
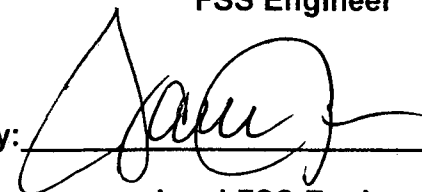


Rancho Seco
Final Status Survey Summary Report
January 30, 2017
IOSB Hot Cell
Survey Unit F8300061

Prepared By:  Date: 1.30.17
FSS Engineer

Reviewed By:  Date: 1.30.17
Lead FSS Engineer

Approved By:  Date: 2/21/17
Manager, Rancho Seco Assets

FINAL STATUS SURVEY F8300061

Survey Unit:

F8300061, Interim Onsite Storage Building (IOSB) Hot Cell

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 on the floor and wall surfaces, to confirm the absence or presence of plant-derived radionuclides. Static measurements showed a mean gross beta activity level of 2,880 dpm/100 cm² and a maximum value of 5,112 dpm/100 cm². Previous surveys and floor scanning indicated significant contamination in excess of the DCGL_w. This area was identified and characterized separately as a hot spot. The average static measurement in the hot spot was 390,104 dpm/100 cm² and a maximum value of 2,285,418 dpm/100 cm². The hot spot was remediated prior to performance of the FSS. Based upon the hot spot the Hot Cell was classified as a MARSSIM Class 1 survey unit.

Survey Unit Design Information:

In accordance with MARSSIM Section 4.6, special considerations may be necessary for survey units with structure surface areas less than 10 m² or land areas less than 100 m². In this case, the number of data points obtained from the statistical tests is unnecessarily large and not appropriate for smaller survey unit areas. The data generated from these smaller survey units should be obtained based on judgment, rather than on systematic or random design, and compared individually to the DCGLs. This survey unit meets this criterion as the size is less than ten square meter (8 m²).

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 based upon professional judgment in accordance with MARSSIM guidance and approximately 100% of the area scanned. The instrumentation used for the survey along with the MDC values are listed in **Table 2-1 Attachment 2**.

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Table 1, Survey Unit Design Parameters

Evaluation Input Values		Comments
Survey Package:	F830	Hot Cell
Survey Unit:	006	
Class	1	
SU Area (m ²)	8	
Evaluator:	JR	
DCGL _w :	43,000	Gross Activity DCGL
Area Factor	3.3	Class 1
Design DCGL _{emc} (dpm/100cm ²):	141,900	Class 1
LBGR:	141,900	Default = 50% DCGL
Sigma:	740	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):	8	
Scan Coverage (%)	100%	Class 1
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:	29.0	
Relative Shift Used:	3.0	Uses 3.0 if Relative Shift >3
N-Value:	11	
N-Value+20%:	14	

Survey Results:

A total of 15 direct measurements were made in F8300061. 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.

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Table 2, Static Measurement Results

Number	Sample #	Beta (cpm)	Beta (dpm)
1	F8300061X00001	364	2,758
2	F8300061X00002	396	3,000
3	F8300061X00003	425	3,220
4	F8300061X00004	362	2,742
5	F8300061X00005	350	2,652
6	F8300061X00006	435	3,295
7	F8300061X00007	605	4,583
8	F8300061X00008	397	3,008
9	F8300061X00009	414	3,136
10	F8300061X00010	314	2,379
11	F8300061X00011	362	2,742
12	F8300061X00012	282	2,136
13	F8300061X00013	357	2,705
14	F8300061X00014	423	3,205
15	F8300061X00015	407	3,083

Table 3 contains the statistical summary of the static measurement data for the Hot Cell.

Table 3, Beta Summary Statistics

<i>Beta Static Hot Cell</i>	
Mean	2,976
Median	3,000
Standard Deviation	550
Minimum	2,136
Maximum	4,583
Count	15

Survey Unit Data Assessment:

The survey design required 15 static measurements located based upon professional judgment. Following the guidance in MARSSIM Section 4.6, these values are compared directly to the DCGL_w.

The comparison and the results are presented in **Table 4**. The sample mean and median values were less than the DCGL.

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Table 4, Data Assessment Results

Static Data Values		Comments
Number of Samples:	15	
Median:	3,000	
Mean:	2,976	
Static Data Standard Deviation:	550	
Maximum:	4,583	
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 1 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 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 1 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.

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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.

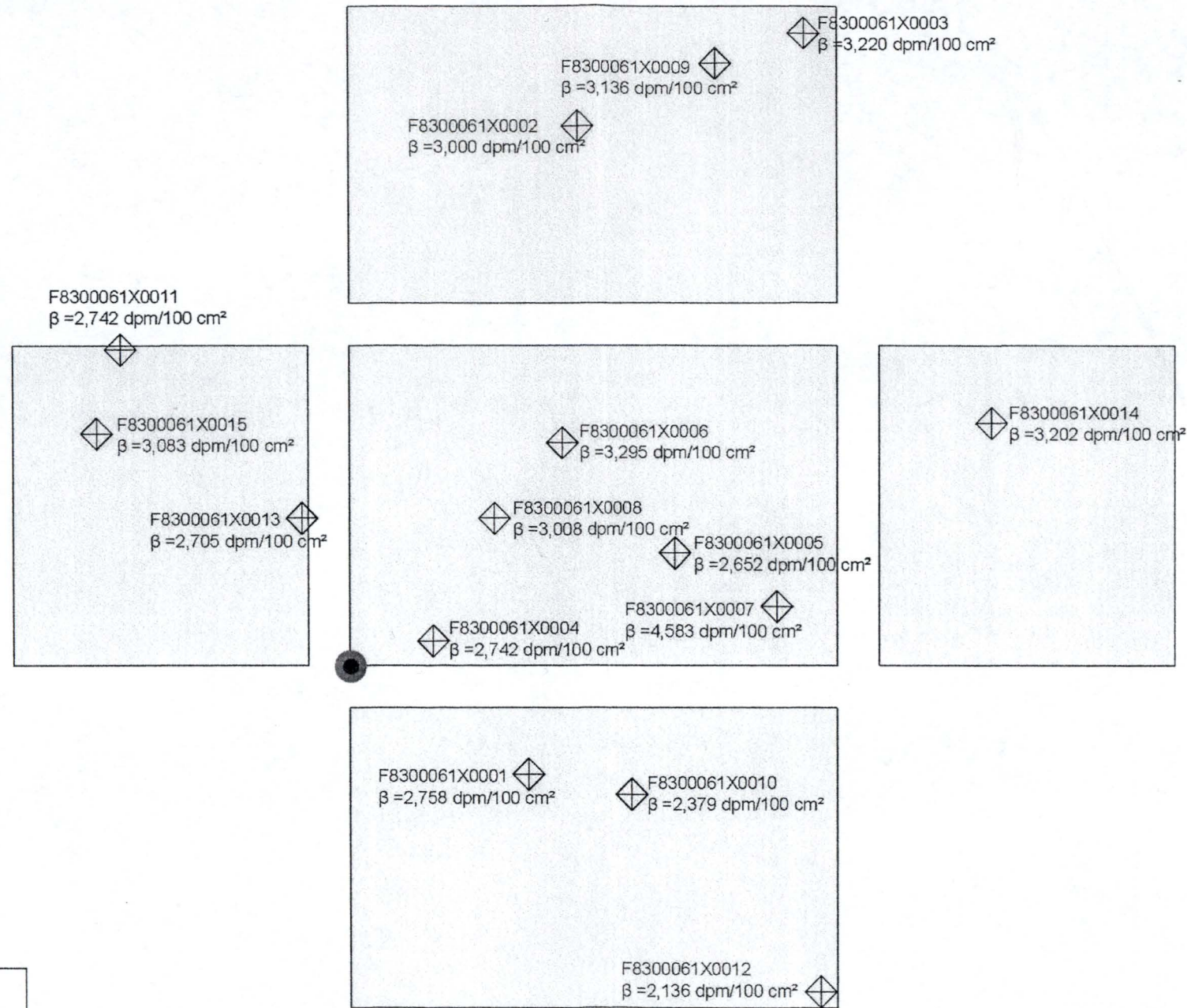
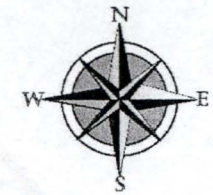
It is concluded that survey unit F8300061 meets the release criteria of 10CFR20.1402.

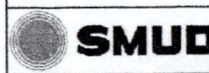
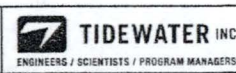
Attachment 1

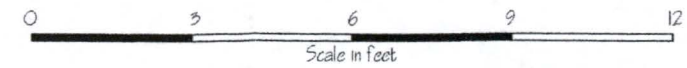
Maps

January 30, 2017

Survey Unit F8300061



 	
DAW BAY - HOT CELL	
Contract No.: 4500091426	SMUD
Location: Rancho Seco	Approved by:
Task: Final Status Survey	
Drawing No.: I05B Final Status Survey	
Description: HOT CELL	
Drawn By: C Gray	
QC'd: J Reese	Approval date:
Date: 01262017	
Rev No.:	



Attachment 2
Instrumentation
January 25, 2017
Survey Unit F83000061

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 – 466 dpm/100 cm ²	13.2%	317897/331972 2/10/17
	Ludlum Model 44-116 B Detector			
Swipe Measurements	Ludlum Model 2929 Ludlum Model 44-10-1	Beta – 74.5 dpm/100 cm ²	43.4%	182597/188736 5/13/17

^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

Beta Survey Type
PR331972 Detector Number
158 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 466 dpm/100 cm²

Attachment 3
Investigation
January 30, 2017
Survey Unit F8300061

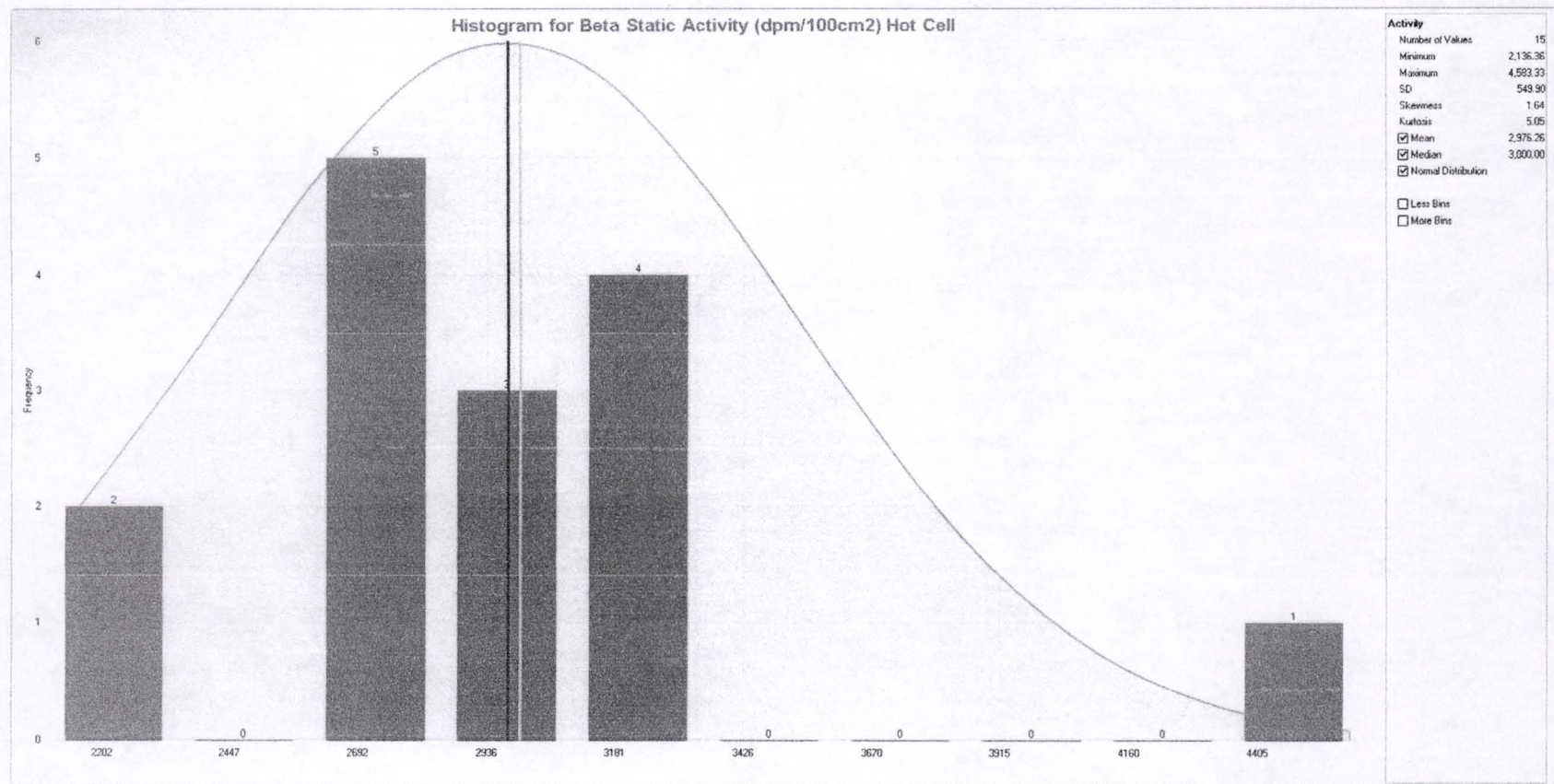
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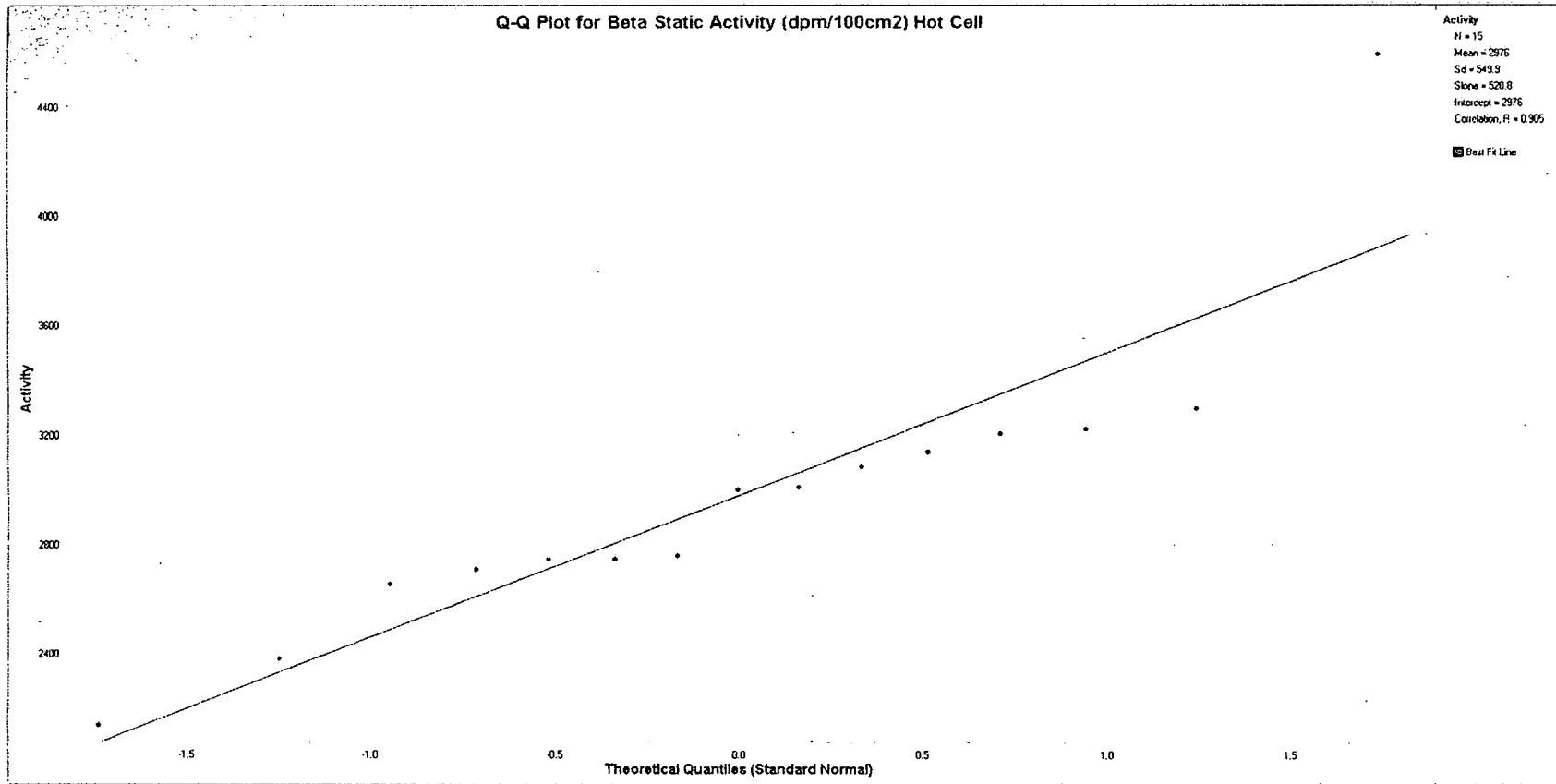
Attachment 4

Data Assessment

January 25, 2017

Survey Unit F8300061





IOSB Final Status Survey																												
	LC1	LC2	LC3	LC4	LC6	LC5		β CPM	β dpm	Date/Time of Count		Sample Comments																
1	F830	006	1	C	00001	SM	Hot Cell	49	10	11/01/16	1210																	
2	F830	006	1	C	00002	SM	Hot Cell	53	20	11/01/16	1211																	
3	F830	006	1	C	00003	SM	Hot Cell	50	13	11/01/16	1212																	
4	F830	006	1	C	00004	SM	Hot Cell	58	31	11/01/16	1214																	
5	F830	006	1	C	00005	SM	Hot Cell	44	-1	11/01/16	1215																	
6	F830	006	1	C	00006	SM	Hot Cell	47	6	11/01/16	1216																	
7	F830	006	1	C	00007	SM	Hot Cell	53	20	11/01/16	1217																	
8	F830	006	1	C	00008	SM	Hot Cell	53	20	11/01/16	1219																	
9	F830	006	1	C	00009	SM	Hot Cell	52	17	11/01/16	1220																	
10	F830	006	1	C	00010	SM	Hot Cell	59	33	11/01/16	1221																	
11	F830	006	1	C	00011	SM	Hot Cell	47	6	11/01/16	1222																	
12	F830	006	1	C	00012	SM	Hot Cell	49	10	11/01/16	1224																	
13	F830	006	1	C	00013	SM	Hot Cell	51	15	11/01/16	1225																	
14	F830	006	1	C	00014	SM	Hot Cell	62	40	11/01/16	1226																	
15	F830	006	1	C	00015	SM	Hot Cell	42	-6	11/01/16	1227																	
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																												
<table border="1"> <thead> <tr> <th></th> <th>efficiency</th> <th>bkg rate</th> <th>bkg count time</th> <th>MDA</th> </tr> </thead> <tbody> <tr> <td>α</td> <td>0.364</td> <td></td> <td></td> <td>#DIV/0!</td> </tr> <tr> <td>β</td> <td>0.434</td> <td>44.5 cpm</td> <td>1 min</td> <td>74.5 dpm per area</td> </tr> </tbody> </table>															efficiency	bkg rate	bkg count time	MDA	α	0.364			#DIV/0!	β	0.434	44.5 cpm	1 min	74.5 dpm per area
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Tech A Sign/ Date		<i>Joe Norris / 12-2-16</i>																										
Tech B Sign/ Date		N/A																										