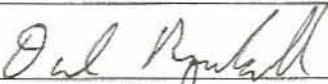
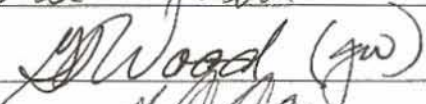
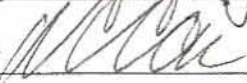


Survey Unit Release Record

Design #	EP-RD-1	Revision #	Original	Page 1 of 3
Survey Unit #(s)	RD-1			
Description	<p>1) Embedded Pipe (EP) Survey Unit RD-1 meets the definition of embedded pipe for Plum Brook Reactor Facility (PBRF).</p> <p>2) EP RD-1 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 RD-1 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			11-7-07	
Technical Reviewer (FSS/Characterization Engineer)			11-7-07	
FSS/Characterization Manager	R. Case 		11/12/07	

Form
CS-09/1
Rev 0

Survey Unit: RD-1

1.0 History/Description

- 1.1 The subject pipe system is a 4" service ring return line located on the -27' el. of the Rx building.
- 1.2 EP RD-1 consists of 4" diameter piping that is approximately 17 feet in length.

2.0 Survey Design Information

- 2.1 EP RD-1 was surveyed IAW Procedure #BSI/LVS-002.
- 2.2 100% of the 4" ID pipe was accessible for survey. The accessible 4" ID pipe was surveyed by static measurement at one foot increments, for a total of 17 survey measurements.
- 2.3 Surface area for the 4" ID piping is 973 cm² for each foot of piping, corresponding to a total 4" ID piping surface area of 16,539 cm² (1.7 m²) for the entire length of (approximately 17') of 4" 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 RD-1 passes FSS.
- 5.4 Background was not subtracted from the survey measurements.
- 5.5 Three (3) of the seventeen (17) measurements performed were found to have unitized values exceeding the 1 mrem/yr DCGL. Two of these measurements were contiguous sections of piping, as such they were averaged and evaluated as per Table 3-6 of the PBRF FSSP. The elevated data were evaluated against the Elevated Measurement Comparison (EMC) and Elevated Measurement Test (EMT) criteria in accordance with the guidance in PBRF FSSP and procedure CS-09. The calculated EMT result was determined to be less than one, indicating that the survey unit passed the test.

Survey Unit: RD-1

5.6 Statistical Summary Table

Statistical Parameter	4" Pipe
Total Number of Survey Measurements	17
Number of Measurements >MDC	17
Number of Measurements Above 50% of DCGL	8
Number of Measurements Above DCGL	3
Mean	0.5424
Median	0.3617
Standard Deviation	0.3704
Maximum	1.2170
Minimum	0.1104

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 RD-1 to be less than 1 mrem/yr. The dose contribution is estimated to be 0.542 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 RD-1 & Spreadsheet

SECTION 7
ATTACHMENT 1
3 **PAGE(S)**



BSI EP/BP SURVEY REPORT

Pipe ID	EP RD-1	Survey Location	PPH Resin Pit -5' el.
Survey Date	13-Jun-06	2350-1 #	203488
Survey Time	08:14	Detector-Sled #	44-159 238369/101
Pipe Size	4"	Detector Efficiency	0.0002
DCGL (dpm/100cm ²)	2.41E+05	Pipe Area Incorporated by Detector Efficiency (in cm ²)	973
Pipe Area Incorporated by Survey Data (m ²)	1.7	Field BKG (cpm)	12.7
Routine Survey	X	Field MDCR (cpm)	15.3
QA Survey		Nominal MDC (dpm/100cm ²)	4,049
Survey Measurement Results			
Total Number of Survey Measurements		17	
Number of Measurements >MDC		17	
Number of Measurements Above 50% DCGL		8	
Number of Measurements Above DCGL		3	
Mean		0.5424	
Median		0.3617	
Standard Deviation		0.3704	
Maximum		1.2170	
Minimum		0.1104	
Survey Technician(s)	STOCK		
Survey Unit Classification		1	
TBD 06-004 Piping Group		1	
SR-13 Radionuclide Distribution Sample		EP 3-7	
Measured Nuclide		Co-60	
Area Factor/EMC Used		<i>Pass</i> YES	
Pass/Fail FSS		Pass	
MREM/YR Contribution		<1	
COMMENTS: ACTIVITY VALUES NOT BACKGROUND CORRECTED			
RP Engineer Date	<i>Del Powell</i> 11-7-07		

EP RD-1
4" 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	36	36	180,000	18,502	733	17,551	4,666	540	129	0.110
2	47	47	235,000	24,155	957	22,914	6,091	705	168	0.144
3	59	59	295,000	30,322	1,202	28,764	7,647	885	211	0.181
4	81	81	405,000	41,629	1,650	39,490	10,498	1,215	290	0.248
5	91	91	455,000	46,768	1,854	44,365	11,794	1,365	326	0.279
6	92	92	460,000	47,282	1,874	44,852	11,924	1,380	329	0.282
7	87	87	435,000	44,713	1,772	42,415	11,276	1,305	312	0.267
8	102	102	510,000	52,422	2,078	49,728	13,220	1,530	365	0.313
9	118	118	590,000	60,645	2,404	57,528	15,293	1,770	423	0.362
10	335	335	1,675,000	172,170	6,824	163,321	43,417	5,024	1,200	1.027
11	199	199	995,000	102,274	4,054	97,018	25,791	2,984	713	0.610
12	266	266	1,330,000	136,708	5,418	129,682	34,475	3,989	953	0.815
13	278	278	1,390,000	142,875	5,663	135,532	36,030	4,169	996	0.852
14	383	383	1,915,000	196,839	7,802	186,722	49,638	5,744	1,372	1.174
15	397	397	1,985,000	204,034	8,087	193,548	51,453	5,954	1,422	1.217
16	263	263	1,315,000	135,166	5,357	128,219	34,086	3,944	942	0.806
17	174	174	870,000	89,425	3,544	84,829	22,551	2,610	623	0.533
									MEAN	0.542
									MEDIAN	0.362
									STD DEV	0.370
									MAX	1.217
									MIN	0.110

Elevated Measurement Comparison
EP RD-1

Measurement #	Elevated Area Mean (Unity)	Elevated Area Area Factor	Co60-137 activity EMC	Cs-137 activity EMC	Eu-152 activity EMC	Eu-154 activity EMC	Nb-94 activity EMC	Ag-108m activity EMC	EMC Unity	EMT Unity
1										0.110
2										0.144
3										0.161
4										0.248
5										0.279
6										0.262
7										0.267
8										0.313
9										0.362
10	1.027	5.9	0.0723	0.0002	0.0225	0.0082	0.0006	0.0001	0.1037	0.510
11										0.615
12										0.852
14	1.196	3.000	0.1813	0.0005	0.0563	0.0207	0.0014	0.0002	0.2603	0.806
15										0.533
16										
17										
Total EMC									0.364	0.779
									EMC Unity	EMT Unity

SECTION 7
ATTACHMENT 2
3 **PAGE(S)**

Pipe Interior Radiological Survey Form

Date: 6/13/06 Time: 0814
 Pipe ID#: RD-1 Pipe Diameter: 4" Access Point Area: RESIN PIT
 Building: RESIN PIT Elevation: -5' System: _____

Type of Survey Investigation _____ Characterization _____ Final Survey X Other ✓
 Gross _____ Co60 ✓ Cs _____

Detector ID# / Sled ID# 44.159 238369 / 101
 Detector Cal Date: 3/6/06 Detector Cal Due Date: 3/6/07
 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 12.7 cpm
 MDCR_{static} 15.29 cpm
 Efficiency Factor for Pipe Diameter 0.0002 (from detector efficiency determination)
 MDC_{static} 4049 dpm/ 100 cm²
 Is the MDC_{static} acceptable? Yes No (if no, adjust sample count time and recalculate MDC_{static})
 Comments: INITIAL SURVEY EP3-7 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	36	36	n/a	n/a
2	2		47	47		
3	3		59	59		
4	4		81	81		
5	5		91	91		
6	6		92	92		
7	7		87	87		
8	8		102	102		
9	9		118	118		
10	10	↓	335	335	↓	↓

REFERENCE COPY

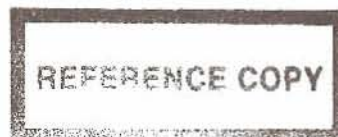


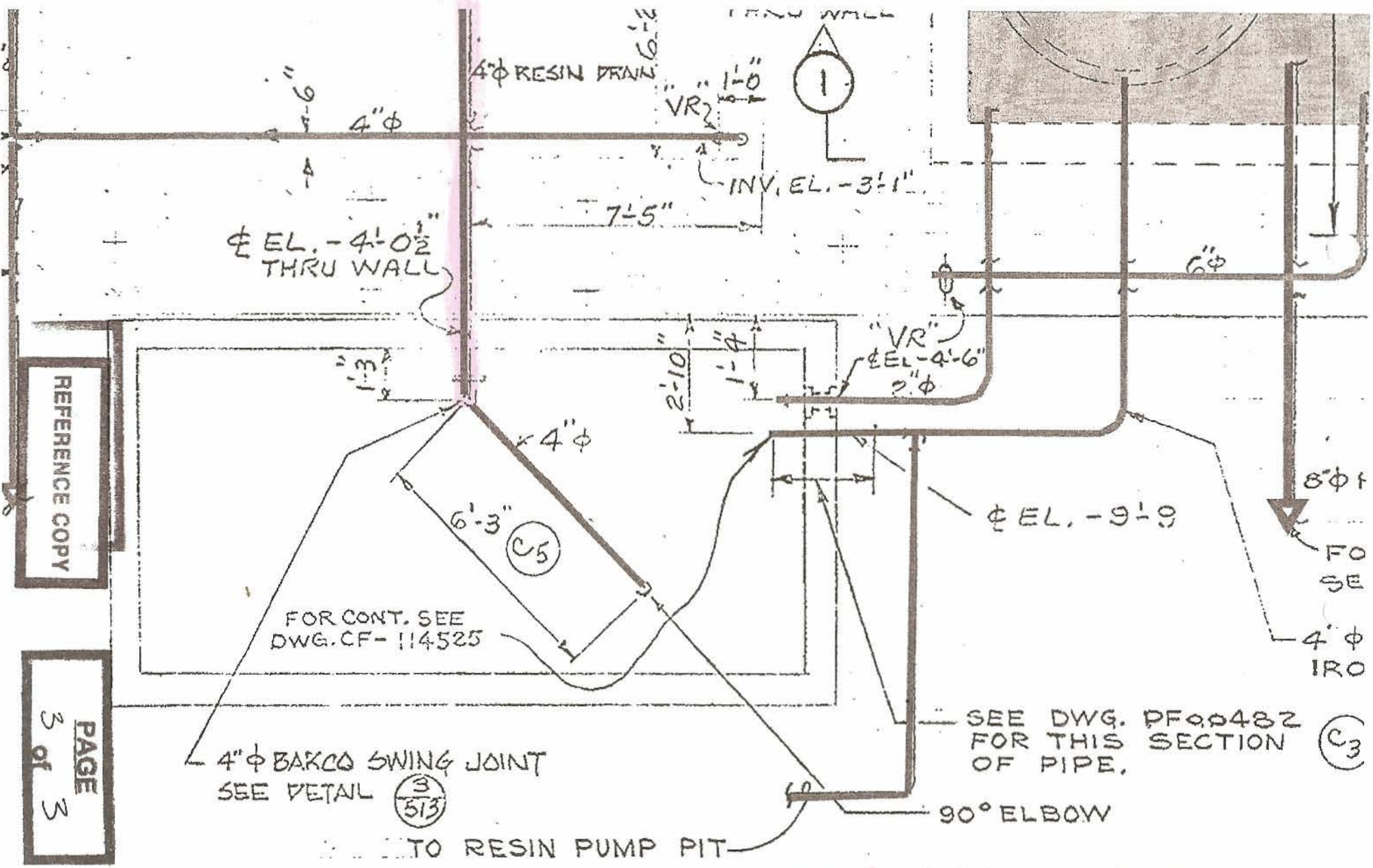
Pipe Interior Radiological Survey Form (Continuation Form)

Date: 6/13/06
 Pipe ID#: RD-1 Pipe Diameter: 4" Access Point Area: RESIN PIT
 Building: RESIN PIT Elevation: -5' System: _____

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
11	11	1	199	199	N/A	N/A
12	12		266	266		
13	13		278	278		
14	14		383	383		
15	15		397	397		
16	16		263	263		
17	17		174	174		
18	18		N/A	N/A		
19	19		N/A	N/A		

N
A





REFERENCE COPY

PAGE 3 of 3

FOR CONT. SEE DWG. CF-114525

4" φ BARCO SWING JOINT SEE DETAIL (3/513)

TO RESIN PUMP PIT

SEE DWG. PFO0482 FOR THIS SECTION OF PIPE.

90° ELBOW

RESIN PIPE SURVIVED RD-1

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DQA Check Sheet

Design #	EP RD-1	Revision #	Original
Survey Unit #	EP RD-1		

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	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 (<i>S</i> + for Sign Test or <i>W</i> _r for WRS Test) ≥ the critical value?			X

Comments: Refer to section 5-5 of the release record narrative. *fw*

FSS/Characterization Engineer (print/sign)	<i>Dale Randolph</i>	Date	11-7-07
FSS/ Characterization Manager (print/sign)	R. Case	Date	11/12/07

Form
CS-09/2
Rev 0

**SECTION 7
ATTACHMENT 4
1 DISC**