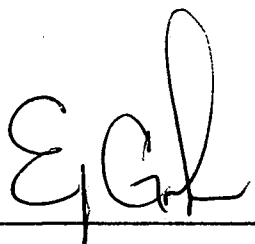
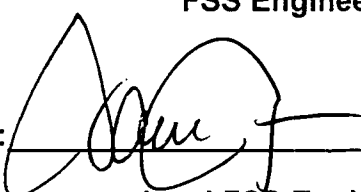


Rancho Seco
Final Status Survey Summary Report
October 21, 2016
IOSB Storage Cell E-1
Survey Unit F8300283

Prepared By:  Date: 11.30.16

FSS Engineer

Reviewed By:  Date: 11.30.16

Lead FSS Engineer

Approved By:  Date: 12/1/16

Manager, Rancho Seco Assets

FINAL STATUS SURVEY F8300283

Survey Unit:

F8300283, Interim Onsite Storage Building (IOSB) Storage Cell E-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 2,722 dpm/100 cm² and a maximum value of 3,264 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 29% scan coverage. The instrumentation used for the survey along with the MDC values are listed in **Table 2-1 Attachment 2**.

FINAL STATUS SURVEY F8300283

Table 1, Survey Unit Design Parameters

Evaluation Input Values		Comments
Survey Package:	F830	Storage Cell E-1
Survey Unit:	028	
Class	3	
SU Area (m ²)	26	
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:	197	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 (%)	29%	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:	109.1	
Relative Shift Used:	3.0	Uses 3.0 if Relative Shift >3
N-Value:	11	
N-Value+20%:	14	

FINAL STATUS SURVEY F8300283

Survey Results:

A total of 15 direct measurements were made in F8300283. 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	F8300283X00001	203	1,562
2	F8300283X00002	256	1,969
3	F8300283X00003	250	1,923
4	F8300283X00004	259	1,992
5	F8300283X00005	264	2,031
6	F8300283X00006	280	2,154
7	F8300283X00007	222	1,708
8	F8300283X00008	252	1,938
9	F8300283X00009	249	1,915
10	F8300283X00010	246	1,892
11	F8300283X00011	270	2,077
12	F8300283X00012	252	1,938
13	F8300283X00013	250	1,923
14	F8300283X00014	202	1,554
15	F8300283X00015	252	1,938

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

Table 3, Beta Summary Statistics

<i>Beta Static Cell E-1</i>	
Mean	1,901
Median	1,938
Standard Deviation	170
Minimum	1,554
Maximum	2,154
Count	15

FINAL STATUS SURVEY F8300283

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:	1,938	
Mean:	1,901	
Static Data Standard Deviation:	170	
Maximum:	2,154	
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 F8300283

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.

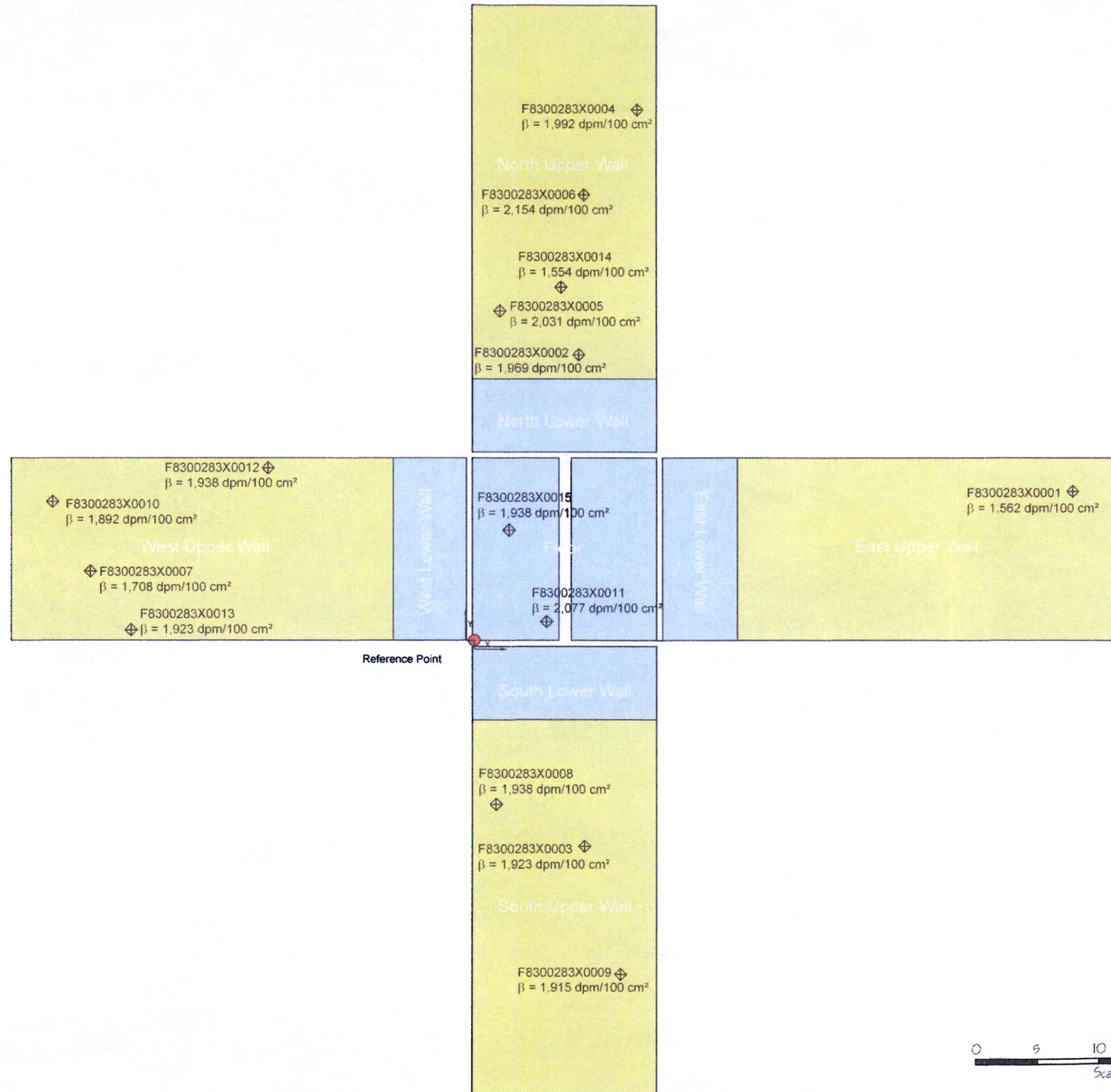
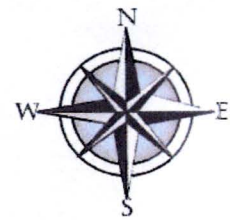
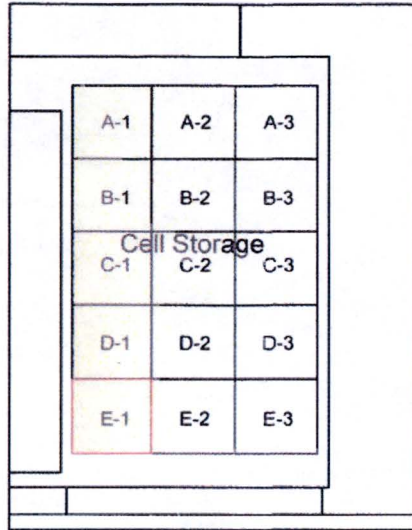
It is concluded that survey unit F8300283 meets the release criteria of 10CFR20.1402.

Attachment 1

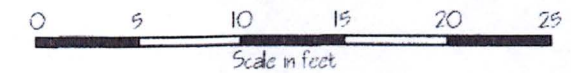
Maps

September 26, 2016

Survey Unit F8300283



INTERIM ONSITE STORAGE BUILDING (IOSB)			
Contract No.:	4500091426	SMUD	
Location:	Rancho Seco		
Task:	Final Status	Approved by:	
Drawing No.:	IOSB Final Status Survey		
Description:	Cell E-1 Upper Wall Results		
Drawn By:	C. Gray	Approval date:	
QC'd:	J. Reese		
Date:	10/27/2016		
Rev No.:	1		



Attachment 2

Instrumentation

September 26, 2016

Survey Unit F8300283

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 – 473 dpm/100 cm ²	13%	317882/331969 2/10/17
	Ludlum Model 44-116 B Detector			
Swipe Measurements	Ludlum Model 2929	Alpha – 3 dpm/100 cm ²	36.9%	166716/170380 11/3/16
	Ludlum Model 44-10-1	Beta – 81 dpm/100 cm ²	42.8%	

^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
PR331969 Detector Number
158 Background count rate (cpm)
1 Count Time (min)
0.130 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 473 dpm/100 cm²

Attachment 3
Investigation
September 26, 2016
Survey Unit F8300283

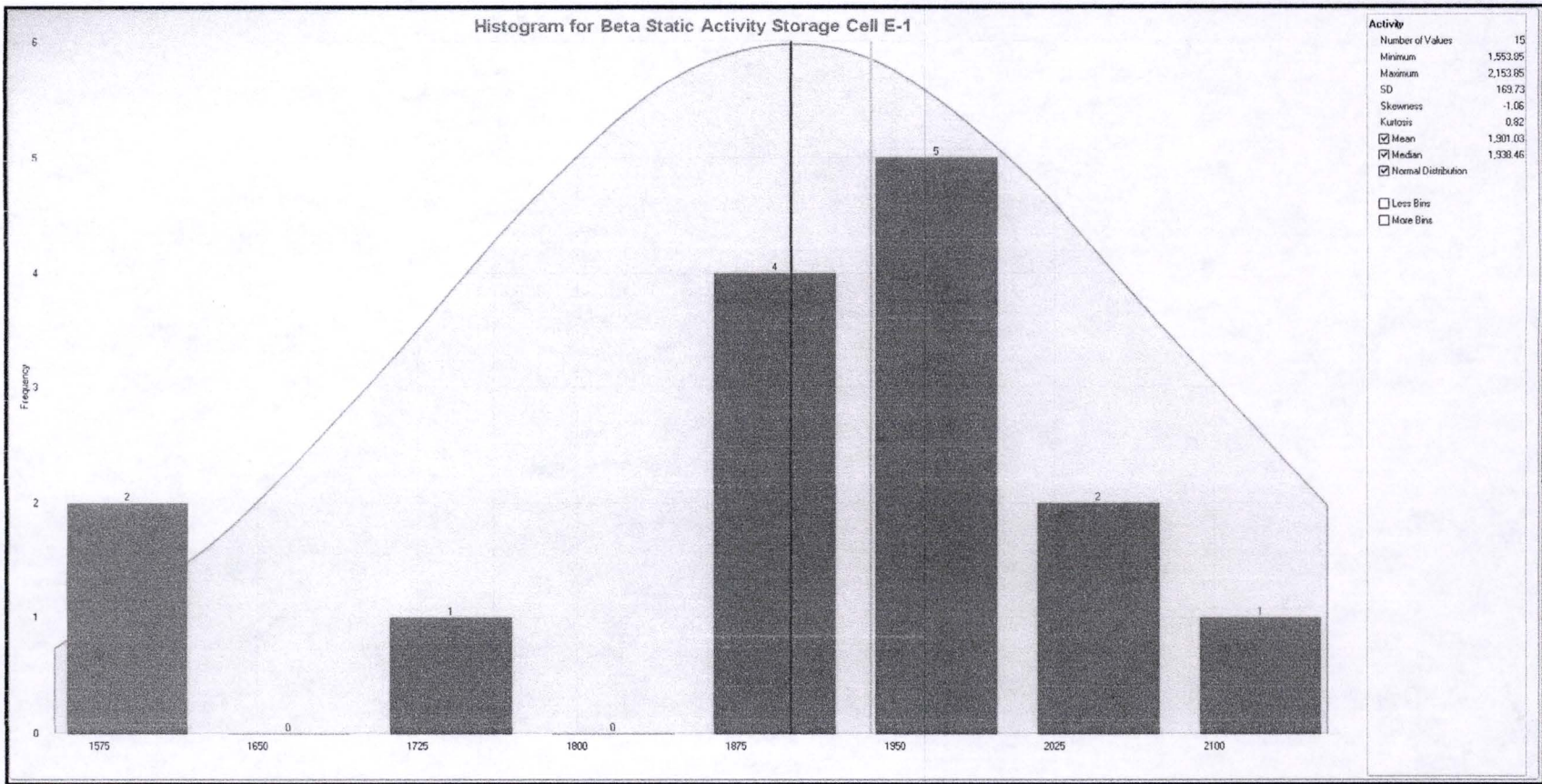
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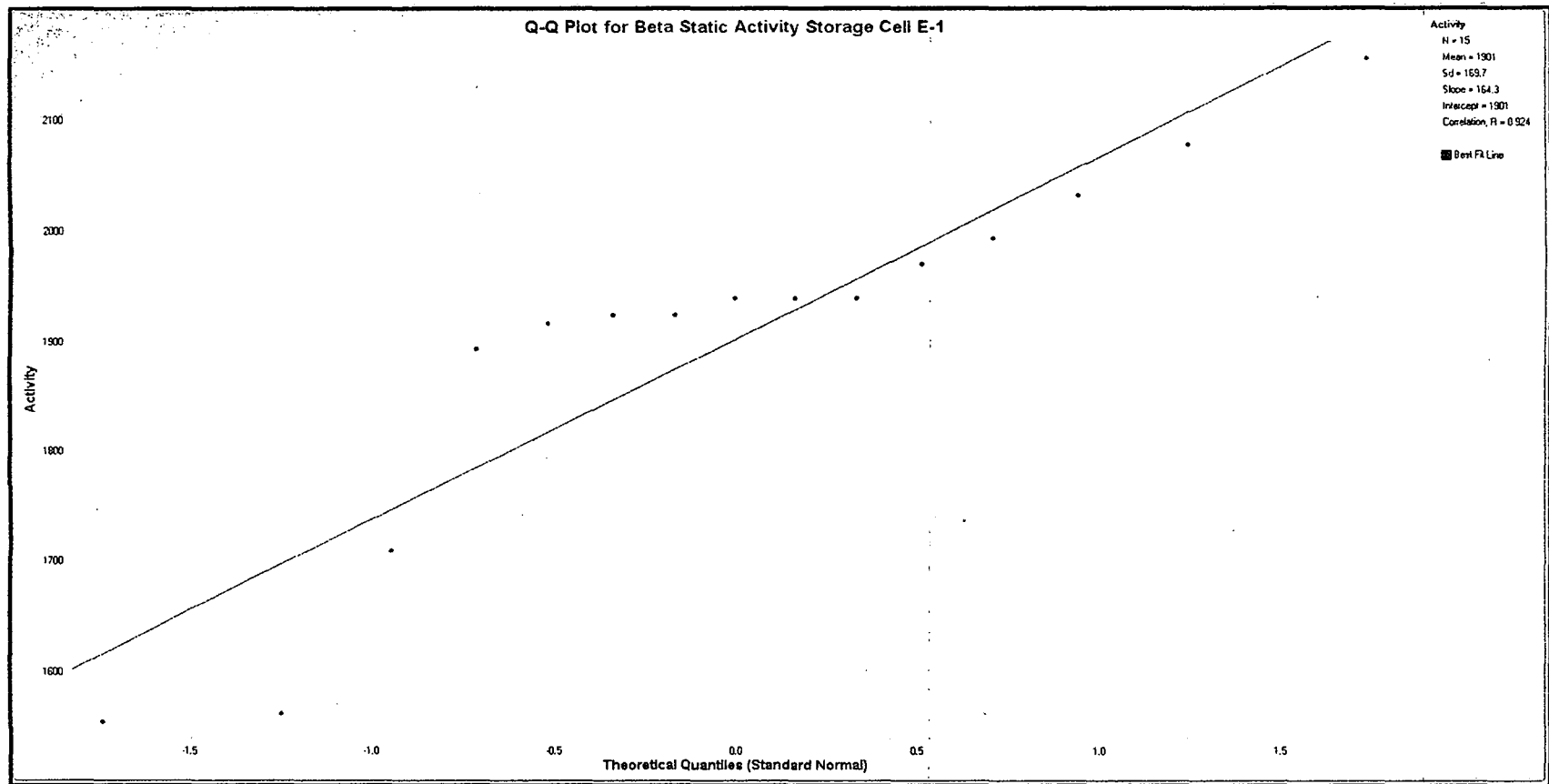
Attachment 4

Data Assessment

September 26, 2016

Survey Unit F8300283





IOSB Final Status Survey

	LC1	LC2	LC3	LC4	LC6	LC5		β CPM	β dpm	Date/Time of Count	Sample Comments
1	F830	028	3	X	00001	SM	Cell E-1	51	0	08/25/16	1408
2	F830	028	3	X	00002	SM	Cell E-1	50	-2	08/25/16	1409
3	F830	028	3	X	00003	SM	Cell E-1	54	7	08/25/16	1410
4	F830	028	3	X	00004	SM	Cell E-1	52	2	08/25/16	1411
5	F830	028	3	X	00005	SM	Cell E-1	53	5	08/25/16	1412
6	F830	028	3	X	00006	SM	Cell E-1	41	-23	08/25/16	1413
7	F830	028	3	X	00007	SM	Cell E-1	36	-35	08/25/16	1415
8	F830	028	3	X	00008	SM	Cell E-1	66	35	08/25/16	1416
9	F830	028	3	X	00009	SM	Cell E-1	40	-26	08/25/16	1417
10	F830	028	3	X	00010	SM	Cell E-1	57	14	08/25/16	1418
11	F830	028	3	X	00011	SM	Cell E-1	49	-5	08/25/16	1419
12	F830	028	3	X	00012	SM	Cell E-1	56	12	08/25/16	1420
13	F830	028	3	X	00013	SM	Cell E-1	57	14	08/25/16	1421
14	F830	028	3	X	00014	SM	Cell E-1	55	9	08/25/16	1422
15	F830	028	3	X	00015	SM	Cell E-1	52	2	08/25/16	1423

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				
		efficiency	bkg rate	bkg count time	MDA	
2929 S/N: 166716		α	0.369	0	1	3.0
44-10-1 S/N: 170380						
Cal Due Date: 11/3/2016		β	0.428	51	1	80.6
Tech A Sign/ Date <i>Alan White</i> 8-25-16						
Tech B Sign/ Date N/A						