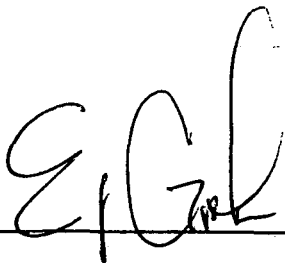
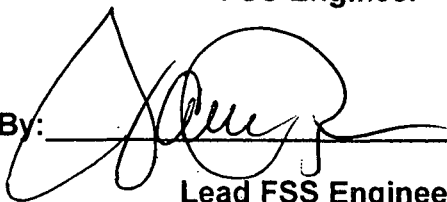


Rancho Seco  
Final Status Survey Summary Report  
January 5, 2017  
IOSB DAW Staging Bay Class 1  
Survey Unit F8300031

Prepared By:  Date: 1.6.17  
FSS Engineer

Reviewed By:  Date: 1.6.17  
Lead FSS Engineer

Approved By:  Date: 1/10/2017  
Manager, Rancho Seco Assets

## FINAL STATUS SURVEY F8300031

### Survey Unit:

F8300031, Interim Onsite Storage Building (IOSB) DAW Staging Bay Class 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), the IOSB contained and possibly stored media of many types, including filters, resins, contaminated chemicals, DAW, activated reactor components, contaminated plant components and other contaminated items.

Site Characterization: Based upon the scanning results of the DAW Staging Bay, two elevated areas were identified on the floor. One of these areas exceeded the  $DCGL_w$  but not the  $DCGL_{EMC}$ . This area required remediation. The other area did not exceed the  $DCGL_w$ . The DAW Staging bay was divided into a small Class 1 Survey Unit, buffered by a Class 2 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  $10 \text{ m}^2$  or land areas less than  $100 \text{ m}^2$ . 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 one square meter ( $0.74 \text{ m}^2$ ).

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 100% 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 F8300031**

**Table 1, Survey Unit Design Parameters**

Evaluation Input Values		Comments
Survey Package:	F830	DAW Staging Bay Class 1
Survey Unit:	03	
Class	01	
SU Area (m <sup>2</sup> )	01	
Evaluator:	JR	
DCGL <sub>w</sub> :	43,000	Gross Activity DCGL
Area Factor	15	DTBD-05-003
Design DCGL <sub>emc</sub> (dpm/100cm <sup>2</sup> ):	640,700	
DCGL <sub>emc</sub> :	640,700	
LBGR:	21,500	Default = 50% DCGL
Sigma:	598	Scoping Survey Data
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	From 10/26/16 Survey
Total Area Scanned (m <sup>2</sup> ):	0.74	
Scan Coverage (%)	100%	Class 1
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:	35.9	
Relative Shift Used:	3.0	Uses 3.0 if Relative Shift >3
N-Value:	5	Values selected based upon Judgement
N-Value+20%:	5	Values selected based upon Judgement

## FINAL STATUS SURVEY F8300031

### Survey Results:

A total of 5 direct measurements were made in F8300031. 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	F8300031C00001	288	2,233
2	F8300031C00002	304	2,357
3	F8300031C00003	305	2,364
4	F8300031C00004	282	2,186
5	F8300031C00005	509	3,946

**Table 3** contains the statistical summary of the static measurement data for the DAW Staging Bay Class 1.

**Table 3, Beta Summary Statistics**

<i>Beta Static DAW Staging Bay Class 1</i>	
Mean	2,617
Median	2,357
Standard Deviation	747
Minimum	2,186
Maximum	3,946
Count	5

### Survey Unit Data Assessment:

The survey design required 5 static measurements based upon the size of the survey unit (0.74 m<sup>2</sup>). Following the guidance in MARSSIM Section 4.6, these values are compared directly to the DCGL<sub>w</sub>. The data collected from location F8300031C00005 while less than 10% of the DCGL<sub>w</sub> was collected over a crevice. In order to evaluate the effect of the crevice on the resulting data, the guidance contained in Section 6.2 of DTBD 06-006 was followed and a follow up evaluation was performed using a gamma sensitive sodium iodide detector (Ludlum model 44-10). The results of the investigation confirmed no levels of residual radioactivity in excess of the DCGL. **Attachment 3** contains the results of the investigation.

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

# FINAL STATUS SURVEY F8300031

## Table 4, Data Assessment Results

Static Data Values		Comments
Number of Samples:	5	
Median:	2,357	
Mean:	2,617	
Static Data Standard Deviation:	747	
Maximum:	3,946	
Criteria Satisfaction		Comments
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> :	Pass	
Sign test results:	N/A	
Final Status		Comments
The survey unit passes all conditions:	Pass	

### Survey Unit Investigations and Results:

An investigation was required for follow up to direct beta measurement F8300031C00005 to evaluate response in relation to a crevice. The results are contained in Attachment 3.

### 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 greater than the characterization data used for survey design. However, 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. Investigation, performed per Attachment 3 results were less than the DCGL.

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.

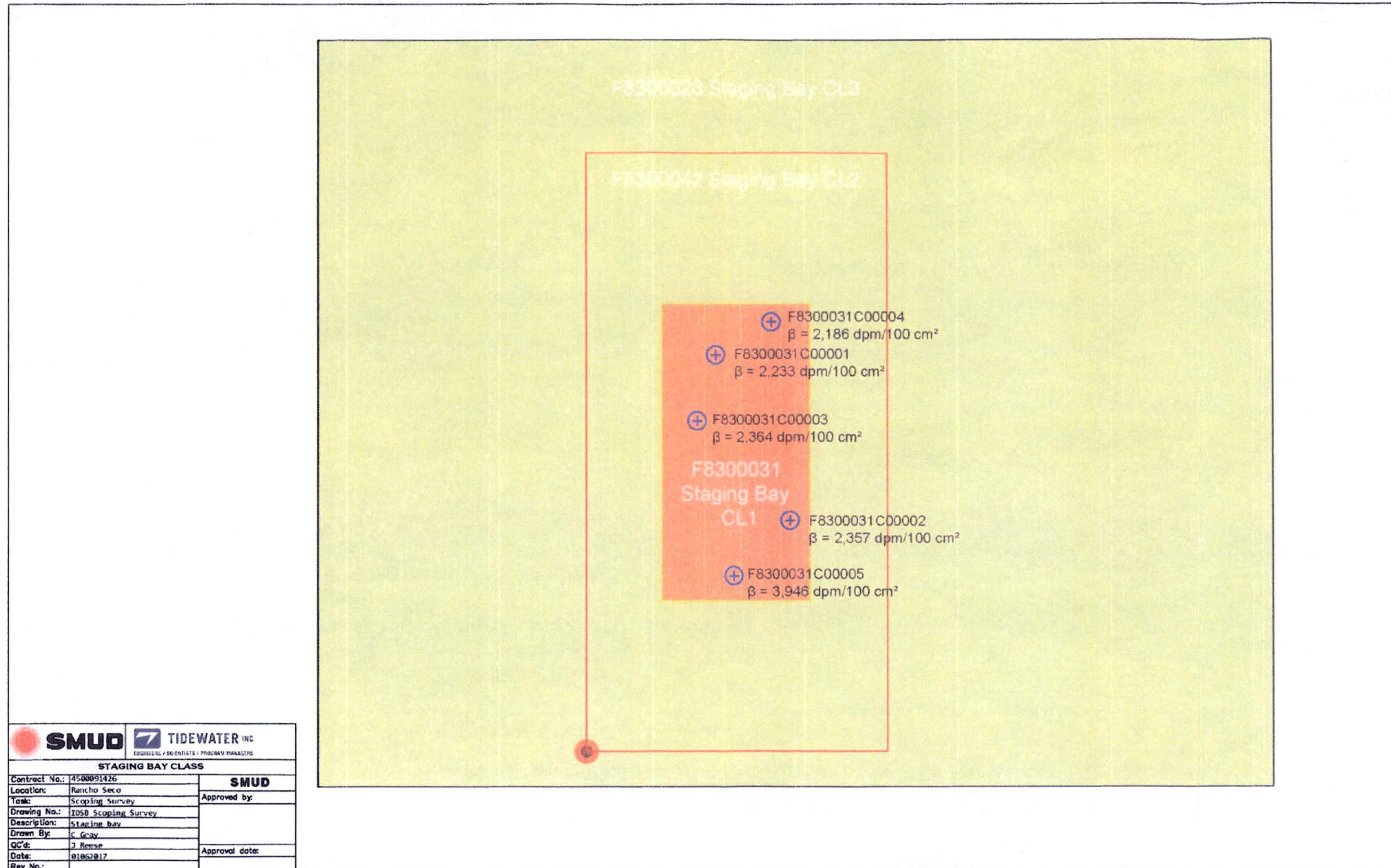
It is concluded that survey unit F8300031 meets the release criteria of 10CFR20.1402.



**Attachment 1**

**Maps**

**January 6, 2017**

**Survey Unit F8300031**



			
<small>ENGINEERING / SCIENTISTS / PROGRAM MANAGERS</small>			
<b>STAGING BAY CLASS</b>			
Contract No.:	4500091426	<b>SMUD</b>	
Location:	Rancho Seco	Approved by:	
Task:	Scoping Survey		
Drawing No.:	I05B Scoping Survey		
Description:	Staging bay		
Drawn By:	C Gray		
QC'd:	J Reese		
Date:	01/05/2017	Approval date:	
Rev No.:			

**Attachment 2**

**Instrumentation**

**January 5, 2017**

**Survey Unit F8300031**



**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	Beta – 454 dpm/100 cm <sup>2</sup>	12.9%	317899/331973 2/10/17
	Ludlum Model 44-116 B Detector			
Swipe Measurements	Ludlum Model 2929 Ludlum Model 44-10-1	Beta – 78 dpm/100 cm <sup>2</sup>	43.4%	182597/188736 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  
PR331973 Detector Number  
143 Background count rate (cpm)  
1 Count Time (min)  
0.129 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: Br Background Countrate  
t Count Time (min)  
E Efficiency  
A Area of detector (cm<sup>2</sup>)

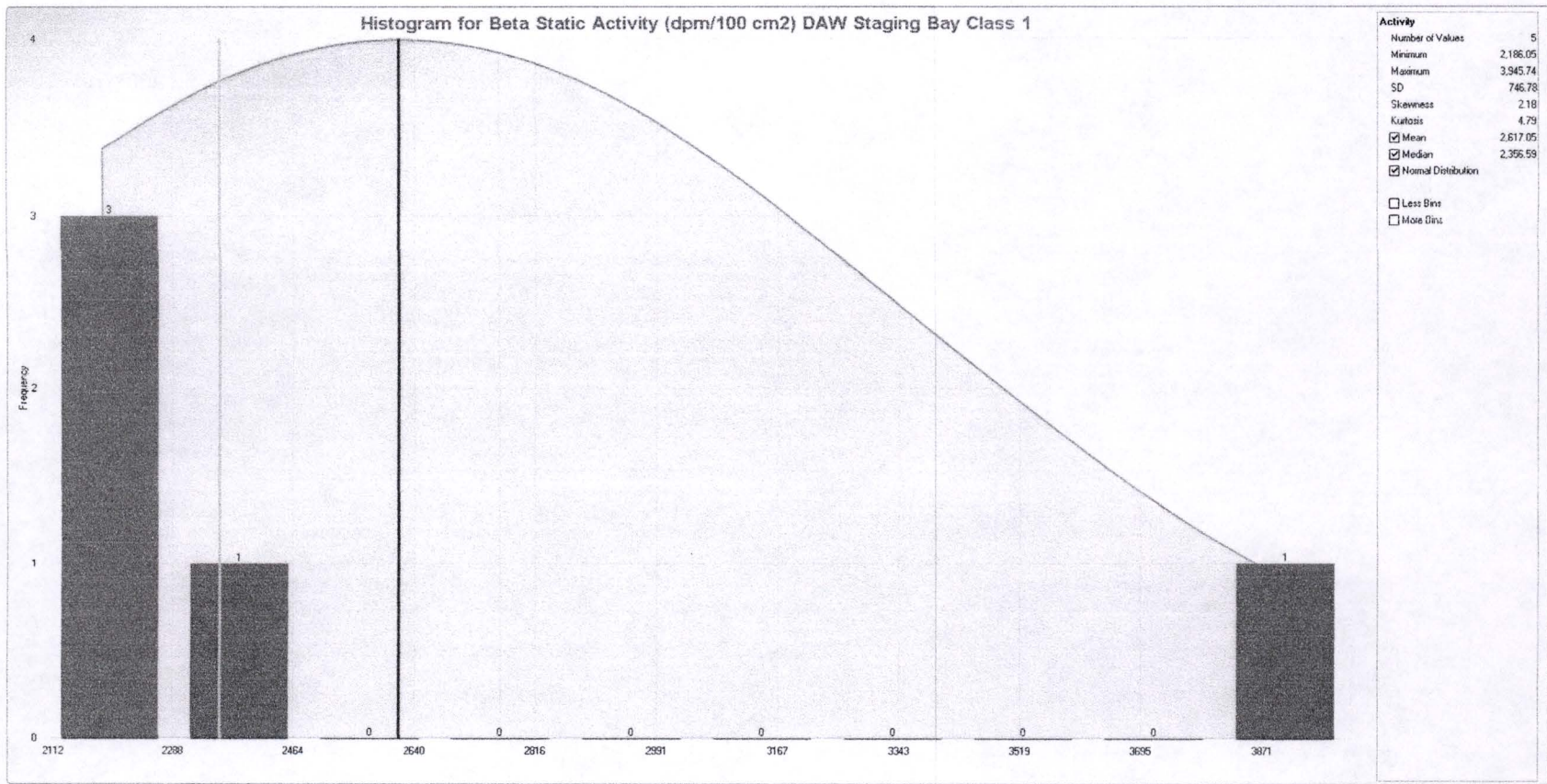
Static MDA 454 dpm/100 cm<sup>2</sup>

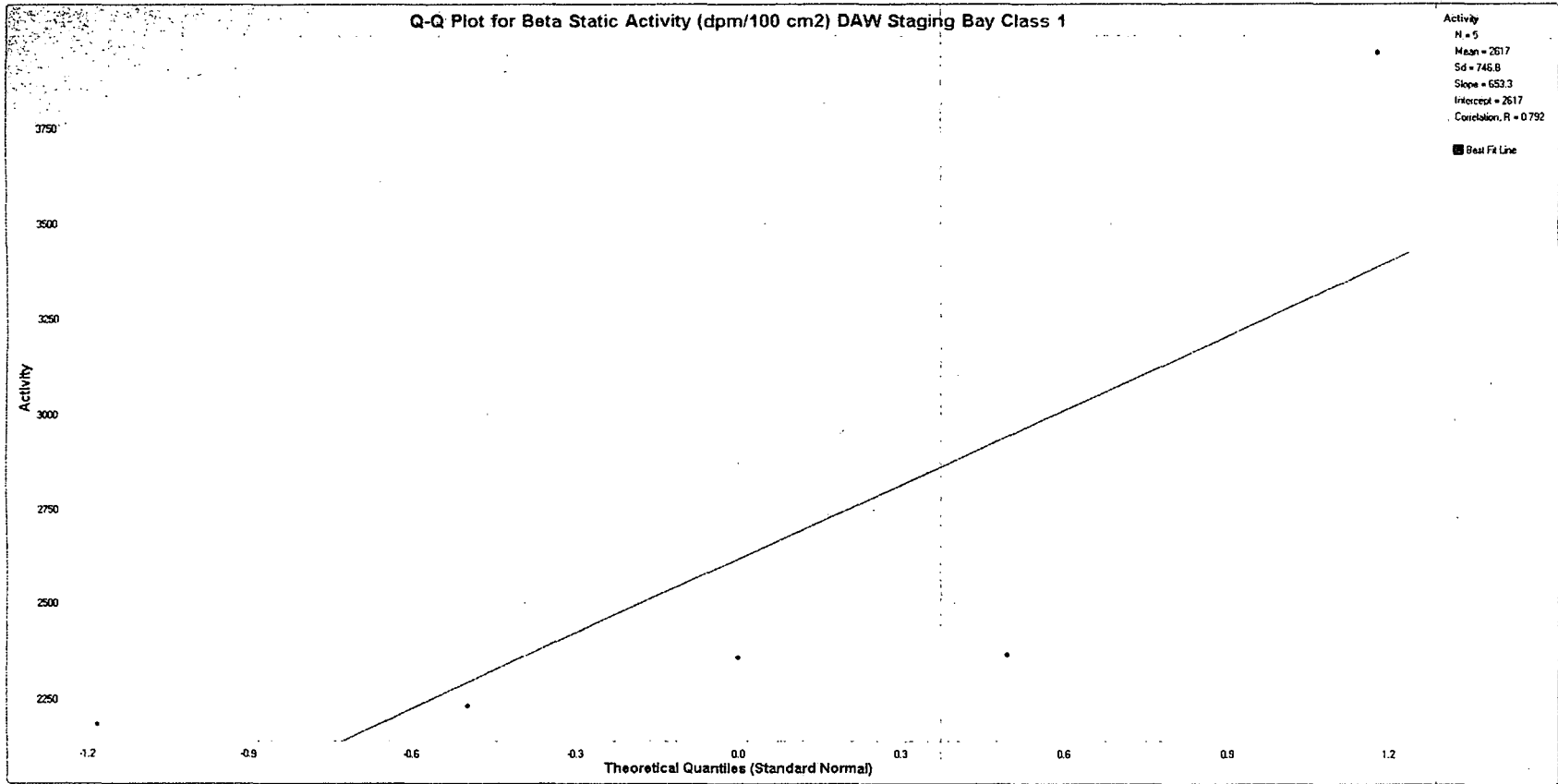
**Attachment 3**  
**Investigation**  
**January 5, 2017**  
**Survey Unit F8300031**

**Final Status Survey Data Investigation/Evaluation**

FSS Package No.	X8300031	Date:	11-29-2016
Location/Description:	F8300031 IOSB Stage Bay CLASS 1 post remediation		
Instrumentation Involved: (include serial numbers) N/A			
<p><b>Data Investigation:</b></p> <p><u>REASON:</u></p> <p>During execution of F8300031, an elevated static (BD- beta direct) measurement above a floor crevice in the IOSB Staging Bay CLASS 1 resulted at location F8300031C00005.</p> <p>These instructions will provide the data necessary to properly evaluate this elevated measurement location.</p> <p><u>SURVEY INSTRUCTIONS:</u></p> <p>Using a calibrated 2350-1 and 44-10 (2"x2" sodium iodide) detector, obtain a one minute gamma direct (GD) measurement in the same location (F8300031C00005) as the elevated beta direct measurement obtained in the execution of package F8300031.</p>			
<p><b>Data Evaluation and Investigation Resolution:</b></p> <p>1. Log the results of the GD measurement below along with instrument and detector serial number, calibration due date and the 2350-1 download file name.</p> <p>2. Sign and date performance of the survey.</p> <p>REFERENCE: Per section 6.2 of DTBD-06-006 elevated measurements will be investigated with 44-10 detector, collimated to a 20,000 cpm criterion.</p> <p align="right"><i>EGL</i> 11/29/16</p> <p align="center"><u>INVESTIGATION LOCATION ID F830003C00005</u></p> <p>RESULTS: <u>9640</u> gross counts. <u>9120</u> bkg counts. <u>20161129-133100</u> download file name</p> <p>2350-1 S/N <u>317892</u> Detector S/N <u>208816</u> Cal due date <u><del>2/10/17</del> 12/29/16</u> or <u>11/29/16</u></p> <p>PERFORMED BY:</p> <p><u><i>H. Shales</i></u> <u>11/29/16</u> <u>N/A</u> <u>N/A</u></p> <p align="center">Technician A                      Date                      Technician B                      Date</p>			
Based on the above resolution, the survey data is determined to be:		<input checked="" type="checkbox"/> <b>Acceptable for use and inclusion in FSS Package</b> <input type="checkbox"/> <b>Not Acceptable for use</b>	
Prepared by:	<i>EGL</i>	FSSE	Date 11-29-2016
Reviewed by:	<i>J. [Signature]</i>	LFSSRE	Date 11-29-2016

**Attachment 4**  
**Data Assessment**  
**January 5, 2017**  
**Survey Unit F8300031**





Smear\_Data\_Calculation\_Sheet\_101316

IOSB Final Status Survey												
	LC1	LC2	LC3	LC4	LC6	LC5		$\beta$ CPM	$\beta$ dpm	Date/Time of Count		Sample Comments
1	F830	003	1	C	00001	SM	Stage Bay Floor	48	-1	11/29/16	1109	
2	F830	003	1	C	00002	SM	Stage Bay Floor	48	-1	11/29/16	1111	
3	F830	003	1	C	00003	SM	Stage Bay Floor	51	6	11/29/16	1112	
4	F830	003	1	C	00004	SM	Stage Bay Floor	38	-24	11/29/16	1113	
5	F830	003	1	C	00005	SM	Stage Bay Floor	45	-8	11/29/16	1115	
6	F830	003	1	C	00006	SM	Stage Bay Floor	X	X	X	X	
7	F830	003	1	C	00007	SM	Stage Bay Floor	X	X	X	X	
8	F830	003	1	C	00008	SM	Stage Bay Floor	X	X	X	X	
9	F830	003	1	C	00009	SM	Stage Bay Floor	X	X	X	X	
10	F830	003	1	C	00010	SM	Stage Bay Floor	X	X	X	X	
11	F830	003	1	C	00011	SM	Stage Bay Floor	X	X	X	X	
12	F830	003	1	C	00012	SM	Stage Bay Floor	X	X	X	X	
13	F830	003	1	C	00013	SM	Stage Bay Floor	X	X	X	X	
14	F830	003	1	C	00014	SM	Stage Bay Floor	X	X	X	X	
15	F830	003	1	C	00015	SM	Stage Bay Floor	X	X	X	X	
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	cpm	min	#DIV/0!
							Cal Due Date: 5/13/2017	$\beta$	0.434	48.5 cpm	1 min	77.6 dpm per area
Tech A Sign/ Date <i>Joe Morris</i> 12-2-16												
Tech B Sign/ Date N/A												