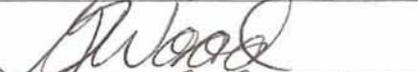


## Survey Unit Release Record

<b>Design #</b>	EP-1.15	<b>Revision #</b>	Original	<b>Page 1 of 4</b>
<b>Survey Unit #(s)</b>	1.15			
Description	<p>1) Embedded Pipe (EP) Survey Unit 1.15 meets the definition of embedded pipe for Plum Brook Reactor Facility (PBRF).</p> <p>2) EP 1.15 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 1.15 were performed using a scintillation detector optimized to measure gamma energies representative of Co-60. Sample #EP 3-9 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> <p>6) This pipe is a drain for the exterior sheath encasing the primary coolant supply and return piping. This is a closed system with only one opening. Historical assessments indicate that this system was not subjected to radioactive contaminated liquids during plant operations or anytime during shutdown. Only the last four feet of the approximate overall length of sixty feet of this pipe was accessible for final survey. However, the four feet of this pipe that was surveyed is the only access to this pipe as well as the low point for the system. It is reasonable to assume that if any radioactive liquid was present in this pipe, it would have accumulated at this point. Subsequently, the final survey of the accessible portion of this pipe system is appropriate to demonstrate the radiological condition of the entire pipe and the suitability of the pipe for unrestricted release.</p>			
<b>Approval Signatures</b>			<b>Date:</b>	
FSS/Characterization Engineer			11/08/2007	
Technical Reviewer (FSS/Characterization Engineer)			11-9-07	
FSS/Characterization Manager	 <small>F. Case</small>		11/12/07	

## Survey Unit: 1.15

**1.0 History/Description**

- 1.1 The subject pipe system is a 2" system line. Access to this pipe is located in the Sub Pile Room. This pipe is the drain for the exterior sheaths surrounding the primary coolant supply and return piping.
- 1.2 EP 1.15 is approximately 60 feet in length. Approximately four feet in from the access, a series of mitered, 90° elbows prevent the travel of radiological detectors past that point. Subsequently, only four of the approximate 60 feet of total length for this pipe was accessible for survey.

**2.0 Survey Design Information**

- 2.1 EP 1.15 was surveyed IAW Procedure #BSI/LVS-002.
- 2.2 The accessible portion of the 2" ID pipe was surveyed by static measurement at one foot increments, for a total of 4 survey measurements.
- 2.3 Surface area for the 2" ID piping is 486 cm<sup>2</sup> for each foot of piping, corresponding to a total 2" ID piping surface area of 1,944 cm<sup>2</sup> (0.2 m<sup>2</sup>) for the entire accessible length of (4') 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 Only the last four feet of the approximate overall length of sixty feet of this pipe was accessible for final survey. However, the four feet of this pipe that was surveyed is the only access to this pipe as well as the low point for the system. It is reasonable to assume that if any radioactive liquid was present in this pipe, it would have accumulated at this point.
- 5.3 All measurement results from the four feet of accessible pipe 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.
- 5.4 Background was not subtracted from the survey measurements and the Elevated Measurement Comparison (EMC) was not employed for the accessible portion of this survey unit.

## Survey Unit: 1.15

- 5.5 In addition to the four final survey measurements taken in the accessible portion of this pipe, additional radiological surveys were performed to the extent possible as allowed by the configuration of this piping. These surveys were performed to provide additional assurance that the radiological conditions represented by the four final survey measurements are representative of the entire length of pipe.
- 5.6 A scan survey was performed using a beta-gamma GM detector on the exterior of the access point for this pipe system. The survey is documented as survey no. NASA-07-2331 performed in support of RWP PB-07-116. The scan survey results indicated activity <1,000 dpm per direct frisk. In addition, smear surveys were taken inside of the pipe opening and on the surrounding wall. No loose radiological contamination greater than 1,000 dpm/100cm<sup>2</sup> was detected.
- 5.7 A screw auger was inserted into the pipe to a distance of 20 feet. The auger was able to transit past the first set of mitered elbows to the second set of elbows, where additional penetration into the pipe was blocked. A large area smear was attached to the auger on two penetration attempts, one to 20 feet and the other to 15 feet. Following extraction from the pipe, the large area smears were surveyed using a beta-gamma GM detector. The survey results were documented on surveys RWP PB-07-2331 and NASA-07-2607 performed in support of RWP PB-0100. No detectable loose radiological contamination was present on either of these smears.
- 5.8 Based upon the results of the final survey measurements combined with the results of the operational survey, it is reasonable to conclude that the final survey of the accessible portion of this pipe system is appropriate to demonstrate the radiological condition of the entire pipe. Survey Unit EP 1.15 demonstrates compliance with the DCGL values, as presented in Sections 3.3, 7.5 and Attachment C of the PBRF FSSP.
- 5.9 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 1.15 passes FSS.

Survey Unit: 1.15

### 5.10 Statistical Summary Table

Statistical Parameter	2" Pipe
Total Number of Survey Measurements	4
Number of Measurements >MDC	2
Number of Measurements Above 50% of DCGL	0
Number of Measurements Above DCGL	0
Mean	0.021
Median	0.017
Standard Deviation	0.016
Maximum	0.043
Minimum	0.006

**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 the accessible portion of EP 1.15 to be less than 1 mrem/yr. The dose contribution is estimated to be 0.021 mrem/yr based on the average of the actual gross counts.

### 7.0 Attachments

Attachment 1 – BSI EP/BP Survey Report

Attachment 2 -Pipe Interior Radiological Survey Form & Radiation Protection Survey Forms

Attachment 3 – DQA Worksheet

Attachment 4 –Disc containing RR for EP 1.15 & Spreadsheet

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



## BSI EP/BP SURVEY REPORT

Pipe ID	EP 1.15	Survey Location	-44 el. Sub Pile Room
Survey Date	21-Feb-06	2350-1 #	217223
Survey Time	13:05	Detector-Sled #	44-62 212701/121
Pipe Size	2"	Detector Efficiency	0.0002
DCGL (dpm/100cm <sup>2</sup> )	2.41E+05	Pipe Area Incorporated by Detector Efficiency (ln cm <sup>2</sup> )	486
Pipe Area Incorporated by Survey Data (m <sup>2</sup> )	0.2	Field BKG (cpm)	5.3
Routine Survey	X	Field MDCR (cpm)	10.4
QA Survey		Nominal MDC (dpm/100cm <sup>2</sup> )	6,636
<b>Survey Measurement Results</b>			
Total Number of Survey Measurements			4
Number of Measurements >MDC			1
Number of Measurements Above 50% DCGL			0
Number of Measurements Above DCGL			0
Mean			0.021
Median			0.017
Standard Deviation			0.016
Maximum			0.043
Minimum			0.006
Survey Technician(s)	ROSENHAGEN		
Survey Unit Classification			1
TBD 06-004 Piping Group			1
SR-13 Radionuclide Distribution Sample			EP 3-9
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			
		11/8/2007	

**EP 1.15**  
**2" Pipe**  
**TBD 06-004 Group 1**

Measurement #	gcpm	ncpm	Co-60 activity (total dpm)	Co-60 activity (dpm/100cm <sup>2</sup> )	Cs-137 activity (dpm/100cm <sup>2</sup> )	Eu-152 activity (dpm/100cm <sup>2</sup> )	Eu-154 activity (dpm/100cm <sup>2</sup> )	Nb-94 activity (dpm/100cm <sup>2</sup> )	Ag-108m activity (dpm/100cm <sup>2</sup> )	Unity
1	14	7	35,000	7,195	285	6,825	1,814	210	50	0.043
2	4	2	10,000	2,056	81	1,950	518	60	14	0.012
3	2	1	5,000	1,028	41	975	259	30	7	0.006
4	7	3.5	17,500	3,598	143	3,413	907	105	25	0.021
									MEAN	0.021
									MEDIAN	0.017
									STD DEV	0.016
									MAX	0.043
									MIN	0.006

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

Pipe Interior Radiological Survey Form

Date: 2-21-06 Time: 1305  
 Pipe ID#: 1.15 Pipe Diameter: 2" Access Point Area: Sub Pile Room  
 Building: RX Elevation: -44 System: Sheath Drive

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

Detector ID# / Sled ID# 44-62 / 212701 1 121  
 Detector Cal Date: 17-Nov-05 Detector Cal Due Date: 17-Nov-06  
 Instrument: 2350-1 Instrument ID #: 217223  
 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 5.3 cpm  
 MDCR<sub>static</sub> 10.9 cpm  
 Efficiency Factor for Pipe Diameter 0.0002 (from detector efficiency determination)  
 MDC<sub>static</sub> 6636 dpm/ 100 cm<sup>2</sup>  
 Is the MDC<sub>static</sub> acceptable? Yes No (if no, adjust sample count time and recalculate MDCR<sub>static</sub>)  
 Comments: INITIAL SURVEY

Technician Signature Jai Dohy

Pipe Interior Radiological Survey

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm <sup>2</sup>
1	1	2	14	7	n/a	n/a
2	2	2	4	2	↓	↓
3	3	2	2	0	↓	↓
4	4	2	7	3.5	↓	↓
5	5 n/a	n/a	n/a	n/a	n/a	n/a
6	↓	↓	↓	↓	↓	↓
7	↓	↓	↓	↓	↓	↓
8	↓	↓	↓	↓	↓	↓
9	↓	↓	↓	↓	↓	↓
10	↓	↓	↓	↓	↓	↓

Package Page 1 of 2



REFERENCE COPY

1,15  
= pipe surveyed

REFERENCE COPY

SEE CF-114401 FOR CONTINUATION  
6" φ HOT DRAIN-PIT

4" φ -45° ELL  
ELEV. -29'-0"

6" φ PWR - INST. SERVICE

ELEV. -34'-0"

CONTAINMENT VENT

14

2" φ PWR - DRAIN

2" φ PWR - DRAIN

SUB PILE ROOM

QUADRANT SLEEVES - 4 REQ'D AS SHOWN IN PLAN  
3" φ WROUGHT IRON SCH 20 WITH 150" WELDING  
NECK FLGS AND BLIND FLANGES AT BOTH ENDS.  
FOR STUB UP ELEVATIONS SEE CF-114400 & CE-114401

ELEV. -39'-4"

2" φ CA-RT VENT

TOP OF FLTR. ELEV. -44'-2"

2" φ STAINLESS STEEL SHEATH DRAIN @ ELEV. -39'-6"

44-20 SHIELDED

20V03

CHECK VALVE

20V07

1/2" DRAIN

15

ELEV. -45'-6"

2" φ DRAIN FROM SHRAPNEL SHIELD  
PIT - SEE DWG CF-114419

52

ELEV. -44'-10"  
ELEV. -44'-6"

ELEV. -45'-8"

2" CHECK VALVE

Primary Containment  
PF-00382

PH-65  
2 of 2

**RADIATION PROTECTION SURVEY FORM**

Location: -37' Sub-pile RM.					RWP: PB-07-116		
Instrument(s)					Date: 9-4-07		
Model	S/N	Cal. Due	Bkgd / cpm	MDA / dpm	Time: 0825		
M-3	205564	5-20-06	100	N/A	Survey #: NASA-07-2331		
Ro-20	4857	8-3-08	<.2 MR/hr	N/A			
N/A					Smear # & Location		
Reason for Survey: <input type="checkbox"/> Daily <input checked="" type="checkbox"/> Job Coverage <input checked="" type="checkbox"/> Dose rates in mr/hr unless otherwise noted <input type="checkbox"/> Weekly <input checked="" type="checkbox"/> Other: Pre-Grout <input type="checkbox"/> Dose rates in µr/hr unless otherwise noted <input type="checkbox"/> N/A					Contamination (dpm/100cm <sup>2</sup> )		
					β	α	
<p align="center">SUB-PILE RM. -37'      GREEN TAG # 11-4</p> <p align="center">PIPE #1-15, ≈ 4½' ABOVE DIAMOND PLATING FLOOR</p> <p>* ≈ 1.5 gal. H<sub>2</sub>O came out when plug was removed.</p> <p>* All direct frisks, (walls, end of pipe) ARE &lt;1K dpm/probe          # 4 LAS ≈ 20' 1/5 pipe          # 5 LAS ≈ 15' 1/5 pipe</p> <p align="right"><b>Legend</b>          xxxx - Radiological boundary          x-x-x - Contaminated area          # - General area dose rate          * - Contact/30cm dose rates          O - Smear location          LAS - Large area smear          # - Direct frisk          A/S - Air sampler location</p>					1 WALL	<1K	N/A
					2 ↓	<1K	
					3 1/5 PIPE	<1K	↓
					4 ↓ LAS	<1K	↓
					5 ↓ LAS	<1K	↓
					6 N/A		
					7		
					8		
					9		
					10		
					11		
					12		
					13		
					14		
					15		
					16		
					17		
					18		
					19		
					20		
					21		
					22		
					23		
					24		
					25		N/A
Performed by: (print/sign/date) G. MORIN      9-4-07							
Reviewed by: (sign/date) D. D...      9-5-07							

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Form  
RP-005/1  
Rev. 0

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

**DQA Check Sheet**

Design #	EP 1.15	Revision #	Original	
Survey Unit #	EP 1.15			

**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 <sub>W</sub> for Class 1 and 2 survey units, or below 0.5 DCGL <sub>W</sub> for Class 3 survey units?					X
3.	Is the instrumentation MDC for embedded/buried piping static measurements below the DCGL <sub>W</sub> ?			X		
4.	Was the instrumentation MDC for structure scan measurements, soil scan measurements, and embedded/buried piping scan measurements below the DCGL <sub>W</sub> 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 <sub>W</sub> ?					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 <sub>W</sub> (Class 1 & 2), or 0.5 DCGL <sub>W</sub> (Class 3)?			X		
2.	Is the mean of the sample data < DCGL <sub>W</sub> ?			X		
3.	If elevated areas have been identified by scans and/or sampling, is the average activity in each elevated area < DCGL <sub>EMC</sub> (Class 1), < DCGL <sub>W</sub> (Class 2), or <0.5 DCGL <sub>W</sub> (Class 3)?					X
4.	Is the result of the Elevated Measurements Test < 1.0?					X
5.	Is the result of the statistical test ( <b>S+</b> for Sign Test or <b>W<sub>r</sub></b> for WRS Test) ≥ the critical value?					X

Comments:

FSS/Characterization Engineer (print/sign)	David Wojtkowiak 	Date	11/08/07
FSS/ Characterization Manager (print/sign)	R. Case 	Date	11/12/07

Form  
CS-09/2  
Rev 0

**SECTION 7  
ATTACHMENT 4  
1 DISC**