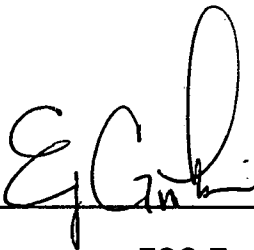
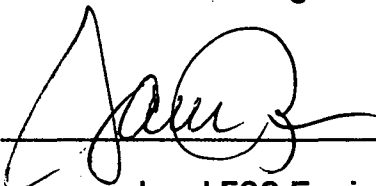


Rancho Seco
Final Status Survey Summary Report
December 1, 2016
IOSB Storage Cell C-3
Survey Unit F8300243

Prepared By:  Date: 12.12.16
FSS Engineer

Reviewed By:  Date: 12.12.16
Lead FSS Engineer

Approved By:  Date: 12/15/16
Manager, Rancho Seco Assets

FINAL STATUS SURVEY F8300243

Survey Unit:

F8300243, Interim Onsite Storage Building (IOSB) Storage Cell C-3

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), each storage cell possibly stored media of many types, including filters, resins, contaminated chemicals, DAW, activated reactor components, contaminated plant components and other contaminated items.

Site Characterization: Static measurements were made of the interior surfaces of the storage cell, to confirm the absence or presence of plant-derived radionuclides. Static measurements showed a mean gross beta activity level of 2,179 dpm/100 cm² and a maximum value of 4,674 dpm/100 cm². 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 33% of the area scanned. The instrumentation used for the survey along with the MDC values are listed in **Table 2-1 Attachment 2**.

FINAL STATUS SURVEY F8300243

Table 1, Survey Unit Design Parameters

Evaluation Input Values		Comments
Survey Package:	F830	Storage Cell C-3
Survey Unit:	24	
Class	03	
SU Area (m ²)	23	
Evaluator:	JR	
DCGL _w :	43,000	Gross Activity DCGL
Area Factor	N/A	Class 3
Design DCGL _{emc} (dpm/100cm ²):	N/A	Class 3
DCGL _{emc} :	N/A	Class 3
LBGR:	21,500	Default = 50% DCGL
Sigma:	365	Scoping Survey Data
Type I error:	0.05	
Type II error:	0.05	
Predominant Nuclide	Cs-137	
Sample Area (m ²)	N/A	
Total Instrument Efficiency:	0.132	
Total Area Scanned (m ²):	7.51	
Scan Coverage (%)	33%	Class 3
Material Type:	N/A	Choosing 'N/A' sets material background to "0"
Calculated Values		Comments
Z _{1-α} :	1.645	
Z _{1-β} :	1.645	
Sign p:	0.99865	
Calculated Relative Shift:	58.9	
Relative Shift Used:	3.0	Uses 3.0 if Relative Shift >3
N-Value:	11	
N-Value+20%:	14	

FINAL STATUS SURVEY F8300243

Survey Results:

A total of 15 direct measurements were made in F8300243. 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.

Table 2, Static Measurement Results

Number	Sample #	Beta (cpm)	Beta (dpm)
1	F8300243X00001	262	1,985
2	F8300243X00002	275	2,083
3	F8300243X00003	283	2,144
4	F8300243X00004	302	2,288
5	F8300243X00005	262	1,985
6	F8300243X00006	288	2,182
7	F8300243X00007	265	2,008
8	F8300243X00008	256	1,939
9	F8300243X00009	267	2,023
10	F8300243X00010	245	1,856
11	F8300243X00011	282	2,136
12	F8300243X00012	245	1,856
13	F8300243X00013	254	1,924
14	F8300243X00014	275	2,083
15	F8300243X00015	289	2,189

Table 3 contains the statistical summary of the static measurement data for the Storage Cell C-3

Table 3, Beta Summary Statistics

<i>Beta Static Storage Cell C-3</i>	
Mean	2,045
Median	2,023
Standard Deviation	127
Minimum	1,856
Maximum	2,288
Count	15

FINAL STATUS SURVEY F8300243

Survey Unit Data Assessment:

The survey design required 14 static measurements for the Sign Test. A total of 15 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.

Table 4, Data Assessment Results

Static Data Values		Comments
Number of Samples:	15	
Median:	2,023	
Mean:	2,045	
Static Data Standard Deviation:	127	
Maximum:	2,288	
Sign Test Results		Comments
Adjusted N Value:	14	
S+ Value:	15	
Critical Value:	10	
Criteria Satisfaction		Comments
Sufficient samples collected:	Pass	
Maximum value <DCGL _w :	Pass	
Median value <DCGL _w :	Pass	
Mean value <DCGL _w :	Pass	
Maximum value <DCGL _{enc} :	N/A	
Sign test results:	Pass	
Final Status		Comments
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.

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. The variability of the survey results was less than the characterization data used for survey design. No potential areas of elevated activity were detected.

FINAL STATUS SURVEY F8300243

Conclusion:

The FSS of this survey unit was properly designed as a Class 3 survey based on the results of the scoping 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 F8300243 meets the release criteria of 10CFR20.1402.

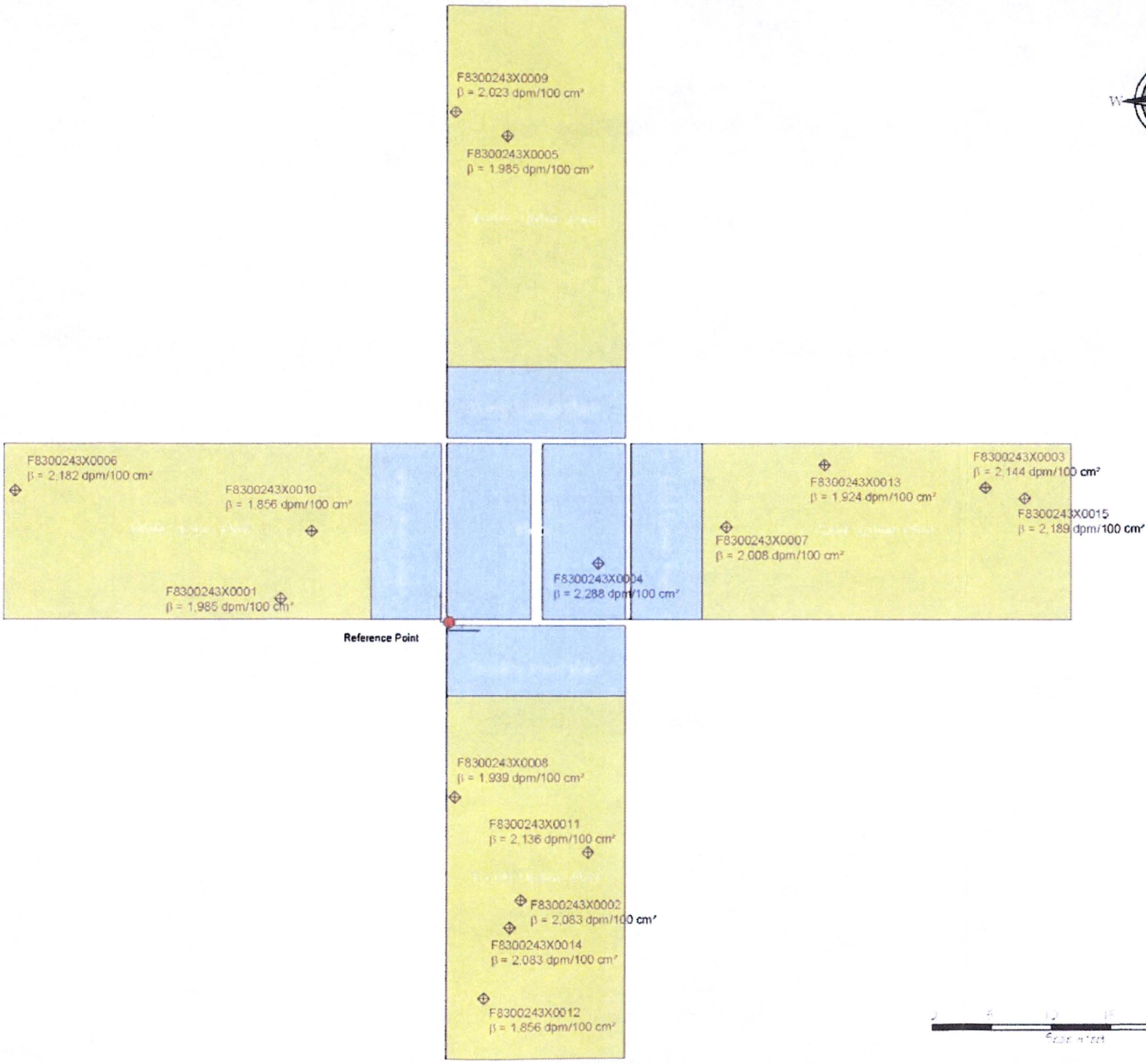
Attachment 1

Maps

December 1, 2016

Survey Unit F8300243

A-1	A-2	A-3
B-1	B-2	B-3
Cell Storage		
C-1	C-2	C-3
D-1	D-2	D-3
E-1	E-2	E-3



INTERIM ONSITE STORAGE BUILDING (IOSB)	
Contract No.: 4500001426	SMUD
Location: Rancho Seco	
Task: Final Status	Approved by:
Drawing No.: IOSB Final Status Survey	
Description: Cell C-3 Upper Wall Results	
Drawn By: C. Gray	
QC'd: J. Bremer	Approval date:
Date: 10/27/16	
Rev No.: 1	

Attachment 2

Instrumentation

October 11, 2016

Survey Unit F8300243

Table 2-1. Survey Unit Instrumentation

Measurement Type	Instrument Type	Minimum Detectable Activity ^a	Detector Efficiencies	Calibration Due Date ^b
Beta Static Measurement	Ludlum Model 2350-1 Ludlum Model 44-116 B Detector	Beta – 532 dpm/100 cm ²	13.2%	317897/331972 2/10/17
Swipe Measurements	Ludlum Model 2929 Ludlum Model 44-10-1	Beta – 79 dpm/100 cm ²	42.8%	166716/170380 11/3/16

^a 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).

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

cm² = square centimeters

cpm = counts per minute

dpm = disintegrations per minute

Static Measurement MDA

Variables

Beta Survey Type
PR331972 Detector Number
209 Background count rate (cpm)
1 Count Time (min)
0.132 Efficiency
100 Area of Detector (cm²)

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_r Background Countrate
t Count Time (min)
E Efficiency
A Area of detector (cm²)

Static MDA 532 dpm/100 cm²

Attachment 3

Investigation

December 1, 2016

Survey Unit F8300243

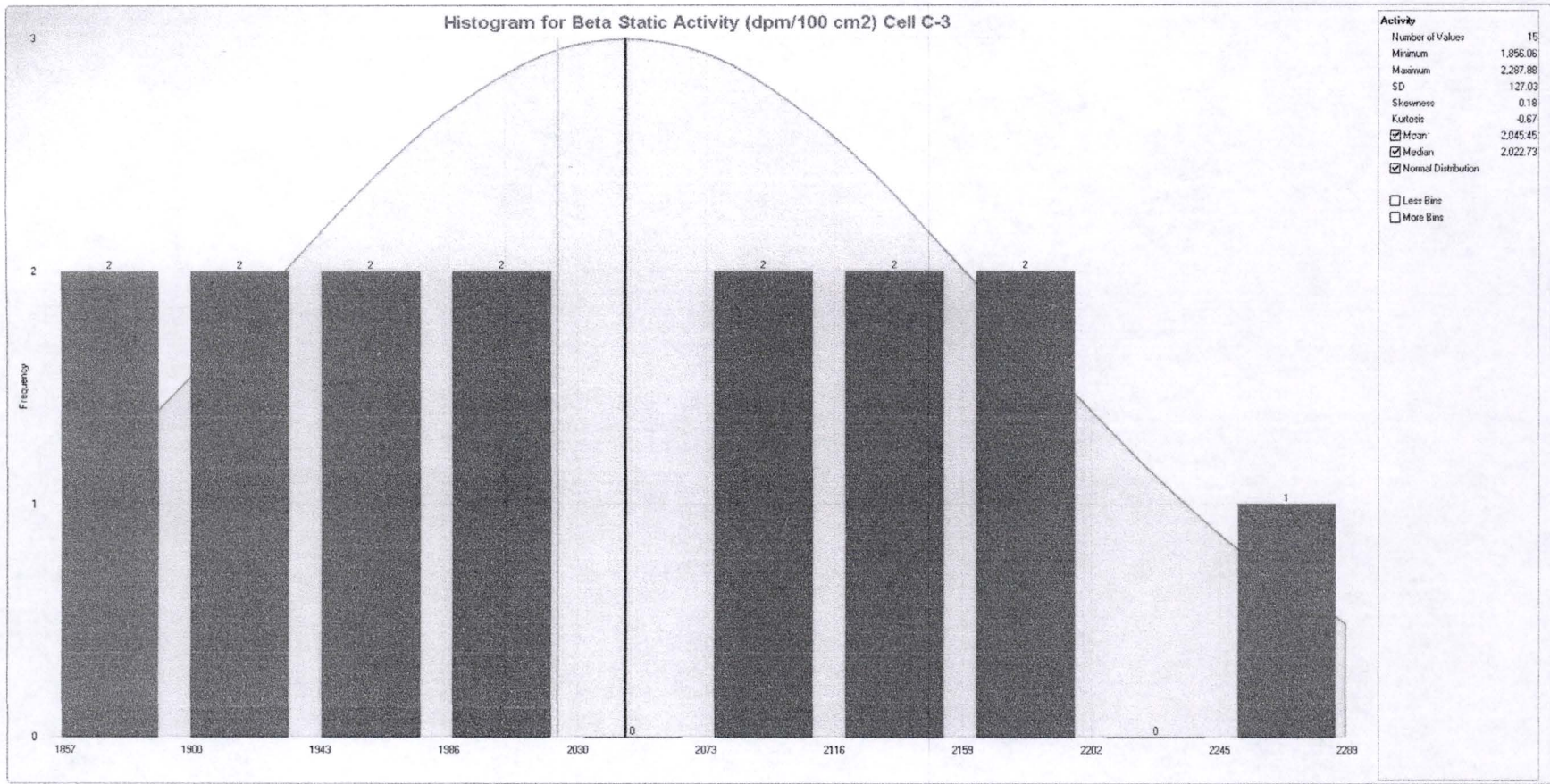
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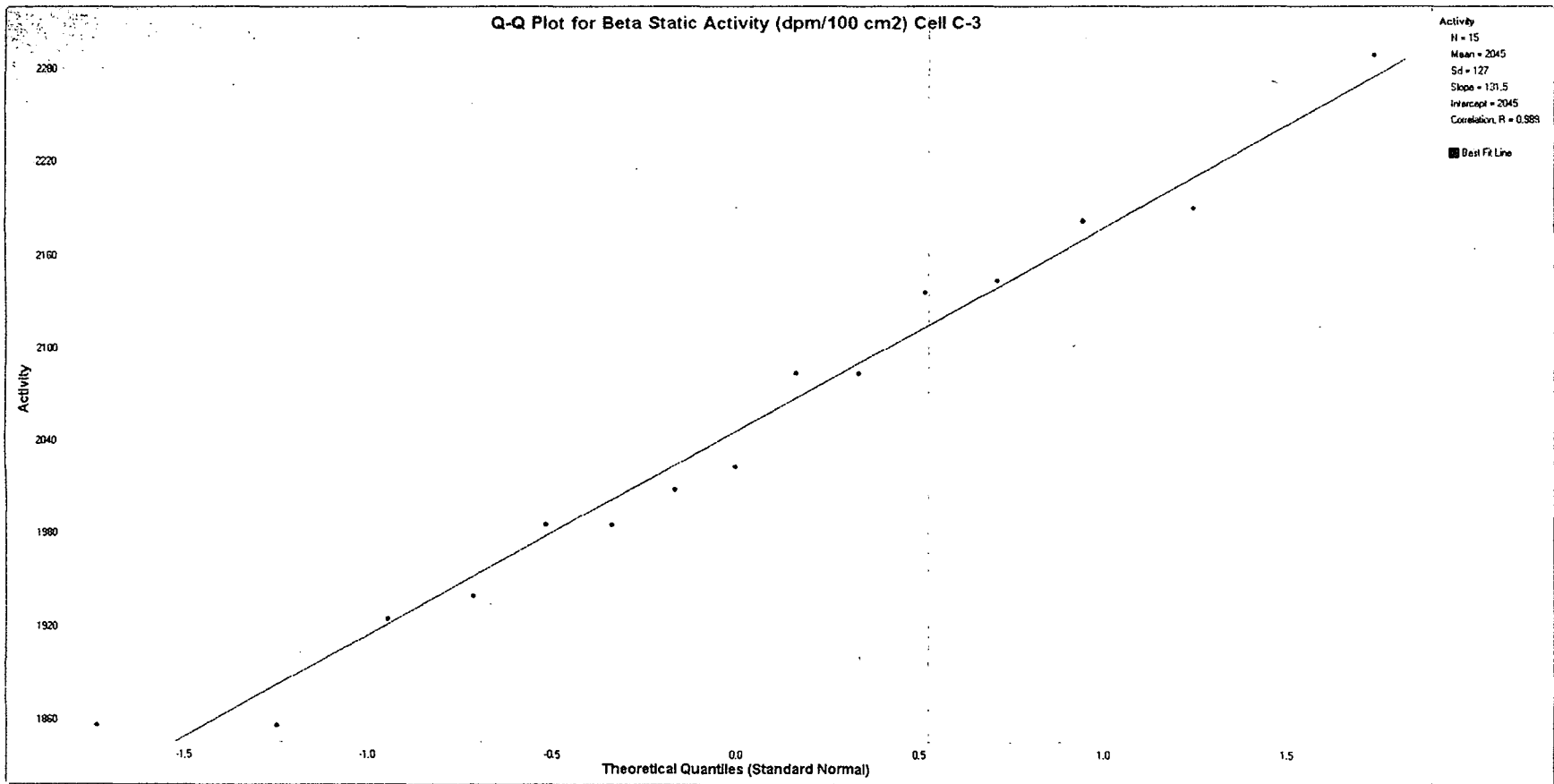
Attachment 4

Data Assessment

December 2, 2016

Survey Unit F8300243





Smear_Data_Calculation_Sheet_101316

IOSB Final Status Survey												
	LC1	LC2	LC3	LC4	LC6	LC5		β CPM	β dpm	Date/Time of Count		Sample Comments
1	F830	024	3	X	00001	SM	Cell C-3	42	-18	10/12/16	1048	
2	F830	024	3	X	00002	SM	Cell C-3	37	-29	10/12/16	1018	
3	F830	024	3	X	00003	SM	Cell C-3	46	-9	10/12/16	0958	
4	F830	024	3	X	00004	SM	Cell C-3	51	3	10/12/16	1042	
5	F830	024	3	X	00005	SM	Cell C-3	48	-4	10/12/16	1008	
6	F830	024	3	X	00006	SM	Cell C-3	49	-2	10/12/16	0950	
7	F830	024	3	X	00007	SM	Cell C-3	62	28	10/12/16	1039	
8	F830	024	3	X	00008	SM	Cell C-3	49	-2	10/12/16	1033	
9	F830	024	3	X	00009	SM	Cell C-3	43	-16	10/12/16	1007	
10	F830	024	3	X	00010	SM	Cell C-3	53	7	10/12/16	1045	
11	F830	024	3	X	00011	SM	Cell C-3	51	3	10/12/16	1025	
12	F830	024	3	X	00012	SM	Cell C-3	35	-34	10/12/16	1004	
13	F830	024	3	X	00013	SM	Cell C-3	58	19	10/12/16	1030	
14	F830	024	3	X	00014	SM	Cell C-3	37	-29	10/12/16	1016	
15	F830	024	3	X	00015	SM	Cell C-3	42	-18	10/12/16	0957	
Comments: By signature below, the required source check and background checks were satisfactorily performed prior to use of the instrument identified below.												
Tech A Sign/ Date <i>Ken White</i> 12-2-16 Tech B Sign/ Date <i>N/A</i>								Ludlum 2929 Benchtop Instrument				
								2929 S/N: 182597	efficiency	bkg rate	bkg count time	MDA
								α	0.364	cpm	1	3.0 2 1/2 16 dpm per area
								β	0.434	49.8 cpm	1 min	78.6 dpm per area
								Cal Due Date: 5/13/2017				