
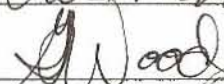
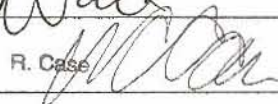


Survey Unit Release Record

Design #	EP-WHB-111-6	Revision #	Original	Page 1 of 3
Survey Unit #(s)	WHB-111-6			
Description	<p>1) Embedded Pipe (EP) Survey Unit WHB-111-6 meets the definition of embedded pipe for Plum Brook Reactor Facility (PBRF).</p> <p>2) EP WHB-111-6 is a Class 1, Group 3.3 survey unit as per the PBRF Final Status Survey Plan (FSSP) and Technical Basis Document (TBD)-06-004.</p> <p>3) Surveys in EP WHB-111-6 were performed using a scintillation detector optimized to measure gamma energies representative of Cs-137. Sample #EP 3-3 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)			11-6-07	
FSS/Characterization Manager	R. Case 		11/7/07	

Form
CS-09/1
Rev 0

Survey Unit: WHB-111-6

1.0 History/Description

- 1.1 The subject pipe system is an evaporator pit drain line located on the Waste Handling Building (WHB) -5' el.
- 1.2 EP WHB-111-6 consists of 2" diameter piping that is approximately 30 feet in length.

2.0 Survey Design Information

- 2.1 EP WHB-111-6 was surveyed IAW Procedure #BSI/LVS-002.
- 2.2 100% of the 2" ID pipe was accessible for survey. The accessible 2" ID pipe was surveyed by static measurement at one foot increments, for a total of 30 survey measurements.
- 2.3 Surface area for the 2" ID piping is 486 cm² for each foot of piping, corresponding to a total 2" ID piping surface area of 14,593 cm² (1.5 m²) for the entire length of (approximately 30') of 2" 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 WHB-111-6 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: WHB-111-6

5.5 Statistical Summary Table

Statistical Parameter	2" Pipe
Total Number of Survey Measurements	30
Number of Measurements >MDC	30
Number of Measurements Above 50% of DCGL	0
Number of Measurements Above DCGL	0
Mean	0.0272
Median	0.0273
Standard Deviation	0.0053
Maximum	0.0386
Minimum	0.0173

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 WHB-111-6 to be less than 1 mrem/yr. The dose contribution is estimated to be 0.027 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 WHB-111-6 & Spreadsheet

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3 **PAGE(S)**



BSI EP/BP SURVEY REPORT

Pipe ID	EP WHB-111-6	Survey Location	Evap Pit -5' el.
Survey Date	28-Aug-06	2350-1 #	189094
Survey Time	12:51	Detector-Sled #	238367 / no sled
Pipe Size	2"	Detector Efficiency	0.00038
DCGL (dpm/100cm ²)	3.79E+06	Pipe Area Incorporated by Detector Efficiency (in cm ²)	486
Pipe Area Incorporated by Survey Data (m ²)	1.5	Field BKG (cpm)	35.1
Routine Survey	X	Field MDCR (cpm)	23.4
QA Survey		Nominal MDC (dpm/100cm ²)	5,314
Survey Measurement Results			
Total Number of Survey Measurements		30	
Number of Measurements >MDC		30	
Number of Measurements Above 50% DCGL		0	
Number of Measurements Above DCGL		0	
Mean		0.0272	
Median		0.0273	
Standard Deviation		0.0053	
Maximum		0.0386	
Minimum		0.0173	
Survey Technician(s)		STOCK	
Survey Unit Classification		1	
TBD 06-004 Piping Group		3.3	
SR-13 Radionuclide Distribution Sample		EP 3-3	
Measured Nuclide		Cs-137	
Area Factor/EMC Used		No	
Pass/Fail FSS		Pass	
MREM/YR Contribution		<1	
COMMENTS: ACTIVITY VALUES NOT BACKGROUND CORRECTED			
RP Engineer Date		Dul Rockwell / 10-30-07	

EP WHB-111-6
2" Pipe
TBD 06-004 Group 3.3

Measurement #	gcpm	ncpm	Cs-137 activity (total dpm)	Cs-137 activity (dpm/100cm2)	Co-60 activity (dpm/100cm2)	Eu-152 activity (dpm/100cm2)	Eu-154 activity (dpm/100cm2)	Nb-94 activity (dpm/100cm2)	Ag-108m activity (dpm/100cm2)	Unity
1	69	69	181,579	37,328	1,841	-	-	-	-	0.018
2	115	115	302,632	62,214	3,068	-	-	-	-	0.029
3	115	115	302,632	62,214	3,068	-	-	-	-	0.029
4	148	148	389,474	80,066	3,948	-	-	-	-	0.038
5	131	131	344,737	70,869	3,495	-	-	-	-	0.033
6	107	107	281,579	57,886	2,854	-	-	-	-	0.027
7	92	92	242,105	49,771	2,454	-	-	-	-	0.023
8	118	118	310,526	63,837	3,148	-	-	-	-	0.030
9	152	152	400,000	82,230	4,055	-	-	-	-	0.039
10	137	137	360,526	74,115	3,655	-	-	-	-	0.035
11	123	123	323,684	66,542	3,281	-	-	-	-	0.031
12	107	107	281,579	57,886	2,854	-	-	-	-	0.027
13	111	111	292,105	60,050	2,961	-	-	-	-	0.028
14	94	94	247,368	50,853	2,508	-	-	-	-	0.024
15	101	101	265,789	54,640	2,694	-	-	-	-	0.026
16	123	123	323,684	66,542	3,281	-	-	-	-	0.031
17	109	109	286,842	58,968	2,908	-	-	-	-	0.028
18	94	94	247,368	50,853	2,508	-	-	-	-	0.024
19	89	89	234,211	48,148	2,374	-	-	-	-	0.023
20	103	103	271,053	55,722	2,748	-	-	-	-	0.026
21	113	113	297,368	61,132	3,015	-	-	-	-	0.029
22	80	80	210,526	43,279	2,134	-	-	-	-	0.020
23	92	92	242,105	49,771	2,454	-	-	-	-	0.023
24	85	85	223,684	45,984	2,268	-	-	-	-	0.022
25	94	94	247,368	50,853	2,508	-	-	-	-	0.024
26	121	121	318,421	65,460	3,228	-	-	-	-	0.031
27	129	129	339,474	69,787	3,441	-	-	-	-	0.033
28	108	108	284,211	58,427	2,881	-	-	-	-	0.027
29	90	90	236,842	48,689	2,401	-	-	-	-	0.023
30	68	68	178,947	36,787	1,814	-	-	-	-	0.017

EP WHB-111-6
2" Pipe
TBD 06-004 Group 3.3

Measurement #	gcpm	ncpm	Cs-137 activity (total dpm)	Cs-137 activity (dpm/100cm2)	Co-60 activity (dpm/100cm2)	Eu-152 activity (dpm/100cm2)	Eu-154 activity (dpm/100cm2)	Nb-94 activity (dpm/100cm2)	Ag-108m activity (dpm/100cm2)	Unity
									MEAN	0.027
									MEDIAN	0.027
									STD DEV	0.005
									MAX	0.039
									MIN	0.017

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3 **PAGE(S)**

Pipe Interior Radiological Survey Form

Date: 8/28/06 Time: 1251
Pipe ID#: WHB-111-6 Pipe Diameter: 2" Access Point Area: EVAP. PIT
Building: WHB Elevation: - 5' System: DRAINS

Type of Survey Investigation _____ Characterization _____ Final Survey X Other ✓

Gross _____ Co60 _____ Cs ✓

Detector ID# / Sled ID# 44-159 #2383671 NO SLED

Detector Cal Date: 6/21/06 Detector Cal Due Date: 6/21/07

Instrument: 2350-1 Instrument ID #: 189094

Instrument Cal Date: 3/15/06 Instrument Cal Due Date: 3/15/07

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

Background Value 35.1 cpm

MDCR_{static} 23.4 cpm

Efficiency Factor for Pipe Diameter 0.00038 (from detector efficiency determination)

MDC_{static} 5314 dpm/ 100 cm²

Is the MDC_{static} acceptable? Yes No (if no, adjust sample count time and recalculate MDCR_{static})

Comments: INITIAL SURVEY EP3-3 COMPLETE

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	69	69	N/A	N/A
2	2	1	115	115		
3	3		115	115		
4	4		148	148		
5	5		131	131		
6	6		107	107		
7	7		92	92		
8	8		118	118		
9	9		152	152		
10	10	↓	137	137	↓	↓

Package Page 1 of 3

Pipe Interior Radiological Survey Form (Continuation Form)

Date: 8/28/06
 Pipe ID#: WHB-111-6 Pipe Diameter: 2"
 Building: WHB Elevation: -5' Access Point Area: EVAP PIT
 System: DRAINS

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
11	11	1	123	123	n/a	n/a
12	12		107	107		
13	13		111	111		
14	14		94	94		
15	15		101	101		
16	16		123	123		
17	17		109	109		
18	18		94	94		
19	19		89	89		
20	20		103	103		
21	21		113	113		
22	22		80	80		
23	23		92	92		
24	24		85	85		
25	25		94	94		
26	26		121	121		
27	27		129	129		
28	28		108	108		
29	29		90	90		
30	30		68	68		
<div style="position: relative; height: 200px;"> <div style="position: absolute; top: 0; left: 0; right: 0; bottom: 0; border-left: 1px solid black; border-right: 1px solid black;"></div> <div style="position: absolute; top: 50%; left: 50%; transform: translate(-50%, -50%); font-size: 4em;">N</div> <div style="position: absolute; top: 70%; left: 60%; font-size: 3em;">A</div> </div>						

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FOR CONT. PF-00855



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 1 **PAGE(S)**

DQA Check Sheet

Design #	WHB-111-6	Revision #	Original			
Survey Unit #	WHB-111-6					
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)				Date <i>Randall</i> / <i>Randall</i>		Date 10-30-07
FSS/ Characterization Manager (print/sign)				R. Case		Date 11/7/07

Form
CS-09/2
Rev 0

SECTION 7
ATTACHMENT 4
1 DISC