	
776028-21AB	I	796.24	74.0	70,468	234.9	
776028-21CD	I	796.24	74.0	59,869	199.6	
776028-21E	I	390.59	36.3	57,300	93.7	
776028-22A	I	59.18	5.5	46,239	11.5	
776028-23A	I	48.42	4.5	67,433	13.7	
Average				51,571		

Floors

The average contamination level from the in-process survey for the floors was 9,669 dpm/100 cm². See in-process data. No remediation effort was identified as required on the floors for this survey unit. Final survey points were taken on the floors per the random sampling criteria.

Ceilings

The average contamination level from the in-process survey for the ceilings was 13,934 dpm/100 cm². This corresponds to the average critical level for the instruments used. See in-process data. No remediation effort was identified as required on the ceilings for this survey unit. Final survey points were taken on the ceilings per the random sampling criteria.

FINAL SURVEY REPORT

Survey Unit 776028

PDS Data Summary

The values for the accessible areas and inaccessible areas were summed and divided by the total area for the survey unit to calculate the "Average Surface Contamination Value" ($ASCV_u$) and source term for the survey unit. The results are summarized in Table 3 below:

Table 3.0 PDS Final Results

	Final Results
776028 Inaccessible Area Source Term (μCi)	0.0
776028 Accessible Area Source Term (μCi)	1106.2
776028 Total Source Term (μCi)	1106.2
Survey Unit Area (m^2)	1651
($ASCV_u$) ($\mu\text{Ci}/\text{m}^2$)	0.67
($ASCV_u$) ($\text{dpm}/100\text{cm}^2$)	14,765

Notes:

See Attachment 1 for the standard methods used for calculating the ASCV

Attachment 1

Standard Method for Calculating the ASCV for Each Survey Unit

Prerequisites:

1. Final survey map for the survey unit
2. PDS survey results
3. Survey information used to estimate activities in inaccessible areas;
4. Survey information for any structural members or elevated regions not represented by the PDS survey.

Conversions:

1 square meter (m^2) = $100 \times 100 \text{ cm}^2$

1 microcurie (μCi) = $2.22 \times 10^6 \text{ dpm}$

1 ($\mu\text{Ci}/m^2$) = 22,200 dpm/ 100cm^2 evenly distributed over one square meter.

12 inches = 1 foot = 0.305 meters

Calculations:

Accessible Area Inventory

1. Calculate the average surface contamination for the applicable survey unit from a minimum of 30 sodium iodide measurements obtained by the PDS survey.
2. Average the total surface contamination activity present.
3. Convert the average surface contamination value from step 2 from "dpm/ 100cm^2 " to " $\mu\text{Ci}/m^2$ "

Example:

$$22,200 \text{ dpm}/100\text{cm}^2 \times (100 \times 100 \text{ cm}^2/m^2) \times (1\mu\text{Ci}/2.22 \times 10^6 \text{ dpm}) = 1 \mu\text{Ci}/m^2$$

4. Obtain surface area of survey unit from title box of final survey map. This is reported in square meters.
5. Calculate inventory for accessible areas

The surface area from a survey unit map title box is 1,000 square meters and the average contamination level from the 30 PDS points is 22,200 dpm/ 100cm^2 .

Example:

$$1,000 \text{ m}^2 \times 22,200 \text{ dpm}/100\text{cm}^2 \times (100 \times 100 \text{ cm}^2/m^2) \times (1\mu\text{Ci}/2.22 \times 10^6 \text{ dpm}) = 1,000 \mu\text{Ci}$$

Inaccessible Area Inventory

1. Document methods used to estimate contamination levels and potential inventory in seams, cracks or other surfaces in the final survey report. Provide an estimated remaining inventory for each item/area in the report.

Example:

There are 20 feet of seams contaminated to an average level of 2,220,000 dpm/100 cm^2 . Each seam has two sides. The total inventory can be estimated assuming the contamination levels measured at the top of the seam extend down each side of the seam. The depth of the seam can be determined from design drawings or from direct observation as the seam is chipped away. If a seam is determined to be 4 inches deep, then the inventory of the seam can be calculated as follows:

The contaminated area of the seam is:

$$(20 \text{ feet} \times .305 \text{ m/ft}) \times (0.3 \text{ feet} \times 0.305 \text{ m/ft}) = .61 \text{ m}^2 \times 2 \text{ sides} = 1.22 \text{ m}^2$$

Therefore the inventory in the seam in μCi is:

$$1.22 \text{ m}^2 \times (2,220,000 \text{ dpm}/100 \text{ cm}^2) \times (10,000 \text{ cm}^2/m^2) \times \mu\text{Ci}/2.22\text{E}6 \text{ dpm} = 122 \mu\text{Ci}$$

Attachment 1

Calculating the ASCV

1. Sum the inventories from the inaccessible areas with the inventory for the accessible area to obtain a total inventory for the survey unit.

Total Inventory = Accessible Inventory + Inaccessible inventory + Inventory items (areas not represented by other inventories listed i.e. Stairs, columns, etc)

Example: 1000 μCi = accessible inventory

122 μCi = inaccessible inventory

100 μCi = inaccessible contamination in the columns and contamination on the stairs

1000 + 122 + 100 = 1222 μCi

2. Divide the total inventory for the survey unit by the accessible area of the survey unit obtained from the final survey map.

Example: 1222 μCi = total inventory

1000 m^2 = total surface area of the survey unit

1222 $\mu\text{Ci}/1,000 \text{ m}^2 = 1.22 \mu\text{Ci} / \text{m}^2$

1.22 $\mu\text{Ci} / \text{m}^2 * (1\text{m}^2 / (100*100 \text{ cm}^2)) * (2.22\text{E}6 \text{ dpm}/\mu\text{Ci}) = 27084 \text{ dpm}/ 100\text{cm}^2$

776028 In-Process

Location #	Column letter	Column Number	North	East	Elevation	Gross Counts	Dpm/100cm2
28-1	C	1	11	9	Floor	1169	21,302
28-2	C	1	13	15	Floor	972	7,583
28-3	C	2	17	2	Floor	997	7,583
28-4	C	2	9	2	Floor	1109	15,006
28-5	C	1	7	16	Floor	1086	12,592
28-6	C	1	8	9	Floor	1118	15,950
28-7	B	1	18	7	Floor	964	7,583
28-8	B	1	16	16	Floor	922	7,583
28-9	B	2	5	9	Floor	976	7,583
28-10	B	2	17	13	Floor	1046	8,395
28-11	B	3	12	8	Floor	1110	15,111
28-12	B	3	11	18	Floor	931	7,583
28-13	B	4	15	5	Floor	994	7,583
28-14	B	4	14	3	Floor	1003	7,583
28-15	B	5	13	3	Floor	1012	7,583
28-16	B	5	12	19	Floor	1019	7,583
28-17	B	6	17	5	Floor	977	7,583
28-18	B	6	17	12	Floor	1041	7,870
28-19	B	7	17	9	Floor	1005	7,583
28-20	B	7	17	18	Floor	1025	7,583
28-21	B	8	1	1	Floor	933	7,583
28-22	B	7	5	15	Floor	1134	17,629
28-23	B	7	3	9	Floor	1119	16,055
28-24	B	6	4	11	Floor	1118	15,950
28-25	B	6	8	1	Floor	1047	8,500
28-26	B	5	1	11	Floor	1108	14,901
28-27	B	5	1	9	Floor	1033	7,583
28-28	B	4	1	14	Floor	1059	9,759
28-29	B	4	5	5	Floor	1092	13,222
28-30	B	3	5	15	Floor	1081	12,067
28-31	B	3	9	1	Floor	1058	9,654
28-32	B	2	6	16	Floor	998	7,583
28-33	B	2	5	4	Floor	841	7,583
28-34	B	1	6	15	Floor	929	7,583
28-35	B	1	5	5	Floor	881	7,583
28-36	A	1	16	6	Floor	939	7,583
28-37	A	1	16	14	Floor	908	7,583
28-38	A	2	18	3	Floor	885	7,583
28-39	A	2	11	18	Floor	969	7,583
28-40	A	3	15	4	Floor	1050	8,815
28-41	A	3	2	3	Floor	845	7,583
28-42	A	2	6	13	Floor	844	7,583

776028 In-Process

28-43	A	2	6	4	Floor	828	7,583
28-44	A	1	3	12	Floor	922	7,583
28-45	A	1	3	1	Floor	910	7,583
28-46	C	1	15	10	CEILING	63	13,934
28-47	C	1	15	15	CEILING	50	13,934
28-48	C	2	15	5	CEILING	41	13,934
28-49	C	2	5	5	CEILING	63	13,934
28-50	C	1	5	15	CEILING	39	13,934
28-51	C	1	5	10	CEILING	46	13,934
28-52	B	1	19	8	CEILING	60	13,934
28-53	B	1	19	15	CEILING	40	13,934
28-54	B	2	19	5	CEILING	44	13,934
28-55	B	2	19	15	CEILING	46	13,934
28-56	B	3	12	9	CEILING	28	13,934
28-57	B	3	12	15	CEILING	41	13,934
28-58	B	4	15	5	CEILING	42	13,934
28-59	B	4	15	15	CEILING	39	13,934
28-60	B	5	12	2	CEILING	40	13,934
28-61	B	5	19	19	CEILING	53	13,934
28-62	B	6	15	5	CEILING	50	13,934
28-63	B	6	15	15	CEILING	48	13,934
28-64	B	7	15	5	CEILING	54	13,934
28-65	B	7	11	19	CEILING	46	13,934
28-66	B	8	5	5	CEILING	34	13,934
28-67	B	7	5	15	CEILING	34	13,934
28-68	B	7	5	3	CEILING	37	13,934
28-69	B	6	5	15	CEILING	36	13,934
28-70	B	6	3	5	CEILING	22	13,934
28-71	B	5	3	11	CEILING	39	13,934
28-72	B	5	3	5	CEILING	27	13,934
28-73	B	4	5	15	CEILING	39	13,934
28-74	B	4	8	3	CEILING	36	13,934
28-75	B	3	5	15	CEILING	31	13,934
28-76	B	3	5	5	CEILING	39	13,934
28-77	B	2	5	15	CEILING	29	13,934
28-78	B	2	5	5	CEILING	36	13,934
28-79	B	1	5	15	CEILING	38	13,934
28-80	B	1	9	8	CEILING	46	13,934
28-81	A	1	15	5	CEILING	53	13,934
28-82	A	1	15	15	CEILING	44	13,934
28-83	A	2	15	5	CEILING	49	13,934
28-84	A	2	15	15	CEILING	42	13,934
28-85	A	3	15	4	CEILING	43	13,934
28-86	A	3	5	4	CEILING	55	13,934

776028 In-Process

28-87	A	2	5	15	CEILING	57	13,934
28-88	A	2	5	5	CEILING	46	13,934
28-89	A	1	5	15	CEILING	40	13,934
28-90	A	1	5	5	CEILING	60	13,934

Survey Unit 776028 Summary

Total Activity Measurements

30	30
Number Required	Number Obtained

MIN	4109	dpm/100 cm ²
MAX	38980	dpm/100 cm ²
Average	14765	dpm/100 cm ²
STD DEV	12259	dpm/100 cm ²

*Average Contamination Value for Accessable Areas Only

Inaccessible Areas 0.0 uCi, Alpha

Total Surface Area 1651 m²
Accessible Inventory = 1098.1 uCi, Alpha

Total Inventory 1098.1 uCi, Alpha

ASCV _u =	0.67 uCi/m ²
ASCV _u =	14,765 dpm/100 cm ²

Survey Unit 776028

Sample Location Number					
	Measurement Used	Comment	Surface	Coating	(dpm/100 cm ²)
1	Sodium Iodide	N/A	Ceiling	Thin/No Paint	4,336
2	Sodium Iodide	N/A	Ceiling	Thin/No Paint	4,336
3	Sodium Iodide	N/A	Floor	Thin/No Paint	4,109
4	Sodium Iodide	N/A	Floor	Thin/No Paint	4,109
5	Sodium Iodide	N/A	Wall	Thin/No Paint	29,861
6	Sodium Iodide	N/A	Floor	Thin/No Paint	4,109
7	Sodium Iodide	N/A	Floor	Thin/No Paint	5,658
8	Sodium Iodide	N/A	Ceiling	Thin/No Paint	4,336
9	Sodium Iodide	N/A	Ceiling	Thin/No Paint	4,336
10	Sodium Iodide	N/A	Wall	Thin/No Paint	6,456
11	Sodium Iodide	N/A	Floor	Thin/No Paint	20,357
12	Sodium Iodide	N/A	Wall	Thin/No Paint	34,471
13	Sodium Iodide	N/A	Wall	Thin/No Paint	37,577
14	Sodium Iodide	N/A	Wall	Thin/No Paint	7,816
15	Sodium Iodide	N/A	Ceiling	Thin/No Paint	4,336
16	Sodium Iodide	N/A	Wall	Thin/No Paint	6,456
17	Sodium Iodide	N/A	Floor	Thin/No Paint	33,245
18	Sodium Iodide	N/A	Wall	Thin/No Paint	29,260
19	Sodium Iodide	N/A	Wall	Thin/No Paint	32,767
20	Sodium Iodide	N/A	Floor	Thin/No Paint	11,131
21	Sodium Iodide	N/A	Wall	Thin/No Paint	7,315
22	Sodium Iodide	N/A	Wall	Thin/No Paint	7,215
23	Sodium Iodide	N/A	Floor	Thin/No Paint	21,097
24	Sodium Iodide	N/A	Wall	Thin/No Paint	27,356
25	Sodium Iodide	N/A	Wall	Thin/No Paint	38,980
26	Sodium Iodide	N/A	Floor	Thin/No Paint	4,109
27	Sodium Iodide	N/A	Wall	Thin/No Paint	6,456
28	Sodium Iodide	N/A	Wall	Thin/No Paint	12,726
29	Sodium Iodide	N/A	Floor	Thin/No Paint	8,690
30	Sodium Iodide	N/A	Wall	Thin/No Paint	19,941
				MIN	4109.2
				MAX	38980.2
				AVERAGE	14765.1
				SD	12259.4

Total Surface Activity

Survey Area:		2nd Floor	Survey Unit:		776028		
Meter Model:		NE Electra w/ DP6 Probe			Date:	12/30/04	
		1	2	3			
Instrument #:		4067	N/A	N/A	N/A	A priori MDA:	94
Cal. Due Date:		3/2/05	N/A	N/A	N/A	Avg. Local Bkgd	10.0
Efficiency (c/d):		22.60%	N/A	N/A	N/A	Avg. Efficiency	0.226
Sample Location #	RCT ID #	Inst. #	Local Bkgd (cpm)	Gross (cpm)	(dpm/100 cm ²)		
1	Inaccessible	N/A	N/A	N/A	N/A		
2	Inaccessible	N/A	N/A	N/A	N/A		
3	2	1	2	9.0	31.0		
4	1	1	0	5.0	22.1		
5	3	1	7	6.0	-4.4		
6	2	1	4	21.0	75.2		
7	1	1	5	28.0	101.8		
8	Inaccessible	N/A	N/A	N/A	N/A		
9	Inaccessible	N/A	N/A	N/A	N/A		
10	1	1	3	6.0	13.3		
11	2	1	2	8.0	26.5		
12	Inaccessible	N/A	N/A	N/A	N/A		
13	1	1	4	5.0	4.4		
14	3	1	3	7.0	17.7		
15	Inaccessible	N/A	N/A	N/A	N/A		
16	2	1	1	8.0	31.0		
17	1	1	2	12.0	44.2		
18	1	1	2	6.0	17.7		
19	2	1	3	3.0	0.0		
20	2	1	2	7.0	22.1		
21	1	1	7	7.0	0.0		
22	1	1	3	7.0	17.7		
23	1	1	4	21.0	75.2		
24	1	1	3	4.0	4.4		
25	2	1	3	3.0	0.0		
26	2	1	2	16.0	61.9		
27	1	1	5	3.0	-8.8		
28	1	1	4	6.0	8.8		
29	1	1	2	35.0	146.0		
30	1	1	0	7.0	31.0		
				MIN	-8.8		
				MAX	146.0		
				MEAN	30.8		
				SD	37.3		

Removable Activity

Survey Area:		2nd Floor	Survey Unit:		776028
Dates Counted:	12/30/04				
A priori MDA:	16				
Efficiency (c/d)	0.333				
Smear Location Number	Smear Results				
	RCT ID #	Serial Number	Gross (cpm)	Bkg.	(dpm/100 cm ²)
1	Inaccessible	N/A	N/A	N/A	N/A
2	Inaccessible	N/A	N/A	N/A	N/A
3	1	953		0.5	-2
4	1	811		0.3	-1
5	1	1352		0.5	-2
6	1	964		0.6	-2
7	1	953		0.5	-2
8	Inaccessible	N/A	N/A	N/A	N/A
9	Inaccessible	N/A	N/A	N/A	N/A
10	1	811		0.3	-1
11	1	1352		0.5	-2
12	Inaccessible	N/A	N/A	N/A	N/A
13	1	964		0.6	-2
14	1	953		0.5	-2
15	Inaccessible	N/A	N/A	N/A	N/A
16	1	811		0.3	-1
17	1	1352		0.5	-2
18	1	964		0.6	-2
19	1	953		0.5	-2
20	1	811		0.3	-1
21	1	1352		0.5	-2
22	1	964		0.6	-2
23	1	953		0.5	-2
24	1	811		0.3	-1
25	1	1352		0.5	-2
26	1	964		0.6	-2
27	1	953		0.5	-2
28	1	811		0.3	-1
29	1	1352		0.5	-2
30	1	964		0.6	-2
				MIN	-1.8
				MAX	-0.9
				MEAN	-1.4
				SD	0.3

Sodium Iodide Instrument Information

Survey Area:	2nd Floor	Survey Unit:	776028	Survey Date(s):	12/30/04
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Instrument Specifications

Instrument #	1	2
Meter Model:	Ludlum 2350-1	Ludlum 2350-1
Meter Serial #:	201184	201199
Detector Model:	Bicron G-5	Ludlum 44-17
Detector #:	B716T	199764
Detector Size (cm ²):	125	17.8
Calibration Due Date:	6/14/05	6/9/05
Count Time (min)	5	5
Contact Efficiency	7.10%	9.20%

Ratio Used

Pu to Am - 241	8.1
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Comments

In cases where the critical level is greater than the calculated dpm/100cm², the critical level will be used for statistical analysis.

Count Times for backgrounds and samples are equal.

Attenuation Factors: Based on observation of Walls and Ceilings. Epoxy on Floor determined by chip sampling.

Background (Gross)

Instrument #	1	2
Gamma (Ceilings)	N/A	346
Gamma (Floors)	9127	N/A
Gamma (Walls)	N/A	767

Background (cpm)

Instrument #	1	2
Gamma (Ceilings)	N/A	69.2
Gamma (Floors)	1825.4	N/A
Gamma (Walls)	N/A	153.4

Efficiencies (cpm/dpm)

Instrument #	1	2
Thin/No Paint	0.070	0.091
Epoxy	0.057	0.074
Other	0.067	0.087

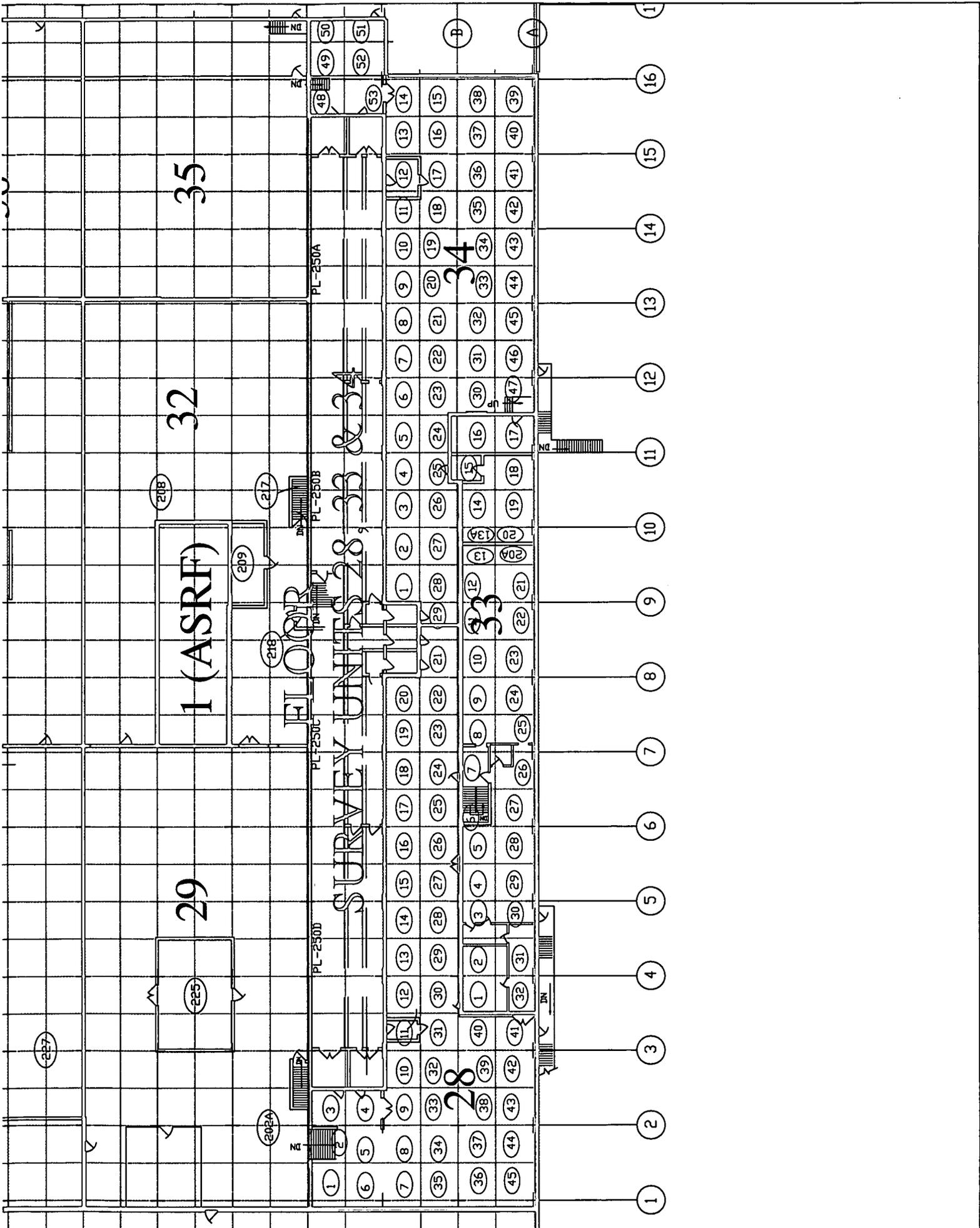
Coatings

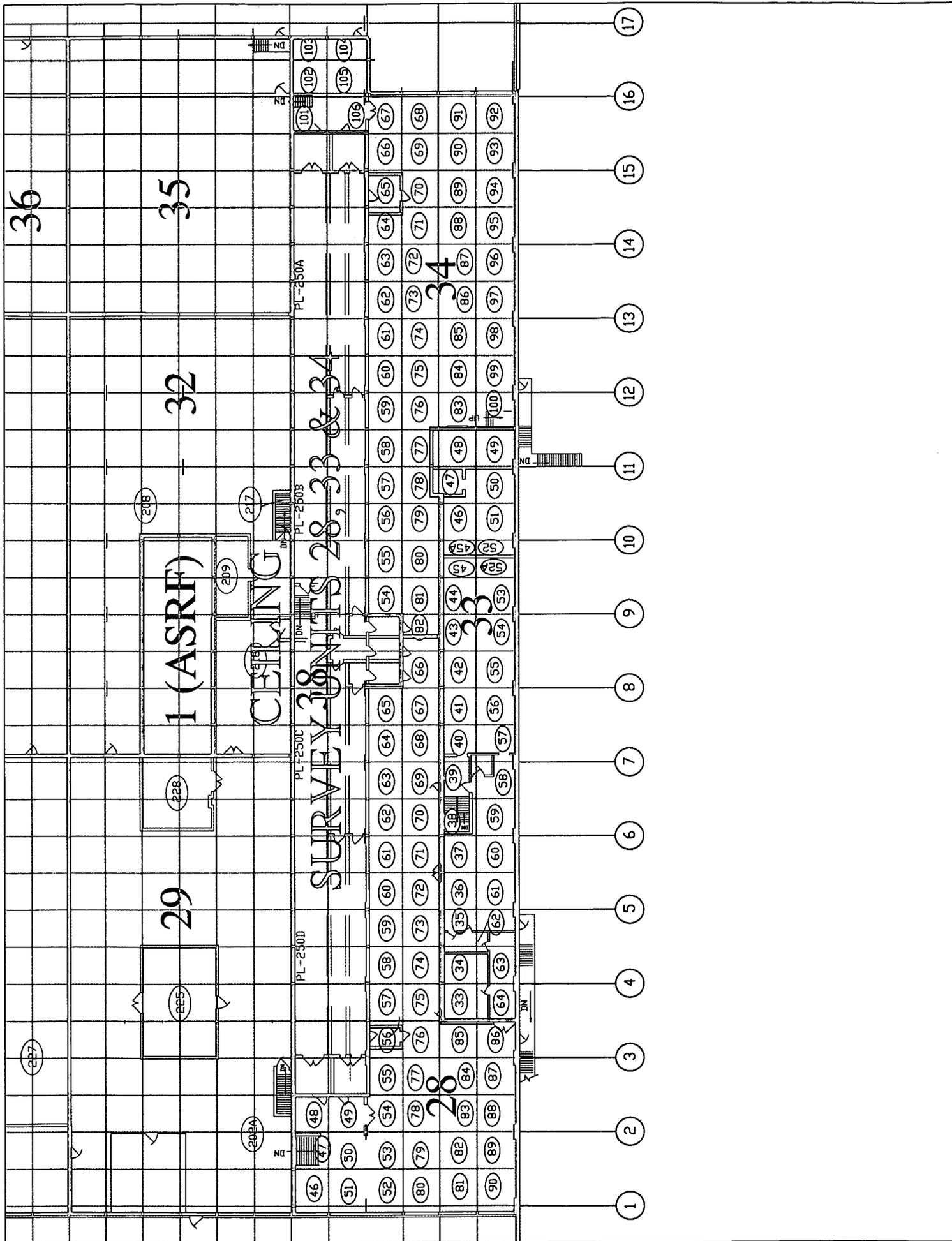
	Thickness (inches)
Thin/No Paint	0.015
Epoxy	0.250
Other	0.06

Total Activity Estimates Using Sodium Iodide Instruments

Survey Area:	2nd Floor	Survey Unit:	776028	Survey Date(s):	12/30/04
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Sample Location #	RCT ID #	Instrument #	Gross Counts	Critical Level (dpm/100cm ²)	Total Alpha (dpm/100cm ²)
1	2	2	244	4,336	4,336
2	2	2	341	4,336	4,336
3	2	1	9338	4,109	4,109
4	2	1	8750	4,109	4,109
5	3	2	1065	6,456	29,861
6	2	1	7396	4,109	4,109
7	2	1	9433	4,109	5,658
8	2	2	307	4,336	4,336
9	3	2	310	4,336	4,336
10	1	2	809	6,456	6,456
11	2	1	10228	4,109	20,357
12	1	2	1111	6,456	34,471
13	3	2	1142	6,456	37,577
14	3	2	845	6,456	7,816
15	3	2	318	4,336	4,336
16	1	2	817	6,456	6,456
17	2	1	10925	4,109	33,245
18	1	2	1059	6,456	29,260
19	1	2	1094	6,456	32,767
20	2	1	9729	4,109	11,131
21	3	2	840	6,456	7,315
22	3	2	839	6,456	7,215
23	2	1	10268	4,109	21,097
24	1	2	1040	6,456	27,356
25	1	2	1156	6,456	38,980
26	2	1	8532	4,109	4,109
27	3	2	786	6,456	6,456
28	3	2	894	6,456	12,726
29	2	1	9597	4,109	8,690
30	1	2	966	6,456	19,941





RADIOLOGICAL CLOSEOUT SURVEY FOR THE 776 CLUSTER

Survey Area: Second Floor

Survey Unit: 776028
Building: 776

Classification: NA

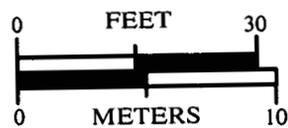
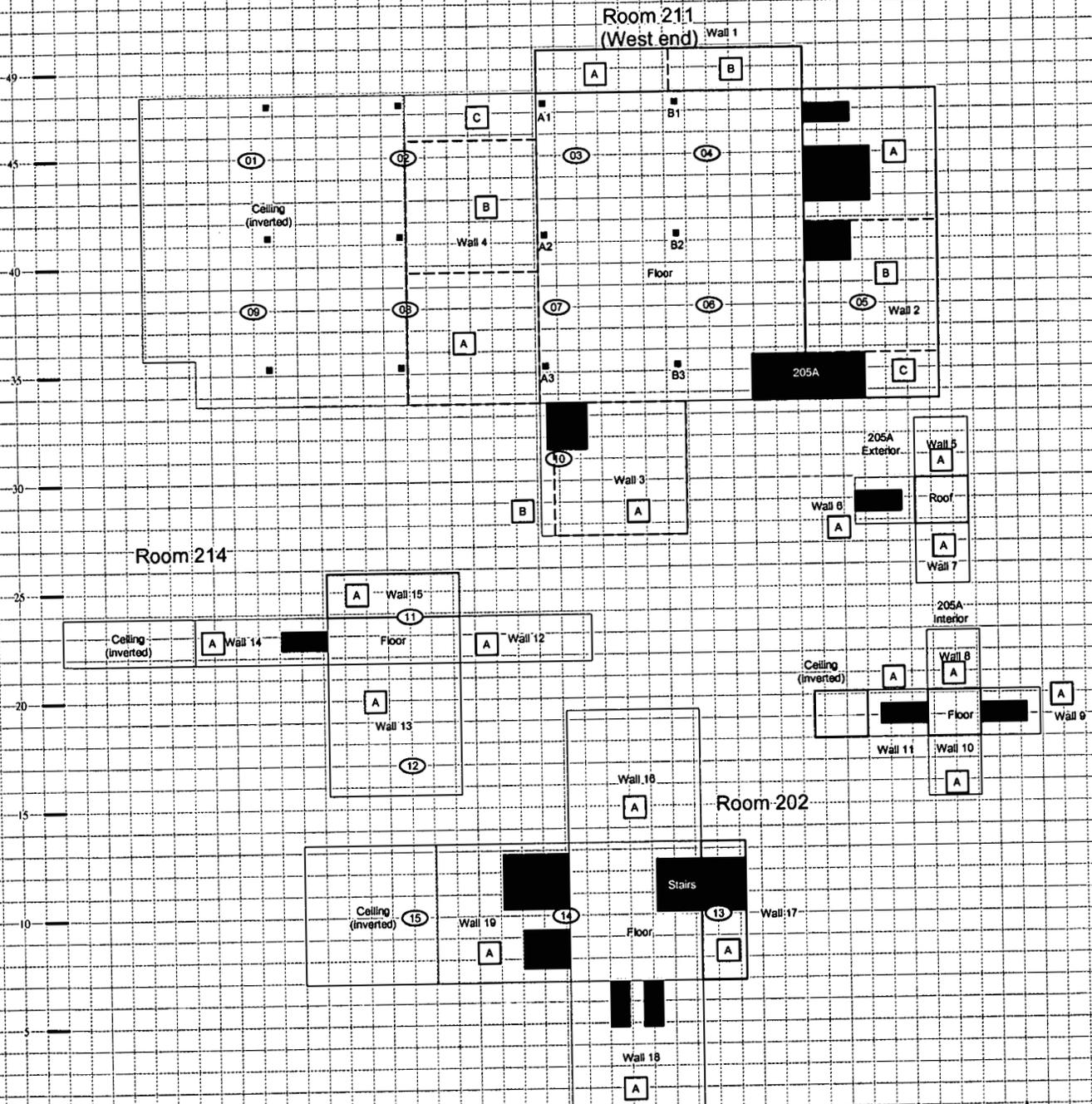
Survey Unit Description: Second floor- Room 211, 214, 202

Total Floor Area: 398 sq. m

Total Area: 1651 sq. m

Random Start Grid Size: 7 x 7 sq. m

SURVEY UNIT 776028 - MAP 1 OF 2



SURVEY MAP LEGEND	
	Smear A TSC Location
	Smear, TSC & Sample Location
	Open/Inaccessible Area
	Area in Another Location

RADIOLOGICAL CLOSEOUT SURVEY FOR THE 776 CLUSTER

Survey Area: Second Floor

Survey Unit: 776028

Classification: NA

Building: 776

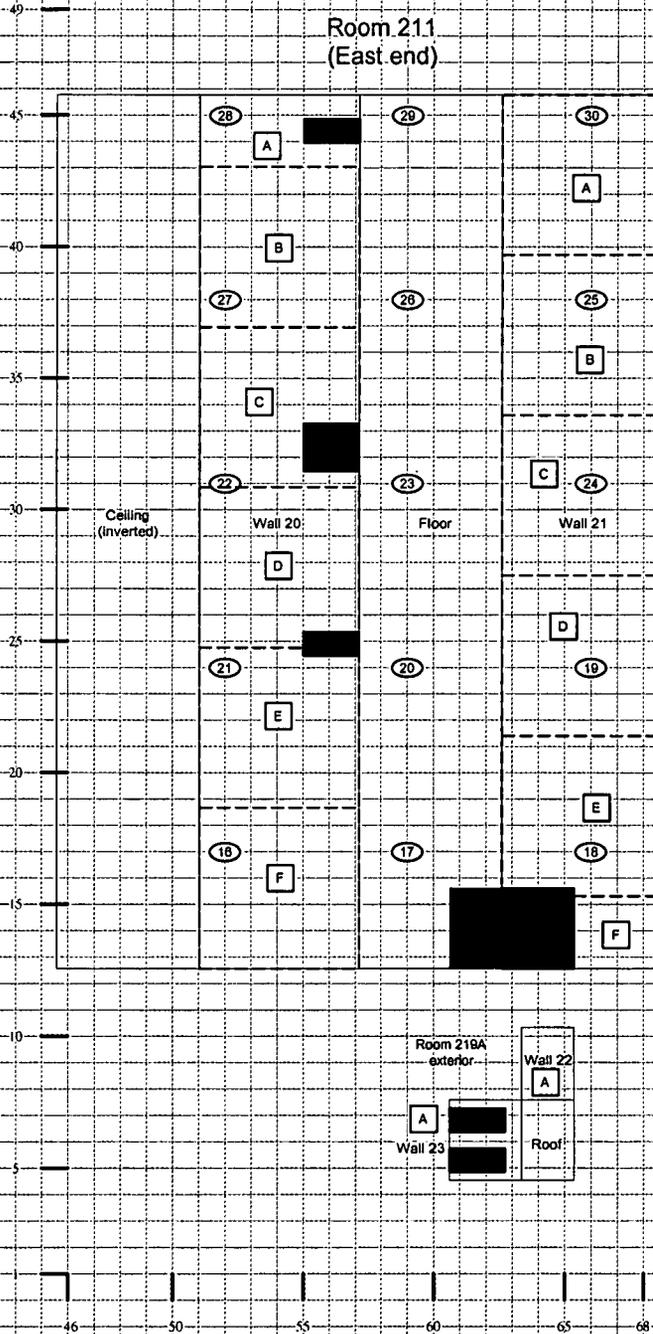
Survey Unit Description: Second floor- Room 211, 214, 202

Total Floor Area: 398 sq. m

Total Area: 1651 sq. m

Random Start Grid Size: 7 x 7 sq. m

SURVEY UNIT 776028- MAP 2 OF 2



Survey Instructions
Building 776 2nd Floor
Survey Unit 776033

Purpose:

This instruction provides guidance for collecting gross gamma and removable contamination data to quantify the amount of residual contamination in Survey Unit 776033 prior to demolition. NaI measurements are performed in accordance with "INS-535-Ludlum2350-1 with Sodium Iodide Detector".

Equipment and materials:

1. A Ludlum 44-17 attached to a Ludlum 2350-1 set to collect five-minute counts that will be displayed on its LCD window.
2. A Bicron G-5 attached to a Ludlum 2350-1 set to collect five-minute counts that will be displayed on its LCD window.
3. One Electra with attached DP-6, calibrated and daily response checked.
4. Two probe holders, one for the G-5 and one for the 44-17 with tin shielding.
5. Calibrated and daily response checked SAC-4.
6. Measuring tape or laser range finder.

Note: The NE Electra with DP-6 probe and the Eberline SAC-4 shall be used in accordance with RSP- 7.01 and 7.02

Procedure:

1. Inspect instrument for obvious damage and ensure battery voltage is equal to or greater than 4.6 volts. If battery voltage is less than 4.6 volts change the batteries.
2. Complete daily performance checks for Sodium Iodide detectors to ensure the instrument is functioning properly by using Americium-241 source TS-912. Record results on Sodium Iodide Data Sheet.
3. For floor and concrete wall background measurements, perform a 300-second background count with a Bicron G-5 for floors or Ludlum 44-17 for walls at background location in room 201-A near column B-13. Record background counts next to "Bkg Floor" or "Bkg Concrete Wall" in background column of attached "Sodium Iodide Data Collection" sheets as needed.
4. For block wall background measurements, perform a 300-second background count with a Ludlum 44-17 at the background location in room 219. Record background counts next to "Bkg Block Wall" in background column of attached Sodium Iodide data collection sheets as needed.
5. For ceiling and metal floor background measurements, perform a 300-second background count with a Ludlum 44-17 or Bicron G-5 at background location in room 201-A near column B-13. Hold the probe waist high, pointed toward ceiling using a sheet metal plate in front of the detector (take background measurement in this configuration). Record background counts next to "Bkg Metal Floor" for the G-5 and " Bkg Metal Ceiling" for the 44-17 on the attached Sodium Iodide data collection sheets as needed.
6. Mark the sample locations on the surfaces to be measured. Take all measurements on contact with the marked surface using tin side shields on the Bicron G-5 and tin side and back shields on the Ludlum 44-17. All Sodium Iodide readings shall have 300 second count times.
7. Collect sodium Iodide, total surface activity and removable surface activity measurements at all locations marked on the attached map.
8. Record the NaI and NE Electra measurements on the attached sheet. Note any items or conditions that may have affected the measurement in the "remarks" section.
9. Count swipes for 60 seconds with a SAC-4, record result on attached sheet for removable contamination.

Survey Instructions
 Building 776 2nd Floor
 Survey Unit 776033

Table 776033-1: Survey Requirements

Surface	Type of Survey	Probe	Placement	Count Time
Floor	Total Alpha Activity	Bicron G-5	On contact	300 seconds
All Surfaces	Total Alpha Activity	Electra with DP-6	On contact	60 seconds
Block walls	Total Alpha Activity	Bicron G-5 or Ludlum 44-17	On contact	300 seconds
All Surfaces	Removable Alpha	SAC-4	Swipe in placed in tray	60 seconds
Ceiling	Total Alpha Activity	Ludlum 44-17	On Contact	300 seconds
Block Walls	Background measurement	Bicron G-5 or Ludlum 44-17	On contact with east wall outside room 219	300 seconds
Metal Floors	Background measurement	Bicron G-5 or Ludlum 44-17	Probe waist high, pointed toward ceiling with sheet metal plate on end in room 201-A near column B-13	300 seconds
Floors and cement walls	Background measurement	Bicron G-5 or Ludlum 44-17	On contact with floor in room 201-A near column B-13	300 seconds
Metal ceilings	Background measurement	Ludlum 44-17	Probe waist high, pointed toward ceiling with sheet metal plate on end in room 201 near column B-13	300 seconds

FINAL SURVEY REPORT

Survey Unit 776033

Introduction and Scope

A pre-demolition radiological survey (PDS) is performed prior to building demolition to define the radiological conditions of a facility. A PDS survey for survey unit 776033 has been completed in accordance with guidelines outlined in the "Radiological Pre-Demolition Survey Plan Building 776/777". Based on the results it is recommended that no further remediation is needed, and that the survey unit may be prepared for demolition. Isolation controls shall be put in place to prevent re-contamination of the area. This report has been prepared in accordance with sections 3 and 8 of the "Radiological Pre-Demolition Survey Plan Building 776/777".

Survey Unit 33 consists of Rooms 219, 230, 230A, 231, 231A, 232, 232A, 232B, 233 and 233A.

PDS Methods and Techniques

The PDS survey results determine the Average Surface Contamination Value (ASCV_u) and source term for the survey unit. These parameters are used to determine whether the building may be demolished within the limits outlined in the "Radiological Pre-Demolition Survey Plan Building 776/777".

To comply with the "Radiological Pre-Demolition Survey Plan Building 776/777", a minimum of 30 survey points were selected per survey unit. A random start, systematic grid method was used to identify the survey point locations. Three types of surveys are performed at each survey point as follows:

- Painted surfaces are evaluated for potential contamination under coatings using sodium iodide (NaI) gamma detectors attached to a single channel analyzer windowed for the 59 keV gamma-ray (Am²⁴¹).
- Direct alpha surface contamination measurements are performed using a NE Electra survey instrument with attached DP-6 probe. This data may be compared to the NaI survey data to show the fraction of contamination that is directly on the surface versus imbedded in the material matrix.
- Removable surface alpha contamination surveys were performed by swiping the survey point with a 47mm filter paper then counting the filter paper on a SAC-4 alpha counter.

To conservatively determine the final Average Surface Contamination Value (ASCV_u) for the survey unit, the source term associated with inaccessible areas of the survey unit (there were no inaccessible areas identified in this survey unit) is added to the source term calculated by the PDS survey.

Results

A final survey has been performed in the area. A total of 30 survey points were selected using a random start grid method in accordance with the "Radiological Pre-Demolition Survey Plan Building 776/777". Additional measurements were performed to ensure the most contaminated portions of the survey unit were adequately represented.

FINAL SURVEY REPORT

Survey Unit 776033

Walls

The average contamination level from the in-process survey for the walls was 9,140 dpm/100 cm². See Table 2.0 below. No remediation effort was identified as required on the walls for this survey unit. Final survey points were taken on the walls per the random sampling criteria.

Table 1.0 B776/777 Survey Unit 776033 - Wall Summary

Wall	Section	Structural	Initial Characterization:		
			Type I	Type II	Type III
776033-1	A		4,208		
776033-2	A		4,514		
776033-2	B		4,514		
776033-2	C		4,514		
776033-2	E		5,080		
776033-2	F		5,080		
776033-2	G		5,080		
776033-2	H		5,080		
776033-4	A		31,046		
776033-5	A		38,960		
776033-6	A		14,615		
776033-7	A		4,208		
776033-8	A		5,080		
776033-9	A		5,080		
776033-10	A		14,809		
776033-11	A		14,809		
776033-12	A		42,311		
776033-13	A		16,924		
776033-14	A		19,720		
776033-15	A		4,117		
776033-16	A		11,064		
776033-18	A		5,115		
	Type I:	<100,000 dpm/100 cm²			
	Type 2:	>100,000 dpm/100cm² to <1,000,000 dpm/100cm²			
	Type 3:	>1,000,000 dpm/100cm²			

FINAL SURVEY REPORT

Survey Unit 776033

Table 2.0 B776/777 Survey Unit 776033 - Wall Source Term

Wall Designation	Wall Type	Area (ft2)	Area (m2)	Average dpm/100cm2	Total Activity (uCi)	Comments
776033-1A	I	359.38	33.4	4,208	6.3	
776033-2A	I	221.66	20.6	4,514	4.2	
776033-2B	I	366.92	34.1	4,514	6.9	
776033-2C	I	366.92	34.1	4,514	6.9	
776033-2E	I	355.08	33.0	5,080	7.6	
776033-2F	I	366.92	34.1	5,080	7.8	
776033-2G	I	366.92	34.1	5,080	7.8	
776033-2H	I	230.26	21.4	5,080	4.9	
776033-4A	I	59.18	5.5	31,046	7.7	
776033-5A	I	189.38	17.6	38,990	30.9	
776033-6A	I	104.37	9.7	14,615	6.4	
776033-7A	I	147.41	13.7	4,208	2.6	
776033-8A	I	91.46	8.5	5,080	1.9	
776033-9A	I	92.536	8.6	5,080	2.0	
776033-10A	I	49.496	4.6	14,809	3.1	
776033-11A	I	47.344	4.4	14,809	2.9	
776033-12A	I	49.496	4.6	42,311	8.8	
776033-13A	I	25.824	2.4	16,924	1.8	
776033-14A	I	406.73	37.8	19,720	33.6	
776033-15A	I	185.07	17.2	4,117	3.2	
776033-16A	I	425.02	39.5	11,064	19.7	
776033-18A	I	269	25.0	5,115	5.8	
Average				9,140		

Floors

The average contamination level from the in-process survey for the floors was 12,229 dpm/100 cm². See in-process data. No remediation effort was identified as required on the floors for this survey unit. Final survey points were taken on the floors per the random sampling criteria.

Ceilings

The average contamination level from the in-process survey for the ceilings was 16,702 dpm/100 cm². This corresponds to the average critical level for the instruments used. See in-process data. No remediation effort was identified as required on the ceilings for this survey unit. Final survey points were taken on the ceilings per the random sampling criteria.

FINAL SURVEY REPORT

Survey Unit 776033

PDS Data Summary

The values for the accessible areas and inaccessible areas were summed and divided by the total area for the survey unit to calculate the "Average Surface Contamination Value" ($ASCV_u$) and source term for the survey unit. The results are summarized in Table 3 below:

Table 3.0 PDS Final Results

	Final Results
776033 Inaccessible Area Source Term (μCi)	0.0
776033 Accessible Area Source Term (μCi)	1,609.0
776033 Total Source Term (μCi)	1,609.0
Survey Unit Area (m^2)	1319
($ASCV_u$) ($\mu\text{Ci}/\text{m}^2$)	1.22
($ASCV_u$) ($\text{dpm}/100\text{cm}^2$)	27,081

Notes:

See Attachment 1 for the standard methods used for calculating the ASCV

Attachment 1

Standard Method for Calculating the ASCV for Each Survey Unit

Prerequisites:

1. Final survey map for the survey unit
2. PDS survey results
3. Survey information used to estimate activities in inaccessible areas;
4. Survey information for any structural members or elevated regions not represented by the PDS survey.

Conversions:

1 square meter (m²) = 100 x 100 cm²

1 microcurie (μCi) = 2.22x 10⁶ dpm

1 (μCi/ m²) = 22,200 dpm/ 100cm² evenly distributed over one square meter.

12 inches = 1 foot = 0.305 meters

Calculations:

Accessible Area Inventory

1. Calculate the average surface contamination for the applicable survey unit from a minimum of 30 sodium iodide measurements obtained by the PDS survey.
2. Average the total surface contamination activity present.
3. Convert the average surface contamination value from step 2 from "dpm/ 100cm²" to "μCi/ m²"

Example:

$$22,200 \text{ dpm}/100\text{cm}^2 \times (100 \times 100 \text{ cm}^2/\text{m}^2) \times (1\mu\text{Ci}/2.22 \times 10^6 \text{ dpm}) = 1 \mu\text{Ci}/\text{m}^2$$

4. Obtain surface area of survey unit from title box of final survey map. This is reported in square meters.
5. Calculate inventory for accessible areas

The surface area from a survey unit map title box is 1,000 square meters and the average contamination level from the 30 PDS points is 22,200 dpm/ 100cm².

Example:

$$1,000 \text{ m}^2 \times 22,200 \text{ dpm}/100\text{cm}^2 \times (100 \times 100 \text{ cm}^2/\text{m}^2) \times (1\mu\text{Ci}/2.22 \times 10^6 \text{ dpm}) = 1,000 \mu\text{Ci}$$

Inaccessible Area Inventory

1. Document methods used to estimate contamination levels and potential inventory in seams, cracks or other surfaces in the final survey report. Provide an estimated remaining inventory for each item/area in the report.

Example:

There are 20 feet of seams contaminated to an average level of 2,220,000 dpm/100 cm². Each seam has two sides. The total inventory can be estimated assuming the contamination levels measured at the top of the seam extend down each side of the seam. The depth of the seam can be determined from design drawings or from direct observation as the seam is chipped away. If a seam is determined to be 4 inches deep, then the inventory of the seam can be calculated as follows:

The contaminated area of the seam is:

$$(20 \text{ feet} \times .305 \text{ m/ft}) \times (0.3 \text{ feet} \times 0.305 \text{ m/ft}) = .61 \text{ m}^2 \times 2 \text{ sides} = 1.22 \text{ m}^2$$

Therefore the inventory in the seam in μCi is:

$$1.22 \text{ m}^2 \times (2,220,000 \text{ dpm}/100 \text{ cm}^2) \times (10,000 \text{ cm}^2/\text{m}^2) \times \mu\text{Ci}/2.22\text{E}6 \text{ dpm} = 122 \mu\text{Ci}$$

Attachment 1

Calculating the ASCV

1. Sum the inventories from the inaccessible areas with the inventory for the accessible area to obtain a total inventory for the survey unit.

Total Inventory = Accessible Inventory + Inaccessible inventory + Inventory items (areas not represented by other inventories listed i.e. Stairs, columns, etc)

Example: 1000 μCi = accessible inventory

122 μCi = inaccessible inventory

100 μCi = inaccessible contamination in the columns and contamination on the stairs

$$1000 + 122 + 100 = 1222 \mu\text{Ci}$$

2. Divide the total inventory for the survey unit by the accessible area of the survey unit obtained from the final survey map.

Example: 1222 μCi = total inventory

1000 m^2 = total surface area of the survey unit

$$1222 \mu\text{Ci} / 1,000 \text{ m}^2 = 1.22 \mu\text{Ci} / \text{m}^2$$

$$1.22 \mu\text{Ci} / \text{m}^2 * (1\text{m}^2 / (100*100 \text{ cm}^2)) * (2.22\text{E}6 \text{ dpm} / \mu\text{Ci}) = 27084 \text{ dpm} / 100\text{cm}^2$$

776033 In-Process

Location #	Column letter	Column Number	North	East	Elevation	Gross Counts	Dpm/100c m2
33-1	A	3	15	18	Floor	1030	9,082
33-2	A	4	15	4	Floor	1477	23,880
33-3	A	4	16	15	Floor	1416	17,167
33-4	A	5	17	5	Floor	1716	50,182
33-5	A	5	15	5	Floor	1129	9,082
33-6	A	6	13	5	Floor	1219	9,082
33-7	A	6	16	15	Floor	1198	9,082
33-8	A	7	15	5	Floor	1149	9,082
33-9	A	7	13	19	Floor	1745	10,525
33-10	A	8	19	19	Floor	1820	14,086
33-11	A	8	19	16	Floor	1907	23,660
33-12	A	9	19	2	Floor	1696	10,525
33-13	A	9	19	15	Floor	1733	10,525
33-13A	A	9	16	18	Floor	1033	9,082
33-14	A	10	15	4	Floor	1119	9,082
33-15	A	10	14	15	Floor	1078	9,082
33-16	A	11	16	5	Floor	1200	9,082
33-17	A	11	7	5	Floor	1106	9,082
33-18	A	10	5	15	Floor	1165	9,082
33-19	A	10	3	6	Floor	1041	9,082
33-20	A	9	5	18	Floor	998	9,082
33-20A	A	9	1	15	Floor	1786	10,525
33-21	A	9	1	7	Floor	1813	13,316
33-22	A	8	9	18	Floor	1854	17,828
33-23	A	8	7	7	Floor	1718	10,525
33-24	A	7	8	14	Floor	1804	12,325
33-25	A	7	5	5	Floor	1091	9,082
33-26	A	6	5	15	Floor	1233	9,082
33-27	A	6	5	5	Floor	1160	9,082
33-28	A	5	5	15	Floor	1111	9,082
33-29	A	5	5	5	Floor	1011	9,082
33-30	A	4	2	13	Floor	1152	9,082
33-31	A	4	4	4	Floor	1000	9,082
33-32	A	3	4	13	Floor	1032	9,082
33-33	A	3	18	17	Ceiling	83	17,827
33-34	A	4	16	3	Ceiling	87	17,827
33-35	A	4	15	14	Ceiling	81	17,827
33-36	A	5	17	4	Ceiling	82	17,827
33-37	A	5	15	11	Ceiling	90	17,827
33-38	A	6	16	7	Ceiling	84	17,827
33-39	A	6	12	16	Ceiling	83	17,827
33-40	A	7	19	6	Ceiling	125	15,226

776033 In-Process

33-41	A	7	19	19	Ceiling	106	15,226
33-42	A	8	18	2	Ceiling	114	15,226
33-43	A	8	13	11	Ceiling	133	18,623
33-44	A	9	11	9	Ceiling	101	15,226
33-45	A	9	19	14	Ceiling	117	15,226
33-45A	A	9	19	18	Ceiling	112	15,226
33-46	A	10	15	5	Ceiling	126	15,226
33-47	A	10	15	15	Ceiling	132	17,981
33-48	A	11	19	4	Ceiling	119	15,226
33-49	A	11	9	4	Ceiling	104	15,226
33-50	A	10	9	12	Ceiling	127	15,226
33-51	A	10	2	5	Ceiling	119	15,226
33-52	A	9	2	18	Ceiling	116	15,226
33-52A	A	9	9	14	Ceiling	109	15,226
33-53	A	9	2	9	Ceiling	129	16,054
33-54	A	8	9	12	Ceiling	136	20,550
33-55	A	8	2	9	Ceiling	114	15,226
33-56	A	7	2	19	Ceiling	121	15,226
33-57	A	7	9	8	Ceiling	130	16,697
33-58	A	6	2	17	Ceiling	87	17,827
33-59	A	6	2	8	Ceiling	80	17,827
33-60	A	5	2	12	Ceiling	84	17,827
33-61	A	5	3	3	Ceiling	89	17,827
33-62	A	4	2	15	Ceiling	85	17,827
33-63	A	4	1	4	Ceiling	88	17,827
33-64	A	3	2	19	Ceiling	81	17,827

Survey Unit 776033 Summary

Total Activity Measurements

30	30
Number Required	Number Obtained

MIN	3902	dpm/100 cm ²
MAX	66938	dpm/100 cm ²
Average	27081	dpm/100 cm ²
STD DEV	22901	dpm/100 cm ²

*Average Contamination Value for Accessible Areas Only

Inaccessible Areas 0.0 uCi, Alpha

Total Surface Area 1319 m²
Accessible Inventory = 1609.0 uCi, Alpha

Total Inventory 1609.0 uCi, Alpha

ASCV _u =	1.22 uCi/m ²
ASCV _u =	27,081 dpm/100 cm ²

Survey Unit 776033

Sample Location Number					
	Measurement Used	Comment	Surface	Coating	(dpm/100 cm ²)
1	Sodium Iodide	N/A	Wall	Thin/No Paint	32,066
2	Sodium Iodide	N/A	Wall	Thin/No Paint	44,391
3	Sodium Iodide	N/A	Wall	Thin/No Paint	56,917
4	Sodium Iodide	N/A	Wall	Thin/No Paint	66,938
5	Sodium Iodide	N/A	Wall	Thin/No Paint	65,936
6	Sodium Iodide	N/A	Wall	Thin/No Paint	63,932
7	Sodium Iodide	N/A	Wall	Thin/No Paint	60,525
8	Sodium Iodide	N/A	Floor	Thin/No Paint	31,784
9	Sodium Iodide	N/A	Floor	Thin/No Paint	5,658
10	Sodium Iodide	N/A	Floor	Thin/No Paint	3,902
11	Sodium Iodide	N/A	Floor	Thin/No Paint	43,063
12	Sodium Iodide	N/A	Floor	Thin/No Paint	4,528
13	Sodium Iodide	N/A	Wall	Thin/No Paint	9,520
14	Sodium Iodide	N/A	Wall	Thin/No Paint	6,659
15	Sodium Iodide	N/A	Wall	Thin/No Paint	6,659
16	Sodium Iodide	N/A	Wall	Thin/No Paint	6,659
17	Sodium Iodide	N/A	Wall	Thin/No Paint	6,418
18	Sodium Iodide	N/A	Wall	Thin/No Paint	6,418
19	Sodium Iodide	N/A	Wall	Thin/No Paint	6,418
20	Sodium Iodide	N/A	Wall	Thin/No Paint	6,418
21	Sodium Iodide	N/A	Ceiling	Thin/No Paint	42,688
22	Sodium Iodide	N/A	Wall	Thin/No Paint	24,851
23	Sodium Iodide	N/A	Wall	Thin/No Paint	31,365
24	Sodium Iodide	N/A	Wall	Thin/No Paint	14,831
25	Sodium Iodide	N/A	Wall	Thin/No Paint	25,152
26	Sodium Iodide	N/A	Ceiling	Thin/No Paint	4,305
27	Sodium Iodide	N/A	Wall	Thin/No Paint	60,224
28	Sodium Iodide	N/A	Floor	Thin/No Paint	54,046
29	Sodium Iodide	N/A	Wall	Thin/No Paint	6,418
30	Sodium Iodide	N/A	Wall	Thin/No Paint	13,728
				MIN	3902.2
				MAX	66937.7
				AVERAGE	27080.5
				SD	22901.1

Total Surface Activity

Survey Area:		2nd Floor	Survey Unit:		776033	
Meter Model:		NE Electra w/ DP6 Probe			Date:	1/4/05
		1	2	3		
Instrument #:	4066	2330	N/A	N/A	A priori MDA:	94
Cal. Due Date:	4/20/05	1/22/05	N/A	N/A	Avg. Local Bkgd	10.8
Efficiency (c/d):	23.20%	21.70%	N/A	N/A	Avg. Efficiency	0.225
Sample Location #	RCT ID #	Inst. #	Local Bkgd (cpm)	Gross (cpm)	(dpm/100 cm ²)	
1	1	1	13.0	13.0	0.0	
2	1	1	10.0	7.0	-13.4	
3	1	1	17.0	5.0	-53.5	
4	1	1	16.0	6.0	-44.5	
5	2	2	11.0	10.0	-4.5	
6	2	2	6.0	15.0	40.1	
7	2	2	8.0	13.0	22.3	
8	1	2	7.0	18.0	49.0	
9	1	2	10.0	9.0	-4.5	
10	1	2	10.0	12.0	8.9	
11	1	1	6.0	3.0	-13.4	
12	1	1	2.0	6.0	17.8	
13	2	1	12.0	7.0	-22.3	
14			Inaccessible		N/A	
15			Inaccessible		N/A	
16			Inaccessible		N/A	
17	2	2	14.0	10.0	-17.8	
18			Inaccessible		N/A	
19	2	2	10.0	14.0	17.8	
20	1	2	6.0	11.0	22.3	
21	1	2	8.0	8.0	0.0	
22	2	2	7.0	10.0	13.4	
23	1	2	6.0	12.0	26.7	
24	2	2	7.0	12.0	22.3	
25	2	2	9.0	21.0	53.5	
26	1	2	8.0	9.0	4.5	
27	1	2	12.0	8.0	-17.8	
28	2	2	7.0	22.0	66.8	
29	1	2	4.0	7.0	13.4	
30	2	2	9.0	13.0	17.8	
				MIN	-53.5	
				MAX	66.8	
				MEAN	7.9	
				SD	28.1	

Removable Activity

Survey Area:		2nd Floor	Survey Unit:		776033
Dates Counted:	1/4/05				
A priori MDA:	16				
Efficiency (c/d)	0.333				
Smear Location Number	Smear Results				
	RCT ID #	Serial Number	Gross (cpm)	Bkg.	(dpm/100 cm ²)
1	1	847	2.0	0.4	5
2	1	847	0.0	0.4	-1
3	1	847	0.0	0.4	-1
4	1	847	0.0	0.4	-1
5	1	847	0.0	0.5	-2
6	1	1051	1.0	0.3	2
7	1	847	1.0	0.5	2
8	2	1051	0.0	0.3	-1
9	2	847	0.0	0.5	-2
10	2	1051	0.0	0.3	-1
11	1	847	0.0	0.4	-1
12	1	847	0.1	0.4	-1
13	1	847	0.0	0.4	-1
14		Inaccessible			N/A
15		Inaccessible			N/A
16		Inaccessible			N/A
17	1	847	1.0	0.5	2
18		Inaccessible			N/A
19	1	1051	0.0	0.5	-2
20	2	847	0.0	0.5	-2
21	2	1051	2.0	0.3	5
22	1	847	1.0	0.5	2
23	2	1051	0.0	0.3	-1
24	1	847	0.0	0.5	-2
25	1	1051	0.0	0.3	-1
26	2	847	0.0	0.5	-2
27	2	1051	0.0	0.3	-1
28	1	847	2.0	0.5	5
29	2	1051	0.0	0.3	-1
30	1	847	0.0	0.5	-2
				MIN	-1.5
				MAX	5.1
				MEAN	-0.1
				SD	2.1

Sodium Iodide Instrument Information

Survey Area:	2nd Floor	Survey Unit:	776033	Survey Date(s):	01/04/05
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Instrument Specifications

Instrument #	1	2
Meter Model:	Ludlum 2350-1	Ludlum 2350-1
Meter Serial #:	201199	201184
Detector Model:	Ludlum 44-17	Bicron G-5
Detector #:	199764	B716T
Detector Size (cm ²):	17.8	125
Calibration Due Date:	6/9/05	6/14/05
Count Time (min)	5	5
Contact Efficiency	9.20%	7.10%

Ratio Used

Pu to Am - 241	8.1
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Comments

In cases where the critical level is greater than the calculated dpm/100cm², the critical level will be used for statistical analysis.

Count Times for backgrounds and samples are equal.

Attenuation Factors: Based on observation of Walls and Ceilings. Epoxy on Floor determined by chip sampling.

Background (Gross)

Instrument #	1	2
Gamma (Ceilings)	N/A	N/A
Gamma (Floors)	N/A	11083
Gamma (Walls)	816	N/A

Background (cpm)

Instrument #	1	2
Gamma (Ceilings)	N/A	N/A
Gamma (Floors)	N/A	2216.6
Gamma (Walls)	163.2	N/A

Efficiencies (cpm/dpm)

Instrument #	1	2
Thin/No Paint	0.091	0.070
Epoxy	0.074	0.057
Other	0.087	0.067

Coatings

	Thickness (Inches)
Thin/No Paint	0.015
Epoxy	0.250
Other	0.06

Total Activity Estimates Using Sodium Iodide Instruments

Survey Area:	2nd Floor	Survey Unit:	776033	Survey Date(s):	01/04/05
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Sample Location #	RCT ID #	Instrument #	Gross Counts	Critical Level (dpm/100cm2)	Total Alpha (dpm/100cm2)
1	1	1	1136	6,659	32,066
2	1	1	1259	6,659	44,391
3	1	1	1384	6,659	56,917
4	1	1	1484	6,659	66,938
5					N/A
6					N/A
7					N/A
8					N/A
9					N/A
10					N/A
11	1	2	13412	4,528	43,063
12	1	2	10124	4,528	4,528
13	2	1	911	6,659	9,520
14	2	1	776	6,659	6,659
15	2	1	821	6,659	6,659
16	2	1	815	6,659	6,659
17					N/A
18					N/A
19					N/A
20					N/A
21					N/A
22					N/A
23					N/A
24					N/A
25					N/A
26					N/A
27					N/A
28					N/A
29					N/A
30					N/A

Sodium Iodide Instrument Information

Survey Area:	2nd Floor	Survey Unit:	776033	Survey Date(s):	01/08/05
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Instrument Specifications

Instrument #	1	2
Meter Model:	Ludlum 2350-1	Ludlum 2350-1
Meter Serial #:	201199	201184
Detector Model:	Ludlum 44-17	Bicron G-5
Detector #:	199764	B716T
Detector Size (cm ²):	17.8	125
Calibration Due Date:	6/9/05	6/14/05
Count Time (min)	5	5
Contact Efficiency	9.20%	7.10%

Ratio Used

Pu to Am - 241	8.1
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Comments

In cases where the critical level is greater than the calculated dpm/100cm², the critical level will be used for statistical analysis.

Count Times for backgrounds and samples are equal.

Attenuation Factors: Based on observation of Walls and Ceilings. Epoxy on Floor determined by chip sampling.

Background (Gross)

Instrument #	1	2
Gamma (Ceilings)	341	N/A
Gamma (Floors)	N/A	8230
Gamma (Walls)	758	N/A

Background (cpm)

Instrument #	1	2
Gamma (Ceilings)	68.2	N/A
Gamma (Floors)	N/A	1646
Gamma (Walls)	151.6	N/A

Efficiencies (cpm/dpm)

Instrument #	1	2
Thin/No Paint	0.091	0.070
Epoxy	0.074	0.057
Other	0.060	0.046

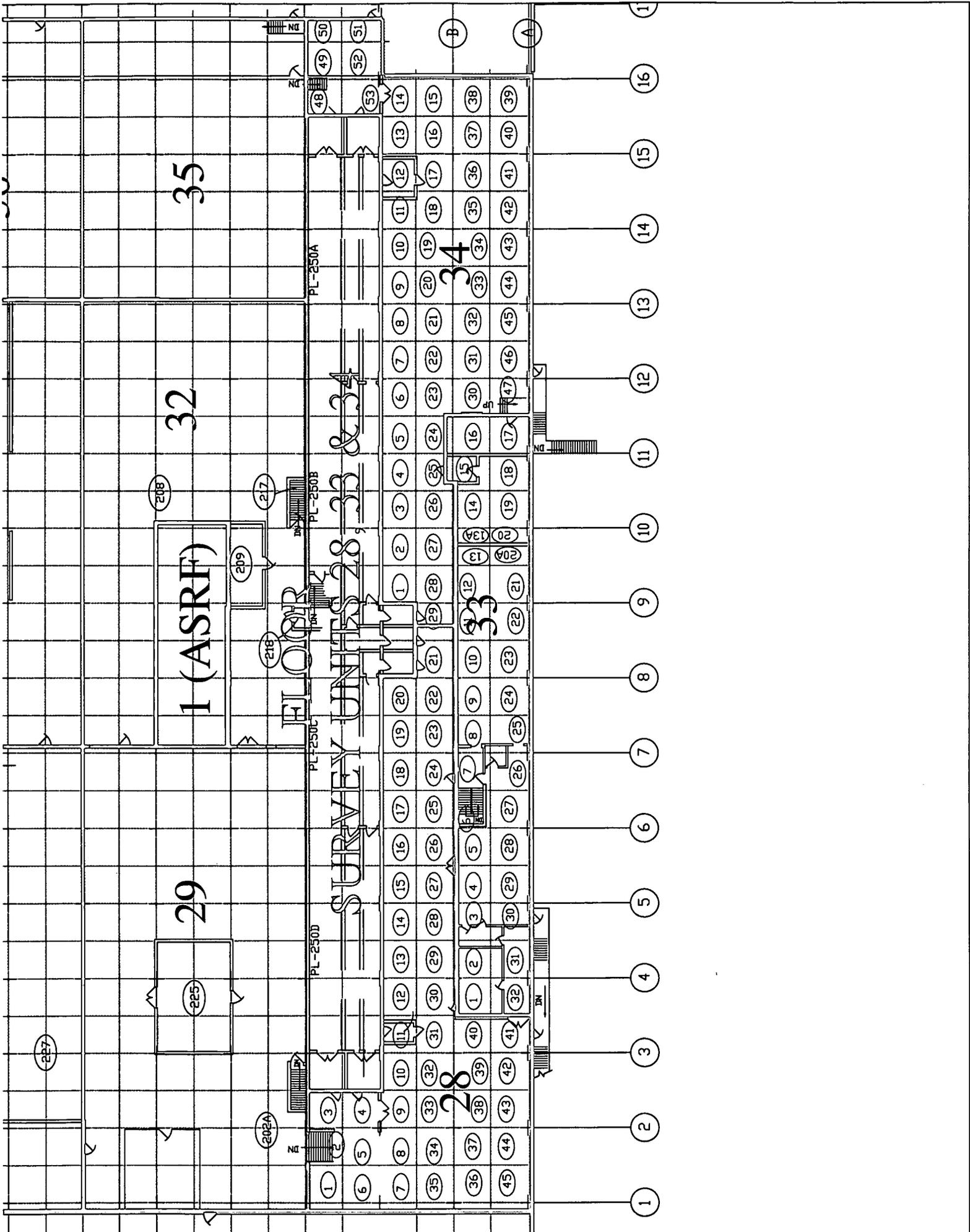
Coatings

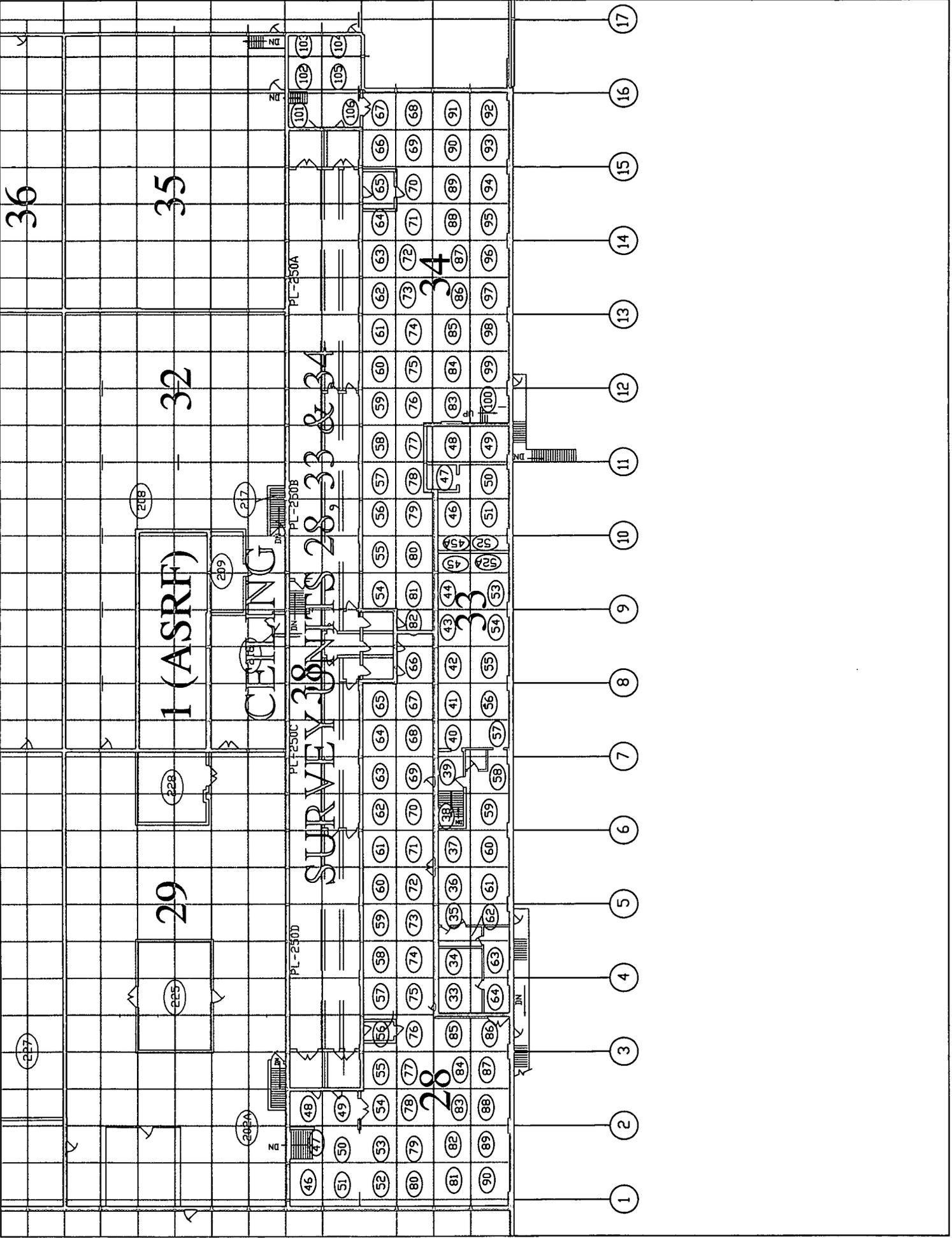
Coatings	Thickness (Inches)
Thin/No Paint	0.015
Epoxy	0.250
Other	0.5

Total Activity Estimates Using Sodium Iodide Instruments

Survey Area:	2nd Floor	Survey Unit:	776033	Survey Date(s):	01/08/05
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Sample Location #	RCT ID #	Instrument #	Gross Counts	Critical Level (dpm/100cm2)	Total Alpha (dpm/100cm2)
1					N/A
2					N/A
3					N/A
4					N/A
5	1	1	1416	6,418	65,936
6	1	1	1396	6,418	63,932
7	1	1	1362	6,418	60,525
8	1	2	9949	3,902	31,784
9	1	2	8536	3,902	5,658
10	1	2	8271	3,902	3,902
11					N/A
12					N/A
13					N/A
14					N/A
15					N/A
16					N/A
17	1	1	768	6,418	6,418
18	1	1	706	6,418	6,418
19	1	1	779	6,418	6,418
20	1	1	740	6,418	6,418
21	1	1	767	4,305	42,688
22	1	1	1006	6,418	24,851
23	1	1	1071	6,418	31,365
24	1	1	906	6,418	14,831
25	1	1	1009	6,418	25,152
26	1	1	345	4,305	4,305
27	1	1	1359	6,418	60,224
28	1	2	11153	3,902	54,046
29	1	1	817	6,418	6,418
30	1	1	895	6,418	13,728





RADIOLOGICAL CLOSEOUT SURVEY FOR THE 776 CLUSTER

Survey Area: 2nd Floor

Survey Unit: 776033

Classification: NA

Building: 776

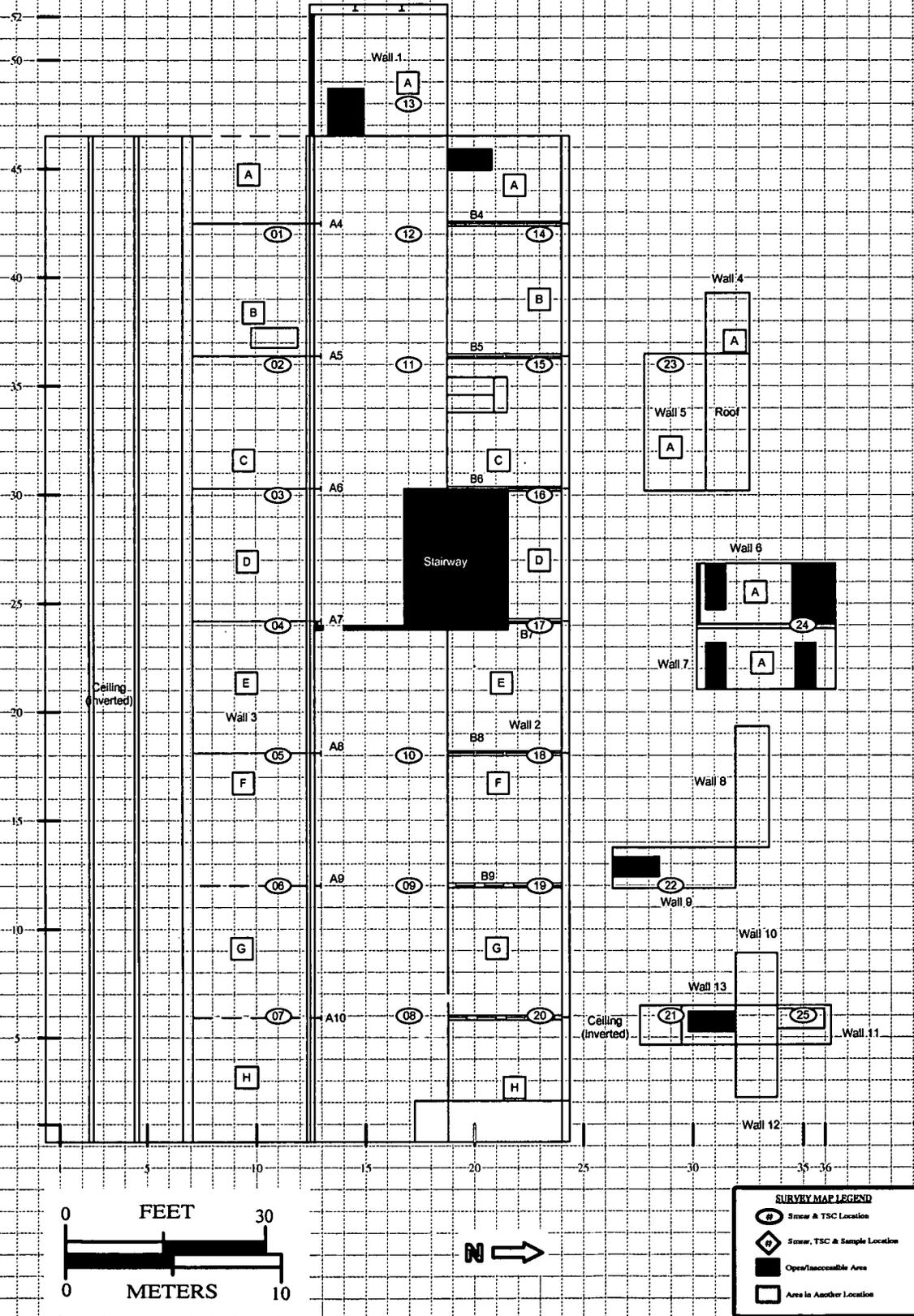
Survey Unit Description: Second floor- SOE Control Room

Total Floor Area: 291 sq. m

Total Area: 1319 sq. m

Random Start Grid Size: 6 x 6 sq. m

SURVEY UNIT 776033 - MAP 1 OF 2



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RADIOLOGICAL CLOSEOUT SURVEY FOR THE 776 CLUSTER

Survey Area: 2nd Floor

Survey Unit: 776033

Classification: NA

Building: 776

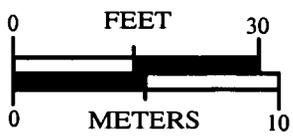
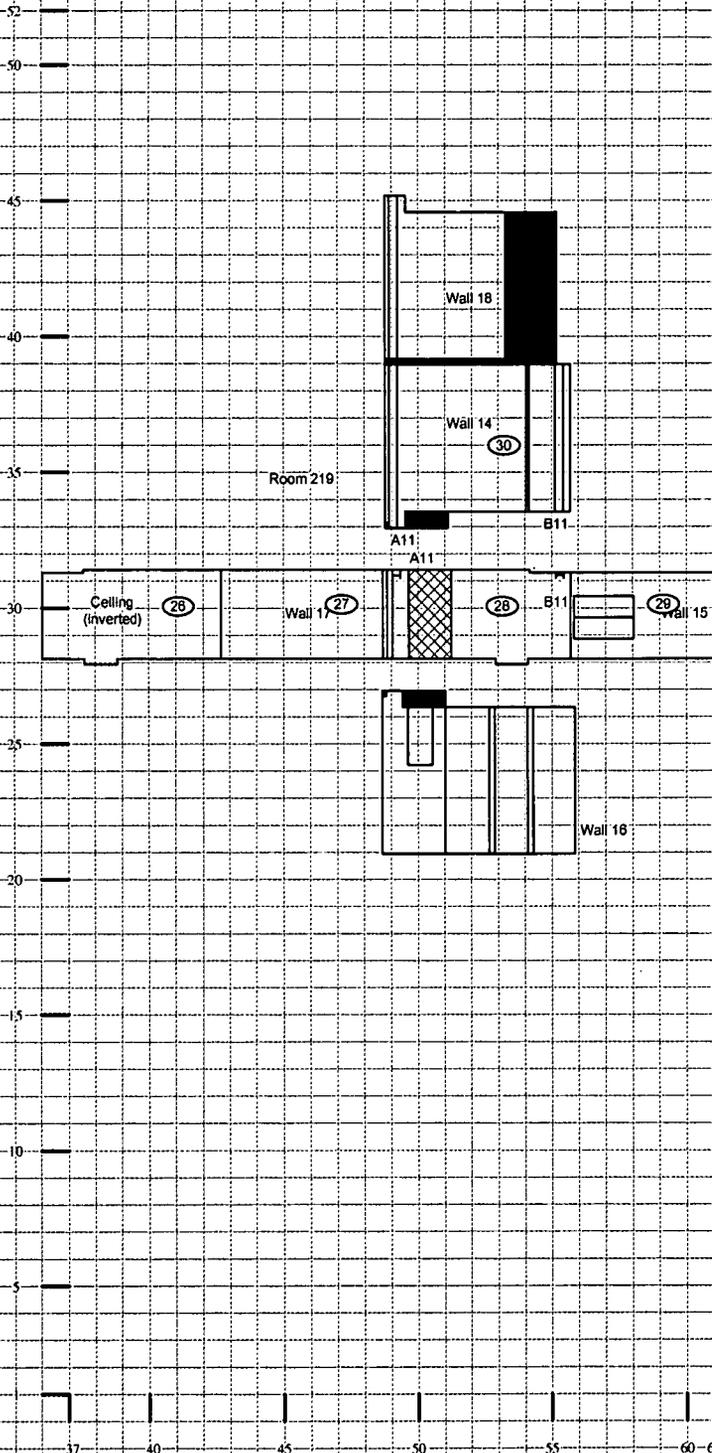
Survey Unit Description: Second floor- SOE Control Room

Total Floor Area: 291 sq. m

Total Area: 1319 sq. m

Random Start Grid Size: 6 x 6 sq. m

SURVEY UNIT 776033 - MAP 2 OF 2



SURVEY MAP LEGEND

- ⊙ # Smear & TSC Location
- ⊕ # Smear, TSC & Sample Location
- Open/Inaccessible Area
- Area in Another Location

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Final Survey for Survey Unit 776034

Survey Instructions
Building 776 2nd Floor
Survey Unit 776034

Purpose:

This instruction provides guidance for collecting gross gamma and removable contamination data to quantify the amount of residual contamination in Survey Unit 776034 prior to demolition. NaI measurements are performed in accordance with "INS-535-Ludlum2350-1 with Sodium Iodide Detector".

Equipment and materials:

1. A Ludlum 44-17 attached to a Ludlum 2350-1 set to collect five-minute counts that will be displayed on its LCD window.
2. A Bicon G-5 attached to a Ludlum 2350-1 set to collect five-minute counts that will be displayed on its LCD window.
3. One Electra with attached DP-6, calibrated and daily response checked.
4. Two probe holders, one for the G-5 and one for the 44-17 with tin shielding.
5. Calibrated and daily response checked SAC-4.
6. Measuring tape or laser range finder.

Note: The NE Electra with DP-6 probe and the Eberline SAC-4 shall be used in accordance with RSP- 7.01 and 7.02

Procedure:

1. Inspect instrument for obvious damage and ensure battery voltage is equal to or greater than 4.6 volts. If battery voltage is less than 4.6 volts change the batteries.
2. Complete daily performance checks for Sodium Iodide detectors to ensure the instrument is functioning properly by using Americium-241 source TS-912. Record results on Sodium Iodide Data Sheet.
3. For floor and concrete wall background measurements, perform a 300-second background count with a Bicon G-5 for floors or Ludlum 44-17 for walls at background location in room 201-A near column B-13. Record background counts next to "Bkg Floor" or "Bkg Concrete Wall" in background column of attached "Sodium Iodide Data Collection" sheets as needed.
4. For block wall background measurements, perform a 300-second background count with a Ludlum 44-17 at the background location in room 219. Record background counts next to "Bkg Block Wall" in background column of attached Sodium Iodide data collection sheets as needed.
5. For ceiling and metal floor background measurements, perform a 300-second background count with a Ludlum 44-17 or Bicon G-5 at background location in room 201-A near column B-13. Hold the probe waist high, pointed toward ceiling using a sheet metal plate in front of the detector (take background measurement in this configuration). Record background counts next to "Bkg Metal Floor" for the G-5 and "Bkg Metal Ceiling" for the 44-17 on the attached Sodium Iodide data collection sheets as needed.
6. Mark the sample locations on the surfaces to be measured. Take all measurements on contact with the marked surface using tin side shields on the Bicon G-5 and tin side and back shields on the Ludlum 44-17. All Sodium Iodide readings shall have 300 second count times.
7. Collect sodium Iodide, total surface activity and removable surface activity measurements at all locations marked on the attached map.
8. Record the NaI and NE Electra measurements on the attached sheet. Note any items or conditions that may have affected the measurement in the "remarks" section.
9. Count swipes for 60 seconds with a SAC-4, record result on attached sheet for removable contamination.

Survey Instructions
 Building 776 2nd Floor
 Survey Unit 776034

Table 776034-1: Survey Requirements

Surface	Type of Survey	Probe	Placement	Count Time
Floor	Total Alpha Activity	Bicron G-5	On contact	300 seconds
All Surfaces	Total Alpha Activity	Electra with DP-6	On contact	60 seconds
Block walls	Total Alpha Activity	Bicron G-5 or Ludlum 44-17	On contact	300 seconds
All Surfaces	Removable Alpha	SAC-4	Swipe in placed in tray	60 seconds
Ceiling	Total Alpha Activity	Ludlum 44-17	On Contact	300 seconds
Block Walls	Background measurement	Bicron G-5 or Ludlum 44-17	On contact with east wall outside room 219	300 seconds
Metal Floors	Background measurement	Bicron G-5 or Ludlum 44-17	Probe waist high, pointed toward ceiling with sheet metal plate on end in room 201-A near column B-13	300 seconds
Floors and cement walls	Background measurement	Bicron G-5 or Ludlum 44-17	On contact with floor in room 201-A near column B-13	300 seconds
Metal ceilings	Background measurement	Ludlum 44-17	Probe waist high, pointed toward ceiling with sheet metal plate on end in room 201 near column B-13	300 seconds

FINAL SURVEY REPORT

Survey Unit 776034

Introduction and Scope

A pre-demolition radiological survey (PDS) is performed prior to building demolition to define the radiological conditions of a facility. A PDS survey for survey unit 776034 has been completed in accordance with guidelines outlined in the "Radiological Pre-Demolition Survey Plan Building 776/777". Based on the results it is recommended that no further remediation is needed, and that the survey unit may be prepared for demolition. Isolation controls shall be put in place to prevent re-contamination of the area. This report has been prepared in accordance with sections 3 and 8 of the "Radiological Pre-Demolition Survey Plan Building 776/777".

Survey Unit 34 consists of Rooms 201A, 205B, 210 and 212.

PDS Methods and Techniques

The PDS survey results determine the Average Surface Contamination Value (ASCV₀) and source term for the survey unit. These parameters are used to determine whether the building may be demolished within the limits outlined in the "Radiological Pre-Demolition Survey Plan Building 776/777".

To comply with the "Radiological Pre-Demolition Survey Plan Building 776/777", a minimum of 30 survey points were selected per survey unit. A random start, systematic grid method was used to identify the survey point locations. Three types of surveys are performed at each survey point as follows:

- Painted surfaces are evaluated for potential contamination under coatings using sodium iodide (NaI) gamma detectors attached to a single channel analyzer windowed for the 59 keV gamma-ray (Am²⁴¹).
- Direct alpha surface contamination measurements are performed using a NE Electra survey instrument with attached DP-6 probe. This data may be compared to the NaI survey data to show the fraction of contamination that is directly on the surface versus imbedded in the material matrix.
- Removable surface alpha contamination surveys were performed by swiping the survey point with a 47mm filter paper then counting the filter paper on a SAC-4 alpha counter.

To conservatively determine the final Average Surface Contamination Value (ASCV₀) for the survey unit, the source term associated with inaccessible areas of the survey unit is added to the source term calculated by the PDS survey. There were only four inaccessible ceiling grids identified during the in-process surveys. The adjacent grids showed background levels of contamination. Therefore, there will be no inaccessible source term included in this survey unit report.

Results

A final survey has been performed in the area. A total of 30 survey points were selected using a random start grid method in accordance with the "Radiological Pre-Demolition Survey Plan Building 776/777". Additional measurements were performed to ensure the most contaminated portions of the survey unit were adequately represented.

FINAL SURVEY REPORT

Survey Unit 776034

Walls

The average contamination level from the in-process survey for the walls was 19,307 dpm/100 cm². See Table 2.0 below. No remediation effort was identified as required on the walls for this survey unit. Final survey points were taken on the walls per the random sampling criteria.

Table 1.0 B776/777 Survey Unit 776034 - Wall Summary

Wall	Section	Structural	Initial Characterization:		
			Type I	Type II	Type III
776034-1	A		20,684		
776034-2	A		35,322		
776034-3	A		3,498		
776034-4	A		17,720		
776034-4	BC		14,835		
776034-4	DE		22,204		
776034-4	FG		25,389		
776034-6	A		6,365		
776034-7	A		3,983		
776034-9	BC		13,145		
776034-11	A		44,313		
776034-12	A		77,066		
776034-13	A		3,555		
776034-14	A		47,524		
776034-15	A		74,497		
776034-17	A		87,341		
	Type I:	<100,000 dpm/100 cm ²			
	Type 2:	>100,000 dpm/100cm ² to <1,000,000 dpm/100cm ²			
	Type 3:	>1,000,000 dpm/100cm ²			

FINAL SURVEY REPORT

Survey Unit 776034

Table 2.0 B776/777 Survey Unit 776034 - Wall Source Term

Wall Designation	Wall Type	Area (ft2)	Area (m2)	Average dpm/100cm2	Total Activity (uCi)	Comments
776034-1A	I	337.86	31.4	20,694	29.3	
776034-2A	I	60.256	5.6	35,322	8.9	
776034-3A	I	158.17	14.7	3,496	2.3	
776034-4A	I	355.08	33	17,720	26.3	
776034-6BC	I	799.47	74.3	14,335	48.0	
776034-4DE	I	799.47	74.3	22,204	74.3	
776034-4FG	I	718.77	66.8	25,599	77.0	
776034-6A	I	459.45	42.7	6,366	12.2	
776034-7A	I	359.38	33.4	3,983	6.0	
776034-9BC	I	689.72	64.1	13,145	38.0	
776034-11A	I	59.18	5.5	44,313	11.0	
776034-12A	I	72.092	6.7	77,066	23.3	
776034-13A	I	41.964	3.9	3,555	0.6	
776034-14A	I	73.168	6.8	47,524	14.6	
776034-15A	I	60.256	5.6	74,497	18.8	
776034-17A	I	60.256	5.6	87,341	22.0	
Average				19,307		

Floors

The average contamination level from the in-process survey for the floors was 7,949 dpm/100 cm². See in-process data. No remediation effort was identified as required on the floors for this survey unit. Final survey points were taken on the floors per the random sampling criteria.

Ceilings

The average contamination level from the in-process survey for the ceilings was 14,040 dpm/100 cm². This corresponds to the average critical level for the instruments used. See in-process data. No remediation effort was identified as required on the ceilings for this survey unit. Final survey points were taken on the ceilings per the random sampling criteria.

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FINAL SURVEY REPORT

Survey Unit 776034

PDS Data Summary

The values for the accessible areas and inaccessible areas were summed and divided by the total area for the survey unit to calculate the "Average Surface Contamination Value" (ASCV_u) and source term for the survey unit. The results are summarized in Table 3 below:

Table 3.0 PDS Final Results

	Final Results
776034 Inaccessible Area Source Term (μCi)	0.0
776034 Accessible Area Source Term (μCi)	1131.1
776034 Total Source Term (μCi)	1131.1
Survey Unit Area (m^2)	1469
(ASCV _u) ($\mu\text{Ci}/\text{m}^2$)	0.77
(ASCV _u) ($\text{dpm}/100\text{cm}^2$)	17,189

Notes:

See Attachment 1 for the standard methods used for calculating the ASCV

Attachment 1

Standard Method for Calculating the ASCV for Each Survey Unit

Prerequisites:

1. Final survey map for the survey unit
2. PDS survey results
3. Survey information used to estimate activities in inaccessible areas;
4. Survey information for any structural members or elevated regions not represented by the PDS survey.

Conversions:

1 square meter (m²) = 100 x 100 cm²

1 microcurie (μCi) = 2.22x 10⁶ dpm

1 (μCi/ m²) = 22,200 dpm/ 100cm² evenly distributed over one square meter.

12 inches = 1 foot = 0.305 meters

Calculations:

Accessible Area Inventory

1. Calculate the average surface contamination for the applicable survey unit from a minimum of 30 sodium iodide measurements obtained by the PDS survey.
2. Average the total surface contamination activity present.
3. Convert the average surface contamination value from step 2 from "dpm/ 100cm²" to "μCi/ m²"

Example:

$$22,200 \text{ dpm}/100\text{cm}^2 \times (100 \times 100 \text{ cm}^2/ \text{m}^2) \times (1\mu\text{Ci}/2.22 \times 10^6 \text{ dpm}) = 1 \mu\text{Ci}/ \text{m}^2$$

4. Obtain surface area of survey unit from title box of final survey map. This is reported in square meters.
5. Calculate inventory for accessible areas

The surface area from a survey unit map title box is 1,000 square meters and the average contamination level from the 30 PDS points is 22,200 dpm/ 100cm².

Example:

$$1,000 \text{ m}^2 \times 22,200 \text{ dpm}/ 100\text{cm}^2 \times (100 \times 100 \text{ cm}^2/ \text{m}^2) \times (1\mu\text{Ci}/2.22 \times 10^6 \text{ dpm}) = 1,000 \mu\text{Ci}$$

Inaccessible Area Inventory

1. Document methods used to estimate contamination levels and potential inventory in seams, cracks or other surfaces in the final survey report. Provide an estimated remaining inventory for each item/area in the report.

Example:

There are 20 feet of seams contaminated to an average level of 2,220,000 dpm/100 cm². Each seam has two sides. The total inventory can be estimated assuming the contamination levels measured at the top of the seam extend down each side of the seam. The depth of the seam can be determined from design drawings or from direct observation as the seam is chipped away. If a seam is determined to be 4 inches deep, then the inventory of the seam can be calculated as follows:

The contaminated area of the seam is:

$$(20 \text{ feet} \times .305 \text{ m/ft}) \times (0.3 \text{ feet} \times 0.305 \text{ m/ft}) = .61 \text{ m}^2 \times 2 \text{ sides} = 1.22 \text{ m}^2$$

Therefore the inventory in the seam in μCi is:

$$1.22 \text{ m}^2 \times (2,220,000 \text{ dpm}/100 \text{ cm}^2) \times (10,000 \text{ cm}^2/ \text{m}^2) \times \mu\text{Ci} / 2.22\text{E}6 \text{ dpm} = 122 \mu\text{Ci}$$

Attachment 1

Calculating the ASCV

1. Sum the inventories from the inaccessible areas with the inventory for the accessible area to obtain a total inventory for the survey unit.

Total Inventory = Accessible Inventory + Inaccessible inventory + Inventory items (areas not represented by other inventories listed i.e. Stairs, columns, etc)

Example: 1000 μCi = accessible inventory

122 μCi = inaccessible inventory

100 μCi = inaccessible contamination in the columns and contamination on the stairs

1000 + 122 + 100 = 1222 μCi

2. Divide the total inventory for the survey unit by the accessible area of the survey unit obtained from the final survey map.

Example: 1222 μCi = total inventory

1000 m^2 = total surface area of the survey unit

1222 $\mu\text{Ci}/1,000 \text{ m}^2 = 1.22 \mu\text{Ci} / \text{m}^2$

1.22 $\mu\text{Ci} / \text{m}^2 * (1\text{m}^2 / (100*100 \text{ cm}^2)) * (2.22\text{E}6 \text{ dpm}/\mu\text{Ci}) = 27084 \text{ dpm} / 100\text{cm}^2$

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Location #	Column letter	Column Number	North	East	Surface	Gross Counts	Dpm/100cm2
34-1	B	9	12	5	Floor	971	7,669
34-2	B	9	18	12	Floor	1046	7,669
34-3	B	10	15	5	Floor	1047	7,669
34-4	B	10	8	11	Floor	1048	7,669
34-5	B	11	15	5	Floor	1045	7,669
34-6	B	11	18	13	Floor	1025	7,669
34-7	B	12	15	3	Floor	982	7,669
34-8	B	12	15	15	Floor	958	7,669
34-9	B	13	17	4	Floor	1007	7,669
34-10	B	13	13	13	Floor	953	7,669
34-11	B	14	15	5	Floor	1047	7,669
34-12	B	14	15	15	Floor	1171	19,203
34-13	B	15	15	5	Floor	1068	8,395
34-14	B	15	15	15	Floor	859	7,669
34-15	B	15	5	15	Floor	849	7,669
34-16	B	15	8	6	Floor	878	7,669
34-17	B	14	9	14	Floor	990	7,669
34-18	B	14	5	5	Floor	906	7,669
34-19	B	13	1	16	Floor	971	7,669
34-20	B	13	5	5	Floor	971	7,669
34-21	B	12	15	17	Floor	910	7,669
34-22	B	12	6	4	Floor	904	7,669
34-23	B	11	5	15	Floor	1047	7,669
34-24	B	11	5	5	Floor	971	7,669
34-25	B	10	6	15	Floor	1044	7,669
34-26	B	10	3	2	Floor	1048	7,669
34-27	B	9	6	12	Floor	1050	7,669
34-28	B	9	6	5	Floor	943	7,669
34-29	B	8	5	15	Floor	1086	10,284
34-30	A	11	17	16	Floor	944	7,669
34-31	A	12	19	9	Floor	862	7,669
34-32	A	12	16	18	Floor	889	7,669
34-33	A	13	15	5	Floor	899	7,669
34-34	A	13	15	16	Floor	836	7,669
34-35	A	14	15	16	Floor	936	7,669
34-36	A	14	13	15	Floor	931	7,669
34-37	A	15	15	5	Floor	873	7,669
34-38	A	15	15	15	Floor	890	7,669
34-39	A	15	2	11	Floor	901	7,669
34-40	A	15	4	16	Floor	822	7,669
34-41	A	14	16	17	Floor	797	7,669
34-42	A	14	2	8	Floor	837	7,669

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34-43	A	13	5	15	Floor	974	7,669
34-44	A	13	5	5	Floor	966	7,669
34-45	A	12	2	16	Floor	888	7,669
34-46	A	12	2	6	Floor	906	7,669
34-47	A	11	5	15	Floor	837	7,669
34-48	C	16	16	15	Floor	994	7,669
34-49	C	16	13	4	Floor	692	7,669
34-50	C	16	12	11	Floor	816	7,669
34-51	C	16	4	11	Floor	711	7,669
34-52	C	16	4	5	Floor	768	7,669
34-53	C	16	5	17	Floor	975	7,669
34-54	B	9	15	15	Ceiling	79	13,608
34-55	B	9	18	5	Ceiling	76	13,608
34-56	B	10	15	5	Ceiling	69	13,608
34-57	B	10	15	15	Ceiling	62	13,608
34-58	B	11	17	5	Ceiling	70	13,608
34-59	B	11	17	15	Ceiling	74	13,608
34-60	B	12	10	5	Ceiling	92	13,608
34-61	B	12	10	15	Ceiling	69	13,608
34-62	B	13	10	5	Ceiling	57	13,608
34-63	B	13	10	15	Ceiling	48	13,608
34-64	B	14	10	5	Ceiling	79	13,608
34-65	B	14	10	15	Ceiling	62	13,608
34-66	B	15	10	5	Ceiling	47	13,608
34-67	B	15	10	15	Ceiling	75	13,608
34-68	B	15	5	15	Ceiling	80	13,608
34-69	B	15	5	5	Ceiling	77	13,608
34-70	B	14	5	15	Ceiling	85	13,608
34-71	B	14	5	5	Ceiling	91	13,608
34-72	B	13	5	15	Ceiling	75	13,608
34-73	B	13	5	5	Ceiling	87	13,608
34-74	B	12	5	15	Ceiling	89	13,608
34-75	B	12	4	8	Ceiling	75	9,979
34-76	B	11	5	17	Ceiling	82	9,979
34-77	B	11	5	5	Ceiling	80	13,496
34-78	B	10	8	18	Ceiling	83	13,387
34-79	B	10	8	4	Ceiling	69	13,280
34-80	B	9	6	15	Ceiling	75	13,176
34-81	B	9	5	5	Ceiling	86	13,074
34-82	B	8	6	16	Ceiling	84	12,975
34-83	A	11	15	16	Ceiling	63	9,979
34-84	A	12	17	4	Ceiling	60	9,979
34-85	A	12	15	7	Ceiling	67	9,979
34-86	A	13	16	4	Ceiling	75	13,608

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34-88	A	14	15	2	Ceiling	47	16,488
34-89	A	14	15	12	Ceiling	38	16,488
34-90	A	15	18	3	Ceiling	43	16,125
34-91	A	15	11	16	Ceiling	48	16,125
34-92	A	15	4	17	Ceiling	53	16,125
34-93	A	15	5	3	Ceiling	53	16,125
34-94	A	14	8	17	Ceiling	24	16,125
34-95	A	14	2	2	Ceiling	52	16,125
34-96	A	13	15	15	Ceiling	72	16,125
34-97	A	13	5	5	Ceiling	56	16,125
34-98	A	12	16	4	Ceiling	95	18,800
34-99	A	12	5	6	Ceiling	75	16,125
34-100	A	11	5	15	Ceiling	74	16,125
34-101	C	15	15	15	Ceiling	54	16,125
34-102	Inaccessible				Ceiling	Inaccessible	Inaccessible
34-103	Inaccessible				Ceiling	Inaccessible	Inaccessible
34-104	Inaccessible				Ceiling	Inaccessible	Inaccessible
34-105	Inaccessible				Ceiling	Inaccessible	Inaccessible
34-106	C	15	5	15	Ceiling	55	16,125

Survey Unit 776034 Summary

Total Activity Measurements

30	30
Number Required	Number Obtained

MIN	4241	dpm/100 cm ²
MAX	66236	dpm/100 cm ²
Average	17189	dpm/100 cm ²
STD DEV	20038	dpm/100 cm ²

***Average Contamination Value for Accessible Areas Only**

Inaccessible Areas 0.0 uCi, Alpha

Total Surface Area 1469 m²
Accessible Inventory = 1137.4 uCi, Alpha

Total Inventory 1137.4 uCi, Alpha

ASCV _u =	0.77 uCi/m ²
ASCV _u =	17,189 dpm/100 cm ²

Survey Unit 776034

Sample Location Number					
	Measurement Used	Comment	Surface	Coating	(dpm/100 cm ²)
1	Sodium Iodide	N/A	Ceiling	Thin/No Paint	51,807
2	Sodium Iodide	N/A	Ceiling	Thin/No Paint	42,187
3	Sodium Iodide	N/A	Floor	Thin/No Paint	59,122
4	Sodium Iodide	N/A	Floor	Thin/No Paint	66,236
5	Sodium Iodide	N/A	Wall	Thin/No Paint	12,826
6	Sodium Iodide	N/A	Floor	Thin/No Paint	16,534
7	Sodium Iodide	N/A	Floor	Thin/No Paint	4,276
8	Sodium Iodide	N/A	Ceiling	Thin/No Paint	4,276
9	Sodium Iodide	N/A	Ceiling	Thin/No Paint	4,276
10	Sodium Iodide	N/A	Wall	Thin/No Paint	4,276
11	Sodium Iodide	N/A	Floor	Thin/No Paint	11,871
12	Sodium Iodide	N/A	Wall	Thin/No Paint	4,276
13	Sodium Iodide	N/A	Wall	Thin/No Paint	4,276
14	Sodium Iodide	N/A	Wall	Thin/No Paint	4,276
15	Sodium Iodide	N/A	Ceiling	Thin/No Paint	4,276
16	Sodium Iodide	N/A	Wall	Thin/No Paint	4,276
17	Sodium Iodide	N/A	Floor	Thin/No Paint	46,295
18	Sodium Iodide	N/A	Wall	Thin/No Paint	29,360
19	Sodium Iodide	N/A	Wall	Thin/No Paint	4,241
20	Sodium Iodide	N/A	Floor	Thin/No Paint	4,241
21	Sodium Iodide	N/A	Wall	Thin/No Paint	4,241
22	Sodium Iodide	N/A	Wall	Thin/No Paint	53,610
23	Sodium Iodide	N/A	Floor	Thin/No Paint	6,388
24	Sodium Iodide	N/A	Wall	Thin/No Paint	4,241
25	Sodium Iodide	N/A	Wall	Thin/No Paint	4,241
26	Sodium Iodide	N/A	Floor	Thin/No Paint	34,671
27	Sodium Iodide	N/A	Wall	Thin/No Paint	12,325
28	Sodium Iodide	N/A	Wall	Thin/No Paint	4,276
29	Sodium Iodide	N/A	Floor	Thin/No Paint	4,241
30	Sodium Iodide	N/A	Wall	Thin/No Paint	4,241
				MIN	4241
				MAX	66236
				AVERAGE	17189
				SD	20038

Total Surface Activity

Survey Area:		2nd Floor	Survey Unit:		776034		
Meter Model:		NE Electra w/ DP6 Probe			Date:	12/30/04	
		1	2	3			
Instrument #:		4067	1280	N/A	N/A	A priori MDA:	94
Cal. Due Date:		3/2/05	1/28/05	N/A	N/A	Avg. Local Bkgd	5.4
Efficiency (c/d):		22.60%	22.00%	N/A	N/A	Avg. Efficiency	0.223
Sample Location #	RCT ID #	Inst. #	Local Bkgd (cpm)	Gross (cpm)	(dpm/100 cm ²)		
1	1	1	2.0	4.0	9.0		
2	1	1	5.0	2.0	-13.5		
3	1	1	6.0	6.0	0.0		
4	1	1	4.0	5.0	4.5		
5	1	1	4.0	3.0	-4.5		
6	1	1	3.0	3.0	0.0		
7	1	2	2.0	7.0	22.4		
8	1	2	1.0	18.0	76.2		
9	1	2	2.0	9.0	31.4		
10	1	2	0.0	7.0	31.4		
11	1	2	3.0	8.0	22.4		
12	1	2	1.0	8.0	31.4		
13	1	2	2.0	6.0	17.9		
14	1	2	2.0	31.0	130.0		
15	1	2	2.0	4.0	9.0		
16	1	2	1.0	1.0	0.0		
17	1	1	3.0	2.0	-4.5		
18	1	1	2.0	2.0	0.0		
19	1	2	1.0	1.0	0.0		
20	1	2	0.0	1.0	4.5		
21	1	1	2.0	4.0	9.0		
22	2	1	3.0	2.0	-4.5		
23	1	1	2.0	5.0	13.5		
24	2	1	4.0	7.0	13.5		
25	1	1	2.0	2.0	0.0		
26	2	1	2.0	3.0	4.5		
27	2	1	5.0	3.0	-9.0		
28	2	1	1.0	6.0	22.4		
29	1	2	0.0	1.0	4.5		
30	1	2	2.0	2.0	0.0		
				MIN	-13.5		
				MAX	130.0		
				MEAN	14.1		
				SD	27.9		

Removable Activity

Survey Area:		2nd Floor	Survey Unit:		776034
Dates Counted:	12/30/04				
A priori MDA:	16				
Efficiency (c/d)	0.333				
Smear Location Number	Smear Results				
	RCT ID #	Serial Number	Gross (cpm)	Bkg.	(dpm/100 cm ²)
1	1	1141	0.0	0.3	-0.9
2	1	964	1.0	0.3	2.1
3	1	1141	1.0	0.3	2.1
4	1	964	2.0	0.3	5.1
5	1	1141	0.0	0.3	-0.9
6	1	964	1.0	0.3	2.1
7	1	1411	4.0	0.3	11.1
8	1	1352	2.0	0.4	4.8
9	1	1352	1.0	0.4	1.8
10	1	1141	0.0	0.3	-0.9
11	1	964	1.0	0.3	2.1
12	1	1411	2.0	0.3	5.1
13	1	964	1.0	0.3	2.1
14	1	1411	2.0	0.3	5.1
15	1	964	6.0	0.3	17.1
16	1	1352	1.0	0.4	1.8
17	1	1411	1.0	0.3	2.1
18	1	964	0.0	0.3	-0.9
19	1	964	0.0	0.3	-0.9
20	1	1411	0.0	0.3	-0.9
21	1	1411	1.0	0.3	2.1
22	2	811	2.0	0.3	5.1
23	1	1411	1.0	0.3	2.1
24	2	953	0.0	0.5	-1.5
25	1	964	1.0	0.3	2.1
26	2	811	2.0	0.5	4.5
27	2	811	1.0	0.6	1.2
28	2	953	0.0	0.5	-1.5
29	1	1352	2.0	0.4	4.8
30	1	964	0.0	0.3	-0.9
				MIN	-1.5
				MAX	17.1
				MEAN	2.6
				SD	3.9

Sodium Iodide Instrument Information

Survey Area:	2nd Floor	Survey Unit:	776034	Survey Date(s):	12/30/04
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Instrument Specifications

Instrument #	1	2
Meter Model:	Ludlum 2350-1	Ludlum 2350-1
Meter Serial #:	201184	201199
Detector Model:	Bicron G-5	Ludlum 44-17
Detector #:	B716T	199764
Detector Size (cm ²):	125	17.8
Calibration Due Date:	6/14/05	6/9/05
Count Time (min)	5	5
Contact Efficiency	7.10%	9.20%

Ratio Used

Pu to Am - 241	8.1
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Comments

In cases where the critical level is greater than the calculated dpm/100cm², the critical level will be used for statistical analysis.

Count Times for backgrounds and samples are equal.

Attenuation Factors: Based on observation of Walls and Ceilings. Epoxy on Floor determined by chip sampling.

Background (Gross)

Instrument #	1	2
Gamma (Ceilings)	N/A	331
Gamma (Floors)	9882	N/A
Gamma (Walls)	N/A	751

Background (cpm)

Instrument #	1	2
Gamma (Ceilings)	N/A	66.2
Gamma (Floors)	1976.4	N/A
Gamma (Walls)	N/A	150.2

Efficiencies (cpm/dpm)

Instrument #	1	2
Thin/No Paint	0.070	0.091
Epoxy	0.057	0.074
Other	0.067	0.087

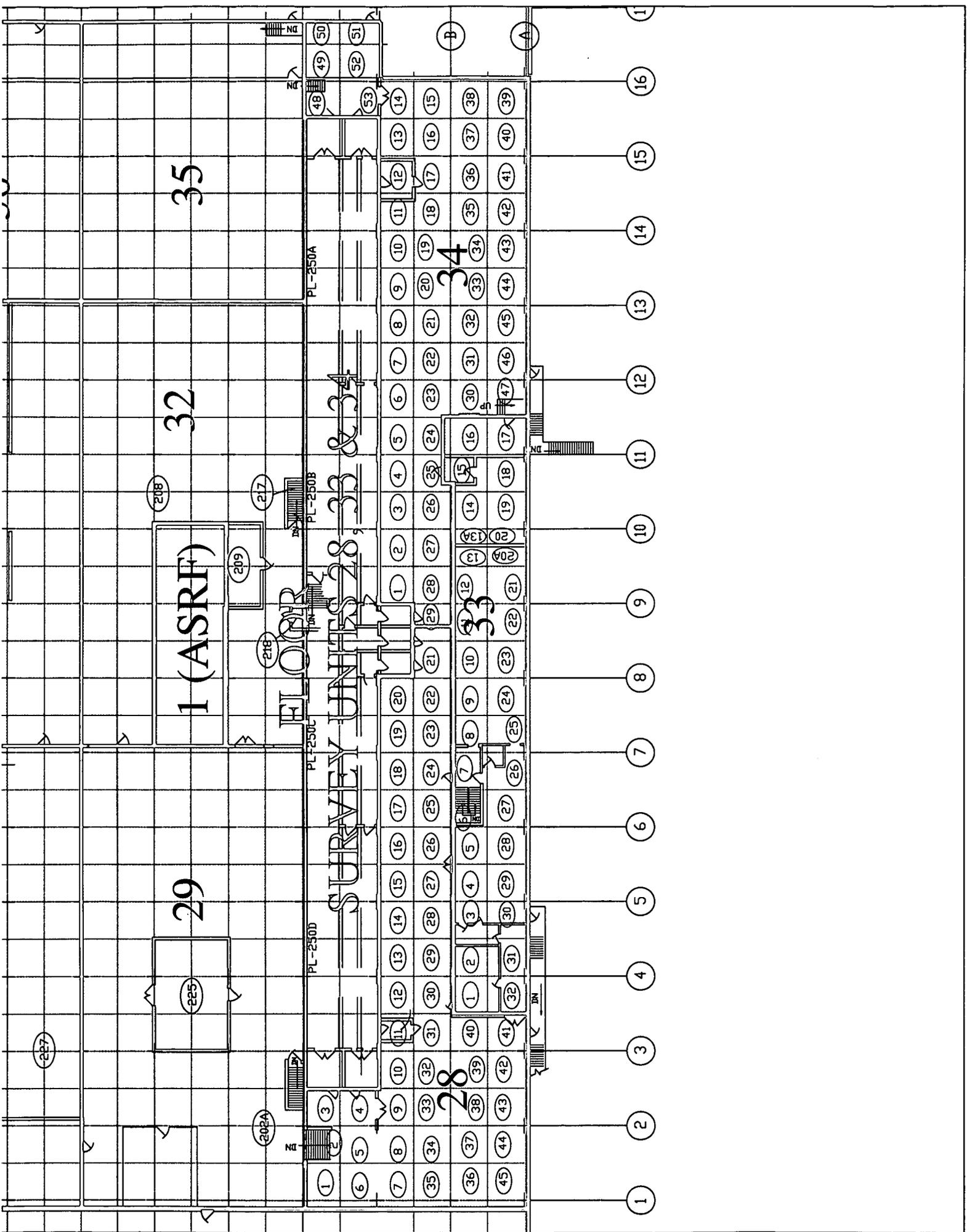
Coatings

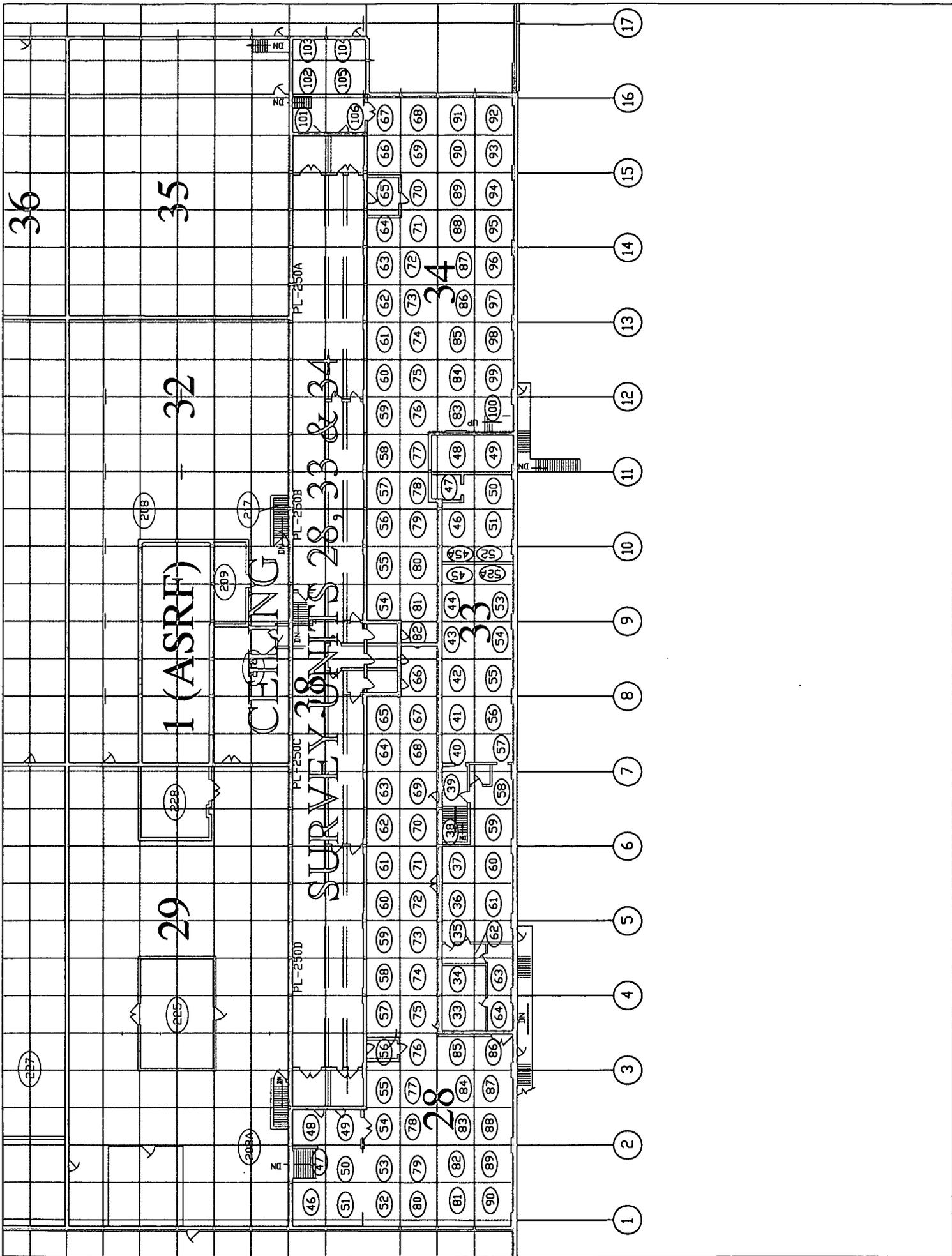
Coatings	Thickness (inches)
Thin/No Paint	0.015
Epoxy	0.250
Other	0.06

Total Activity Estimates Using Sodium Iodide Instruments

Survey Area:	2nd Floor	Survey Unit:	776034	Survey Date(s):	12/30/04
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Sample Location #	RCT ID #	Instrument #	Gross Counts	Critical Level (dpm/100cm ²)	Total Alpha (dpm/100cm ²)
1	2	2	1268	6,388	51,807
2	2	2	1172	6,388	42,187
3	2	2	1341	6,388	59,122
4	2	2	1412	6,388	66,236
5	2	2	879	6,388	12,826
6	2	2	916	6,388	16,534
7	1	1	6882	4,276	4,276
8	1	1	10096	4,276	4,276
9	1	1	9650	4,276	4,276
10	1	1	9204	4,276	4,276
11	1	1	10524	4,276	11,871
12	1	1	9953	4,276	4,276
13	1	1	7967	4,276	4,276
14	1	1	9622	4,276	4,276
15	1	1	8492	4,276	4,276
16	1	1	7556	4,276	4,276
17	2	2	1213	6,388	46,295
18	2	2	1044	6,388	29,360
19	1	2	329	4,241	4,241
20	1	2	329	4,241	4,241
21	2	2	345	4,241	4,241
22	1	2	1286	6,388	53,610
23	2	2	714	6,388	6,388
24	1	2	334	4,241	4,241
25	2	2	317	4,241	4,241
26	1	2	1097	6,388	34,671
27	1	2	874	6,388	12,325
28	2	1	8240	4,276	4,276
29	1	2	335	4,241	4,241
30	1	2	343	4,241	4,241





RADIOLOGICAL CLOSEOUT SURVEY FOR THE 776 CLUSTER

Survey Area: Second Floor

Survey Unit: 776034

Classification: NA

Building: 776

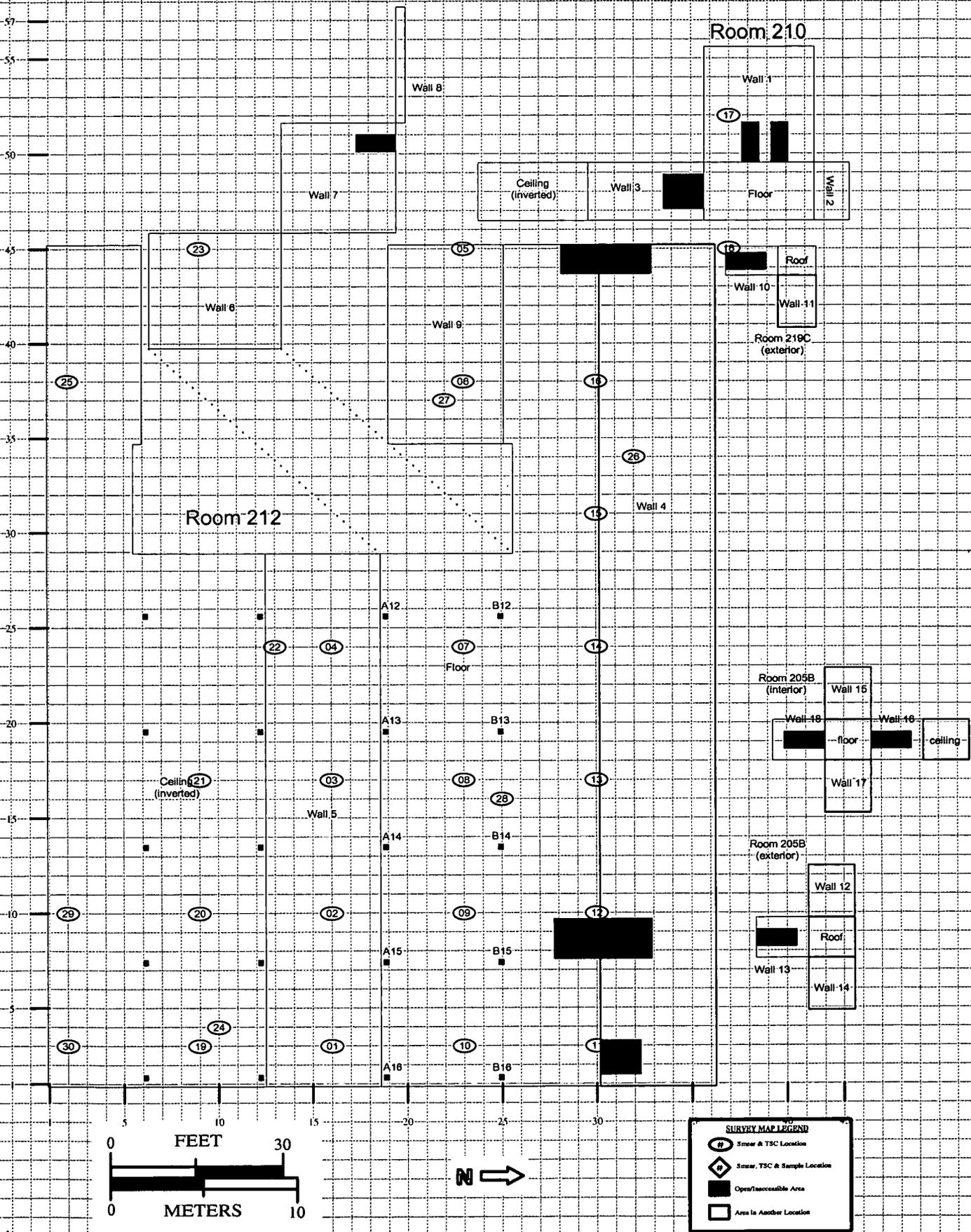
Survey Unit Description: Second floor- Room 212, 210

Total Floor Area: 414 sq. m

Total Area: 1469 sq. m

Random Start Grid Size: 6 x 6 sq. m

SURVEY UNIT 776034 - MAP 1 OF 1



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