Survey Unit Release Record				
Design #	EP-Rx 111	**Revision #**	Original	**Page 1 of 3**
Survey Unit #(s)	Rx 111			
Description	1) Embedded Pipe (EP) Survey Unit Rx 111 meets the definition of embedded pipe for Plum Brook Reactor Facility (PBRF). 2) EP Rx 111 is a Class 1, Group 2 survey unit as per the PBRF Final Status Survey Plan (FSSP) and Technical Basis Document (TBD)-06-004. 3) Surveys in EP Rx 111 were performed using a scintillation detector optimized to measure gamma energies representative of Co-60. Sample #EP 2-2 from Survey Request (SR)-13 was referenced for this decision. 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. 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.			

Approval Signatures		**Date:**
FSS/Characterization Engineer	Dal Rudolph	11-26-07
Technical Reviewer (FSS/Characterization Engineer)	L Wood	11-27-07
FSS/Characterization Manager	R. Case	11/29/07

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1.0 History/Description

1.1 The subject pipe system is a 12" drain line located in the Room 22 trench on the -27' el. of the Rx building.

1.2 EP Rx 111 consists of 12" diameter piping that is approximately 1 foot in length.

2.0 Survey Design Information

2.1 EP Rx 111 was surveyed IAW Procedure #BSI/LVS-002.

2.2 100% of the 12" ID pipe was accessible for survey. The accessible 12" ID pipe was surveyed by static measurement at one foot increments. Since the piping section was approximately one foot in length, only one measurement was performed.

2.3 Surface area for the 12" ID piping is 2,919 cm^2 (0.3 m^2) for the entire length of (approximately 1') of 12" 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 111 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.

5.5 At the request of the FSS/Characterization Manager, additional characterization data were collected and analyzed. These results support the conclusion that the any remaining residual activity is well below the release limits. A summary of these results are included as Attachment 4.

5.6 Statistical Summary Table

Statistical Parameter	12" Pipe
Total Number of Survey Measurements	1
Number of Measurements >MDC	1
Number of Measurements Above 50% of DCGL	0
Number of Measurements Above DCGL	0
Mean	0.0556
Median	0.0556
Standard Deviation	N/A
Maximum	0.0556
Minimum	0.0556

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 111 to be less than 1 mrem/yr. The dose contribution is estimated to be 0.056 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 – Additional Characterization radiological data summary
Attachment 5 –Disc containing RR for EP Rx 111 & Spreadsheet

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ATTACHMENT 1
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BSI EP/BP SURVEY REPORT

Pipe ID	EP Rx 111	Survey Location	Rm. 22 Trench el.-27
Survey Date	06-Mar-07	2350-1 #	189094
Survey Time	08:37	Detector-Sled #	G3 #B566A/108
Pipe Size	12"	Detector Efficiency	0.0041
DCGL (dpm/100cm2)	2.41E+05	Pipe Area Incorporated by Detector Efficiency (in cm2)	2,919
Pipe Area Incorporated by Survey Data (m^2)	0.3	Field BKG (cpm)	77.8
Routine Survey	X	Field MDCR (cpm)	33.4
QA Survey		Nominal MDC (dpm/100cm2)	340

Survey Measurement Results	
Total Number of Survey Measurements	1
Number of Measurements >MDC	1
Number of Measurements Above 50% DCGL	0
Number of Measurements Above DCGL	0
Mean	0.0556
Median	0.0556
Standard Deviation	N/A
Maximum	0.0556
Minimum	0.0556

Survey Technician(s)	STOCK

Survey Unit Classification	1
TBD 06-004 Piping Group	2
SR-13 Radionuclide Distribution Sample	EP 2-2
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	Dal Rudell 11-26-07

EP Rx 111
12" Pipe
TBD 06-004 Group 2

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
1	1534	1534	374,146	12,819	6,647	106	75	6	369	0.056
									MEAN	0.056
									MEDIAN	0.056
									STD DEV	N/A
									MAX	0.056
									MIN	0.056

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Pipe Interior Radiological Survey Form

Date: 3/6/07 Time: 0837
Pipe ID#: Rx 111 Pipe Diameter: 12" Access Point Area: Rm 22 TRENCH
Building: Rx Elevation: -27' System: RT DRN TO SUMP

Type of Survey Investigation ____ Characterization ____ Final Survey X Other ✓
Gross ____ Co60 ✓ Cs ____
Detector ID# / Sled ID# G3 #B566A / 108
Detector Cal Date: 1/11/07 Detector Cal Due Date: 1/11/08
Instrument: 2350-1 Instrument ID #: 189094
Instrument Cal Date: 1/11/07 Instrument Cal Due Date: 1/11/08

From the Daily Pipe Survey Detector Control Form for the Selected Detector
Background Value 77.8 cpm
$MDCR_{static}$ 33.4 cpm
Efficiency Factor for Pipe Diameter 0.0041 (from detector efficiency determination)
MDC_{static} 340 dpm/ 100 cm^2
Is the MDC_{static} acceptable? (Yes) No (if no, adjust sample count time and recalculate $MDCR_{static}$)
Comments: CA-05 #0295 SURVEY COMPLETE 100% OF 1FT
NO MAP AVAILABLE - 4m

Technician Signature

Pipe Interior Radiological Survey

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm²
1	1	1	1534	1534	n/a	n/a
2	2					
3	3					
4	4		N			
5	5		A			
6	6					
7	7					
8	n/a	n/a	n/a	n/a		
9	↓	↓	↓	↓		
10	↓	↓	↓	↓	↓	↓

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DQA Check Sheet				
Design #	Rx 111	Revision #	Original	
Survey Unit #	Rx 111			

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)	Dale Randall / Dale Randall	Date	11-26-07
FSS/ Characterization Manager (print/sign)	R. Case	Date	11/29/07

Form
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Rev 0

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BSI EP/BP SURVEY REPORT

Pipe ID	EP Rx 111	Survey Location	Rm. 22 Trench el.-27
Survey Date	15-Nov-07	2350-1 #	201186
Survey Time	10:00	Detector-Sled #	44-116 197312/ no sled
Pipe Size	12"	Detector Efficiency	0.15
DCGL (dpm/100cm2)	3.79E+06	Pipe Area Incorporated by Detector Efficiency (in cm2)	100
Pipe Area Incorporated by Survey Data (m^2)	0.0	Field BKG (cpm)	200
Routine Survey	X	Field MDCR (cpm)	N/A
QA Survey		Nominal MDC (dpm/100cm2)	340

Survey Measurement Results	
Total Number of Survey Measurements	1
Number of Measurements >MDC	2
Number of Measurements Above 50% DCGL	0
Number of Measurements Above DCGL	0
Mean	0.0725
Median	0.0174
Standard Deviation	0.1183
Maximum	0.2492
Minimum	0.0000

Survey Technician(s)	J. SORG

Survey Unit Classification	1
TBD 06-004 Piping Group	2
SR-13 Radionuclide Distribution Sample	EP 2-2
Measured Nuclide	Cs-137
Area Factor/EMC Used	No
Pass/Fail FSS	Pass
MREM/YR Contribution	<1

COMMENTS:
ACTIVITY VALUES NOT BACKGROUND CORRECTED
CHARACTERIZATION DATA FOR INFORMATION ONLY

RP Engineer | Date	Del Randall 11-26-07

EP Rx 111
12" Pipe
TBD 06-004 Group 2
Characterization Data (FOR INFOMATION ONLY)

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	4996	4502	29,815	29,815	57,498	477	337	28	1,655	0.249
2	706	499	3,305	3,305	6,373	53	37	3	183	0.028
3	311	107	709	709	1,367	11	8	1	39	0.006
4	333	129	854	854	1,648	14	10	1	47	0.007
									MEAN	0.072
									MEDIAN	0.017
									STD DEV	0.118
									MAX	0.249
									MIN	0.000

RADIATION PROTECTION SURVEY FORM

Location: Rx BLDG -25' PUMP ROOM

RWP: PB-07- 002

Date: 11-15-07

Time: 1000

Survey #: NASA-07- 3122

Instrument(s)

Model	S/N	Cal. Due	Bkgd / cpm	MDA / dpm
2350-1	201186	8-31-08	N/A	
44-116	197312	8-31-08	200	N/A
N/A	N/A	N/A	N/A	

SM #	cpm	
	UNS	Shield
SM-1	4996	494
SM-2	706	207
SM-3	311	204
SM-4	333	204

SM#	dpm/100 cm2
SM-1	29,800
SM-2	3,300
SM-3	709
SM-4	854

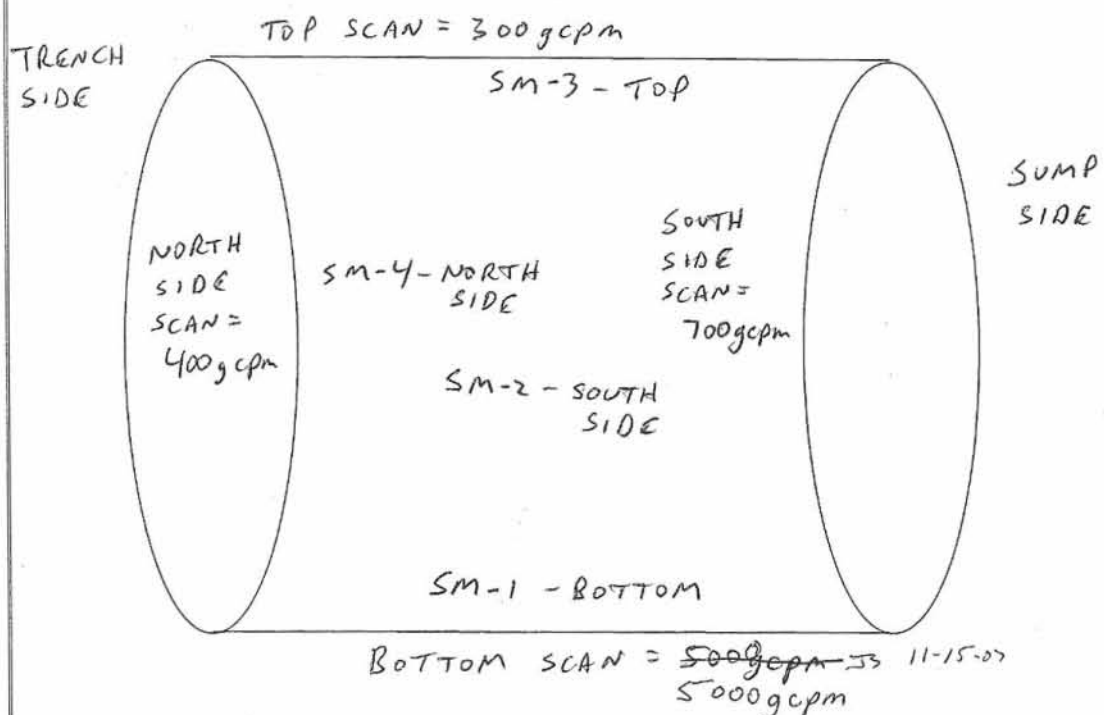
Reason for Survey:
- ☐ Daily
- ☐ Job Coverage
- ☐ Weekly
- ☒ Other: VERIFICATION

- ☐ Dose rates in mr/hr unless otherwise noted
- ☐ Dose rates in μr/hr unless otherwise noted
- ☒ N/A

PERFORMED SCAN SURVEY AND STATIC MEASUREMENTS (SM) INSIDE OF PIPE # Rx-111. Rx-111 IS LOCATED IN THE WALL THAT SEPERATES THE PUMP ROOM WEST TRENCH FROM THE AREA BETWEEN THE SUMP TOP AND THE -25' FLOOR. PIPE Rx-111 IS 12" IN DIAMETER AND 16" LONG.

PIPE Rx-111 IS UNDER FSS-IC CONTROLS. RSO PERMISSION WAS OBTAINED TO MOVE FSS-IC TAG TO PERFORM THIS SURVEY.

$E_i = 30.2\%$, $E_S = 50\%$, $E_T = 15.1\%$



Legend
- 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

Performed by: (print/sign/date)
J. SORG 11-15-07

Reviewed by: (sign/date)
11-15-07

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1 DISC