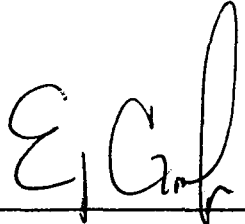



Rancho Seco
Final Status Survey Summary Report
October 21, 2016
IOSB Storage Cell B-1
Survey Unit F8300193

Prepared By:  Date: 11.7.16

FSS Engineer

Reviewed By:  Date: 11.7.16

Lead FSS Engineer

Approved By:  Date: 11/17/16

Manager, Rancho Seco Assets

FINAL STATUS SURVEY F8300193

Survey Unit:

F8300193, Interim Onsite Storage Building (IOSB) Storage Cell B-1

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 activity level of 2,071 dpm/100 cm² and a maximum value of 2,416 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 F8300193

Table 1, Survey Unit Design Parameters

Evaluation Input Values		Comments
Survey Package:	F830	Storage Cell B-1
Survey Unit:	019	
Class	3	
SU Area (m ²)	23.1	
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:	177	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:	0.129	
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:	121.4	
Relative Shift Used:	3.0	Uses 3.0 if Relative Shift >3
N-Value:	11	
N-Value+20%:	14	

FINAL STATUS SURVEY F8300193

Survey Results:

A total of 15 direct measurements were made in F8300193. 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	F8300193X00001	225	1,744
2	F8300193X00002	238	1,845
3	F8300193X00003	247	1,915
4	F8300193X00004	242	1,876
5	F8300193X00005	227	1,760
6	F8300193X00006	236	1,829
7	F8300193X00007	254	1,969
8	F8300193X00008	246	1,907
9	F8300193X00009	224	1,736
10	F8300193X00010	208	1,612
11	F8300193X00011	244	1,891
12	F8300193X00012	213	1,651
13	F8300193X00013	251	1,946
14	F8300193X00014	241	1,868
15	F8300193X00015	268	2,078

Table 3 contains the statistical summary of the static measurement data for the Storage Cell B-1.

Table 3, Beta Summary Statistics

<i>Beta Statics B-1</i>	
Mean	1,842
Median	1,868
Standard Deviation	123
Minimum	1,612
Maximum	2,078
Count	15

FINAL STATUS SURVEY F8300193

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:	1,868	
Mean:	1,842	
Static Data Standard Deviation:	123	
Maximum:	2,078	
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 _{emc} :	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 F8300193

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.

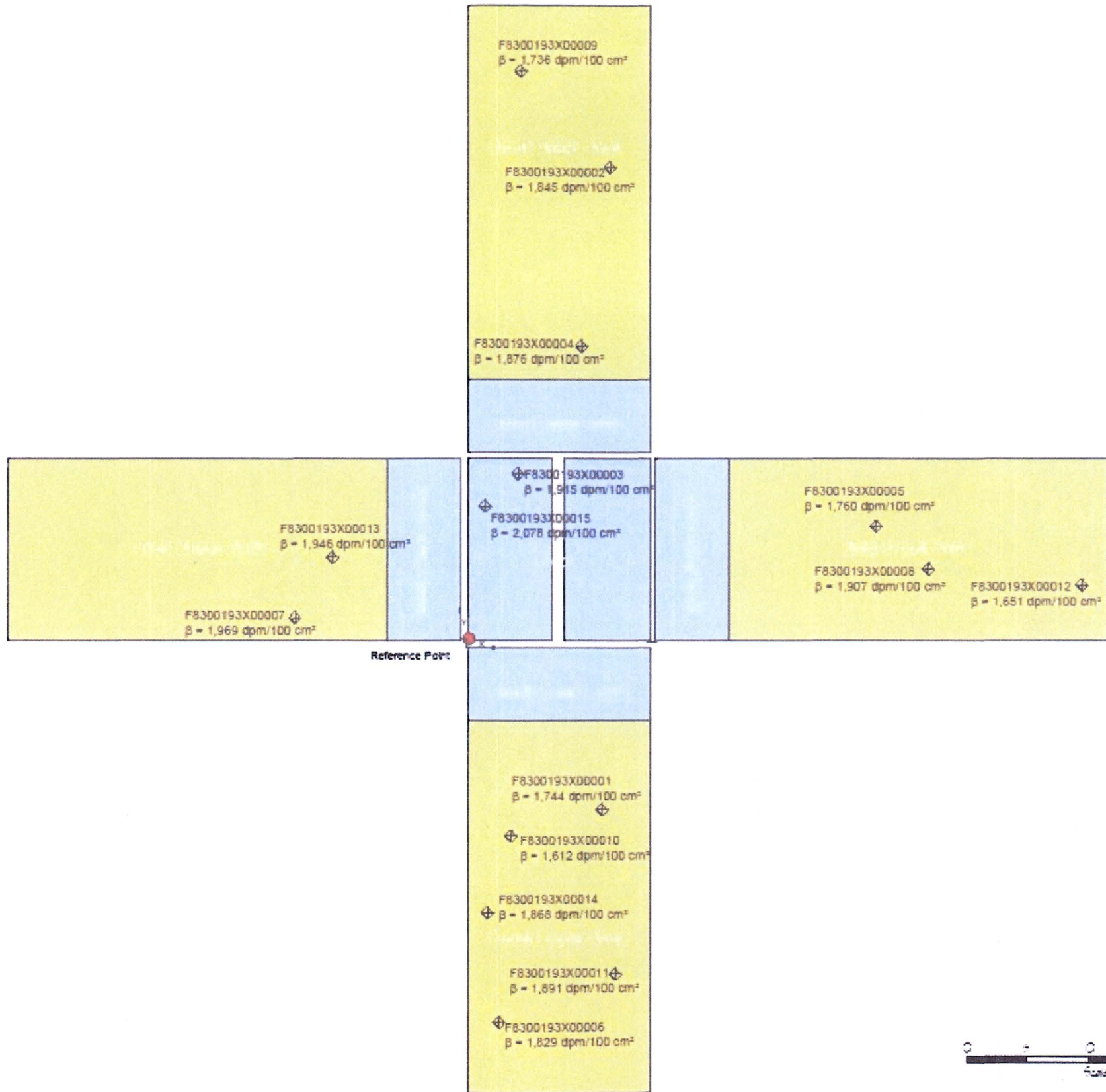
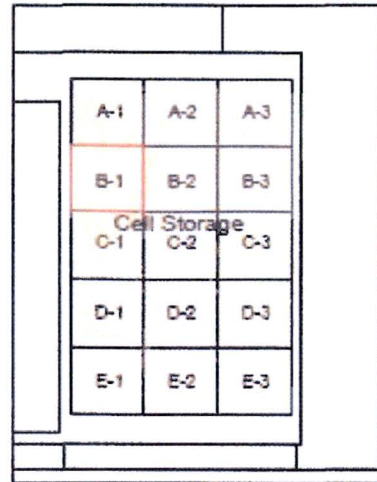
It is concluded that survey unit F8300193 meets the release criteria of 10CFR20.1402.

Attachment 1

Maps

November 8, 2016

Survey Unit F8300193



INTERIM ONSITE STORAGE BUILDING (IOSSB)	
Contract No:	450001626
Location:	Rancho Seco
Year:	Final Status
Drawing No.:	IOSSB Final Status Survey
Description:	Cell E-1 Results
Drawn By:	K. Gray
Checked:	J. Jones
Date:	10/26/2016
Rev No.:	1
SMUD	
Approved by:	
Approval date:	



Attachment 2

Instrumentation

September 23, 2016

Survey Unit F8300193

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	Beta – 569 dpm/100 cm ²	12.9%	317899/331973 2/10/17
	Ludlum Model 44-116 B Detector			
Swipe Measurements	Ludlum Model 2929	Alpha – 11 dpm/100 cm ²	36.9%	166716/170380
	Ludlum Model 44-10-1	Beta – 80 dpm/100 cm ²	42.8%	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
331973 Detector Number
229 Background count rate (cpm)
1 Count Time (min)
0.129 Efficiency
Area of Detector
100 (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
 t Count Time (min)
 E Efficiency
 A Area of detector
 (cm²)

Static MDA 569 dpm/100 cm²

Attachment 3

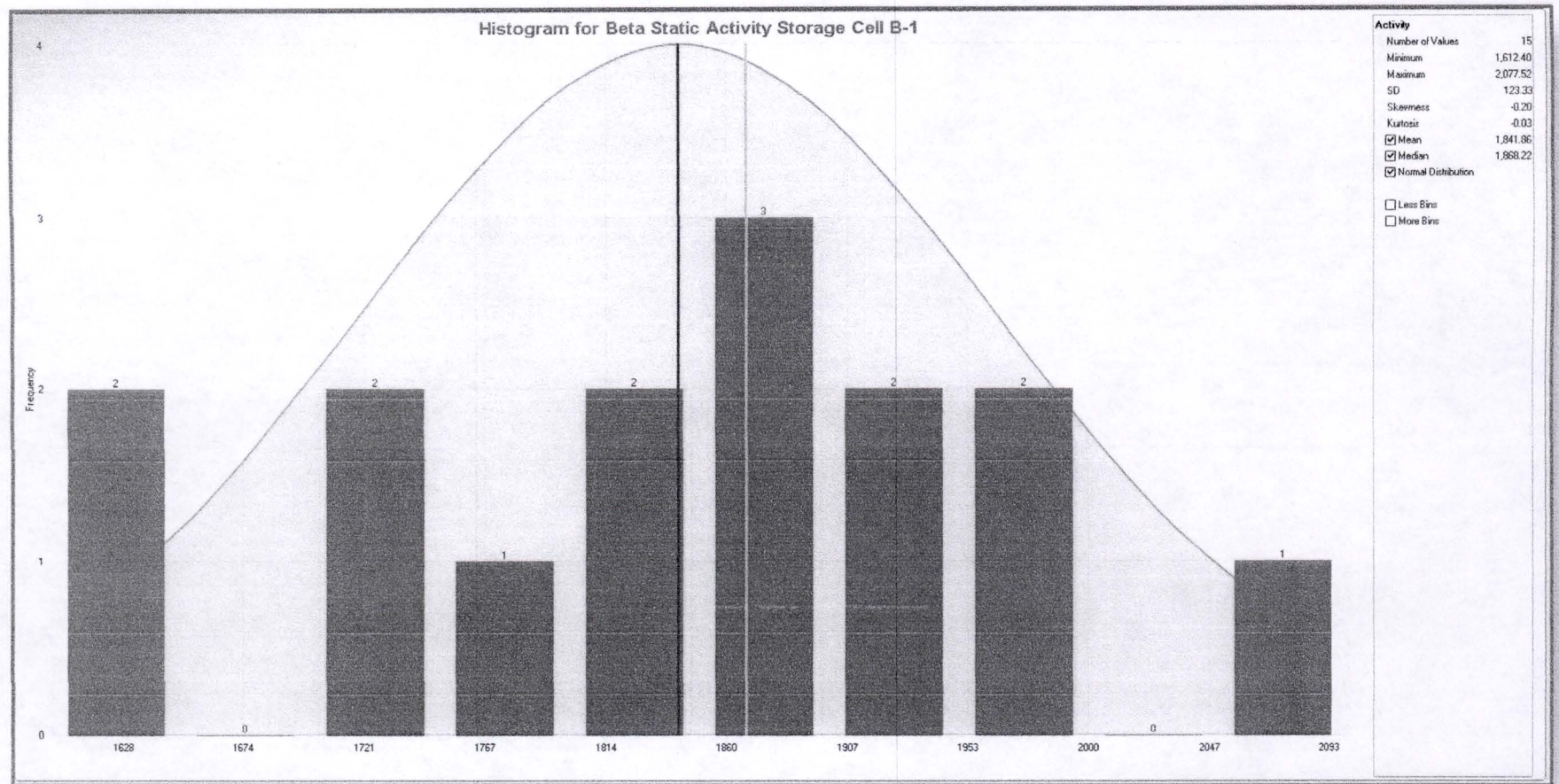
Investigation

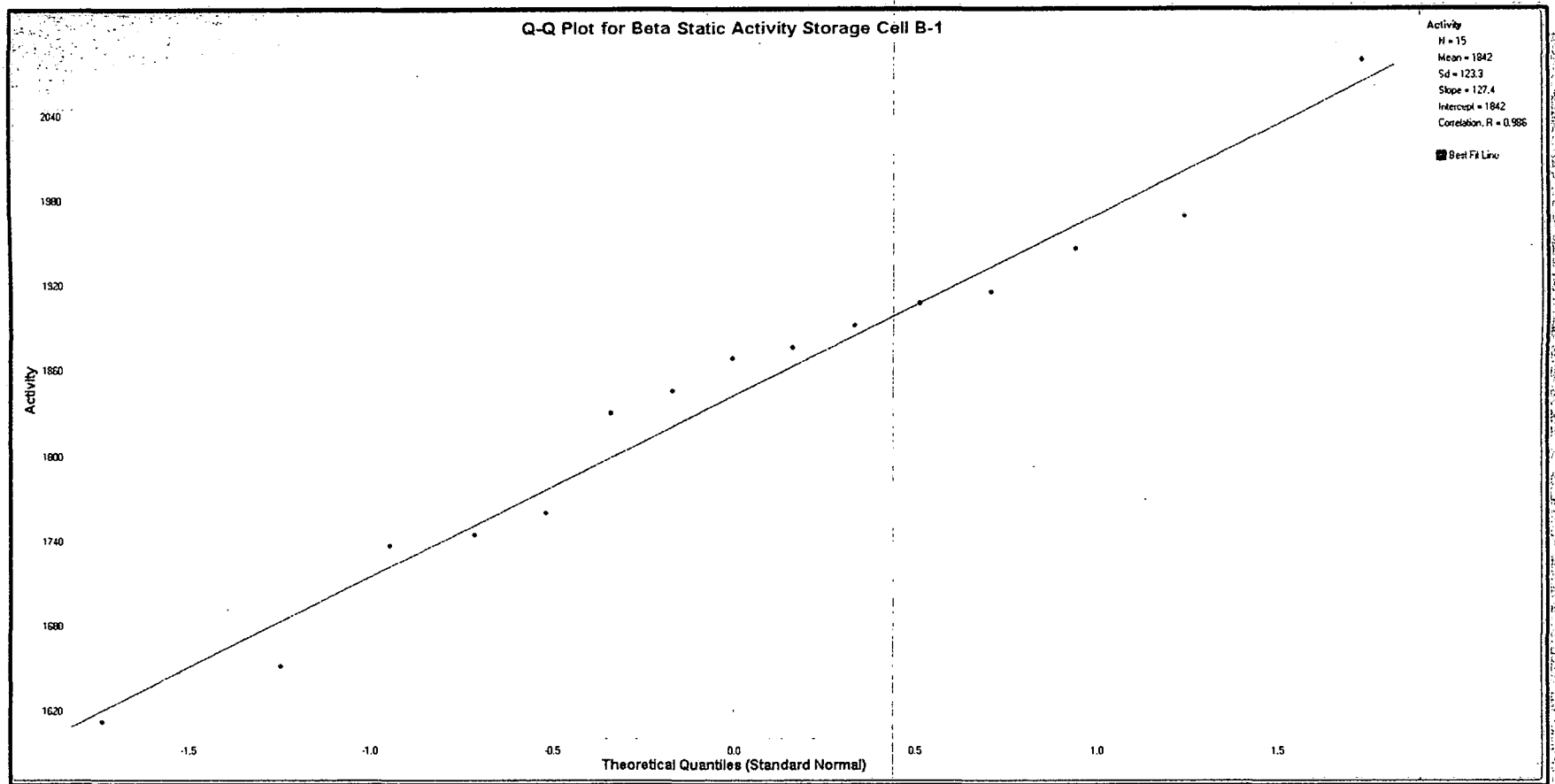
September 23, 2016

Survey Unit F8300193

(none required)

Attachment 4
Data Assessment
September 23, 2016
Survey Unit F830019



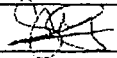


Smear_Data_Calculation_Sheet_101316

IOSB Final Status Survey

	LC1	LC2	LC3	LC4	LC6	LC5		β CPM	β dpm	Date/Time of Count		Sample Comments
1	F830	019	3	X	00001	SM	Cell B-1	59	20	08/31/16	10:04	
2	F830	019	3	X	00002	SM	Cell B-1	51	1	08/31/16	10:05	
3	F830	019	3	X	00003	SM	Cell B-1	43	-18	08/31/16	10:06	
4	F830	019	3	X	00004	SM	Cell B-1	53	6	08/31/16	10:07	
5	F830	019	3	X	00005	SM	Cell B-1	47	-8	08/31/16	10:09	
6	F830	019	3	X	00006	SM	Cell B-1	51	1	08/31/16	10:10	
7	F830	019	3	X	00007	SM	Cell B-1	55	11	08/31/16	10:11	
8	F830	019	3	X	00008	SM	Cell B-1	57	15	08/31/16	10:12	
9	F830	019	3	X	00009	SM	Cell B-1	52	4	08/31/16	10:13	
10	F830	019	3	X	00010	SM	Cell B-1	42	-20	08/31/16	10:15	
11	F830	019	3	X	00011	SM	Cell B-1	43	-18	08/31/16	10:16	
12	F830	019	3	X	00012	SM	Cell B-1	38	-29	08/31/16	10:18	
13	F830	019	3	X	00013	SM	Cell B-1	60	22	08/31/16	10:19	
14	F830	019	3	X	00014	SM	Cell B-1	53	6	08/31/16	10:20	
15	F830	019	3	X	00015	SM	Cell B-1	48	-6	08/31/16	10:21	

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: 166716		efficiency	bkg count
		44-10-1 S/N: 170380		rate	time
		Cal Due Date: 11/3/2016		MDA	
Tech A Sign/ Date		8-29-16	8-31-16	α	0.369
Tech B Sign/ Date	N/A			β	0.428
					0.4
					1
					11.0
					dpm per area
					50.5
					1
					80.2
					dpm per area