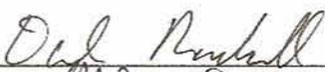
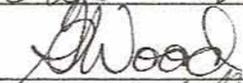


Survey Unit Release Record

Design #	EP-Rx 043	Revision #	Original	Page 1 of 3
Survey Unit #(s)	Rx 043			
Description	<p>1) Embedded Pipe (EP) Survey Unit Rx 043 meets the definition of embedded pipe for Plum Brook Reactor Facility (PBRF).</p> <p>2) EP Rx 043 is a Class 1, Group 1 survey unit as per the PBRF Final Status Survey Plan (FSSP) and Technical Basis Document (TBD)-06-004.</p> <p>3) Surveys in EP Rx 043 were performed using a scintillation detector optimized to measure gamma energies representative of Co-60. Sample #EP 3-1 from Survey Request (SR)-13 was referenced for this decision.</p> <p>4) Survey Instructions for this survey unit are incorporated into and performed in accordance with (IAW) the Babcock Services Incorporated (BSI)/LVS-002, Work Execution Package (WEP) 05-006. Survey instructions described in this document constitute "Special Methods" and the survey design used in the acquisition of survey measurements.</p> <p>5) Instrument efficiency determinations are developed in accordance with the BSI/LVS-002, WEP 05-006, these determinations are appropriate for the types of radiation involved and the media being surveyed.</p>			
Approval Signatures			Date:	
FSS/Characterization Engineer			10-30-07	
Technical Reviewer (FSS/Characterization Engineer)			11-5-07	
FSS/Characterization Manager	Fl. Case			11/2/07

Form
 CS-09/1
 Rev 0

Survey Unit: Rx 043

1.0 History/Description

- 1.1 The subject pipe system is a 6" service ring return line located on the -27' el. of the Rx building.
- 1.2 EP Rx 043 consists of 6" diameter piping that is approximately 46 feet in length.

2.0 Survey Design Information

- 2.1 EP Rx 043 was surveyed IAW Procedure #BSI/LVS-002.
- 2.2 100% of the 6" ID pipe was accessible for survey. The accessible 6" ID pipe was surveyed by static measurement at one foot increments, for a total of 46 survey measurements.
- 2.3 Surface area for the 6" ID piping is 1,459 cm² for each foot of piping, corresponding to a total 6" ID piping surface area of 67,129 cm² (6.7 m²) for the entire length of (approximately 46') of 6" piping.

3.0 Survey Unit Measurement Locations/Data

- 3.1 Pipe interior radiological survey forms are provided in Attachment 2 of this release record.

4.0 Survey Unit Investigations/Results

- 4.1 None

5.0 Data Assessment Results

- 5.1 Data assessment results are provided in the EP/Buried Pipe (BP) Survey Report provided in Attachment 1.
- 5.2 All measurement results are less than the Derived Concentration Guideline Level (DCGL) for radionuclide specific EP that corresponds to the 1 mrem/yr dose goal established in Table 3-3 of the FSSP.
- 5.3 When implementing the Unity Rule, provided in Section 3.6.3 of the FSSP, and applying the Nuclide Fraction (NF), provided in TBD-06-004, the survey unit that is constituted by EP Rx 043 passes FSS.
- 5.4 Background was not subtracted from the survey measurements and the Elevated Measurement Comparison (EMC) was not employed for this survey unit.

Survey Unit: Rx 043

5.5 Statistical Summary Table

Statistical Parameter	6" Pipe
Total Number of Survey Measurements	46
Number of Measurements >MDC	46
Number of Measurements Above 50% of DCGL	0
Number of Measurements Above DCGL	0
Mean	0.0489
Median	0.0480
Standard Deviation	0.0111
Maximum	0.0736
Minimum	0.0286

6.0 Documentation of evaluations pertaining to compliance with the unrestricted use limit of 25 mrem/yr and dose contributions from Embedded Pipe and radionuclides contributing 10% in aggregate of the total dose for both structural scenarios and soils.

6.1 A review of the survey results has shown that the dose contribution for EP Rx 043 to be less than 1 mrem/yr. The dose contribution is estimated to be 0.049 mrem/yr based on the average of the actual gross counts measured.

7.0 Attachments

Attachment 1 – BSI EP/BP Survey Report

Attachment 2 – Pipe Interior Radiological Survey Form

Attachment 3 – DQA Worksheet

Attachment 4 – Disc containing RR for EP Rx 043 & Spreadsheet

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ATTACHMENT 1
3 **PAGE(S)**



BSI EP/BP SURVEY REPORT

Pipe ID	EP Rx 043	Survey Location	service ring return -27' el.
Survey Date	13-Feb-06	2350-1 #	203488
Survey Time	08:55	Detector-Sled #	Bicron 1MG1/LVS-1/106
Pipe Size	6"	Detector Efficiency	0.0002
DCGL (dpm/100cm ²)	2.41E+05	Pipe Area Incorporated by Detector Efficiency (in cm ²)	1,459
Pipe Area Incorporated by Survey Data (m ²)	6.7	Field BKG (cpm)	20.2
Routine Survey	X	Field MDCR (cpm)	18.5
QA Survey		Nominal MDC (dpm/100cm ²)	3,393
Survey Measurement Results			
Total Number of Survey Measurements		46	
Number of Measurements >MDC		46	
Number of Measurements Above 50% DCGL		0	
Number of Measurements Above DCGL		0	
Mean		0.0489	
Median		0.0480	
Standard Deviation		0.0111	
Maximum		0.0736	
Minimum		0.0286	
Survey Technician(s)	ROSENHAGEN		
Survey Unit Classification		1	
TBD 06-004 Piping Group		1	
SR-13 Radionuclide Distribution Sample		EP 3-1	
Measured Nuclide		Co-60	
Area Factor/EMC Used		No	
Pass/Fail FSS		Pass	
MREM/YR Contribution		<1	
COMMENTS: ACTIVITY VALUES NOT BACKGROUND CORRECTED			
RP Engineer Date	<i>Paul Rindell 10-30-07</i>		

EP Rx 043
6" Pipe
TBD 06-004 Group 1

Measurement #	gcpm	ncpm	Co-60 activity (total dpm)	Co-60 activity (dpm/100cm ²)	Cs-137 activity (dpm/100cm ²)	Eu-152 activity (dpm/100cm ²)	Eu-154 activity (dpm/100cm ²)	Nb-94 activity (dpm/100cm ²)	Ag-108m activity (dpm/100cm ²)	Unity
1	24	24	120,000	8,223	326	7,800	2,074	240	57	0.049
2	18	18	90,000	6,167	244	5,850	1,555	180	43	0.037
3	23	23	115,000	7,880	312	7,475	1,987	230	55	0.047
4	27	27	135,000	9,251	367	8,775	2,333	270	64	0.055
5	21	21	105,000	7,195	285	6,825	1,814	210	50	0.043
6	22	22	110,000	7,538	299	7,150	1,901	220	53	0.045
7	23	23	115,000	7,880	312	7,475	1,987	230	55	0.047
8	15	15	75,000	5,139	204	4,875	1,296	150	36	0.031
9	31	31	155,000	10,621	421	10,076	2,678	310	74	0.063
10	31	31	155,000	10,621	421	10,076	2,678	310	74	0.063
11	21	21	105,000	7,195	285	6,825	1,814	210	50	0.043
12	18	18	90,000	6,167	244	5,850	1,555	180	43	0.037
13	16	16	80,000	5,482	217	5,200	1,382	160	38	0.033
14	14	14	70,000	4,797	190	4,550	1,210	140	33	0.029
15	26	26	130,000	8,908	353	8,450	2,246	260	62	0.053
16	19	19	95,000	6,510	258	6,175	1,642	190	45	0.039
17	17	17	85,000	5,825	231	5,525	1,469	170	41	0.035
18	24	24	120,000	8,223	326	7,800	2,074	240	57	0.049
19	20	20	100,000	6,853	272	6,500	1,728	200	48	0.041
20	24	24	120,000	8,223	326	7,800	2,074	240	57	0.049
21	34	34	170,000	11,649	462	11,051	2,938	340	81	0.069
22	18	18	90,000	6,167	244	5,850	1,555	180	43	0.037
23	27	27	135,000	9,251	367	8,775	2,333	270	64	0.055
24	28	28	140,000	9,594	380	9,100	2,419	280	67	0.057
25	22	22	110,000	7,538	299	7,150	1,901	220	53	0.045
26	27	27	135,000	9,251	367	8,775	2,333	270	64	0.055
27	21	21	105,000	7,195	285	6,825	1,814	210	50	0.043
28	27	27	135,000	9,251	367	8,775	2,333	270	64	0.055
29	27	27	135,000	9,251	367	8,775	2,333	270	64	0.055
30	17	17	85,000	5,825	231	5,525	1,469	170	41	0.035
31	36	36	180,000	12,335	489	11,701	3,110	360	86	0.074

EP Rx 043
6" Pipe
TBD 06-004 Group 1

Measurement #	gcpm	ncpm	Co-60 activity (total dpm)	Co-60 activity (dpm/100cm2)	Cs-137 activity (dpm/100cm2)	Eu-152 activity (dpm/100cm2)	Eu-154 activity (dpm/100cm2)	Nb-94 activity (dpm/100cm2)	Ag-108m activity (dpm/100cm2)	Unity
32	24	24	120,000	8,223	326	7,800	2,074	240	57	0.049
33	31	31	155,000	10,621	421	10,076	2,678	310	74	0.063
34	26	26	130,000	8,908	353	8,450	2,246	260	62	0.053
35	23	23	115,000	7,880	312	7,475	1,987	230	55	0.047
36	33	33	165,000	11,307	448	10,726	2,851	330	79	0.067
37	27	27	135,000	9,251	367	8,775	2,333	270	64	0.055
38	18	18	90,000	6,167	244	5,850	1,555	180	43	0.037
39	30	30	150,000	10,279	407	9,751	2,592	300	72	0.061
40	23	23	115,000	7,880	312	7,475	1,987	230	55	0.047
41	23	23	115,000	7,880	312	7,475	1,987	230	55	0.047
42	34	34	170,000	11,649	462	11,051	2,938	340	81	0.069
43	25	25	125,000	8,566	339	8,125	2,160	250	60	0.051
44	28	28	140,000	9,594	380	9,100	2,419	280	67	0.057
45	18	18	90,000	6,167	244	5,850	1,555	180	43	0.037
46	19	19	95,000	6,510	258	6,175	1,642	190	45	0.039
									MEAN	0.049
									MEDIAN	0.048
									STD DEV	0.011
									MAX	0.074
									MIN	0.029

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ATTACHMENT 2
6 **PAGE(S)**

Pipe Interior Radiological Survey Form

Date: 2-13-06 Time: 0855
 Pipe ID#: (1.43) Rx043 Pipe Diameter: 6" Access Point Area: -27 TRENCH
 Building: REACTOR Elevation: -25 System: Service Ring Return
 Type of Survey Investigation _____ Characterization _____ Final Survey X Other ✓
 Gross _____ Co60 ✓ Cs _____
 Detector ID# / Sled ID# BIARON/IMG1/LVS-11 106
 Detector Cal Date: 12-20-05 Detector Cal Due Date: 12-20-06
 Instrument: 2350-1 Instrument ID #: 203488
 Instrument Cal Date: 17-NOV-05 Instrument Cal Due Date: 17-NOV-06

From the Daily Pipe Survey Detector Control Form for the Selected Detector

Background Value 20.2 cpm
 MDCR_{static} 18.5 cpm
 Efficiency Factor for Pipe Diameter 0.0002 (from detector efficiency determination)
 MDC_{static} 3393 dpm/ 100 cm²
 Is the MDC_{static} acceptable? Yes No (if no, adjust sample count time and recalculate MDCR_{static})
 Comments: INITIAL SURVEY

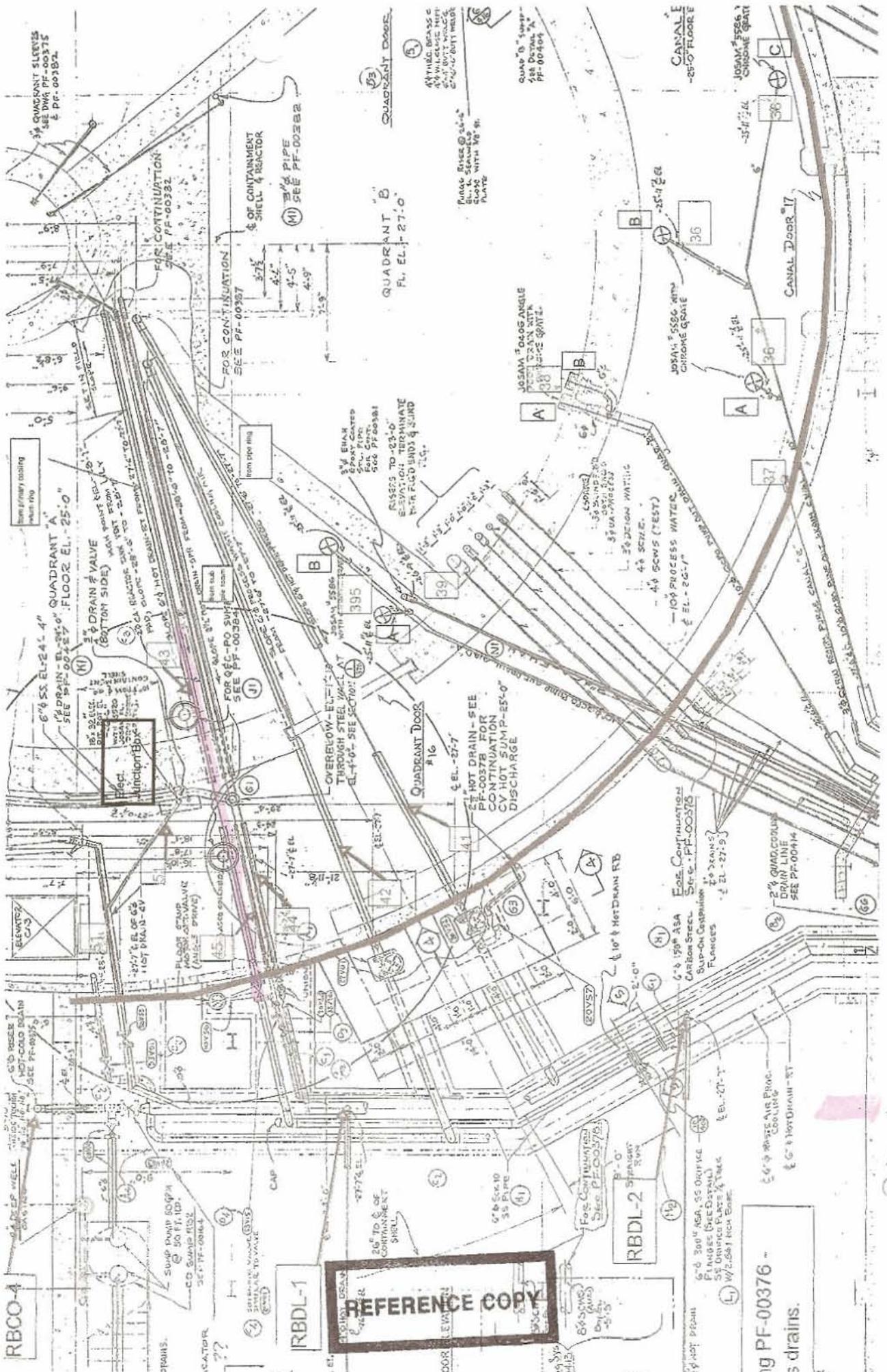
Technician Signature [Signature]

Pipe Interior Radiological Survey

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
1	1	1	24	24	n/a	n/a
2	2	↓	18	18	↓	↓
3	3		23	23		
4	4		27	27		
5	5		21	21		
6	6		22	22		
7	7		23	23		
8	8		15	15		
9	9		31	31		
10	10		31	31		

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s drains.

1" pipe
Surveyed
(1.43)
R2043

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Pipe Interior Radiological Survey Form

Date: 2-14-06 Time: 0830
 Pipe ID#: (1.43)RX043 Pipe Diameter: 6" Access Point Area: TRENCH
 Building: RX Elevation: -27 System: SERVICE RING RETURN
 Type of Survey Investigation _____ Characterization _____ Final Survey X Other X
 Gross _____ Co60 ✓ Cs _____
 Detector ID# / Sled ID# BICRON/MCE1/LVS-11 106
 Detector Cal Date: 12-20-05 Detector Cal Due Date: 12-20-06
 Instrument: 2350-1 Instrument ID #: 203488
 Instrument Cal Date: 11-17-05 Instrument Cal Due Date: 11-17-06

From the Daily Pipe Survey Detector Control Form for the Selected Detector

Background Value 21.3 cpm
 MDCR_{static} 18.9 cpm
 Efficiency Factor for Pipe Diameter 0.0002 (from detector efficiency determination)
 MDC_{static} 3393 dpm/ 100 cm²
 Is the MDC_{static} acceptable? (Yes) No (if no, adjust sample count time and recalculate MDCR_{static})
 Comments: CONTINUATION SURVEY COMPLETE

Technician Signature C. DeBRAUN

Pipe Interior Radiological Survey

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
1	26	1	27	27 net	net	net
2	27	1	21	21		
3	28	1	27	27		
4	29	1	27	27		
5	30	1	17	17		
6	31	1	36	36		
7	32	1	24	24		
8	33	1	31	31		
9	34	1	26	26		
10	35	1	23	23		

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REFERENCE COPY

Pipe Interior Radiological Survey Form (Continuation Form)

Date: 2-14-06
 Pipe ID#: (1.43) 2x 043 Pipe Diameter: 6" Access Point Area: TRENCH
 Building: 2x Elevation: -27 System: SERVICE RING RETURN

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
11	36	1	33	33	n/a	n/a
12	37	1	27	27		
13	38	1	18	18		
14	39	1	30	30		
15	40	1	23	23		
16	41	1	23	23		
17	42	1	34	34		
18	43	1	25	25		
19	44	1	28	28		
20	45	1	18	18		
21	46	1	19	19		
n/a						

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DQA Check Sheet

Design #	Rx 043	Revision #	Original	
Survey Unit #	Rx 043			

Preliminary Data Review

Answers to the following questions should be fully documented in the Survey Unit Release Record				Yes	No	N/A
1.	Have surveys been performed in accordance with survey instructions in the Survey Design?	X				
2.	Is the instrumentation MDC for structure static measurements below the DCGL _W for Class 1 and 2 survey units, or below 0.5 DCGL _W for Class 3 survey units?					X
3.	Is the instrumentation MDC for embedded/buried piping static measurements below the DCGL _W ?	X				
4.	Was the instrumentation MDC for structure scan measurements, soil scan measurements, and embedded/buried piping scan measurements below the DCGL _W , or, if not, was the need for additional static measurements or soil samples addressed in the survey design?					X
5.	Was the instrumentation MDC for volumetric measurements and smear analysis < 10% DCGL _W ?					X
6.	Were the MDCs and assumptions used to develop them appropriate for the instruments and techniques used to perform the survey?	X				
7.	Were the survey methods used to collect data proper for the types of radiation involved and for the media being surveyed?	X				
8.	Were "Special Methods" for data collection properly applied for the survey unit under review?	X				
9.	Is the data set comprised of qualified measurement results collected in accordance with the survey design, which accurately reflects the radiological status of the facility?	x				

Graphical Data Review

1.	Has a posting plot been created?				X
2.	Has a histogram (or other frequency plot) been created?				X
3.	Have other graphical data tools been created to assist in analyzing the data?				X

Data Analysis

1.	Are all sample measurements below the DCGL _W (Class 1 & 2), or 0.5 DCGL _W (Class 3)?	X			
2.	Is the mean of the sample data < DCGL _W ?	X			
3.	If elevated areas have been identified by scans and/or sampling, is the average activity in each elevated area < DCGL _{EMC} (Class 1), < DCGL _W (Class 2), or <0.5 DCGL _W (Class 3)?				X
4.	Is the result of the Elevated Measurements Test < 1.0?				X
5.	Is the result of the statistical test (S+ for Sign Test or W_r for WRS Test) ≥ the critical value?				X

Comments:

FSS/Characterization Engineer (print/sign)	<i>Date Randall D. Dwyer</i>	Date	10-30-07
FSS/ Characterization Manager (print/sign)	R. Case <i>[Signature]</i>	Date	11/7/07

Form
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1 DISC**