

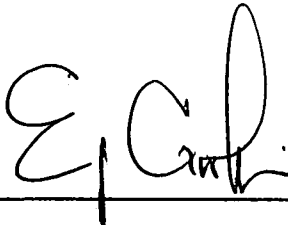
**Rancho Seco**

**Final Status Survey Summary Report**

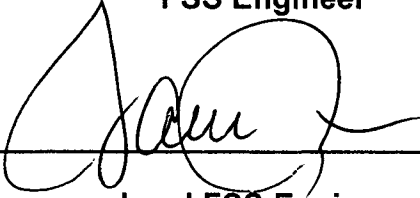
**February 1, 2017**

**IOSB Office Area**

**Survey Unit F8300133**

Prepared By:  Date: 2.1.17

**FSS Engineer**

Reviewed By:  Date: 2.3.17

**Lead FSS Engineer**

Approved By:  Date: 2/24/17

**Manager, Rancho Seco Assets**

## FINAL STATUS SURVEY F8300133

### Survey Unit:

F8300133, Interim Onsite Storage Building (IOSB) Office Area

### Survey Unit Description:

Operating History: Designed primarily to store packaged radioactive waste containers safely, protected from the elements, and maintain radiological dose as low as reasonably achievable (ALARA), the IOSB possibly stored media of many types, including filters, resins, contaminated chemicals, DAW, activated reactor components, contaminated plant components and other contaminated items. The office area was outside the radiologically controlled area during operations at the facility.

Site Characterization: Static measurements were made of the floor, walls, and ceiling, to confirm the absence or presence of plant-derived radionuclides. Static measurements showed a mean gross beta activity level of 2,047 dpm/100 cm<sup>2</sup> and a maximum value of 2,742 dpm/100 cm<sup>2</sup>. Based on the levels of gross activity reported, the area was determined to be a Class 3 area.

### Survey Unit Design Information:

The Survey Unit Design Parameters are presented in **Table 1** below. The survey unit and measurement locations are depicted on the maps in **Attachment 1**. Static measurement locations were randomly determined and approximately 3% of the area scanned by beta scanning. The instrumentation used for the survey along with the MDC values are listed in **Table 2-1 Attachment 2**.

## FINAL STATUS SURVEY F8300133

**Table 1, Survey Unit Design Parameters**

Evaluation Input Values		Comments
Survey Package:	F830	Office
Survey Unit:	13	
Class	03	
SU Area (m <sup>2</sup> )	370	
Evaluator:	JR	
DCGL <sub>w</sub> :	43,000	Gross Activity DCGL
Area Factor	NA	Class 3
Design DCGL <sub>emc</sub> (dpm/100cm <sup>2</sup> ):	NA	Class 3
DCGL <sub>emc</sub> :	NA	Class 3
LBGR:	21,500	Default = 50% DCGL
Sigma:	334	Scoping Survey
Type I error:	0.05	
Type II error:	0.05	
Predominant Nuclide	Cs-137	
Sample Area (m <sup>2</sup> )	N/A	
Total Instrument Efficiency:	0.132	
Total Area Scanned (m <sup>2</sup> ):	11.1	
Scan Coverage (%)	3%	Class 3
Material Type:	N/A	Choosing 'N/A' sets material background to "0"
Calculated Values		Comments
Z <sub>1-α</sub> :	1.645	
Z <sub>1-β</sub> :	1.645	
Sign p:	0.99865	
Calculated Relative Shift:	64.3	
Relative Shift Used:	3.0	Uses 3.0 if Relative Shift >3
N-Value:	11	
N-Value+20%:	14	

### Survey Results:

A total of 30 direct measurements were made in F8300133 floor, ceiling, and walls. The results of the static measurements are shown in **Table 2**. All of the static measurements were less than the DCGL. None of the scan measurements indicated areas of elevated activity. Swipe data did not indicate elevated activity levels above the MDA.

**FINAL STATUS SURVEY F8300133**

**Table 2, Static Measurement Results**

Number	Sample #	Beta (cpm)	Beta (dpm)
1	F8300313C00001	269	1,795
2	F8300313C00002	272	1,848
3	F8300313C00003	240	2,182
4	F8300313C00004	237	2,152
5	F8300313C00005	270	1,652
6	F8300313C00006	262	1,932
7	F8300313C00007	251	2,402
8	F8300313C00008	211	2,038
9	F8300313C00009	297	2,061
10	F8300313C00010	267	1,818
11	F8300313C00011	275	1,795
12	F8300313C00012	297	2,045
13	F8300313C00013	246	1,985
14	F8300313C00014	239	1,902
15	F8300313C00015	229	1,598
16	F8300313C00016	318	2,250
17	F8300313C00017	263	2,023
18	F8300313C00018	217	2,083
19	F8300313C00019	254	2,250
20	F8300313C00020	263	1,864
21	F8300313C00021	290	1,811
22	F8300313C00022	223	1,735
23	F8300313C00023	277	2,409
24	F8300313C00024	269	1,992
25	F8300313C00025	272	1,644
26	F8300313C00026	240	1,924
27	F8300313C00027	237	1,992
28	F8300313C00028	270	2,197
29	F8300313C00029	262	1,689
30	F8300313C00030	251	2,098

**FINAL STATUS SURVEY F8300133**

**Table 3** contains the statistical summary of the static measurement data for the office area.

**Table 3, Beta Summary Statistics**

<i>Beta Static Office</i>	
Mean	1,972
Median	1,989
Standard Deviation	215
Minimum	1,598
Maximum	2,409
Count	30

**Survey Unit Data Assessment:**

The survey design required 14 static measurements for the Sign Test. A total of 30 static measurements were collected. The critical value and the results of the Sign Test are presented in **Table 4**. The sample mean and median values were less than the DCGL. The sample standard deviation was greater than the design standard deviation but both values of sigma resulted in a relative shift greater than three (3), no additional samples were required.

**Table 4, Data Assessment Results**

<b>Static Data Values</b>		<b>Comments</b>
Number of Samples:	30	
Median:	1,989	
Mean:	1,972	
Static Data Standard Deviation:	215	
Maximum:	2,409	
<b>Sign Test Results</b>		<b>Comments</b>
Adjusted N Value:	14	
S+ Value:	30	
Critical Value:	10	
<b>Criteria Satisfaction</b>		<b>Comments</b>
Sufficient samples collected:	Pass	
Maximum value <DCGL <sub>w</sub> :	Pass	
Median value <DCGL <sub>w</sub> :	Pass	
Mean value <DCGL <sub>w</sub> :	Pass	
Maximum value <DCGL <sub>emc</sub> :	NA	
Sign test results:	Pass	
<b>Final Status</b>		<b>Comments</b>
The survey unit passes all conditions:	Pass	

**Survey Unit Investigations and Results:**

No investigations were required for either direct or scan measurements and no investigation results are reported.

## FINAL STATUS SURVEY F8300133

### **ALARA Statement:**

As stated in Chapter 4 of the LTP, as long as the residual activity within the survey unit is less than the DCGL, the ALARA criterion has been met.

### **Changes in Initial Survey Unit Assumptions:**

The survey unit was designed as a Class 3 survey and the sample results are consistent with that classification. No individual measurement exceeded the DCGL. No potential areas of elevated activity were detected.

### **Conclusion:**

The FSS of this survey unit was properly designed as a Class 3 survey based on the results of the investigation survey. The required number of direct measurements was made and the scan coverage met the requirement of Table 5-6 of the LTP. All of the static measurements were less than the DCGL. No investigations were required.

The static measurement data support rejection of the null hypothesis, providing high confidence that the survey unit satisfied the release criteria and that the data quality objectives were met.

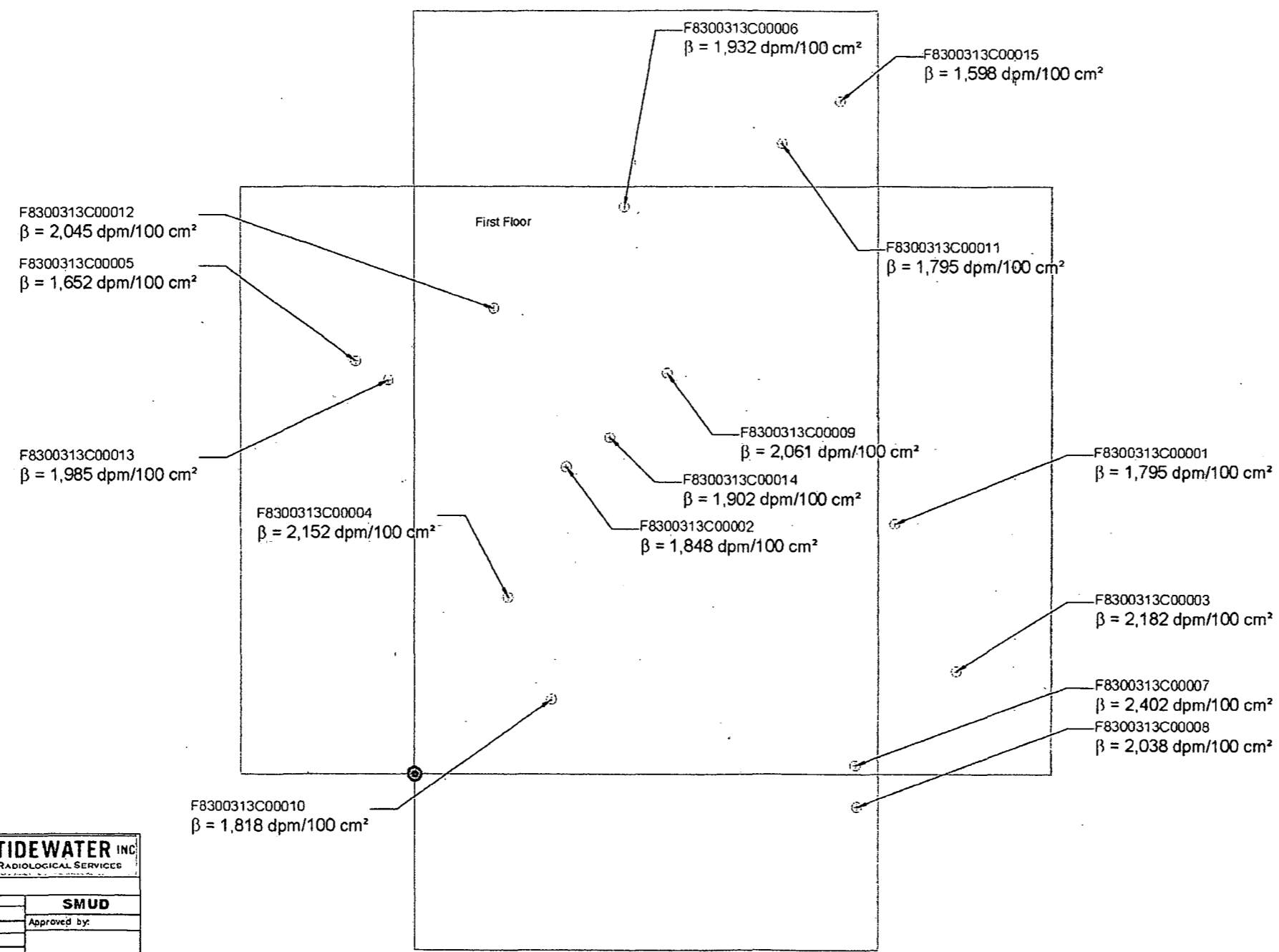
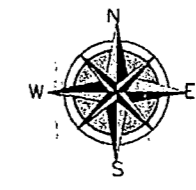
It is concluded that survey unit F8300133 meets the release criteria of 10CFR20.1402.

**Attachment 1**

**Maps**

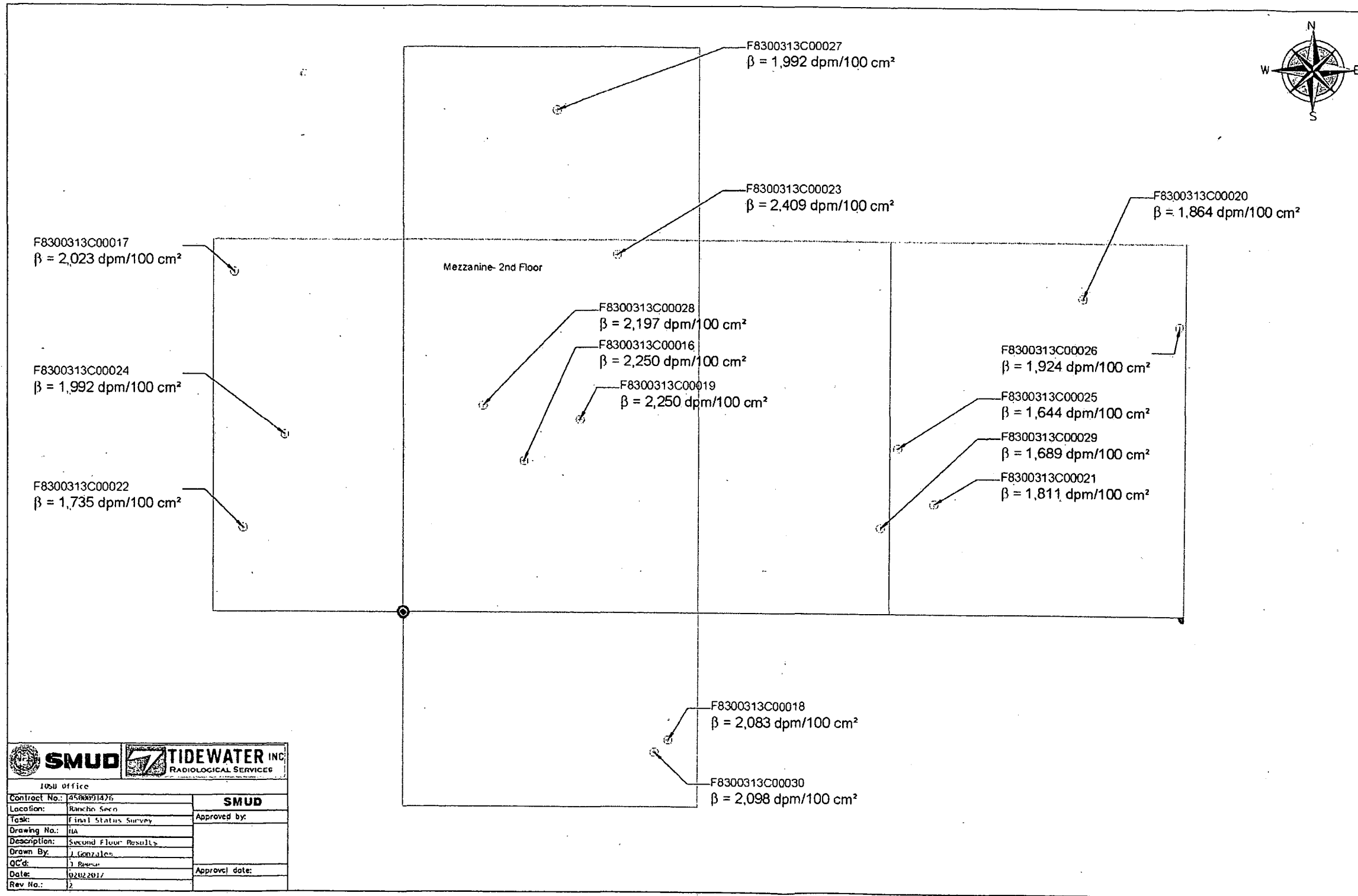
**February 3, 2017**

**Survey Unit F8300133**



1058 Office	
Contract No.: 45009/1426	SMUD
Location: Rancho Seco	Approved by:
Task: Final Status Survey	
Drawing No.: 11A	
Description: First Floor Results	
Drawn By: J. Gonzalez	
QC'd: J. Reese	Approval date:
Date: 02/02/17	
Rev No.: 2	





1050 office	
Contract No.: 4500091476	SMUD
Location: Rancho Seco	Approved by:
Task: Final Status Survey	
Drawing No.: 11A	
Description: Second Floor Results	
Drawn By: J. Gonzalez	
QC'd: J. Reese	
Date: 9/20/2017	Approval date:
Rev No.: 2	

**Attachment 2**  
**Instrumentation**  
**February 3, 2017**  
**Survey Unit F8300133**

**Table 2-1. Survey Unit Instrumentation**

Measurement Type	Instrument Type	Minimum Detectable Activity <sup>a</sup>	Detector Efficiencies	Calibration Due Date <sup>b</sup>
Beta Static Measurement	Ludlum Model 2350-1 Ludlum Model 44-116 B Detector	Beta – 502 dpm/100 cm <sup>2</sup>	13.2%	<u>317897/331972</u> 2/10/17
Swipe Measurements	Ludlum Model 2929 Ludlum Model 44-10-1	Beta – 78dpm/100 cm <sup>2</sup>	36.9% 42.8%	<u>166716/170380</u> 5/13/17

<sup>a</sup> Minimum detectable activities for the count rate instrumentation were calculated in accordance with NUREG-1507, "Minimum Detectable Concentrations with Typical Radiation Survey Instruments for Various Contaminants and Field Conditions" (U.S. NRC, 1997).

<sup>b</sup> Detectors are required to be calibrated once every 12 months. Calibration due date indicates the date by which the detector must be calibrated again.

cm<sup>2</sup> = square centimeters

cpm = counts per minute

dpm = disintegrations per minute

## Static Measurement MDA

Beta Survey Type  
PR331972 Detector Number  
185 Background count rate (cpm)  
1 Count Time (min)  
0.132 Efficiency  
100 Area of Detector (cm<sup>2</sup>)

### Constants

60 sec/min  
2.54 cm/in

### Assumptions

Background count time and sample count time are equivalent

### Calculate Static MDA

Static MDA =  $3 + 4.65(B_r * t)^{0.5} / t * E * A / 100$  (NUREG 1507)

Where:            B<sub>r</sub> Background Countrate  
                      t    Count Time (min)  
                      E    Efficiency  
                      A    Area of detector (cm<sup>2</sup>)

Static MDA                            502 dpm/100 cm<sup>2</sup>

**Attachment 3**  
**Investigation**  
**February 1, 2017**  
**Survey Unit F8300133**

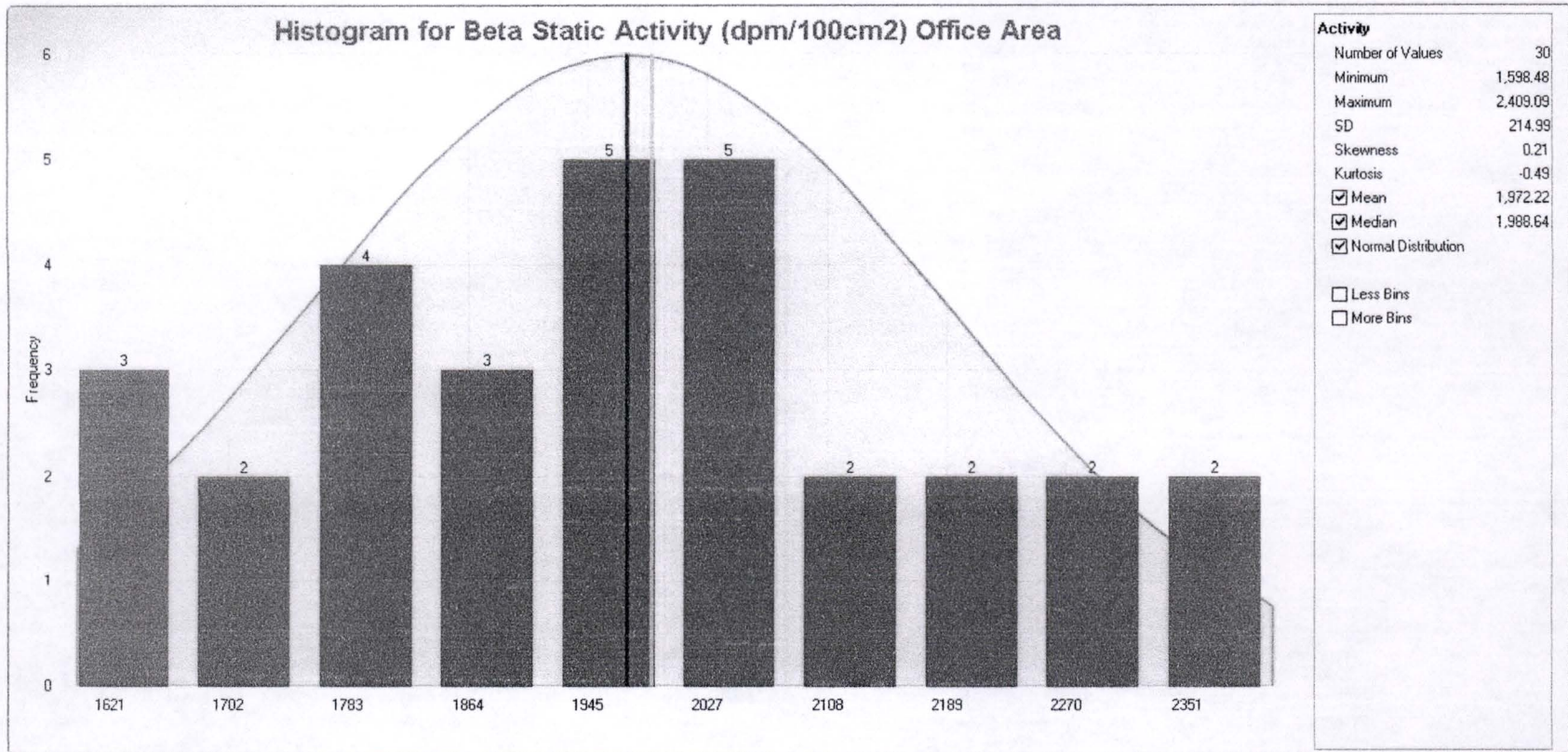
**(none required)**

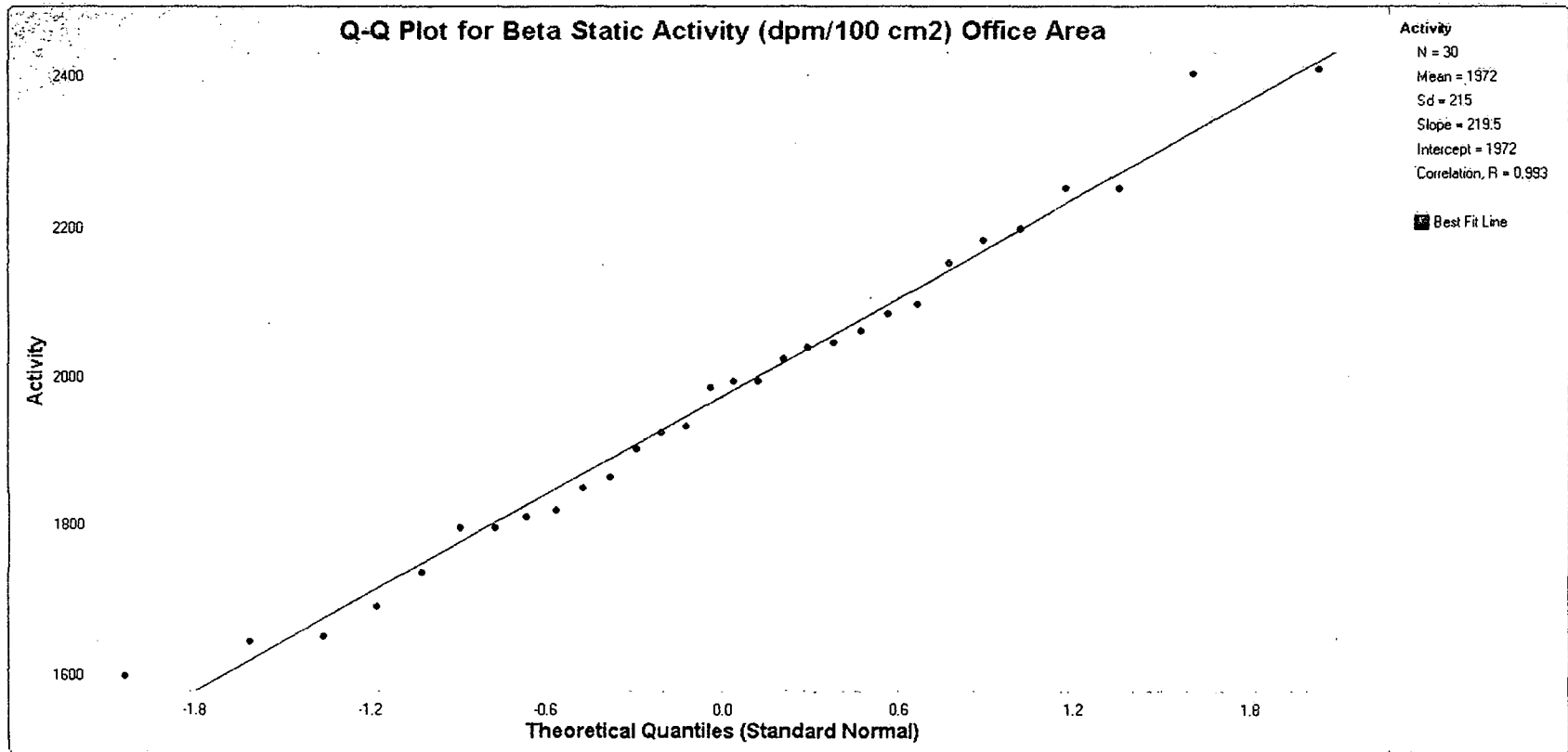
**Attachment 4**

**Data Assessment**

**February 3, 2017**

**Survey Unit F8300133**



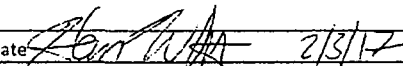




Swipe sheet office

IOSB Final Status Survey												
	LC1	LC2	LC3	LC4*	LC6	LC5		$\beta$ CPM	$\beta$ dpm	Date/Time of Count	Sample Comments	
1	F830	013	3		00001	SM	IOSB Offices	56	17			
2	F830	013	3		00002	SM	IOSB Offices	51	5			
3	F830	013	3		00003	SM	IOSB Offices	36	-29			
4	F830	013	3		00004	SM	IOSB Offices	37	-27			
5	F830	013	3		00005	SM	IOSB Offices	35	-32			
6	F830	013	3		00006	SM	IOSB Offices	58	21			
7	F830	013	3		00007	SM	IOSB Offices	44	-11			
8	F830	013	3		00008	SM	IOSB Offices	59	24			
9	F830	013	3		00009	SM	IOSB Offices	46	-6			
10	F830	013	3		00010	SM	IOSB Offices	40	-20			
11	F830	013	3		00011	SM	IOSB Offices	44	-11			
12	F830	013	3		00012	SM	IOSB Offices	49	1			
13	F830	013	3		00013	SM	IOSB Offices	55	15			
14	F830	013	3		00014	SM	IOSB Offices	44	-11			
15	F830	013	3		00015	SM	IOSB Offices	34	-34			
Comments: By signature below, the required source check and background checks were satisfactorily performed prior to use of the instrument identified below.												
							Ludlum 2929 Benchtop Instrument					
							2929 S/N: 182597	efficiency	bkg rate	bkg count time	MDA	
							43-10-1 S/N: 188736	$\alpha$	0.364	3 cpm	1 min	25.1 dpm per area
							Cal Due Date: 5/13/2017	$\beta$	0.434	48.7 cpm	1 min	77.8 dpm per area
Tech A Sign/ Date <i>[Signature]</i> 2/3/17												
Tech B Sign/ Date												

Swipe sheet office

IOSB Final Status Survey											
	LC1	LC2	LC3	LC4*	LC6	LC5		$\beta$ CPM	$\beta$ dpm	Date/Time of Count	Sample Comments
1	F830	013	3		00016	SM	IOSB Offices	40	-20		
2	F830	013	3		00017	SM	IOSB Offices	31	-41		
3	F830	013	3		00018	SM	IOSB Offices	52	8		
4	F830	013	3		00019	SM	IOSB Offices	46	-6		
5	F830	013	3		00020	SM	IOSB Offices	43	-13		
6	F830	013	3		00021	SM	IOSB Offices	50	3		
7	F830	013	3		00022	SM	IOSB Offices	43	-13		
8	F830	013	3		00023	SM	IOSB Offices	42	-15		
9	F830	013	3		00024	SM	IOSB Offices	54	12		
10	F830	013	3		00025	SM	IOSB Offices	41	-18		
11	F830	013	3		00026	SM	IOSB Offices	50	3		
12	F830	013	3		00027	SM	IOSB Offices	39	-22		
13	F830	013	3		00028	SM	IOSB Offices	44	-11		
14	F830	013	3		00029	SM	IOSB Offices	32	-38		
15	F830	013	3		00030	SM	IOSB Offices	48	-2		
Comments By signature below, the required source check and background checks were satisfactorily performed prior to use of the instrument identified below.											
								Ludlum 2929 Benchtop Instrument			
								2929 S/N: 182597			
								43-10-1 S/N: 188736			
								Cal Due Date: 5/13/2017			
Tech A Sign/ Date								2/3/12			
Tech B Sign/ Date											
		efficiency		bkg rate		bkg count time		MDA			
		$\alpha$		0.364		3 cpm		1 min		25.1 dpm per area	
		$\beta$		0.434		48.7 cpm		1 min		77.8 dpm per area	