Rancho Seco

Final Status Survey Summary Report

January 30, 2017

IOSB Outside Area Class 2

Survey Unit F8300142

Prepared By: _____ Date: 1.30.17

FSS Engineer

Reviewed By: _____ Date: 1.30.17

Lead FSS Engineer

Approved By: _____ Date: 2/23/17

Manager, Rancho Seco Assets

Survey Unit:

F8300142, Interim Onsite Storage Building (IOSB) Outside Area Class 2

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 possibly stored media of many types, including filters, resins, contaminated chemicals, DAW, activated reactor components, contaminated plant components and other contaminated items. The outside asphalt area at times held waste ready to ship in storage containers and a respiratory cleaning facility.

Site Characterization: Based upon the scanning results of the outside asphalt area an elevated area was identified on the asphalt next to the IOSB. Certain spots in the area exceeded the $DCGL_w$ but not the $DCGL_{EMC}$. The area required remediation. The Outside area was divided into a small Class 1 Survey Unit, buffered by a Class 2 Survey Unit. The remainder of the outside asphalt was designated as a Class 3 Survey Unit and is the subject of a separate report.

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 m^2 or land areas less than 100 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 ten square meters (1.85 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 determined by 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.**

Table 1, Survey Unit Design Parameters

Evaluation Input Values		Comments
Survey Package:	**F830**	Outside Asphalt Class 2
Survey Unit:	**014**	
Class	**2**	
SU Area (m^2)	**1.85**	
Evaluator:	JR	
$DCGL_w$:	43,000	Gross Activity DCGL
Area Factor	NA	Class 2
Design DCGLemc ($dpm/100cm^2$):	NA	Class 2
$DCGL_{emc}$:	NA	Class 2
LBGR:	21,500	Default = 50% DCGL
Sigma:	513	
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):	1.85	
Scan Coverage (%)	100%	Class 2
Material Type:	N/A	Choosing 'N/A' sets material background to "0"
Calculated Values		**Comments**
$Z_{1-\alpha}$:	1.645	
$Z_{1-\beta}$:	1.645	
Sign p:	0.99865	
Calculated Relative Shift:	41.9	
Relative Shift Used:	3.0	Uses 3.0 if Relative Shift >3
N-Value:	10	Values selected based upon Judgement
N-Value+20%:	NA	Values selected based upon Judgement

Survey Results:

A total of 10 direct measurements were made in F8300142. 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.

Table 2, Static Measurement Results

Number	Sample #	Beta (cpm)	Beta (dpm)
1	F8300142A00001	266	2,015
2	F8300142A00002	316	2,394
3	F8300142A00003	345	2,614
4	F8300142A00004	340	2,576
5	F8300142A00005	320	2,424
6	F8300142A00006	373	2,826
7	F8300142A00007	350	2,652
8	F8300142A00008	369	2,795
9	F8300142A00009	373	2,826
10	F8300142A00010	343	2,598

Table 3 contains the statistical summary of the static measurement data for the Outside Area Class 2.

Table 3, Beta Summary Statistics

Beta Static Outside Asphalt Class 2	
Mean	2,572
Median	2,606
Standard Deviation	247
Minimum	2,015
Maximum	2,826
Count	10

Survey Unit Data Assessment:

The survey design was based upon professional judgement and resulted in 10 static measurements. 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.

Table 4, Data Assessment Results

Static Data Values		Comments
Number of Samples:	10	
Median:	2,606	
Mean:	2,572	
Static Data Standard Deviation:	247	
Maximum:	2,826	
Sign Test Results		**Comments**
Adjusted N Value:	10	
S+ Value:	10	
Critical Value:	NA	
Criteria Satisfaction		**Comments**
Sufficient samples collected:	Pass	
Maximum value <$DCGL_W$:	Pass	
Median value <$DCGL_W$:	Pass	
Mean value <$DCGL_W$:	Pass	
Maximum value <$DCGL_{EMC}$:	NA	
Sign test results:	NA	
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 2 survey and the sample results are consistent with that classification. 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 2 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.

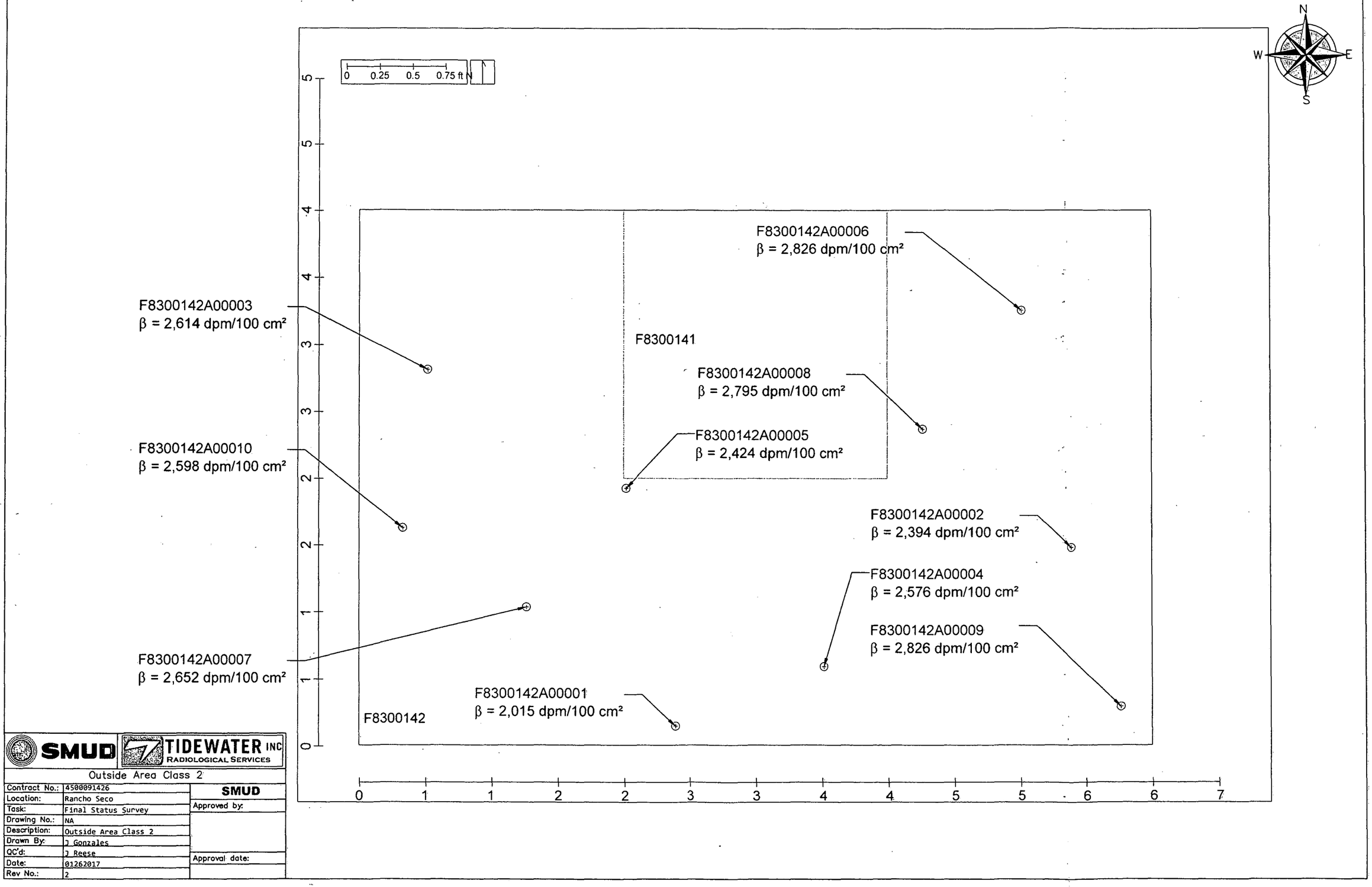
It is concluded that survey unit F8300142 meets the release criteria of 10CFR20.1402.

Attachment 1

Maps

January 30, 2017

Survey Unit F8300142



SMUD | TIDEWATER INC RADIOLOGICAL SERVICES

Outside Area Class 2

Contract No.:	4500091426	SMUD
Location:	Rancho Seco	Approved by:
Task:	Final Status Survey	
Drawing No.:	NA	
Description:	Outside Area Class 2	
Drawn By:	J Gonzales	
QC'd:	J Reese	Approval date:
Date:	01262017	
Rev No.:	2	

Attachment 2

Instrumentation

January 30, 2017

Survey Unit F83000142

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 – 522 dpm/100 cm^2	13.2%	317897/331972 2/10/17

[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.

cm^2 = square centimeters
cpm = counts per minute
dpm = disintegrations per minute

Static Measurement MDA

Beta	Survey Type
PR331972	Detector Number
201	Background count rate (cpm)
1	Count Time (min)
0.132	Efficiency
100	Area of Detector (cm^2)

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 (cm^2)

Static MDA	522	dpm/100 cm^2

Attachment 3

Investigation

January 30, 2017

Survey Unit F8300142

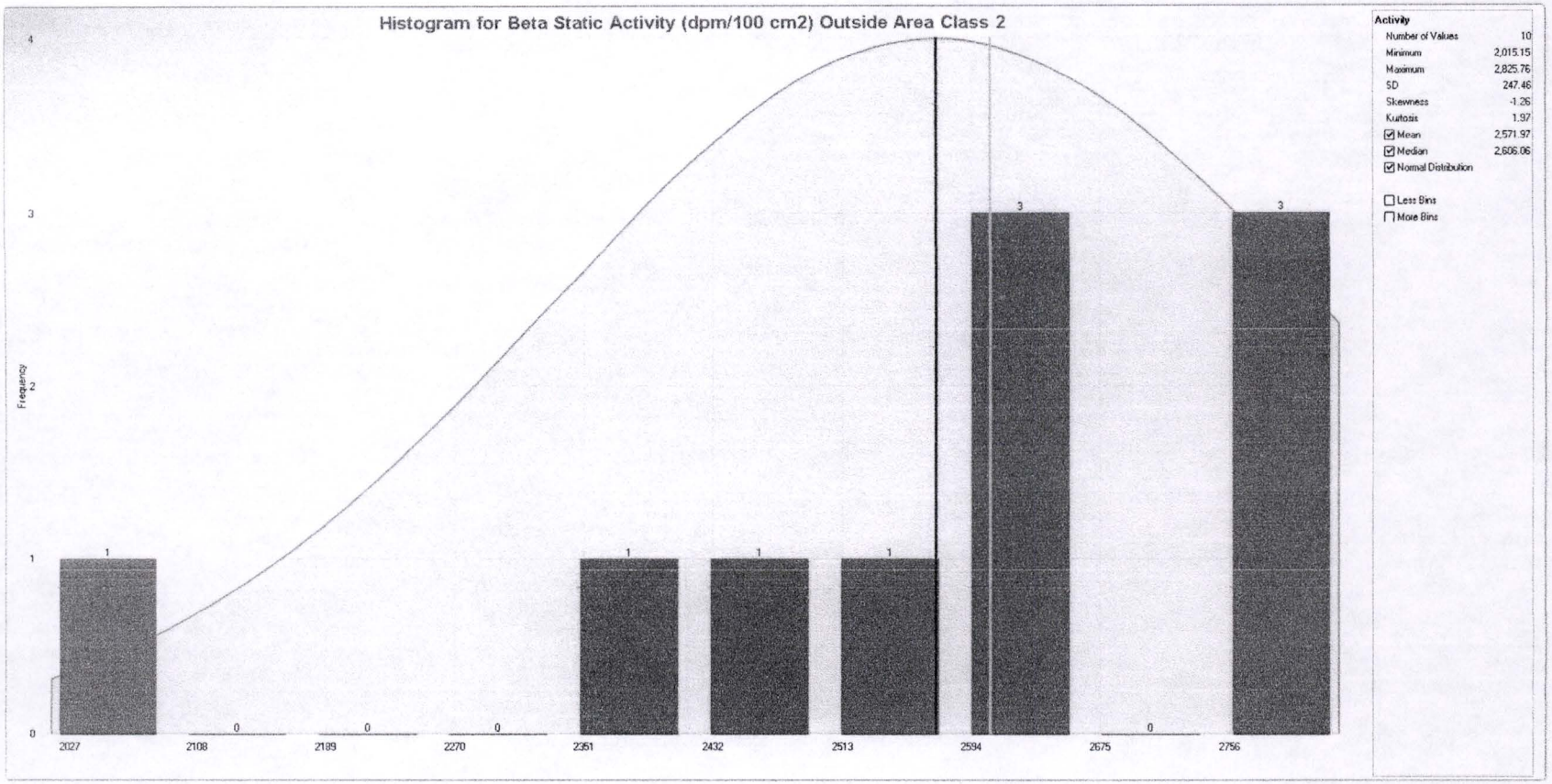
(none)

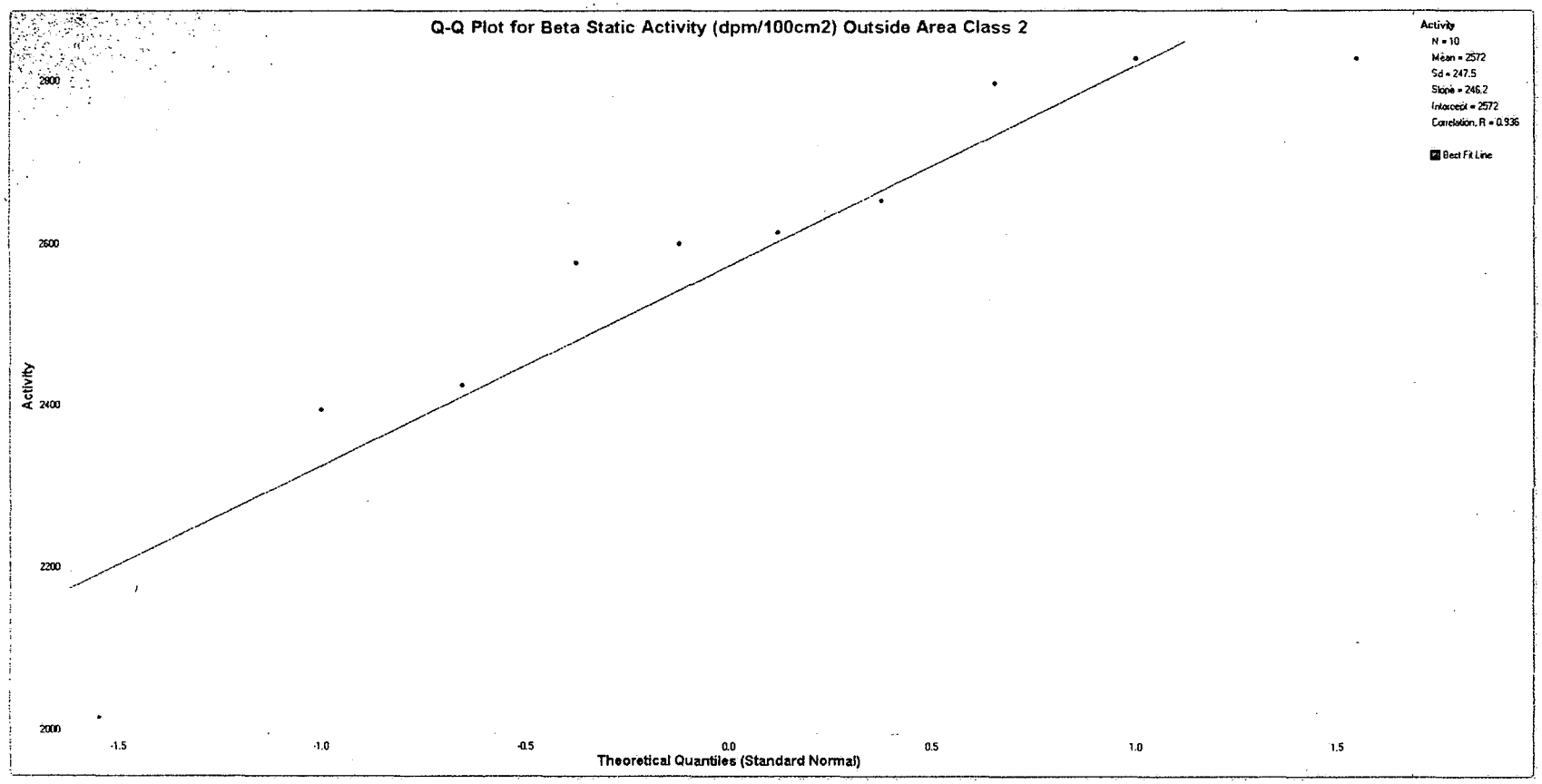
Attachment 4

Data Assessment

January 30, 2017

Survey Unit F8300142


Histogram for Beta Static Activity (dpm/100 cm2) Outside Area Class 2
Frequency
0
1
2
3
4
1
0
0
0
1
1
1
3
0
3
2027
2108
2189
2270
2351
2432
2513
2594
2675
2756
Activity
Number of Values 10
Minimum 2,015.15
Maximum 2,825.76
SD 247.46
Skewness -1.26
Kurtosis 1.97
Mean 2,571.97
Median 2,606.06
Normal Distribution
Less Bins
More Bins


Q-Q Plot for Beta Static Activity (dpm/100cm2) Outside Area Class 2
Activity
N = 10
Mean = 2572
Sd = 247.5
Slope = 246.2
Intercept = 2572
Correlation, R = 0.936
Best Fit Line
2800
2600
2400
2200
2000
Activity
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
Theoretical Quantiles (Standard Normal)