

National Aeronautics and
Space Administration
John H. Glenn Research Center
Lewis Field
Plum Brook Station
Sandusky, OH 44870



August 9, 2007

Reply to Attn of: QD

U.S. NRC Region III
Mr. William G. Snell, RIII/DNMS/DB
2443 Warrenville Road
Suite 210
Lisle, IL 60532-4352

Subject: Submittal of Embedded Pipe Survey Unit Release Records, Plum Brook Reactor Facility, License No. TR-3, Docket No. 50-30, and License No. R-93, Docket No. 50-185

Dear Mr. Snell:

Enclosed for your review and assessment are copies of the following completed embedded pipe survey unit release records:

Survey Unit Release Record EP-1.13	Survey Unit Release Record EP-Rx 127
Survey Unit Release Record EP-1.14	Survey Unit Release Record EP-Rx 148
Survey Unit Release Record EP-1.41	Survey Unit Release Record EP-Rx 152
Survey Unit Release Record EP-1.43	Survey Unit Release Record EP-Rx 157
Survey Unit Release Record EP-1.93	Survey Unit Release Record EP-1.31
Survey Unit Release Record EP- HPT 102	Survey Unit Release Record EP-1.33
Survey Unit Release Record EP-Rx 139	Survey Unit Release Record EP 1.82
Survey Unit Release Record EP-Rx 151	Survey Unit Release Record EP-Rx 150
Survey Unit Release Record EP-Rx 162	Survey Unit Release Record EP-Rx 160
Survey Unit Release Record EP-Rx 163	Survey Unit Release Record EP-Rx 204
Survey Unit Release Record EP-1.37	Survey Unit Release Record EP-Rx 207
Survey Unit Release Record EP-1.81	Survey Unit Release Record EP-Rx 208

As discussed during your on site inspection on June 25 through June 27, 2007, we will periodically submit the completed survey unit release records for your inspection. Further, as discussed at the exit meeting, it is our intention to begin grouting of the embedded piping that has been shown by the Final Status Survey to meet the dose criteria of Subpart E, Section 20.1402, 10 CFR Part 20.

RECEIVED AUG 10 2007

If you have no issues with the records under this submittal, we will begin the grouting process on August 20, 2007.

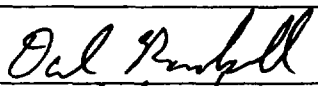
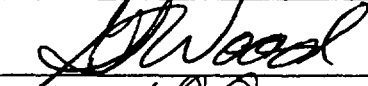

Should you have any questions or need additional information, please contact Mr. William Stoner of my staff, NASA Plum Brook Station, 6100 Columbus Avenue, Sandusky, OH 44870, at (419) 621- 3349, or Mr. John Thomas of my staff, NASA Plum Brook Station, 6100 Columbus Avenue, Sandusky, OH 44870, at (419) 621- 3357.

Sincerely,

A handwritten signature in black ink, appearing to read "Keith M. Peacock", with a long horizontal flourish extending to the right.

Keith M. Peacock
Decommissioning Program Manager

Survey Unit Release Record

Design #	EP-1.13	Revision #	Original	Page 1 of 3
Survey Unit #(s)	1.13			
Description	<p>1) Embedded Pipe (EP) Survey Unit 1.13 meets the definition of embedded pipe for Plum Brook Reactor Facility (PBRF).</p> <p>2) EP 1.13 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 1.13 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>			
Approval Signatures			Date:	
FSS/Characterization Engineer			7-13-07	
Technical Reviewer (FSS/Characterization Engineer)			7-16-07	
FSS/Characterization Manager	 R. Case		7/25/07	

Form
CS-09/1
Rev 0

Survey Unit: 1.13

1.0 History/Description

- 1.1 The subject pipe is the 2" drain line for the 24" Rx Coolant return loop piping. The function of this piping was to convey water from the coolant loop to the sump in the sub pile room corridor on the -47.
- 1.2 EP 1.13 consists of 2" diameter piping that is approximately 39 feet in length and has three elbows from 45° to 90°.

2.0 Survey Design Information

- 2.1 EP 1.13 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 39 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 18,971 cm² (1.9 m²) for the entire length of (approximately 39') 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 1.13 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 Statistical Summary Table

Statistical Parameter	2" Pipe
Total Number of Survey Measurements	39
Number of Measurements >MDC	5
Number of Measurements Above 50% of DCGL	0
Number of Measurements Above DCGL	0
Mean	0.0224
Median	0.0184
Standard Deviation	0.0135
Maximum	0.0797
Minimum	0.0065

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 1.13 to be less than 1 mrem/yr. The dose contribution is estimated to be 0.0224 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 – EP 1.13 SURR & Spreadsheet Disc

SECTION 7
ATTACHMENT 1
3 PAGE(S)

**BSI EP/BP SURVEY REPORT**

Pipe ID	1.13	Survey Location	Sub Pile Room -42'
Survey Date	2/22/2006, 6/27/2007	2350-1 #	212223/189094
Survey Time	1025, 1145	Detector-Sled #	44-62 #212701/121 44-159#238367/nosled
Pipe Size	2"	Detector Efficiency	0.0002/0.00038
DCGL (dpm/100cm ²)	2.41E+05	Pipe Area Incorporated by Detector Efficiency (in cm ²)	486
Pipe Area Incorporated by Survey Date (m ²)	1.9	Field BKG (cpm)	4.4/1.6
Routine Survey	X	Field MDCR (cpm)	10.6/7.4
QA Survey		Nominal MDC (dpm/100cm ²)	6636/5314
Survey Measurement Results			
Total Number of Survey Measurements		39	
Number of Measurements >MDC		5	
Number of Measurements Above 50% DCGL		0	
Number of Measurements Above DCGL		0	
Mean		0.0224	
Median		0.0184	
Standard Deviation		0.0135	
Maximum		0.0797	
Minimum		0.0065	
Survey Technician(s)	DEBRAUX, FOWLER		
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		Owl Penhall 7-13-07	

EP 1.13
2" 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
1	5.5	5.5	27,500	5,653	224	5,363	1,426	165	39	0.034
2	3.5	3.5	17,500	3,598	143	3,413	907	105	25	0.021
3	3.5	3.5	17,500	3,598	143	3,413	907	105	25	0.021
4	3.5	3.5	17,500	3,598	143	3,413	907	105	25	0.021
5	3.5	3.5	17,500	3,598	143	3,413	907	105	25	0.021
6	3	3	15,000	3,084	122	2,925	778	90	21	0.018
7	5.5	5.5	27,500	5,653	224	5,363	1,426	165	39	0.034
8	4.5	4.5	22,500	4,625	183	4,388	1,166	135	32	0.028
9	3	3	15,000	3,084	122	2,925	778	90	21	0.018
10	2.5	2.5	12,500	2,570	102	2,438	648	75	18	0.015
11	6.5	6.5	32,500	6,681	265	6,338	1,685	195	47	0.040
12	5.5	5.5	27,500	5,653	224	5,363	1,426	165	39	0.034
13	3	3	15,000	3,084	122	2,925	778	90	21	0.018
14	2.5	2.5	12,500	2,570	102	2,438	648	75	18	0.015
15	2.5	2.5	12,500	2,570	102	2,438	648	75	18	0.015
16	4	4	20,000	4,112	163	3,900	1,037	120	29	0.025
17	13	13	65,000	13,362	530	12,676	3,370	390	93	0.080
18	2	2	5,263	1,082	43	1,026	273	32	8	0.006
19	4	4	10,526	2,164	86	2,053	546	63	15	0.013
20	8	8	21,053	4,328	172	4,105	1,091	126	30	0.026
21	5	5	13,158	2,705	107	2,566	682	79	19	0.016
22	4	4	10,526	2,164	86	2,053	546	63	15	0.013
23	7	7	18,421	3,787	150	3,592	955	111	26	0.023
24	14	14	36,842	7,574	300	7,185	1,910	221	53	0.045
25	9	9	23,684	4,869	193	4,619	1,228	142	34	0.029
26	13	13	34,211	7,033	279	6,671	1,774	205	49	0.042
27	5	5	13,158	2,705	107	2,566	682	79	19	0.016
28	6	6	15,789	3,246	129	3,079	819	95	23	0.019
29	8	8	21,053	4,328	172	4,105	1,091	126	30	0.026
30	4	4	10,526	2,164	86	2,053	546	63	15	0.013
31	5	5	13,158	2,705	107	2,566	682	79	19	0.016
32	5	5	13,158	2,705	107	2,566	682	79	19	0.016

EP 1.13
2" 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
33	3	3	7,895	1,623	64	1,540	409	47	11	0.010
34	4	4	10,526	2,164	86	2,053	546	63	15	0.013
35	3	3	7,895	1,623	64	1,540	409	47	11	0.010
36	2	2	5,263	1,082	43	1,026	273	32	8	0.006
37	3	3	7,895	1,623	64	1,540	409	47	11	0.010
38	4	4	10,526	2,164	86	2,053	546	63	15	0.013
39	10	10	26,316	5,410	214	5,132	1,364	158	38	0.032
									MEAN	0.022
									MEDIAN	0.018
									STD DEV	0.013
									MAX	0.080
									MIN	0.006

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

Pipe Interior Radiological Survey Form

Date: 2-22-06 Time: 1025
 Pipe ID#: 1.13 Pipe Diameter: 2" Access Point Area: SPR BELOW GROUND
 Building: RK Elevation: -45 System: Drain Line
 Type of Survey Investigation _____ Characterization _____ Final Survey X Other ✓
 Gross _____ Co60 ✓ Cs _____
 Detector ID# / Sled ID# 44-62 # 212701 / 121
 Detector Cal Date: 11-17-05 Detector Cal Due Date: 11-17-06
 Instrument: 235-01 Instrument ID #: 212223
 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 4.9 cpm

MDCR_{static} 10.6 cpm

Efficiency Factor for Pipe Diameter 0.0002 (from detector efficiency determination)

MDC_{static} 6636 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

C. OUSNAME

Pipe Interior Radiological Survey

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
1	1	2	11	5.5	n/a	n/a
2	2	2	7	3.5		
3	3	2	7	3.5		
4	4	2	7	3.5		
5	5	2	7	3.5		
6	6	2	6	3		
7	7	2	11	5.5		
8	8	2	9	4.5		
9	9	2	6	3		
10	10	2	5	2.5		

Package Page 1 of 3

REFERENCE COPY

Pipe Interior Radiological Survey Form (Continuation Form)

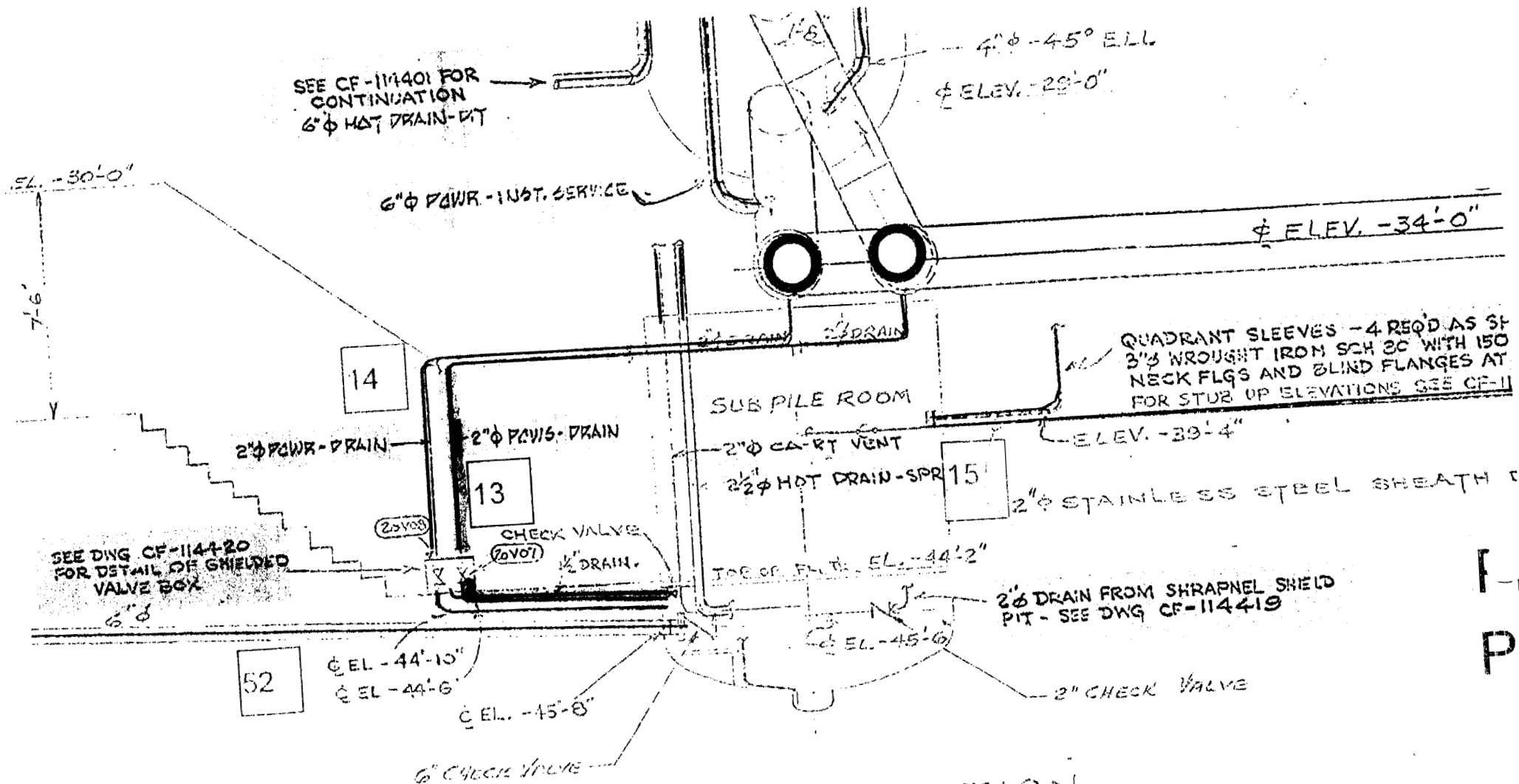
Date: 2-22-06
 Pipe ID#: 113 Pipe Diameter: 2" Access Point Area: SPR THE CAVE +
 Building: RR Elevation: -45 System: BELOW GRATING-

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
11	11	2	13	6.5	N/A	N/A
12	12	2	11	5.5		
13	13	2	6	3		
14	14	2	5	2.5		
15	15	2	5	2.5		
16	16	2	8	4		
17	17	2	26	13		
n a						

Package Page 2 of 3

REFERENCE COPY

PIPE SURVEYED
1.13



ELEVATION

REFERENCE COPY

PTL-35
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Pipe Interior Radiological Survey Form

Date: 6-27-07 Time: 1145
 Pipe ID#: 1.13 Pipe Diameter: 2" Access Point Area: Sub Pile Rm
 Building: CV Elevation: -42' System: Penetration
 Type of Survey Investigation _____ Characterization _____ Final Survey X Other ✓
 Gross _____ Co60 ✓ Cs _____
 Detector ID# / Sled ID# 44-159 / 238367 / N. Sled
 Detector Cal Date: 6-21-06 Detector Cal Due Date: 6-21-07
 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 1.6 cpm
 MDCR_{static} 7.4 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: 3rd Post Action EP 3-9 100%, Complete
Cal due is within 15 months as per procedure

Technician Signature R. Funch

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	2	2	n/a	n/a
2	2	1	4	4		
3	3	1	8	8		
4	4	1	5	5		
5	5	1	4	4		
6	6	1	7	7		
7	7	1	14	14		
8	8	1	9	9		
9	9	1	13	13		
10	10	↓	5	5	↓	↓

Package Page 1 of 3

REFERENCE COPY

Pipe Interior Radiological Survey Form (Continuation Form)

Date: 6-27-07
Pipe ID#: 1.13 Pipe Diameter: 2" Access Point Area: Sub Pile Rm
Building: CV Elevation: -42' System: Penetration

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
11	11	1	6	6	n/a	n/a
12	12	1	8	8		
13	13		4	4		
14	14		5	5		
15	15		5	5		
16	16		3	3		
17	17		4	4		
18	18		3	3		
19	19		2	2		
20	20		3	3		
21	21		4	4		
22	22		10	10		
<div style="position: relative; height: 350px;"> <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: 2em;">N A</div> </div>						

Package Page 2 of 3

1.13

REFERENCE COPY

6" Ø POWER - HOT SERVICE

14

2" Ø DRAIN - DRAIN

13

2" Ø DRAIN - DRAIN

2" Ø V08

CHECK VALVE

2" Ø V07

1 1/2" DRAIN

SUB PILE ROOM

2" Ø CART VENT

2 1/2" Ø HOT DRAIN - SPR

15

2" Ø S

TOE OF FL. TO EL. - 44'-2"

EL. 44'-20"
OF SHIELDED
CABLE

52

EL. - 44'-10"

EL. - 44'-6"

EL. - 45'-8"

EL. - 45'-6"

2" Ø DRAIN F
PIT - SEE D

PAGE
3 of 3

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




DQA Check Sheet

Design #	EP 1.13	Revision #	Original			
Survey Unit #	EP 1.13					
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, for WRS Test) ≥ the critical value?						X
Comments:						
FSS/Characterization Engineer (print/sign)				<i>Dale Raymond</i>		Date 7-13-07
FSS/ Characterization Manager (print/sign)				<i>[Signature]</i> R. Case		Date 7/25/07

Form
CS-09/2
Rev 0

SECTION 7
ATTACHMENT 4
1 DISC

Survey Unit Release Record

Design #	EP-1.14	Revision #	Original	Page 1 of 3
Survey Unit #(s)	1.14			
Description	<p>1) Embedded Pipe (EP) Survey Unit 1.14 meets the definition of embedded pipe for Plum Brook Reactor Facility (PBRF).</p> <p>2) EP 1.14 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 1.14 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>			
Approval Signatures			Date:	
FSS/Characterization Engineer			7-18-07	
Technical Reviewer (FSS/Characterization Engineer)			7/18/07	
FSS/Characterization Manager	 R. Case		7/30/07	



COPY

Form
CS-09/1
Rev 0

Survey Unit: 1.14

1.0 History/Description

- 1.1 The subject pipe is the 2" drain line for the 24" Rx Coolant return loop piping. The function of this piping was to convey water from the coolant loop to the sump in the sub pile room corridor on the -47 foot elevation.
- 1.2 EP 1.14 consists of 2" diameter piping that is approximately 35 feet in length and has three elbows from 45° to 90°.

2.0 Survey Design Information

- 2.1 EP 1.14 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 35 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 17,025 cm² (1.7 m²) for the entire length of (approximately 35') 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 1.14 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 Statistical Summary Table

Statistical Parameter	2" Pipe
Total Number of Survey Measurements	35
Number of Measurements >MDC	12
Number of Measurements Above 50% of DCGL	0
Number of Measurements Above DCGL	0
Mean	0.0391
Median	0.0307
Standard Deviation	0.0519
Maximum	0.3227
Minimum	0.0032

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 1.14 to be less than 1 mrem/yr. The dose contribution is estimated to be 0.0391 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 – EP 1.14 SURR & Spreadsheet Disc

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



BSI EP/BP SURVEY REPORT

Pipe ID	1.14	Survey Location	Primary Coolant Drain -42'
Survey Date	2/22/2006, 6/26/2007	2350-1 #	212223/189094
Survey Time	0851, 1600	Detector-Sled #	44-62 #212701/121 44-159#238367/nosled
Pipe Size	2"	Detector Efficiency	0.0002/0.00038
DCGL (dpm/100cm2)	2.41E+05	Pipe Area Incorporated by Detector Efficiency (in cm2)	486
Pipe Area Incorporated by Survey Data (in ²)	1.7	Field BKG (cpm)	4.4/1.3
Routine Survey	X	Field MDCR (cpm)	10.6/6.9
QA Survey		Nominal MDC (dpm/100cm2)	6636/5314
Survey Measurement Results			
Total Number of Survey Measurements		35	
Number of Measurements >MDC		12	
Number of Measurements Above 50% DCGL		0	
Number of Measurements Above DCGL		0	
Mean		0.0391	
Median		0.0307	
Standard Deviation		0.0519	
Maximum		0.3227	
Minimum		0.0032	
Survey Technician(s)		DEBRAUX, FOWLER	
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		 /7-1807	

EP 1.14
2" 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	5	5	25,000	5,139	204	4,875	1,296	150	36	0.031
2	3.5	3.5	17,500	3,598	143	3,413	907	105	25	0.021
3	3	3	15,000	3,084	122	2,925	778	90	21	0.018
4	5	5	25,000	5,139	204	4,875	1,296	150	36	0.031
5	3	3	15,000	3,084	122	2,925	778	90	21	0.018
6	3.5	3.5	17,500	3,598	143	3,413	907	105	25	0.021
7	3	3	15,000	3,084	122	2,925	778	90	21	0.018
8	2	2	10,000	2,056	81	1,950	518	60	14	0.012
9	7.5	7.5	37,500	7,709	306	7,313	1,944	225	54	0.046
10	6	6	30,000	6,167	244	5,850	1,555	180	43	0.037
11	5.5	5.5	27,500	5,653	224	5,363	1,426	165	39	0.034
12	6	6	30,000	6,167	244	5,850	1,555	180	43	0.037
13	4.5	4.5	22,500	4,625	183	4,388	1,166	135	32	0.028
14	5	5	25,000	5,139	204	4,875	1,296	150	36	0.031
15	4.5	4.5	22,500	4,625	183	4,388	1,166	135	32	0.028
16	7	7	35,000	7,195	285	6,825	1,814	210	50	0.043
17	7	7	18,421	3,787	150	3,592	955	111	26	0.023
18	15	15	39,474	8,115	322	7,698	2,046	237	57	0.048
19	11	11	28,947	5,951	236	5,645	1,501	174	41	0.035
20	6	6	15,789	3,246	129	3,079	819	95	23	0.019
21	14	14	36,842	7,574	300	7,185	1,910	221	53	0.045
22	100	100	263,158	54,099	2,144	51,318	13,642	1,579	377	0.323
23	8	8	21,053	4,328	172	4,105	1,091	126	30	0.026
24	16	16	42,105	8,656	343	8,211	2,183	253	60	0.052
25	7	7	18,421	3,787	150	3,592	955	111	26	0.023
26	10	10	26,316	5,410	214	5,132	1,364	158	38	0.032
27	12	12	31,579	6,492	257	6,158	1,637	189	45	0.039
28	6	6	15,789	3,246	129	3,079	819	95	23	0.019
29	10	10	26,316	5,410	214	5,132	1,364	158	38	0.032
30	6	6	15,789	3,246	129	3,079	819	95	23	0.019
31	27	27	71,053	14,607	579	13,856	3,683	426	102	0.087
32	4	4	10,526	2,164	86	2,053	546	63	15	0.013

EP 1.14
2" 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
33	1	1	2,632	541	21	513	136	16	4	0.003
34	20	20	52,632	10,820	429	10,264	2,728	316	75	0.065
35	4	4	10,526	2,164	86	2,053	546	63	15	0.013
									MEAN	0.039
									MEDIAN	0.031
									STD DEV	0.052
									MAX	0.323
									MIN	0.003

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

Pipe Interior Radiological Survey Form

Date: 2-22-06 Time: 0851
 Pipe ID#: 1.14 Pipe Diameter: 2" Access Point Area: SPR ^{UNDERGRADING} CASE
 Building: 24 Elevation: -45 System: PAVING ^{CONCRETE} DRAIN LINE
 Type of Survey Investigation _____ Characterization _____ Final Survey X Other 1
 Gross _____ Co60 ✓ Cs _____
 Detector ID# / Sled ID# 44-62 # 212701 / 121
 Detector Cal Date: 11-17-05 Detector Cal Due Date: 11-17-06
 Instrument: 2350-1 Instrument ID #: 212223
 Instrument Cal Date: 11-17-05 Instrument Cal Due Date: 11-7-06

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

Background Value 4.4 cpm
 MDCR_{static} 10.6 cpm
 Efficiency Factor for Pipe Diameter 0.0002 (from detector efficiency determination)
 MDC_{static} 6636 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

C. Dosman

Pipe Interior Radiological Survey

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
1	1	2	10	5	n/a	n/a
2	2	2	7	3.5		
3	3	2	6	3		
4	4	2	10	5		
5	5	2	6	3		
6	6	2	7	3.5		
7	7	2	6	3		
8	8	2	4	2		
9	9	2	15	7.5		
10	10	2	12	6		

Package Page 1 of 3

REFERENCE COPY

Pipe Interior Radiological Survey Form (Continuation Form)

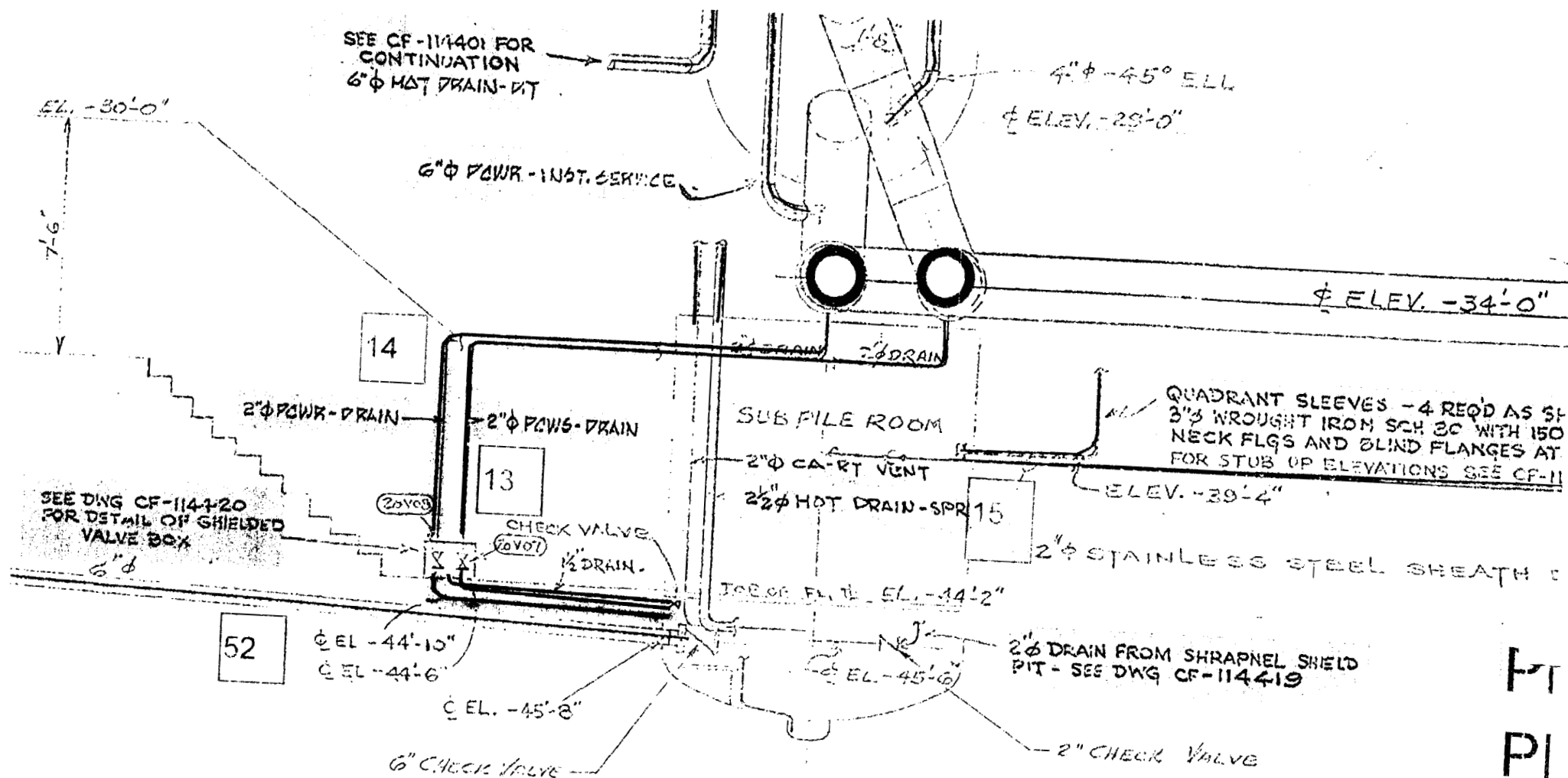
Date: 2-22-06 Pipe ID#: 1.14 Pipe Diameter: 2" Access Point Area: SPR THE CAVE
Building: RX Elevation: -45 System:

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
11	11	2	11	5.5	N/A	N/A
12	12	2	12	6		
13	13	2	9	4.5		
14	14	2	10	5		
15	15	2	9	4.5		
16	16	2	14	7		
<div style="position: relative; height: 100px;"> <div style="position: absolute; top: 0; left: 0; width: 100%; height: 100%; border-left: 2px solid black; border-bottom: 2px solid black; transform: rotate(45deg);"></div> <div style="position: absolute; top: 50%; left: 50%; transform: translate(-50%, -50%); font-size: 48px; font-family: cursive;">N/A</div> </div>						

Package Page 2 of 3

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= pipe surveyed
1.14



ELEVATION

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PT 323

Pipe Interior Radiological Survey Form

Date: 6-27-07 Time: 1110
 Pipe ID#: 1.14 Pipe Diameter: 2" Access Point Area: Sub Pipe Rm
 Building: CV Elevation: -42' System: Penetration
 Type of Survey Investigation _____ Characterization _____ Final Survey X Other ✓
 Gross _____ Co60 ✓ Cs _____
 Detector ID# / Sled ID# 44-159 / 238367 / No Sled
 Detector Cal Date: 6-21-06 Detector Cal Due Date: 6-21-07
 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 1.6 cpm

MDCR_{static} 7.4 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: 3rd Post Down EP3-9 100% Complete
Cal Due is within 15 months as per procedure

Technician Signature R Fowler

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	7	7	n/a	no
2	2	1	15	15		
3	3	1	11	11		
4	4	1	6	6		
5	5	1	14	14		
6	6	1	100	100		
7	7	1	8	8		
8	8	1	16	16		
9	9	1	7	7		
10	10	1	10	10		

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Package Page 1 of 3

Pipe Interior Radiological Survey Form (Continuation Form)

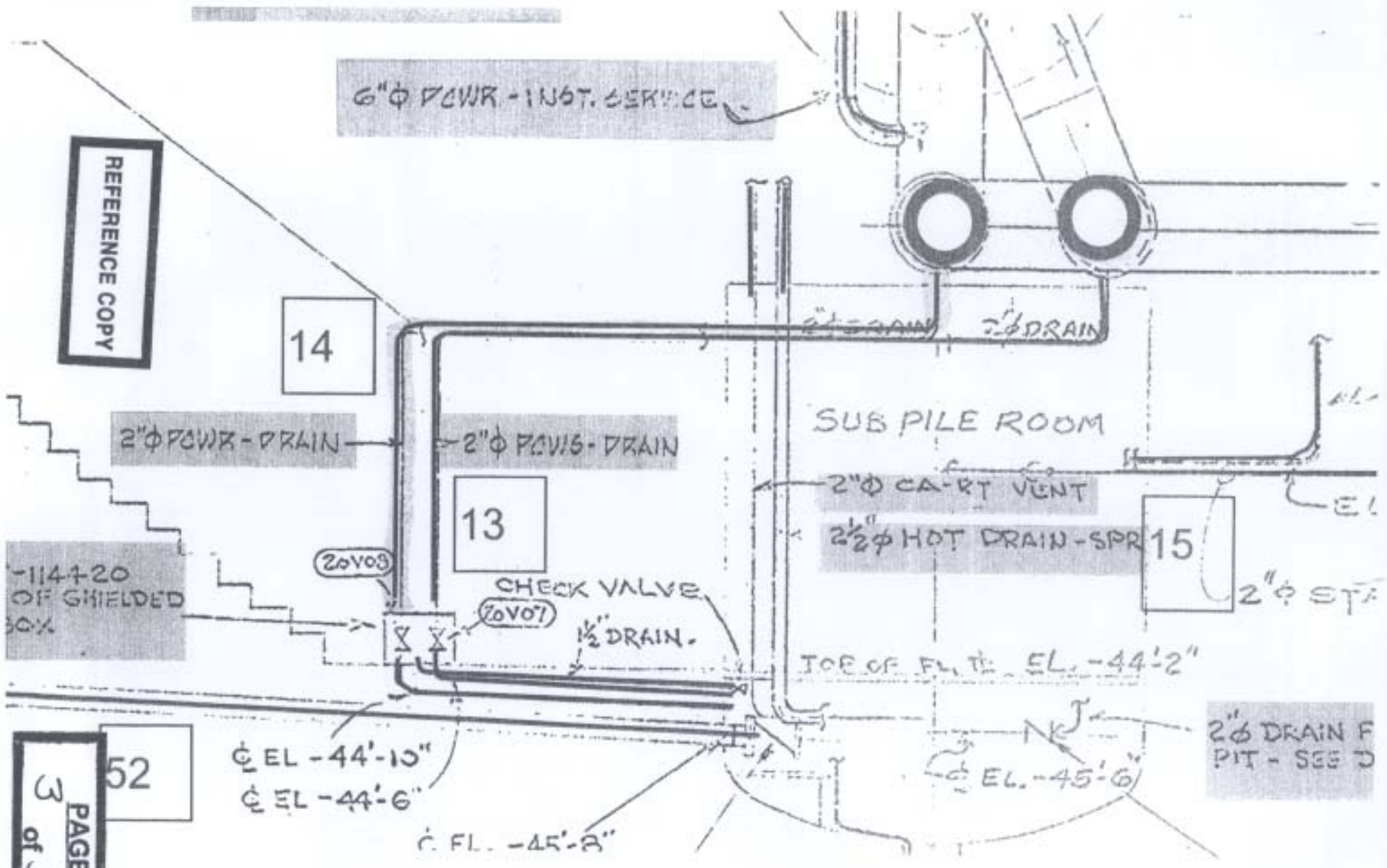
Date: 6-27-07
 Pipe ID#: 1.14 Pipe Diameter: 2" Access Point Area: Sub Pile Rm
 Building: CV Elevation: -42' System: Penetration

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
11	11	↓	12	12	n/a	n/a
12	12		6	6		
13	13		10	10		
14	14		6	6		
15	15		27	27		
16	16		4	4		
17	17		1	1		
18	18		20	20		
19	19		4	4		
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FIGURE 1.14

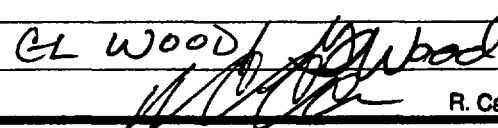
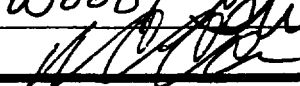


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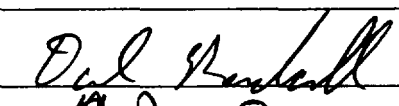
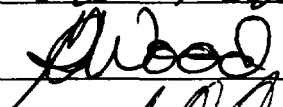

SECTION 7
ATTACHMENT 3
1 PAGE(S)

DQA Check Sheet

Design #	EP 1.14	Revision #	Original						
Survey Unit #	EP 1.14								
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 (<i>S</i> + for Sign Test or <i>W</i> _r for WRS Test) ≥ the critical value?								X	
Comments:									
FSS/Characterization Engineer (print/sign)						 EL WOOD		Date	7-17-07
FSS/ Characterization Manager (print/sign)						 R. Case		Date	7/30/07

Form
CS-09/2
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SECTION 7
ATTACHMENT 4
1 DISC

Survey Unit Release Record				
Design #	EP-1.41	Revision #	Original	Page 1 of 3
Survey Unit #(s)	1.41			
Description	<p>1) Embedded Pipe (EP) Survey Unit 1.41 meets the definition of embedded pipe for Plum Brook Reactor Facility (PBRF).</p> <p>2) EP 1.41 is a Class 1, Group 2 survey unit as per the PBRF Final Status Survey Plan (FSSP) and Technical Basis Document (TBD)-06-004.</p> <p>3) Surveys in EP 1.41 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.</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			7-13-07	
Technical Reviewer (FSS/Characterization Engineer)			7-16-07	
FSS/Characterization Manager	 Case		7/25/07	

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Survey Unit: 1.41

1.0 History/Description

- 1.1 The subject pipe system is the 6 inch header from the hot drain system service ring to the drain trench on the Rx building -25 foot elevation.
- 1.2 The pipe section has one 90 degree along its 45 foot length.

2.0 Survey Design Information

- 2.1 EP 1.41 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 45 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 65,655 cm² (6.6 m²) for the entire length of (approximately 45') 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 1.41 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 Statistical Summary Table

Statistical Parameter	6" Pipe
Total Number of Survey Measurements	45
Number of Measurements >MDC	44
Number of Measurements Above 50% of DCGL	0
Number of Measurements Above DCGL	0
Mean	0.0192
Median	0.0172
Standard Deviation	0.0126
Maximum	0.0876
Minimum	0.0086

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 1.41 to be less than 1 mrem/yr. The dose contribution is estimated to be 0.019 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 – EP 1.41 SURR & Spreadsheet Disc

SECTION 7
ATTACHMENT 1
3 PAGE(S)



BSI EP/BP SURVEY REPORT

Pipe ID	1.41	Survey Location	Quad B Trench Drain
Survey Date	02-Apr-07	2350-1 #	189094
Survey Time	13:27	Detector-Sled #	1MG1 LVS-1/107
Pipe Size	6"	Detector Efficiency	0.00038
DCGL (dpm/100cm ²)	2.41E+05	Pipe Area Incorporated by Detector Efficiency (in cm ²)	1459
Pipe Area Incorporated by Survey Data (m ²)	6.6	Field BKG (cpm)	3.6
Routine Survey	X	Field MDCR (cpm)	9.5
QA Survey		Nominal MDC (dpm/100cm ²)	2,066
Survey Measurement Results			
Total Number of Survey Measurements			45
Number of Measurements >MDC			44
Number of Measurements Above 50% DCGL			0
Number of Measurements Above DCGL			0
Mean			0.0192
Median			0.0172
Standard Deviation			0.0126
Maximum			0.0876
Minimum			0.0086
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		Orel Penhall 7-13-07	

EP 1.41
6" 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	16	16	42,105	2,886	1,496	24	17	1	83	0.013
2	24	24	63,158	4,329	2,245	36	25	2	125	0.019
3	18	18	47,368	3,247	1,683	27	19	2	93	0.014
4	14	14	36,842	2,525	1,309	21	15	1	73	0.011
5	23	23	60,526	4,148	2,151	34	24	2	119	0.018
6	22	22	57,895	3,968	2,058	33	23	2	114	0.017
7	31	31	81,579	5,591	2,899	46	33	3	161	0.024
8	24	24	63,158	4,329	2,245	36	25	2	125	0.019
9	20	20	52,632	3,607	1,871	30	21	2	104	0.016
10	22	22	57,895	3,968	2,058	33	23	2	114	0.017
11	28	28	73,684	5,050	2,619	42	30	2	145	0.022
12	22	22	57,895	3,968	2,058	33	23	2	114	0.017
13	20	20	52,632	3,607	1,871	30	21	2	104	0.016
14	24	24	63,158	4,329	2,245	36	25	2	125	0.019
15	21	21	55,263	3,788	1,964	31	22	2	109	0.016
16	26	26	68,421	4,690	2,432	39	27	2	135	0.020
17	14	14	36,842	2,525	1,309	21	15	1	73	0.011
18	14	14	36,842	2,525	1,309	21	15	1	73	0.011
19	21	21	55,263	3,788	1,964	31	22	2	109	0.016
20	22	22	57,895	3,968	2,058	33	23	2	114	0.017
21	17	17	44,737	3,066	1,590	25	18	1	88	0.013
22	16	16	42,105	2,886	1,496	24	17	1	83	0.013
23	27	27	71,053	4,870	2,525	40	29	2	140	0.021
24	23	23	60,526	4,148	2,151	34	24	2	119	0.018
25	21	21	55,263	3,788	1,964	31	22	2	109	0.016
26	20	20	52,632	3,607	1,871	30	21	2	104	0.016
27	11	11	28,947	1,984	1,029	16	12	1	57	0.009
28	12	12	31,579	2,164	1,122	18	13	1	62	0.009
29	30	30	78,947	5,411	2,806	45	32	3	156	0.023
30	16	16	42,105	2,886	1,496	24	17	1	83	0.013
31	19	19	50,000	3,427	1,777	28	20	2	99	0.015
32	20	20	52,632	3,607	1,871	30	21	2	104	0.016

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

Pipe Interior Radiological Survey Form

Date: 4/2/07 Time: 1327
Pipe ID#: 1.41 Pipe Diameter: 6" Access Point Area: TRENCH
Building: R Elevation: -27' System: QUAD B Hot Dren

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

Detector ID# / Sled ID# 1MG1 LVS-1 / 107
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 3.6 cpm

MDCR_{static} 9.5 cpm

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

MDC_{static} 2066 dpm/ 100 cm²

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

Comments: INITIAL EP2-2 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	4	16	16	n/a	n/a
2	2		24	24		
3	3		18	18		
4	4		14	14		
5	5		23	23		
6	6		22	22		
7	7		31	31		
8	8		24	24		
9	9		20	20		
10	10		22	22		

Package Page 1 of 3



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Attachment 3, Page 1

Pipe Interior Radiological Survey Form (Continuation Form)

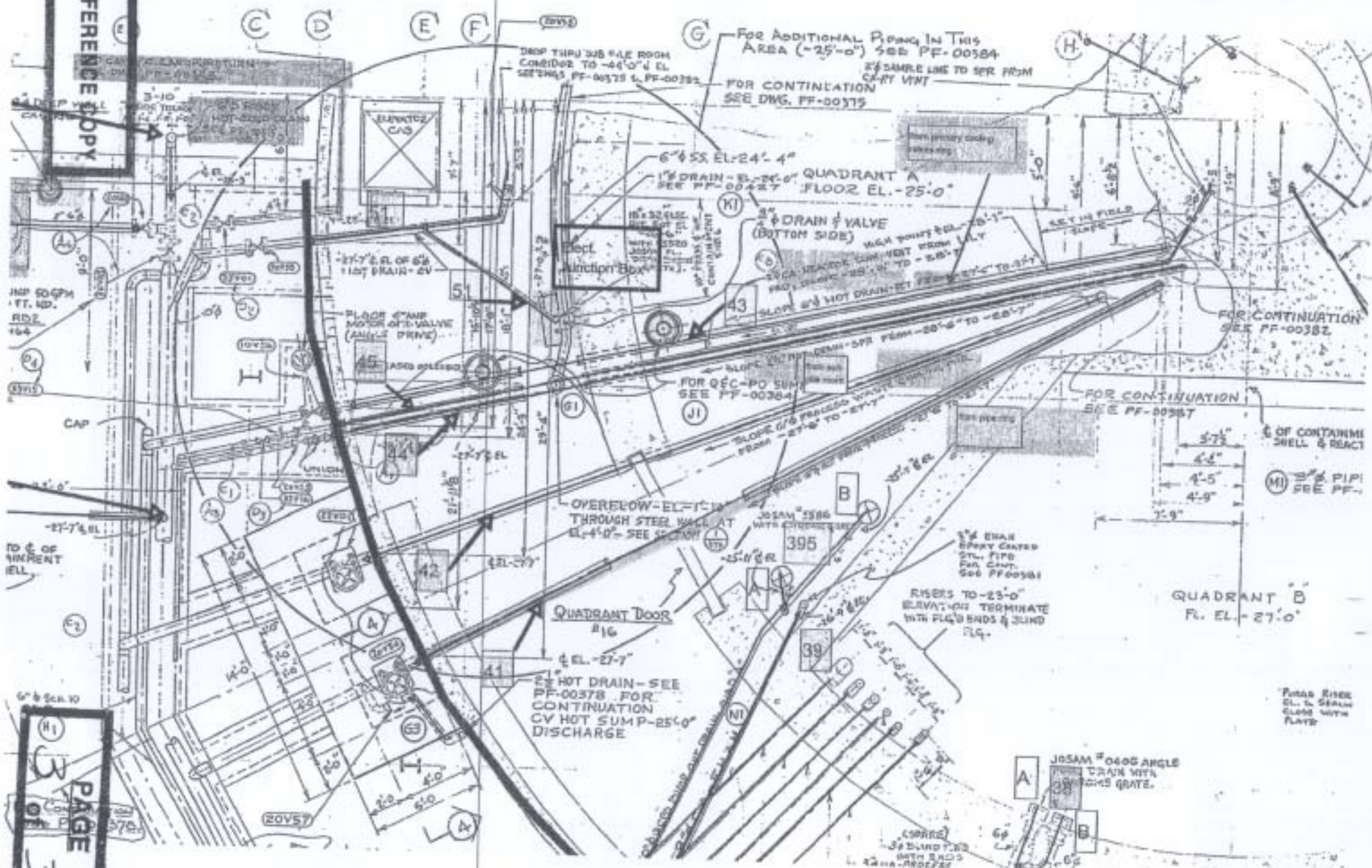
Date: 4/2/07 Pipe ID#: 1.41 Pipe Diameter: 6" Access Point Area: TRENCH
 Building: B Elevation: -27' System: QUAD B Hot Drn

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
11	11	4	28	28	n/a	n/a
12	12		22	22		n/a
13	13		20	20		
14	14		24	24		
15	15		21	21		
16	16		26	26		
17	17		14	14		
18	18		15	15		
19	19		21	21		
20	20		22	22		
21	21		17	17		
22	22		16	16		
23	23		27	27		
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25	25		21	21		
26	26		20	20		
27	27		11	11		
28	28		12	12		
29	29		30	30		
30	30		16	16		
31	31		19	19		
32	32		20	20		
33	33		18	18		
34	34		27	27		
35	35		23	23		
36	36		28	28		
37	37		17	17		
38	38		26	26		
39	39		26	26		
40	40		21	21		
41	41		18	18		
42	42		25	25		
43	43		34	34		
44	44		72	72		
45	45		112	112		

Package Page 2 of 3

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PAGE

SECTION 7
ATTACHMENT 3
1 PAGE(S)

DQA Check Sheet

Design #	EP 1.41	Revision #	Original	
Survey Unit #	EP 1.41			

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>Dale Randolph</i>	Date	7-13-07
FSS/ Characterization Manager (print/sign)	<i>R. Case</i>	Date	7/25/07

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SECTION 7
ATTACHMENT 4
1 DISC

Survey Unit Release Record				
Design #	EP-1.43	Revision #	Original	Page 1 of 3
Survey Unit #(s)	1.43			
Description	<p>1) Embedded Pipe (EP) Survey Unit 1.43 meets the definition of embedded pipe for Plum Brook Reactor Facility (PBRF).</p> <p>2) EP 1.43 is a Class 1, Group 2 survey unit as per the PBRF Final Status Survey Plan (FSSP) and Technical Basis Document (TBD)-06-004.</p> <p>3) Surveys in EP 1.43 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.</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	<i>Del Randall</i>		7-11-07	
Technical Reviewer (FSS/Characterization Engineer)	<i>Wood</i>		7-16-07	
FSS/Characterization Manager	<i>R. Case</i>		7/25/07	

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Survey Unit: 1.43

1.0 History/Description

- 1.1 The subject pipe system is the 6 inch return header from the cooling water service ring to the drain trench on the Rx building -25 foot elevation.
- 1.2 A vertical 90 degree elbow is 34 feet into the pipe section. The pipe is approximately 47 feet in length.

2.0 Survey Design Information

- 2.1 EP 1.43 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 47 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 68,573 cm² (6.9 m²) for the entire length of (approximately 47') 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 1.43 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 Statistical Summary Table

Statistical Parameter	6" Pipe
Total Number of Survey Measurements	47
Number of Measurements >MDC	47
Number of Measurements Above 50% of DCGL	0
Number of Measurements Above DCGL	0
Mean	0.0177
Median	0.0172
Standard Deviation	0.0041
Maximum	0.0258
Minimum	0.0094

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 1.43 to be less than 1 mrem/yr. The dose contribution is estimated to be 0.018 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 – SURR EP 1.43 & Spreadsheet Disc

SECTION 7
ATTACHMENT 1
3 PAGE(S)



BSI EP/BP SURVEY REPORT

Pipe ID	1.43	Survey Location	Trench Service Ring
Survey Date	02-Apr-07	2350-1 #	189094
Survey Time	08:00	Detector-Sled #	1MG1 LVS-1/107
Pipe Size	6"	Detector Efficiency	0.00038
DCGL (dpm/100cm ²)	2.41E+05	Pipe Area Incorporated by Detector Efficiency (in cm ²)	1459
Pipe Area Incorporated by Survey Date (in")	6.9	Field BKG (cpm)	3.6
Routine Survey	X	Field MDCR (cpm)	9.5
QA Survey		Nominal MDC (dpm/100cm ²)	2,066
Survey Measurement Results			
Total Number of Survey Measurements			47
Number of Measurements >MDC			47
Number of Measurements Above 50% DCGL			0
Number of Measurements Above DCGL			0
Mean			0.0177
Median			0.0172
Standard Deviation			0.0041
Maximum			0.0258
Minimum			0.0094
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		Ocl R. Hall 7-11-07	

EP 1.43
6" 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	28	28	73,684	5,050	2,619	42	30	2	145	0.022
2	20	20	52,632	3,607	1,871	30	21	2	104	0.016
3	27	27	71,053	4,870	2,525	40	29	2	140	0.021
4	20	20	52,632	3,607	1,871	30	21	2	104	0.016
5	25	25	65,789	4,509	2,338	37	26	2	130	0.020
6	20	20	52,632	3,607	1,871	30	21	2	104	0.016
7	26	26	68,421	4,690	2,432	39	27	2	135	0.020
8	20	20	52,632	3,607	1,871	30	21	2	104	0.016
9	15	15	39,474	2,706	1,403	22	16	1	78	0.012
10	15	15	39,474	2,706	1,403	22	16	1	78	0.012
11	17	17	44,737	3,066	1,590	25	18	1	88	0.013
12	19	19	50,000	3,427	1,777	28	20	2	99	0.015
13	18	18	47,368	3,247	1,683	27	19	2	93	0.014
14	23	23	60,526	4,148	2,151	34	24	2	119	0.018
15	19	19	50,000	3,427	1,777	28	20	2	99	0.015
16	22	22	57,895	3,968	2,058	33	23	2	114	0.017
17	22	22	57,895	3,968	2,058	33	23	2	114	0.017
18	29	29	76,316	5,231	2,712	43	31	3	151	0.023
19	31	31	81,579	5,591	2,899	46	33	3	161	0.024
20	18	18	47,368	3,247	1,683	27	19	2	93	0.014
21	12	12	31,579	2,164	1,122	18	13	1	62	0.009
22	33	33	86,842	5,952	3,086	49	35	3	171	0.026
23	25	25	65,789	4,509	2,338	37	26	2	130	0.020
24	22	22	57,895	3,968	2,058	33	23	2	114	0.017
25	30	30	78,947	5,411	2,806	45	32	3	156	0.023
26	24	24	63,158	4,329	2,245	36	25	2	125	0.019
27	27	27	71,053	4,870	2,525	40	29	2	140	0.021
28	29	29	76,316	5,231	2,712	43	31	3	151	0.023
29	21	21	55,263	3,788	1,964	31	22	2	109	0.016
30	17	17	44,737	3,066	1,590	25	18	1	88	0.013
31	25	25	65,789	4,509	2,338	37	26	2	130	0.020
32	23	23	60,526	4,148	2,151	34	24	2	119	0.018

EP 1.43
6" 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
33	14	14	36,842	2,525	1,309	21	15	1	73	0.011
34	23	23	60,526	4,148	2,151	34	24	2	119	0.018
35	29	29	76,316	5,231	2,712	43	31	3	151	0.023
36	22	22	57,895	3,968	2,058	33	23	2	114	0.017
37	22	22	57,895	3,968	2,058	33	23	2	114	0.017
38	19	19	50,000	3,427	1,777	28	20	2	99	0.015
39	29	29	76,316	5,231	2,712	43	31	3	151	0.023
40	19	19	50,000	3,427	1,777	28	20	2	99	0.015
41	27	27	71,053	4,870	2,525	40	29	2	140	0.021
42	14	14	36,842	2,525	1,309	21	15	1	73	0.011
43	32	32	84,211	5,772	2,993	48	34	3	166	0.025
44	28	28	73,684	5,050	2,619	42	30	2	145	0.022
45	24	24	63,158	4,329	2,245	36	25	2	125	0.019
46	22	22	57,895	3,968	2,058	33	23	2	114	0.017
47	16	16	42,105	2,886	1,496	24	17	1	83	0.013
									MEAN	0.018
									MEDIAN	0.017
									STD DEV	0.004
									MAX	0.026
									MIN	0.009

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ATTACHMENT 2
4 PAGE(S)

Pipe Interior Radiological Survey Form

Date: 4/2/07 Time: 0800
Pipe ID#: 1.43 Pipe Diameter: 6" Access Point Area: TRENCH
Building: B Elevation: -27' System: ~~M-QUAD B HOT DR~~
SERVICE RING

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

Gross _____ Co60 ✓ Cs _____

Detector ID# / Sled ID# IMG1 LVS-1 / 107

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 3.6 cpm

MDCR_{static} 9.5 cpm

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

MDC_{static} 2066 dpm/ 100 cm²

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

Comments: INITIAL EP2-2 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	<u>1</u>	<u>28</u>	<u>28</u>	<u>n/a</u>	<u>n/a</u>
2	2		<u>20</u>	<u>20</u>		
3	3		<u>22</u>	<u>22</u>		
4	4		<u>20</u>	<u>20</u>		
5	5		<u>25</u>	<u>25</u>		
6	6		<u>20</u>	<u>20</u>		
7	7		<u>26</u>	<u>26</u>		
8	8		<u>20</u>	<u>20</u>		
9	9		<u>15</u>	<u>15</u>		
10	10		<u>15</u>	<u>15</u>		

Package Page 1 of 4

Pipe Interior Radiological Survey Form (Continuation Form)

Date: 4/2/07
 Pipe ID#: 1.43 Pipe Diameter: 6" Access Point Area: TREXIT
 Building: R Elevation: -27' System: ~~McQuay B-101 DRN~~
SERVICE RING

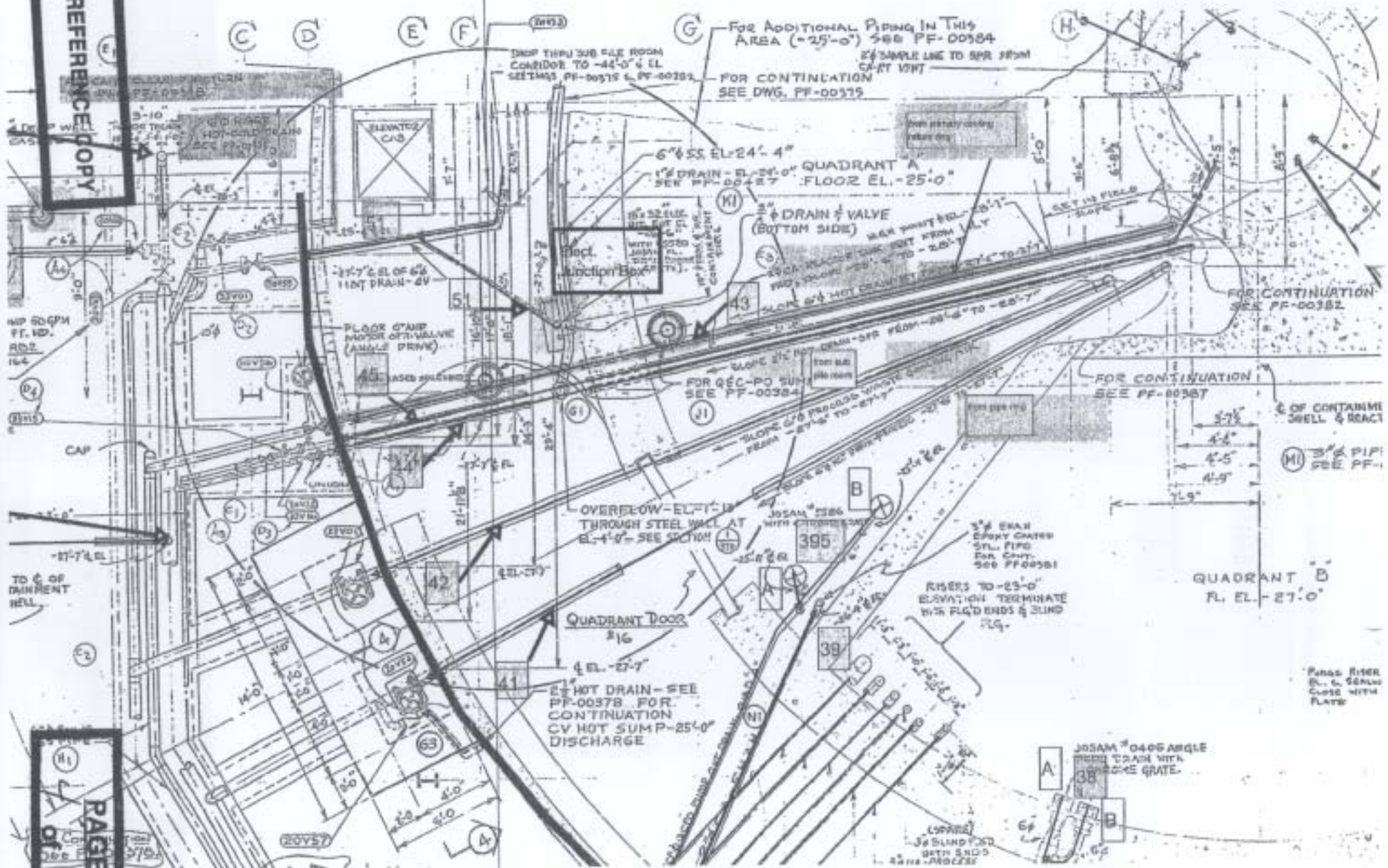
Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
11	11	4	17	17	n/a	n/a
12	12		19	19		
13	13		18	18		
14	14		23	23		
15	15		19	19		
16	16		22	22		
17	17		22	22		
18	18		29	29		
19	19		31	31		
20	20		18	18		
21	21		12	12		
22	22		33	33		
23	23		25	25		
24	24		22	22		
25	25		30	30		
26	26		24	24		
27	27		27	27		
28	28		29	29		
29	29		21	21		
30	30		17	17		
31	31		25	25		
32	32		23	23		
33	33		14	14		
34	34		23	23		
35	35		29	29		
36	36		22	22		
37	37		22	22		
38	38		19	19		
39	39		29	29		
40	40		19	19		
41	41		27	27		
42	42		14	14		
43	43		32	32		
44	44		28	28		
45	45		24	24		

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Attachment 3, Page 2

REFERENCE COPY



RAGE

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ATTACHMENT 3
1 PAGE(S)

DQA Check Sheet

Design #	EP 1.43	Revision #	Original						
Survey Unit #	EP 1.43								
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>Dale R. Case</i>		Date	7-11-07
FSS/ Characterization Manager (print/sign)						<i>[Signature]</i>		Date	7/25/07

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SECTION 7
ATTACHMENT 4
1 DISC

Survey Unit Release Record				
Design #	EP 1.93	Revision #	Original	Page 1 of 3
Survey Unit #(s)	1.93			
Description	<p>1) Embedded Pipe (EP) Survey Unit 1.93 meets the definition of embedded pipe for Plum Brook Reactor Facility (PBRF).</p> <p>2) EP 1.93 is a Class 1, Group 3.2 survey unit as per the PBRF Final Status Survey Plan (FSSP) and Technical Basis Document (TBD)-06-004.</p> <p>3) Surveys in EP 1.93 were performed using a scintillation detector optimized to measure gamma energies representative of Cs-137. Sample #EP 3-11 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	<i>Ogil</i>		7-13-07	
Technical Reviewer (FSS/Characterization Engineer)	<i>Wood</i>		7-14-07 7-16-07	
FSS/Characterization Manager	<i>R. Case</i>		7/25/07	

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Survey Unit: 1.93

1.0 History/Description

- 1.1 The subject pipe is a drain system overflow pipe servicing the Hot Dry Storage (HDS) pit in the Hot Lab. The header runs from the northwest side of the HDS pit to the valve pit on the -25 ft elevation of the Hot Lab.
- 1.2 EP 1.93 consists of 3" diameter piping that is approximately 24 feet in length.

2.0 Survey Design Information

- 2.1 EP 1.93 was surveyed IAW Procedure #BSI/LVS-002.
- 2.2 100% of the 3" ID pipe was accessible for survey. The accessible 3" ID pipe was surveyed by static measurement at one foot increments, for a total of 24 survey measurements.
- 2.3 Surface area for the 3" ID piping is 486 cm^2 for each foot of piping, corresponding to a total 3" ID piping surface area of $17,512 \text{ cm}^2$ (1.8 m^2) for the entire length of (approximately 24') of 3" 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 1.93 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 Statistical Summary Table

Statistical Parameter	3" Pipe
Total Number of Survey Measurements	24
Number of Measurements >MDC	12
Number of Measurements Above 50% of DCGL	0
Number of Measurements Above DCGL	0
Mean	0.0020
Median	0.0019
Standard Deviation	0.0007
Maximum	0.0034
Minimum	0.0009

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 1.93 to be less than 1 mrem/yr. The dose contribution is estimated to be 0.002 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 – EP 1.93 SURR & Spreadsheet Disc

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ATTACHMENT 1
2 PAGE(S)



BSI EP/BP SURVEY REPORT

Pipe ID	EP 1.93	Survey Location	HDS riser -25'
Survey Date	16-Oct-06	2350-1 #	203488
Survey Time	08:49	Detector-Sled #	44-159 #238369/101
Pipe Size	3"	Detector Efficiency	0.00077
DCGL (dpm/100cm ²)	3.79E+06	Pipe Area Incorporated by Detector Efficiency (in cm ²)	730
Pipe Area Incorporated by Survey Date (in")	1.8	Field BKG (cpm)	6.4
Routine Survey	X	Field MDCR (cpm)	11.7
QA Survey		Nominal MDC (dpm/100cm ²)	2,660
Survey Measurement Results			
Total Number of Survey Measurements		24	
Number of Measurements >MDC		12	
Number of Measurements Above 50% DCGL		0	
Number of Measurements Above DCGL		0	
Mean		0.0020	
Median		0.0019	
Standard Deviation		0.0007	
Maximum		0.0034	
Minimum		0.0009	
Survey Technician(s)	STOCK		
Survey Unit Classification		1	
TBD 06-004 Piping Group		3.2	
SR-13 Radionuclide Distribution Sample		EP 3-11	
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		Orel Randall 7-13-07	

EP 1.93
3" Pipe
TBD 06-004 Group 3.2

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	14	14	18,182	2,492	273	-	17	-	-	0.002
2	11	11	14,286	1,958	214	-	14	-	-	0.001
3	8	8	10,390	1,424	156	-	10	-	-	0.001
4	12	12	15,584	2,136	234	-	15	-	-	0.002
5	12	12	15,584	2,136	234	-	15	-	-	0.002
6	17	17	22,078	3,026	331	-	21	-	-	0.002
7	11	11	14,286	1,958	214	-	14	-	-	0.001
8	15	15	19,481	2,670	292	-	19	-	-	0.002
9	15	15	19,481	2,670	292	-	19	-	-	0.002
10	13	13	16,883	2,314	253	-	16	-	-	0.002
11	11	11	14,286	1,958	214	-	14	-	-	0.001
12	9	9	11,688	1,602	175	-	11	-	-	0.001
13	19	19	24,675	3,382	370	-	24	-	-	0.002
14	20	20	25,974	3,560	390	-	25	-	-	0.003
15	7	7	9,091	1,246	136	-	9	-	-	0.001
16	24	24	31,169	4,272	468	-	30	-	-	0.003
17	20	20	25,974	3,560	390	-	25	-	-	0.003
18	12	12	15,584	2,136	234	-	15	-	-	0.002
19	10	10	12,987	1,780	195	-	12	-	-	0.001
20	15	15	19,481	2,670	292	-	19	-	-	0.002
21	19	19	24,675	3,382	370	-	24	-	-	0.002
22	18	18	23,377	3,204	351	-	22	-	-	0.002
23	26	26	33,766	4,628	507	-	32	-	-	0.003
24	23	23	29,870	4,094	448	-	29	-	-	0.003
									MEAN	0.002
									MEDIAN	0.002
									STD DEV	0.001
									MAX	0.003
									MIN	0.001

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ATTACHMENT 2
3 PAGE(S)

Pipe Interior Radiological Survey Form

Date: 10/16/06 Time: 0849
 Pipe ID#: 1.93 Pipe Diameter: 3" Access Point Area: HOT DRY STORAGE
 Building: HOT LAB Elevation: -25' System: RISER

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

Gross _____ Co60 _____ Cs ✓

Detector ID# / Sled ID# 44-159-238369 / 101

Detector Cal Date: 9/5/06 Detector Cal Due Date: 9/5/07

Instrument: 2350-1 Instrument ID #: 203488

Instrument Cal Date: 7/5/06 Instrument Cal Due Date: 7/5/07

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

Background Value 6.4 cpm

MDCR_{static} 11.7 cpm

Efficiency Factor for Pipe Diameter 0.00077 (from detector efficiency determination)

MDC_{static} 2660 dpm/ 100 cm²

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

Comments: RE SURVEY EP3-11 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	4	14	14	n/a	n/a
2	2	↓	11	11	↓	↓
3	3	↓	8	8	↓	↓
4	4	↓	12	12	↓	↓
5	5	↓	12	12	↓	↓
6	6	↓	17	17	↓	↓
7	7	↓	11	11	↓	↓
8	8	↓	15	15	↓	↓
9	9	↓	15	15	↓	↓
10	10	↓	13	13	↓	↓

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Attachment 3, Page 1

Pipe Interior Radiological Survey Form (Continuation Form)

Date: 93
Pipe ID#: 10/16/06 Pipe Diameter: 3" Access Point Area: HOT DRY STORAGE
Building: HOT LAB Elevation: -25' System: RISER

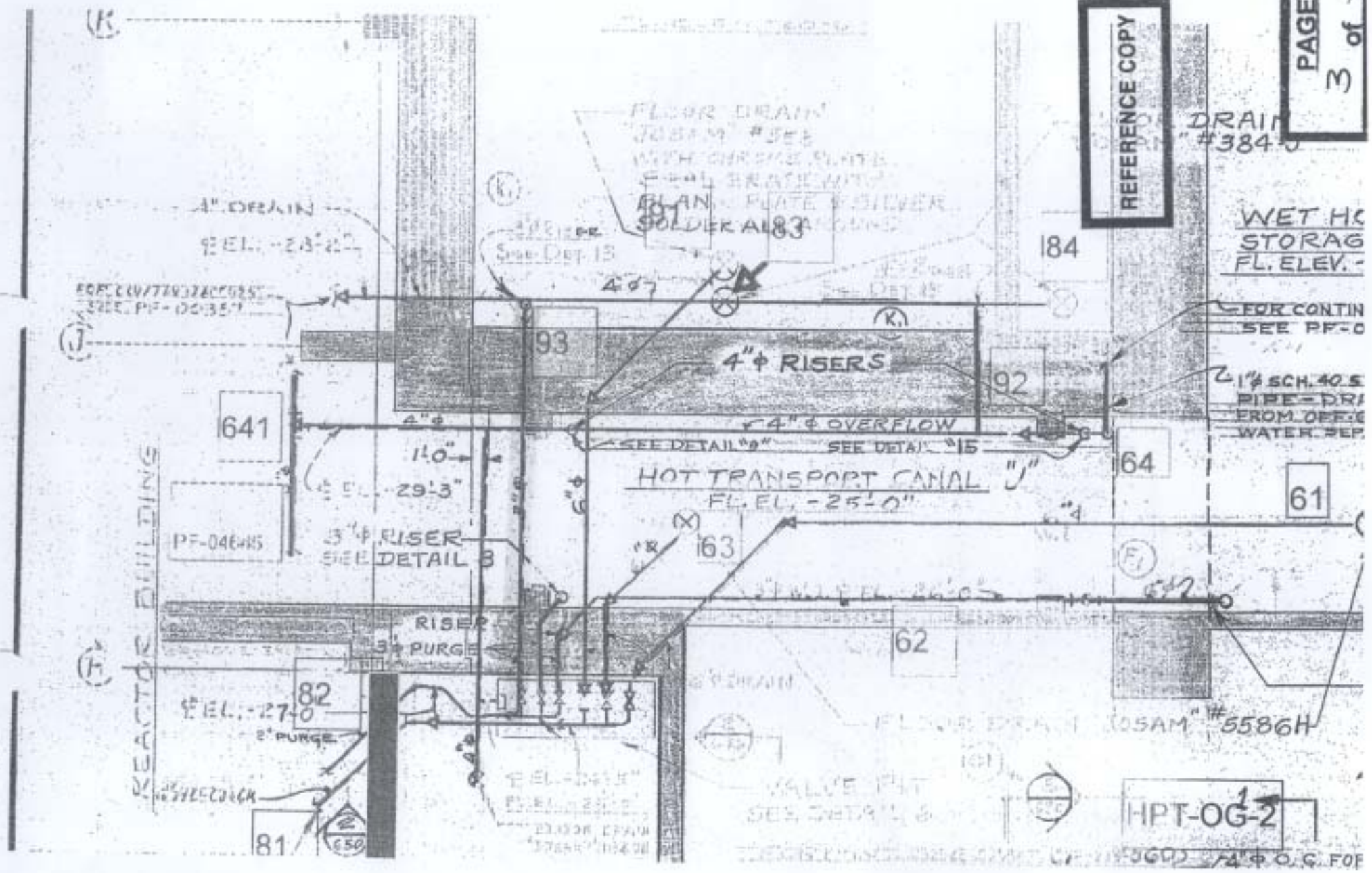
Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
11	11	1	11	11	n/a	n/a
12	12	1	9	9		
13	13	1	19	19		
14	14	1	20	20		
15	15	1	7	7		
16	16	1	24	24		
17	17	1	20	20		
18	18	1	12	12		
19	19	1	10	10		
20	20	1	15	15		
21	21	1	19	19		
22	22	1	18	18		
23	23	1	26	26		
24	24	1	23	23		

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1 PAGE(S)

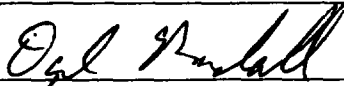

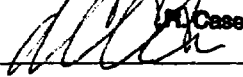
DQA Check Sheet

Design #	EP 1.93	Revision #	Original			
Survey Unit #	EP 1.93					
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>Dale Randall</i>		Date 7-13-07
FSS/ Characterization Manager (print/sign)				<i>R. Case</i>		Date 7/25/07

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SECTION 7
ATTACHMENT 4
1 DISC

Survey Unit Release Record

Design #	EP HPT-102	Revision #	Original	Page 1 of 3
Survey Unit #(s)	HPT-102			
Description	<p>1) Embedded Pipe (EP) Survey Unit HPT-102 meets the definition of embedded pipe for Plum Brook Reactor Facility (PBRF).</p> <p>2) EP HPT-102 is a Class 1, Group 3.2 survey unit as per the PBRF Final Status Survey Plan (FSSP) and Technical Basis Document (TBD)-06-004.</p> <p>3) Surveys in EP HPT-102 were performed using a scintillation detector optimized to measure gamma energies representative of Cs-137. Sample #EP 3-11 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			7-13-07	
Technical Reviewer (FSS/Characterization Engineer)			7-16-07	
FSS/Characterization Manager	 J. Case		7/25/07	

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Survey Unit: HPT-102

1.0 History/Description

- 1.1 The subject pipe is part of the the 2" drain line for the 24" Rx Coolant return loop piping. The function of this piping was to convey water from the coolant loop to the sump in the sub pile room corridor on the -47.
- 1.2 EP HPT-102 consists of 4" diameter piping that is approximately 23 feet in length.

2.0 Survey Design Information

- 2.1 EP HPT-102 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 23 survey measurements.
- 2.3 Surface area for the 4" ID piping is 486 cm² for each foot of piping, corresponding to a total 4" ID piping surface area of 18,971 cm² (1.9 m²) for the entire length of (approximately 23') 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 HPT-102 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 Statistical Summary Table

Statistical Parameter	4" Pipe
Total Number of Survey Measurements	23
Number of Measurements >MDC	14
Number of Measurements Above 50% of DCGL	0
Number of Measurements Above DCGL	0
Mean	0.0017
Median	0.0017
Standard Deviation	0.0007
Maximum	0.0037
Minimum	0.0006

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 HPT-102 to be less than 1 mrem/yr. The dose contribution is estimated to be 0.002 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 – EP HPT 102 SURR & Spreadsheet Disc

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



BSI EP/BP SURVEY REPORT

Pipe ID	HPT 102	Survey Location	Valve Pit floor drains -25
Survey Date	18-Oct-06	2350-1 #	203488
Survey Time	14:58	Detector-Sled #	44-159 #238369/101
Pipe Size	4"	Detector Efficiency	0.00071
DCGL (dpm/100cm ²)	3.79E+06	Pipe Area Incorporated by Detector Efficiency (in cm ²)	973
Pipe Area Incorporated by Survey Data (in m ²)	2.2	Field BKG (cpm)	5
Routine Survey	X	Field MDCR (cpm)	10.7
QA Survey		Nominal MDC (dpm/100cm ²)	2,165
Survey Measurement Results			
Total Number of Survey Measurements		23	
Number of Measurements >MDC		14	
Number of Measurements Above 50% DCGL		0	
Number of Measurements Above DCGL		0	
Mean		0.0017	
Median		0.0017	
Standard Deviation		0.0007	
Maximum		0.0037	
Minimum		0.0006	
Survey Technician(s)		STOCK	
Survey Unit Classification		1	
TBD 06-004 Piping Group		3.2	
SR-13 Radionuclide Distribution Sample		EP 3-11	
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		Oal Runkall 7-13-07	

HPT 102
4" Pipe
TBD 06-004 Group 3.2

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	15	15	21,127	2,172	238	-	15	-	-	0.002
2	13	13	18,310	1,882	206	-	13	-	-	0.001
3	16	16	22,535	2,316	254	-	16	-	-	0.002
4	20	20	28,169	2,895	317	-	20	-	-	0.002
5	11	11	15,493	1,592	174	-	11	-	-	0.001
6	6	6	8,451	869	95	-	6	-	-	0.001
7	16	16	22,535	2,316	254	-	16	-	-	0.002
8	17	17	23,944	2,461	270	-	17	-	-	0.002
9	18	18	25,352	2,606	285	-	18	-	-	0.002
10	16	16	22,535	2,316	254	-	16	-	-	0.002
11	15	15	21,127	2,172	238	-	15	-	-	0.002
12	11	11	15,493	1,592	174	-	11	-	-	0.001
13	16	16	22,535	2,316	254	-	16	-	-	0.002
14	10	10	14,085	1,448	159	-	10	-	-	0.001
15	19	19	26,761	2,751	301	-	19	-	-	0.002
16	14	14	19,718	2,027	222	-	14	-	-	0.001
17	18	18	25,352	2,606	285	-	18	-	-	0.002
18	8	8	11,268	1,158	127	-	8	-	-	0.001
19	14	14	19,718	2,027	222	-	14	-	-	0.001
20	11	11	15,493	1,592	174	-	11	-	-	0.001
21	19	19	26,761	2,751	301	-	19	-	-	0.002
22	35	35	49,296	5,067	555	-	36	-	-	0.004
23	31	31	43,662	4,488	492	-	32	-	-	0.003
									MEAN	0.002
									MEDIAN	0.002
									STD DEV	0.001
									MAX	0.004
									MIN	0.001

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Pipe Interior Radiological Survey Form

Date: 10/18/06 Time: 1458
Pipe ID#: HPT 102 Pipe Diameter: 4" Access Point Area: VALVE P.T
Building: HOT LAB Elevation: -25' System: PLR DRNS

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

Gross _____ Co60 _____ Cs ✓

Detector ID# / Sled ID# 44-159 # 238369 / 101

Detector Cal Date: 9/5/06 Detector Cal Due Date: 9/5/07

Instrument: 2350-1 Instrument ID #: 203488

Instrument Cal Date: 7/5/06 Instrument Cal Due Date: 7/5/07

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

Background Value 5.0 cpm

MDCR_{static} 10.7 cpm

Efficiency Factor for Pipe Diameter 0.00071 (from detector efficiency determination)

MDC_{static} 2165 dpm/ 100 cm²

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

Comments: INITIAL SURVEY EP3-11 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	15	15	n/a	n/a
2	2	1	13	13	↓	↓
3	3	1	16	16	↓	↓
4	4	1	20	20	↓	↓
5	5	1	11	11	↓	↓
6	6	1	6	6	↓	↓
7	7	1	16	16	↓	↓
8	8	1	17	17	↓	↓
9	9	1	18	18	↓	↓
10	10	1	16	16	↓	↓

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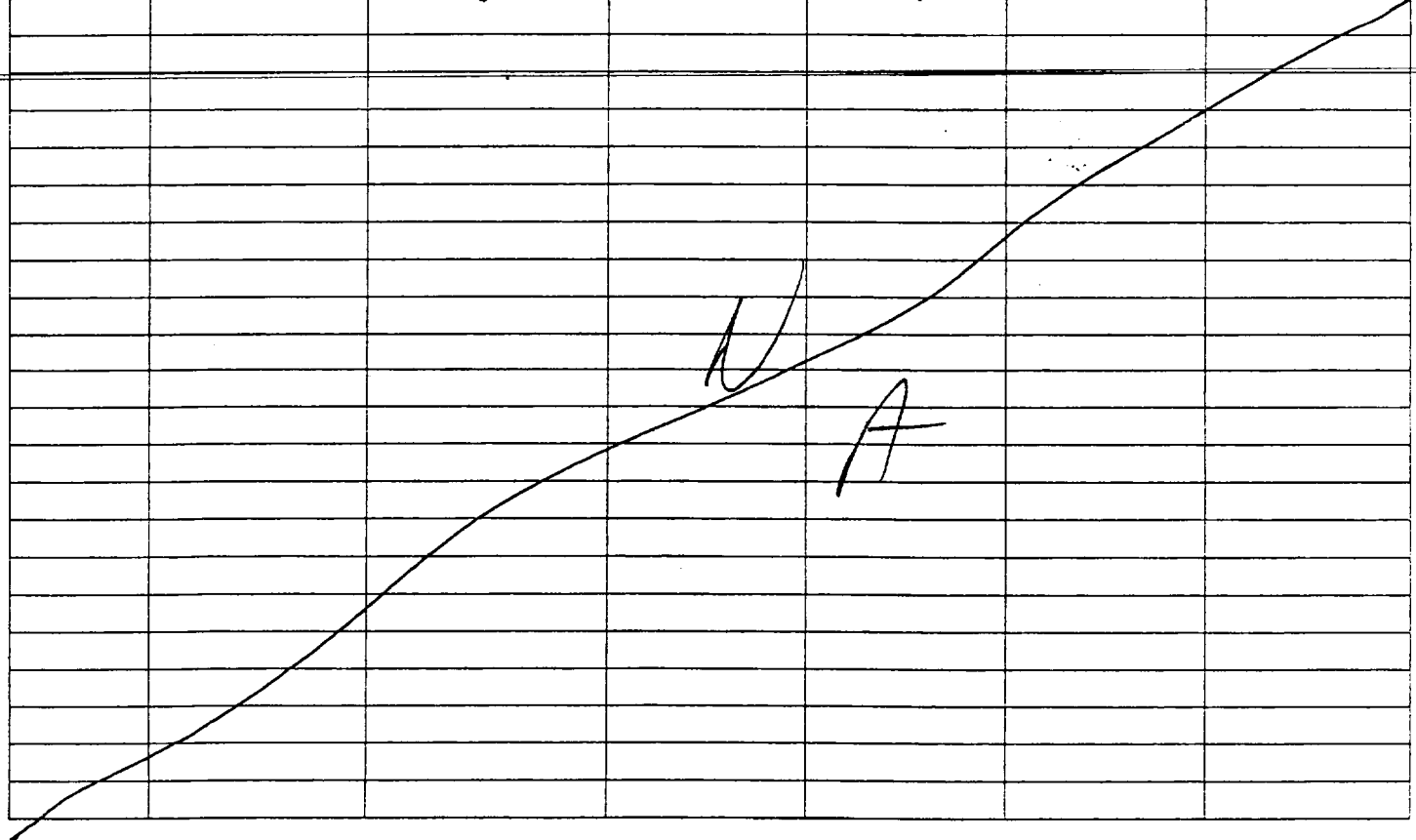
Package Page 1 of 3

Attachment 3, Page 1

Pipe Interior Radiological Survey Form (Continuation Form)

Date: 10/18/06
 Pipe ID#: HPT 102 Pipe Diameter: 4"
 Building: HOT LAB Elevation: -25' Access Point Area: VALVE PIT
 System: PLR DRN

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
11	11	1	15	15	N/A	N/A
12	12	↓	11	11	↓	↓
13	13		16	16		
14	14		10	10		
15	15		19	19		
16	16		14	14		
17	17		18	18		
18	18		8	8		
19	19		14	14		
20	20		11	11		
21	21		19	19		
22	22	↓	35	35	↓	↓
23	23		31	31		



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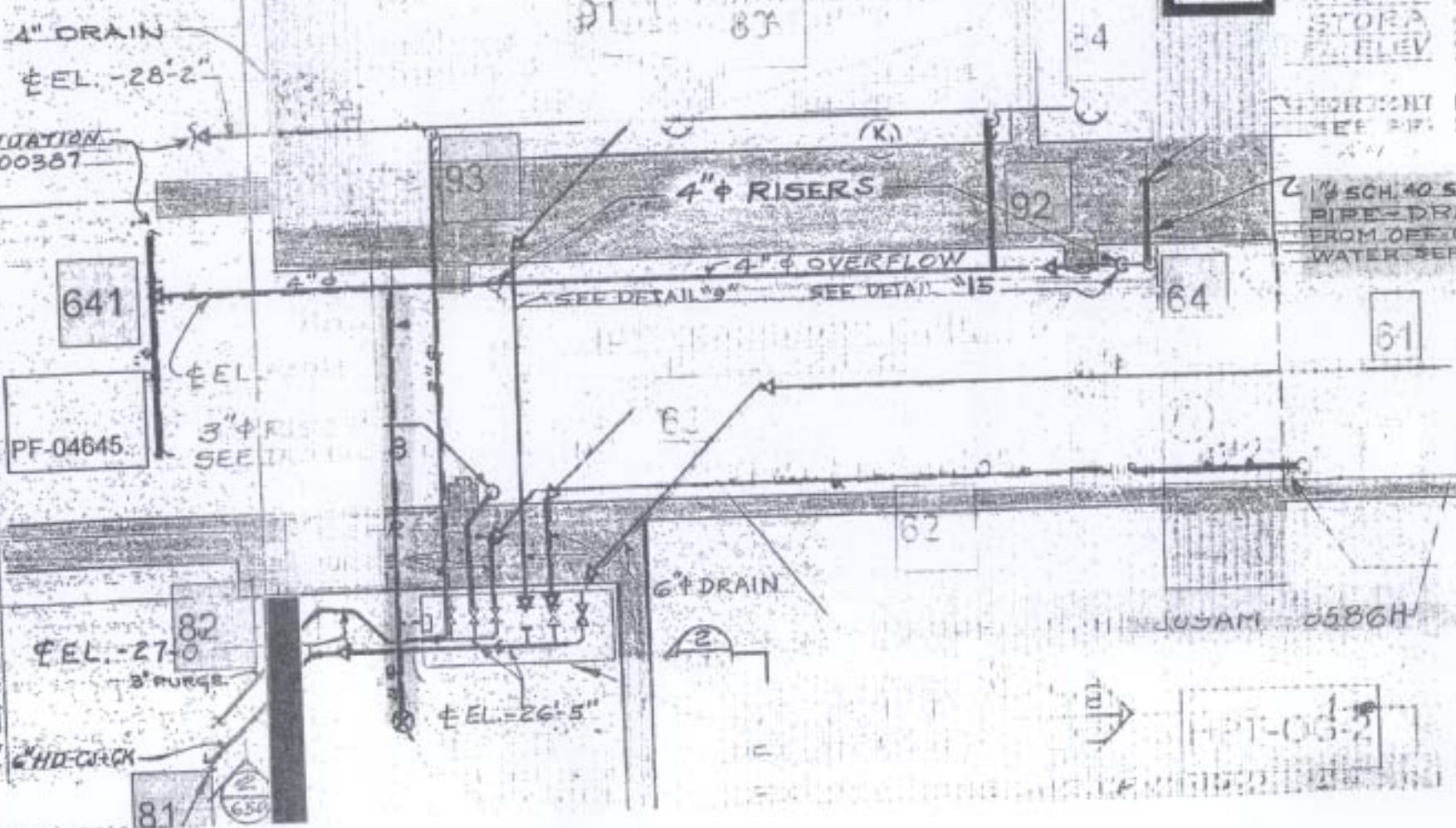
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HPT 102

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REACTOR BUILDING


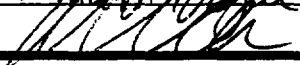


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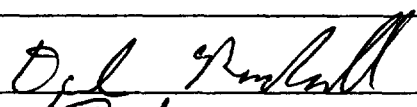
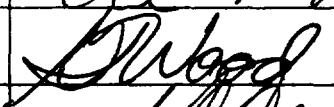

DQA Check Sheet

Design #	HPT 102	Revision #	Original				
Survey Unit #	HPT 102						
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 R. Rydell		Date	7-13-07
FSS/ Characterization Manager (print/sign)				 R. Case		Date	7/25/07

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SECTION 7
ATTACHMENT 4
1 DISC

Survey Unit Release Record

Design #	EP-Rx 139	Revision #	Original	Page 1 of 3
Survey Unit #(s)	Rx 139			
Description	<p>1) Embedded Pipe (EP) Survey Unit Rx 139 meets the definition of embedded pipe for Plum Brook Reactor Facility (PBRF).</p> <p>2) EP Rx 139 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 139 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>			
Approval Signatures				Date:
FSS/Characterization Engineer				7-12-07
Technical Reviewer (FSS/Characterization Engineer)				7-16-07
FSS/Characterization Manager	 R. Case			7/25/07

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Survey Unit: Rx 139

1.0 History/Description

- 1.1 The subject pipe is the drain line from the Rx tank penetration on the Rx Building -8 foot elevation.
- 1.2 EP Rx 139 consists of 1" diameter piping that is approximately 4 feet in length.

2.0 Survey Design Information

- 2.1 EP Rx 139 was surveyed IAW Procedure #BSI/LVS-002.
- 2.2 100% of the 1" ID pipe was accessible for survey. The accessible 1" ID pipe was surveyed by static measurement at one foot increments, for a total of 4 survey measurements.
- 2.3 Surface area for the 1" ID piping is 243 cm² for each foot of piping, corresponding to a total 1" ID piping surface area of 973 cm² (0.1 m²) for the entire length of (approximately 4') of 1" 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 139 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 Statistical Summary Table

Statistical Parameter	1" Pipe
Total Number of Survey Measurements	4
Number of Measurements >MDC	4
Number of Measurements Above 50% of DCGL	0
Number of Measurements Above DCGL	0
Mean	0.1247
Median	0.1165
Standard Deviation	0.0335
Maximum	0.1717
Minimum	0.0940

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 139 to be less than 1 mrem/yr. The dose contribution is estimated to be 0.125 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 – SURR EP RX 139 & Spreadsheet Disc

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ATTACHMENT 1
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BSI EP/BP SURVEY REPORT

Pipe ID	Rx 139	Survey Location	Rx Tank -8 el.
Survey Date	22-Feb-07	2350-1 #	212223
Survey Time	13:30	Detector-Sled #	70006-047/ no sled
Pipe Size	1"	Detector Efficiency	0.0006
DCGL (dpm/100cm ²)	2.41E+05	Pipe Area Incorporated by Detector Efficiency (in cm ²)	243
Pipe Area Incorporated by Survey Data (in ²)	0.1	Field BKG (cpm)	7.7
Routine Survey	X	Field MDCR (cpm)	12.5
QA Survey		Nominal MDC (dpm/100cm ²)	6,687
Survey Measurement Results			
Total Number of Survey Measurements		4	
Number of Measurements >MDC		4	
Number of Measurements Above 50% DCGL		0	
Number of Measurements Above DCGL		0	
Mean		0.1247	
Median		0.1165	
Standard Deviation		0.0335	
Maximum		0.1717	
Minimum		0.0940	
Survey Technician(s)		STOCK	
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		Dale Randall 7-13-07	

EP Rx 139
1" 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
1	30	30	50,000	20,558	815	19,501	5,184	600	143	0.123
2	23	23	38,333	15,761	625	14,951	3,975	460	110	0.094
3	27	27	45,000	18,502	733	17,551	4,666	540	129	0.110
4	42	42	70,000	28,781	1,141	27,301	7,258	840	201	0.172
									MEAN	0.125
									MEDIAN	0.116
									STD DEV	0.033
									MAX	0.172
									MIN	0.094

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ATTACHMENT 2
1 PAGE(S)

Pipe Interior Radiological Survey Form

Date: 2/22/07 Time: 1330
Pipe ID#: Rx 139 Pipe Diameter: 1.0" Access Point Area: Rx TANK
Building: LV Elevation: -8' System: PEN

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

Gross _____ Co60 ✓ Cs _____

Detector ID# / Sled ID# FO/1.5L-X #0047 / NO SLED

Detector Cal Date: 1/11/07 Detector Cal Due Date: 1/11/08

Instrument: 1/11/07 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 7.7 cpm

MDCR_{static} 12.5 cpm

Efficiency Factor for Pipe Diameter 0.0006 (from detector efficiency determination)

MDC_{static} 6687 dpm/ 100 cm²

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

Comments: INITIAL EP3-1 COMPLETE
CA-Q5

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	30	30	N/A	N/A
2	2	↓	23	23	↓	↓
3	3	↓	27	27	↓	↓
4	4	↓	42	42	↓	↓
5	N A	N A	N A	N A	↓	↓
6						
7						
8						
9						
10						

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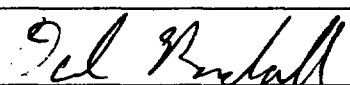

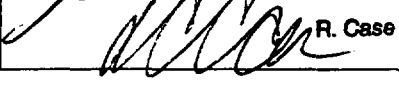
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ATTACHMENT 3
/ PAGE(S)

DQA Check Sheet

Design #	EP Rx 139	Revision #	Original				
Survey Unit #	EP Rx 139						
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 (<i>S</i> + for Sign Test or <i>W</i> _r for WRS Test) ≥ the critical value?						X	
Comments:							
FSS/Characterization Engineer (print/sign)				<i>Dele Randolph Paul Russell</i>		Date	7-12-07
FSS/ Characterization Manager (print/sign)				<i>[Signature]</i> B. Case		Date	7/25/07

Form
CS-09/2
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SECTION 7
ATTACHMENT 4
1 DISC

Survey Unit Release Record				
Design #	EP-Rx 151	Revision #	Original	Page 1 of 3
Survey Unit #(s)	Rx 151			
Description	<p>1) Embedded Pipe (EP) Survey Unit Rx 151 meets the definition of embedded pipe for Plum Brook Reactor Facility (PBRF).</p> <p>2) EP Rx 151 is a Class 1, Group 2 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 151 were performed using a scintillation detector optimized to measure gamma energies representative of Co-60. Sample #EP 2-1 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			7-14-07	
Technical Reviewer (FSS/Characterization Engineer)			7-17-07	
FSS/Characterization Manager	 R. Case		7/25/07	



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Form
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Survey Unit: Rx 151

1.0 History/Description

- 1.1 The subject pipe system is the 3" Quad "B" spare DI water system line.
- 1.2 EP Rx 151 consists of approximately 21 feet in length from the Reactor Building -25' elevation to Quad "B".

2.0 Survey Design Information

- 2.1 EP Rx 151 was surveyed IAW Procedure #BSI/LVS-002.
- 2.2 100% of the 3" ID pipe was accessible for survey. The accessible 3" ID pipe was surveyed by static measurement at one foot increments, for a total of 21 survey measurements.
- 2.3 Surface area for the 3" ID piping is 729.7 cm^2 for each foot of piping, corresponding to a total 3" ID piping surface area of $15,330 \text{ cm}^2$ (1.5 m^2) for the entire length of (21') of 3" 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 151 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 151

5.5 Statistical Summary Table

Statistical Parameter	3" Pipe
Total Number of Survey Measurements	21
Number of Measurements >MDC	7
Number of Measurements Above 50% of DCGL	0
Number of Measurements Above DCGL	0
Mean	0.0105
Median	0.0098
Standard Deviation	0.0048
Maximum	0.0199
Minimum	0.0042

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 151 to be less than 1 mrem/yr. The dose contribution is estimated to be 0.011 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

Attachment 3 – DQA Worksheet

Attachment 4 – EP RX 151 SURR & Spreadsheet Disc

SECTION 7
ATTACHMENT 1
2 PAGE(S)

**BSI EP/BP SURVEY REPORT**

Pipe ID	Rx 151	Survey Location	Quad B Spare line
Survey Date	13-Dec-05	2350-1 #	212223
Survey Time	08:24	Detector-Sled #	44-62 204402/101
Pipe Size	3"	Detector Efficiency	0.00014
DCGL (dpm/100cm²)	2.41E+05	Pipe Area Incorporated by Detector Efficiency (in cm²)	730
Pipe Area Incorporated by Survey Data (m²)	1.5	Field BKG (cpm)	5.2
Routine Survey	X	Field MDCR (cpm)	10.8
QA Survey		Nominal MDC (dpm/100cm²)	2,842
Survey Measurement Results			
Total Number of Survey Measurements			21
Number of Measurements >MDC			7
Number of Measurements Above 50% DCGL			0
Number of Measurements Above DCGL			0
Mean			0.0105
Median			0.0098
Standard Deviation			0.0048
Maximum			0.0199
Minimum			0.0042
Survey Technician(s)		ROSENHAGEN	
Survey Unit Classification			1
TBD 06-004 Piping Group			2
SR-13 Radionuclide Distribution Sample			EP 2-1
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 Rowell</i> 7-14-07	

EP Rx 151
3" 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	1	1	7,143	979	508	8	6	0	28	0.004
2	2	2	14,286	1,958	1,015	16	11	1	56	0.008
3	1.7	1.7	12,143	1,664	863	14	10	1	48	0.007
4	2.7	2.7	19,286	2,643	1,370	22	15	1	76	0.011
5	2.3	2.3	16,429	2,251	1,167	19	13	1	65	0.010
6	4.3	4.3	30,714	4,209	2,183	35	25	2	121	0.018
7	3.3	3.3	23,571	3,230	1,675	27	19	2	93	0.014
8	1.3	1.3	9,286	1,273	660	11	7	1	37	0.006
9	4.3	4.3	30,714	4,209	2,183	35	25	2	121	0.018
10	1.3	1.3	9,286	1,273	660	11	7	1	37	0.006
11	1.7	1.7	12,143	1,664	863	14	10	1	48	0.007
12	4.7	4.7	33,571	4,601	2,386	38	27	2	132	0.020
13	3.3	3.3	23,571	3,230	1,675	27	19	2	93	0.014
14	3.3	3.3	23,571	3,230	1,675	27	19	2	93	0.014
15	2.3	2.3	16,429	2,251	1,167	19	13	1	65	0.010
16	4	4	28,571	3,916	2,030	32	23	2	113	0.017
17	2.3	2.3	16,429	2,251	1,167	19	13	1	65	0.010
18	1	1	7,143	979	508	8	6	0	28	0.004
19	2	2	14,286	1,958	1,015	16	11	1	56	0.008
20	1.7	1.7	12,143	1,664	863	14	10	1	48	0.007
21	1.7	1.7	12,143	1,664	863	14	10	1	48	0.007
									MEAN	0.011
									MEDIAN	0.010
									STD DEV	0.005
									MAX	0.020
									MIN	0.004

SECTION 7
ATTACHMENT 2
3 PAGE(S)

Pipe Interior Radiological Survey Form

Date: 12-13-05 Time: 0824
 Building: RX BLDG Elevation: -25 Access Point Area: QUAD B
 System: ~~VENT DRAIN~~ SPARE Pipe Diameter: 3" Pipe ID # RX 151
 Type of Survey Investigation Characterization Final Survey Other X
 Sled Size 3" inch
 Detector: 44-62 Detector ID #: 204402
 Cal Date: 11-17-05 Cal Due Date: 11-17-06
 Instrument: 2350-1 Instrument ID #: 212223
 Cal Date: 11-17-05 Cal Due Date: 11-17-06

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

Background Value 5.2 cpm
 MDCR_{static} 10.8 cpm
 Efficiency Factor for Pipe Diameter 0.00014 (taken from detector ~~calibration certificate~~ *efficiency determination*)
 MDC_{static} 2842 dpm/100cm²
 Is the MDC_{static} acceptable? Yes No (if no, adjust sample count time and recalculate MDCR_{static})

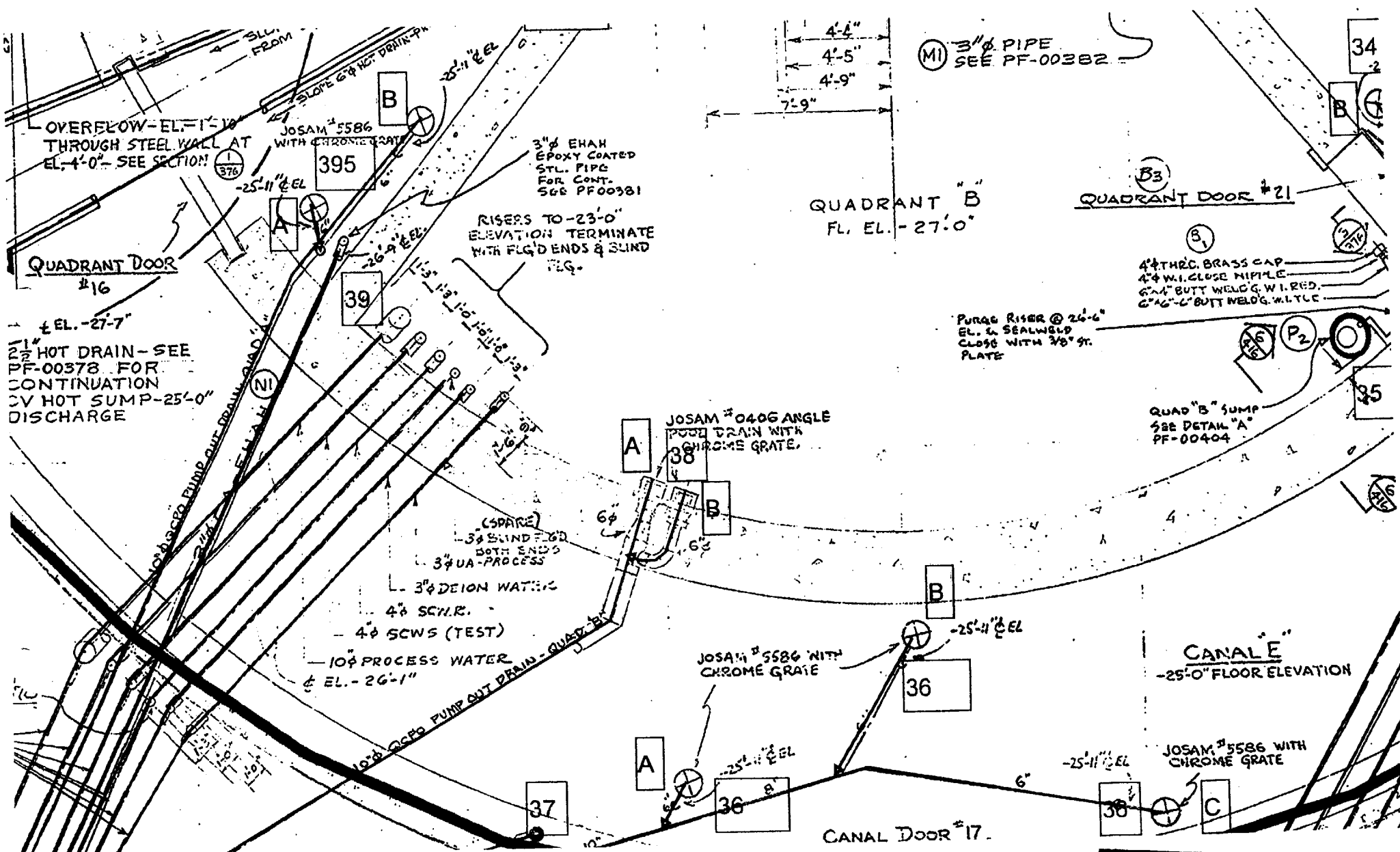
Comments: _____

Pipe Interior Radiological Survey

Radiological Survey Commenced: Date: 12-13-05 Time: 0824

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
1	1	3	3	1	-4.2	N/A
2	2	3	6	2	-3.2	
3	3	3	5	1.7	-3.5	
4	4	3	8	2.7	-2.5	
5	5	3	7	2.3	-2.9	
6	6	3	13	4.3	-0.9	
7	7	3	10	3.3	-1.9	
8	8	3	4	1.3	-3.9	
9	9	3	13	4.3	-0.9	
10	10	3	4	1.3	-3.9	✓

Package Page 1 of 2



= PIPE SURVEYED
21'
END R X 151
12-13-05

REFERENCE COPY

SECTION 7
ATTACHMENT 3
1 PAGE(S)

DQA Check Sheet

Design #	EP Rx 151	Revision #	Original	
Survey Unit #	EP Rx 151			

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, for WRS Test) ≥ the critical value?			X

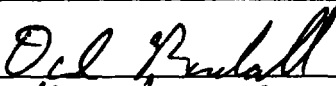


Comments:

FSS/Characterization Engineer (print/sign)	<i>Dale R. Case</i>	Date	7-14-07
FSS/ Characterization Manager (print/sign)	<i>[Signature]</i>	Date	7/25/07

R. Case

Form
CS-09/2
Rev 0

SECTION 7
ATTACHMENT 4
1 DISC

Survey Unit Release Record				
Design #	EP-Rx 162	Revision #	Original	Page 1 of 3
Survey Unit #(s)	Rx 162			
Description	<p>1) Embedded Pipe (EP) Survey Unit Rx 162 meets the definition of embedded pipe for Plum Brook Reactor Facility (PBRF).</p> <p>2) EP Rx 162 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 162 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>			
Approval Signatures			Date:	
FSS/Characterization Engineer			7-15-07	
Technical Reviewer (FSS/Characterization Engineer)			7-17-07	
FSS/Characterization Manager	 R. Case		7/25/07	

Form
CS-09/1
Rev 0

 COPY

Survey Unit: Rx 162

1.0 History/Description

- 1.1 The subject pipe is the drain line from the dry annulus inside the CV to the drain trench on the Rx Building -25 foot elevation.
- 1.2 EP Rx 162 consists of 2" diameter piping that is approximately 27 feet in length.

2.0 Survey Design Information

- 2.1 EP Rx 162 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 27 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 13,134 cm² (1.3 m²) for the entire length of (approximately 27') 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 Rx 162 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 Statistical Summary Table

Statistical Parameter	2" Pipe
Total Number of Survey Measurements	27
Number of Measurements >MDC	0
Number of Measurements Above 50% of DCGL	0
Number of Measurements Above DCGL	0
Mean	0.0116
Median	0.0094
Standard Deviation	0.0055
Maximum	0.0259
Minimum	0.0024

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 162 to be less than 1 mrem/yr. The dose contribution is estimated to be 0.012 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 – EP RX 162 SURR & Spreadsheet Disc

SECTION 7
ATTACHMENT 1
3 PAGE(S)

7/15/2007

EP Rx 162
2" 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
1	4	4	15,385	3,163	125	3,000	798	92	22	0.019
2	3.5	3.5	13,462	2,767	110	2,625	698	81	19	0.017
3	0.5	0.5	1,923	395	16	375	100	12	3	0.002
4	3.5	3.5	13,462	2,767	110	2,625	698	81	19	0.017
5	4	4	15,385	3,163	125	3,000	798	92	22	0.019
6	1	1	3,846	791	31	750	199	23	6	0.005
7	1	1	3,846	791	31	750	199	23	6	0.005
8	2.5	2.5	9,615	1,977	78	1,875	498	58	14	0.012
9	1.5	1.5	5,769	1,186	47	1,125	299	35	8	0.007
10	2	2	7,692	1,581	63	1,500	399	46	11	0.009
11	4	4	15,385	3,163	125	3,000	798	92	22	0.019
12	2	2	7,692	1,581	63	1,500	399	46	11	0.009
13	1.5	1.5	5,769	1,186	47	1,125	299	35	8	0.007
14	2	2	7,692	1,581	63	1,500	399	46	11	0.009
15	2	2	7,692	1,581	63	1,500	399	46	11	0.009
16	2	2	7,692	1,581	63	1,500	399	46	11	0.009
17	2	2	7,692	1,581	63	1,500	399	46	11	0.009
18	2.5	2.5	9,615	1,977	78	1,875	498	58	14	0.012
19	2.5	2.5	9,615	1,977	78	1,875	498	58	14	0.012
20	5.5	5.5	21,154	4,349	172	4,125	1,097	127	30	0.026
21	4	4	15,385	3,163	125	3,000	798	92	22	0.019
22	2	2	7,692	1,581	63	1,500	399	46	11	0.009
23	2	2	7,692	1,581	63	1,500	399	46	11	0.009
24	3	3	11,538	2,372	94	2,250	598	69	17	0.014
25	1.5	1.5	5,769	1,186	47	1,125	299	35	8	0.007
26	3	3	11,538	2,372	94	2,250	598	69	17	0.014
27	1.5	1.5	5,769	1,186	47	1,125	299	35	8	0.007

EP Rx 162
2" 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
									MEAN	0.012
									MEDIAN	0.009
									STD DEV	0.005
									MAX	0.026
									MIN	0.002

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

Pipe Interior Radiological Survey Form

Date: 1-26-06 Time: 0805
 Building: RX Elevation: -25 Access Point Area: ANNULUS
 System: _____ Pipe Diameter: 2" Pipe ID # RX 162
 Type of Survey Investigation Characterization Final Survey Other ✓
 Sled Size 2" VINYL PULLER #121 inch
 Detector: 44-62 Detector ID #: 204402-5/W 121
 Cal Date: 11-17-05 Cal Due Date: 11-17-06
 Instrument: 2350-1 Instrument ID #: 212223
 Cal Date: 11-17-05 Cal Due Date: 11-17-06

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

Background Value 6.4 cpm
 MDCR_{static} 11.7 cpm
 Efficiency Factor for Pipe Diameter 0.00026 (taken from detector efficiency determination calibration certificate) 7
 MDC_{static} 7836 dpm/100cm²
 Is the MDC_{static} acceptable? Yes No (if no, adjust sample count time and recalculate MDCR_{static})

Comments: INITIAL SURVEY POSITION 162 TAKEN FROM
ANNULUS

Pipe Interior Radiological Survey

Radiological Survey Commenced: Date: 1-26-06 Time: 0805

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

Package Page 1 of 1

Pipe Interior Radiological Survey Form

Date: 1-30-06 Time: 1250
 Building: RX Elevation 0' Access Point CABLE TRENCH
 System: SCUPPER DRAIN Pipe Diameter: 2" Area: Pipe ID RX 162
 Type of Survey Investigation Characterization Final Survey # Other ✓
 Sled Size 2" VINYL PULLER #121 inch
 Detector: 44-62 Detector ID #: 804402 - #121
 Cal Date: 11-17-05 Cal Due Date: 11-17-06
 Instrument: 2350-1 Instrument ID #: 212223
 Cal Date: 11-17-05 Cal Due Date: 11-17-06

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

Background Value 5.9 cpm
 MDCR_{static} 11.3 cpm
 Efficiency Factor for Pipe 0.00026 (taken from detector efficiency determination calibration certificate) ju
 Diameter 7836 dpm/100cm²
 MDC_{static} 7836
 Is the MDC_{static} Yes No (if no, adjust sample count time and recalculate MDCR_{static})

Comments: CONTINUATION - POSITION #1 TAKEN FROM
CABLE TRENCH

COMPLETE

Pipe Interior Radiological Survey

Radiological Survey Commenced: Date: 1-30-06 Time: 1250

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
1	1	2	1	.5	n/a	n/a
2	2	2	7	3.5		
3	3	2	8	4		
4	4	2	2	1		
5	5	2	2	1		
6	6	2	5	2.5		
7	7	2	3	1.5		
8	8	2	4	2		
9	9	2	8	4		
10	10	2	4	2		

Pipe Interior Radiological Survey Form (Continuation Form)

SLURPER DRAIN #RX 162 Ø' RX 310G 1-30-06

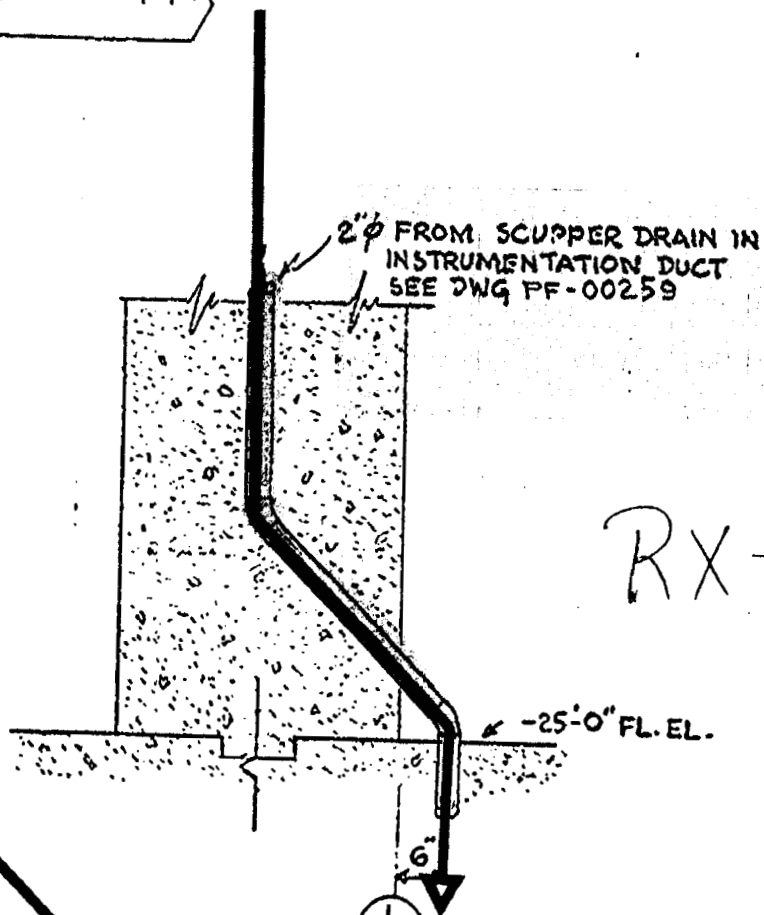
Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
11	11	2	3	1.5	n/a	n/a
12	12	2	4	2		
13	13	2	4	2		
14	14	2	4	2		
15	15	2	4	2		
16	16	2	5	2.5		
17	17	2	5	2.5		
18	18	2	11	5.5		
19	19	2	8	4		
20	20	2	4	2		
n/a						

Package Page 2 of 34

REFERENCE COPY

BCO-2

4" c.o.



SECTION

1/375

SCALE 1/2" = 1'-0"

RX-162

20 FT.
SURVEYED

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REFERENCE COPY

Point B

51

4" C.O.

DISCHARGE FROM
CAVE SUMP (EL. -

Point A

4" FLOOR DRAIN

-25'-5 3/8" EL.

2" DRAIN RISER - FOR
CONTINUATION
SEE DWG
PF-00259

100'-0" I.D.

Rx-162

CAP OFF

6" 304 S.S. (DI)
EL. -24'-0"
PITCH 1" PER 10'

1" DRAIN (EL. -23'-11")
SEE PF-00427

(FI)

PF-00375

QUADRANT "A"
FLOOR EL. -25'-0"

PIPE

ASS

LEVEL

PITCH 6" HOT DEL 111-70 1" PER 10'

PREL 4 of 4

Pipe Interior Radiological Survey Form

Date: 2-6-06 Time: 1324
 Building: Rx Elevation: -25 Access Point Area: Access
 System: Cable Tray D-A to 1.5 Pipe Diameter: 2" Pipe ID #: Rx 162 LINE TO COAL BOILER
 Type of Survey Investigation Characterization Final Survey Other ✓
 Sled Size 121 inch
 Detector: 44-162 Detector ID #: 204402
 Cal Date: 11-17-05 Cal Due Date: 11-17-06
 Instrument: 2350-1 Instrument ID #: 212223
 Cal Date: 11-17-06 Cal Due Date: 11-17-06

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

Background Value 5.1 cpm

MDCR_{static} 10.7 cpm

Efficiency Factor for Pipe Diameter 0.00026 (taken from detector calibration certificate) efficiency determination

MDC_{static} 7836 dpm/100cm²

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

Comments: CONTINUATION SURVEY

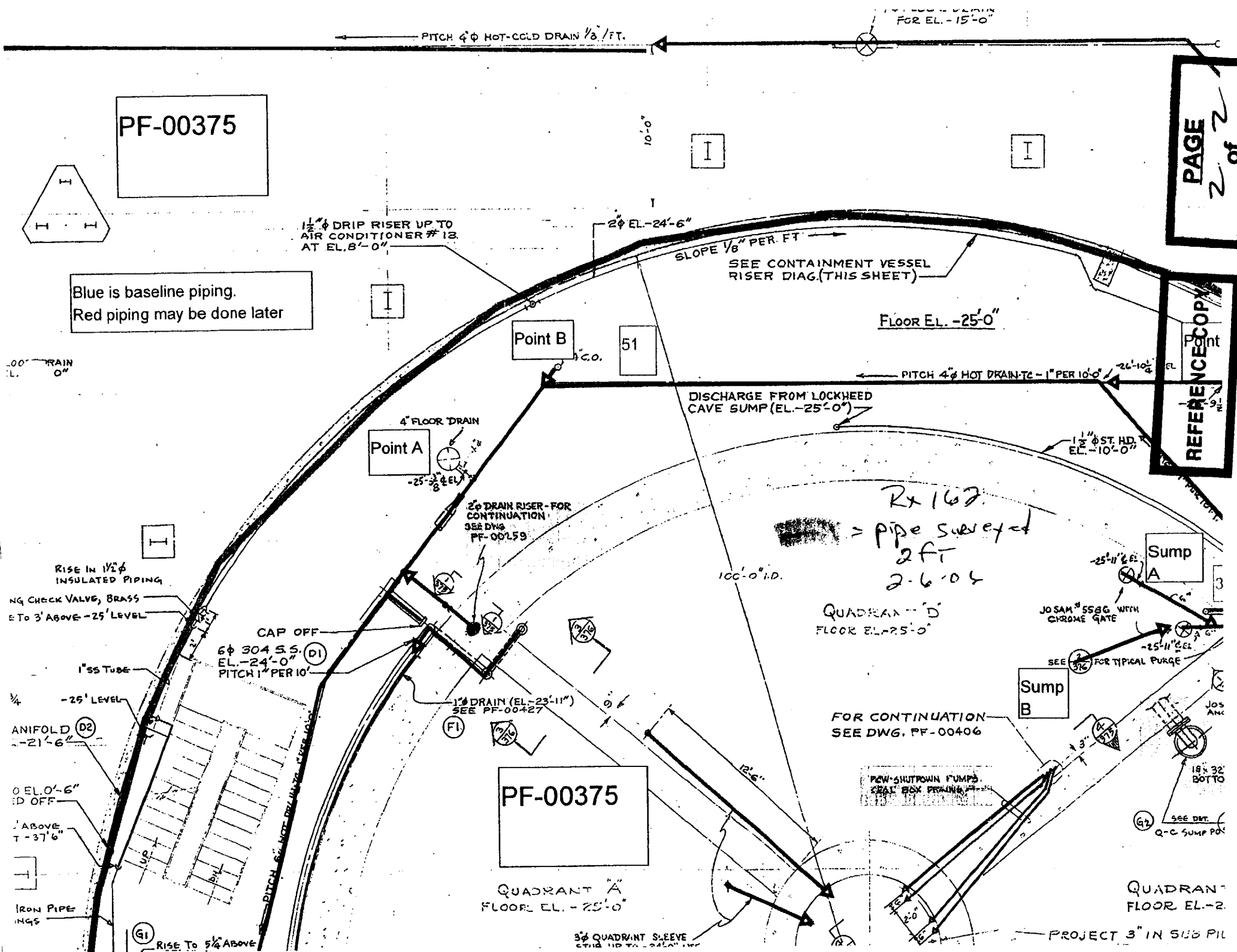
Pipe Interior Radiological Survey

Radiological Survey Commenced: Date: 2-6-06 Time: 1324

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

PAGE
2 of 2

REFERENCE COPY



Pipe Interior Radiological Survey Form

Date: 2-9-06 Time: 1050
 Pipe ID#: RX162 Horiz Pipe Diameter: 2" Access Point Area: -25 ANNUALS
 Building: REAKTOR Elevation: -25 System: _____
 Type of Survey Investigation _____ Characterization _____ Final Survey X Other ✓
 Gross _____ Co60 ✓ Cs _____
 Detector ID# / Sled ID# 44-62 2044021 171
 Detector Cal Date: 17-Nov-05 Detector Cal Due Date: 17-Nov-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 5.1 cpm

MDCR_{static} 10.7 cpm

Efficiency Factor for Pipe Diameter 0.00026 (from detector efficiency determination)

MDC_{static} 7836 dpm/ 100 cm²

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

Comments: CONTINUATION SURVEY

Technician Signature *J. D. [Signature]*

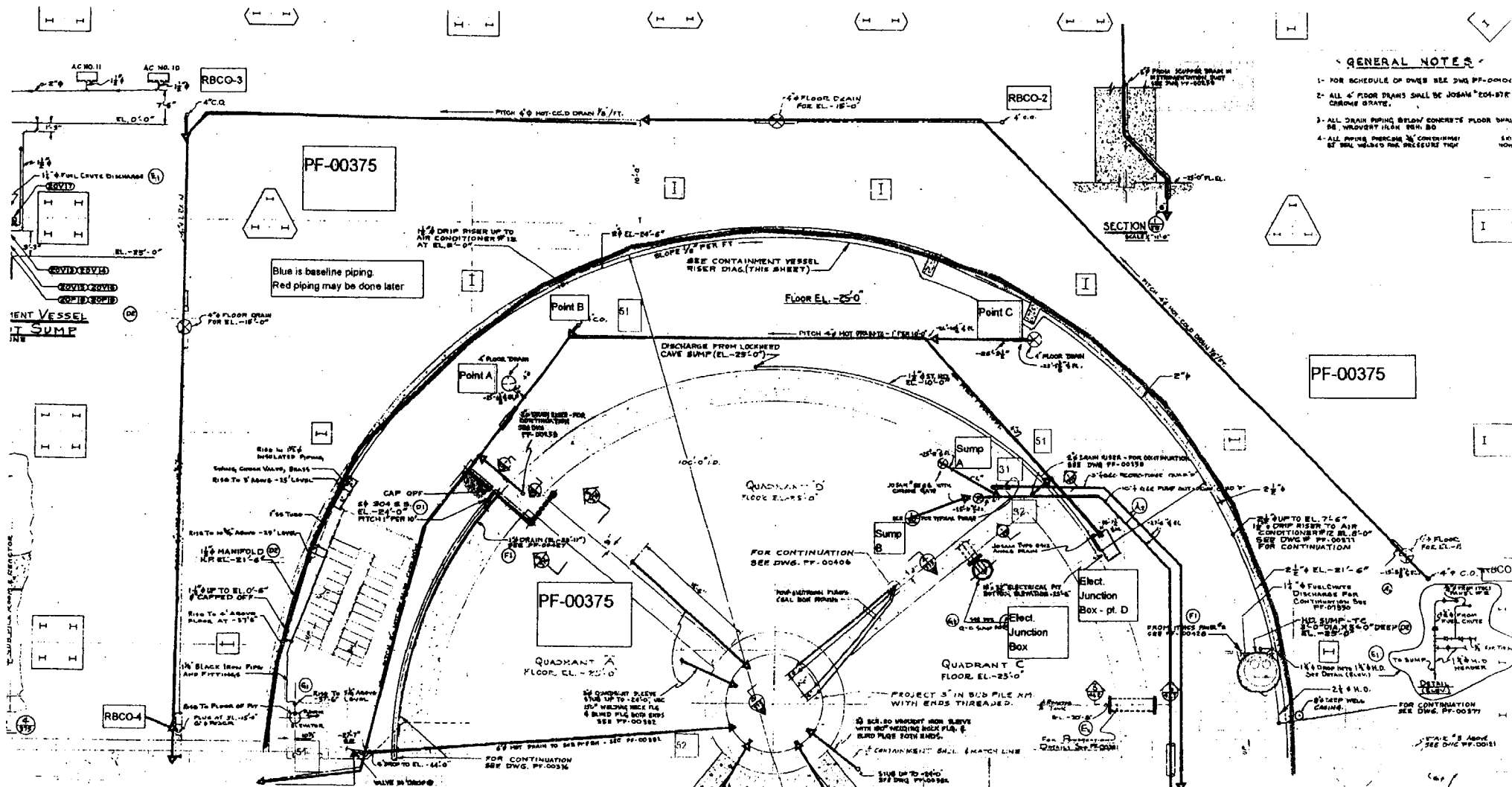
Pipe Interior Radiological Survey

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
1	1	2	3	1.5	n/a	n/a
2	2	2	6	3	↓	↓
3	3	1	3	1.5	↓	↓
4						
5						
6						
7						
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10						

Package Page 1 of 2

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Horizontal
R167
Base
THEY
SURVEY
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SECTION 7
ATTACHMENT 3
1 PAGE(S)

SECTION 7
ATTACHMENT 1
_____ PAGE(S)

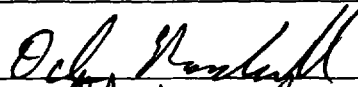
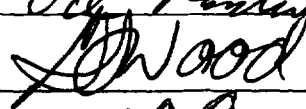

DQA Check Sheet

Design #	EP Rx 162	Revision #	Original					
Survey Unit #	EP 162							
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>Dale R. Campbell</i> <i>Dale R. Campbell</i>		
FSS/ Characterization Manager (print/sign)						<i>R. Case</i> <i>R. Case</i>		
						Date	7-15-07	
						Date	7/25/07	

Form
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SECTION 7
ATTACHMENT 4
1 DISC

Survey Unit Release Record

Design #	EP-Rx 163	Revision #	Original	Page 1 of 3
Survey Unit #(s)	Rx 163			
Description	<p>1) Embedded Pipe (EP) Survey Unit Rx 163 meets the definition of embedded pipe for Plum Brook Reactor Facility (PBRF).</p> <p>2) EP Rx 163 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 163 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>			
Approval Signatures				Date:
FSS/Characterization Engineer				7-15-07
Technical Reviewer (FSS/Characterization Engineer)				7-17-07
FSS/Characterization Manager	 R. Case			7/25/07

Form
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 **COPY**

Survey Unit: Rx 163

1.0 History/Description

- 1.1 The subject pipe is the drain line from the dry annulus inside the CV to the drain trench on the Rx Building -25 foot elevation.
- 1.2 EP Rx 163 consists of 2" diameter piping that is approximately 23 feet in length.

2.0 Survey Design Information

- 2.1 EP Rx 163 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 23 survey measurements.
- 2.3 Surface area for the 2" ID piping is 486 cm^2 for each foot of piping, corresponding to a total 2" ID piping surface area of $7,783 \text{ cm}^2$ (0.8 m^2) for the entire length of (approximately 23') 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 Rx 163 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 Statistical Summary Table

Statistical Parameter	2" Pipe
Total Number of Survey Measurements	26
Number of Measurements >MDC	0
Number of Measurements Above 50% of DCGL	0
Number of Measurements Above DCGL	0
Mean	0.0129
Median	0.0130
Standard Deviation	0.0051
Maximum	0.0234
Minimum	

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 163 to be less than 1 mrem/yr. The dose contribution is estimated to be 0.013 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 – EP RX 163 SURR & Spreadsheet Disc

SECTION 7
ATTACHMENT 1
3 PAGE(S)



BSI EP/BP SURVEY REPORT

Pipe ID	Rx 163	Survey Location	Annulus -25el.
Survey Date	1/26/06, 1/30/06, 2/6/06	2350-1 #	212223
Survey Time	0815, 1350, 1250	Detector-Sled #	44-62/204402-121, 44- 62/204402-no sled
Pipe Size	2"	Detector Efficiency	0.00026/0.00021
DCGL (dpm/100cm2)	2.41E+05	Pipe Area Incorporated by Detector Efficiency (in cm2)	486
Pipe Area Incorporated by Survey Date (m ²)	1.3	Field BKG (cpm)	6.4/5.9/5.1
Routine Survey	X	Field MDCR (cpm)	11.7/11.3/10.7
QA Survey		Nominal MDC (dpm/100cm2)	7836/9701
Survey Measurement Results			
Total Number of Survey Measurements		26	
Number of Measurements >MDC		0	
Number of Measurements Above 50% DCGL		0	
Number of Measurements Above DCGL		0	
Mean		0.0129	
Median		0.0130	
Standard Deviation		0.0051	
Maximum		0.0234	
Minimum		0.0047	
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		<i>Paul Marshall</i> 7-15-07	

EP Rx 163
2" 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
1	2	2	7,692	1,581	63	1,500	399	46	11	0.009
2	2.5	2.5	9,615	1,977	78	1,875	498	58	14	0.012
3	3.5	3.5	13,462	2,767	110	2,625	698	81	19	0.017
4	1	1	3,846	791	31	750	199	23	6	0.005
5	2	2	7,692	1,581	63	1,500	399	46	11	0.009
6	2	2	7,692	1,581	63	1,500	399	46	11	0.009
7	2	2	7,692	1,581	63	1,500	399	46	11	0.009
8	2.5	2.5	9,615	1,977	78	1,875	498	58	14	0.012
9	4	4	15,385	3,163	125	3,000	798	92	22	0.019
10	2	2	7,692	1,581	63	1,500	399	46	11	0.009
11	4.5	4.5	17,308	3,558	141	3,375	897	104	25	0.021
12	3.5	3.5	13,462	2,767	110	2,625	698	81	19	0.017
13	3	3	11,538	2,372	94	2,250	598	69	17	0.014
14	1.5	1.5	5,769	1,186	47	1,125	299	35	8	0.007
15	2	2	7,692	1,581	63	1,500	399	46	11	0.009
16	2	2	7,692	1,581	63	1,500	399	46	11	0.009
17	3	3	11,538	2,372	94	2,250	598	69	17	0.014
18	1	1	3,846	791	31	750	199	23	6	0.005
19	1	1	3,846	791	31	750	199	23	6	0.005
20	3	3	11,538	2,372	94	2,250	598	69	17	0.014
21	4	4	15,385	3,163	125	3,000	798	92	22	0.019
22	3.5	3.5	13,462	2,767	110	2,625	698	81	19	0.017
23	4	4	19,048	3,916	155	3,714	987	114	27	0.023
24	2.5	2.5	11,905	2,447	97	2,322	617	71	17	0.015
25	3	3	14,286	2,937	116	2,786	741	86	20	0.018
26	3	3	14,286	2,937	116	2,786	741	86	20	0.018

EP Rx 163
2" 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
									MEAN	0.013
									MEDIAN	0.013
									STD DEV	0.005
									MAX	0.023
									MIN	0.005

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

Pipe Interior Radiological Survey Form

Date: 1-26-06 Time: 0815
 Building: RX Elevation: -25 Access Point Area: ANNULUS
 System: _____ Pipe Diameter: 2" Pipe ID # RX 163
 Type of Survey Investigation Characterization Final Survey Other ✓
 Sled Size 2" VINYL PULLER 921 inch
 Detector: 44-62 Detector ID #: 204402-51W 121
 Cal Date: 11-17-05 Cal Due Date: 11-17-06
 Instrument: 2350-1 Instrument ID #: 212223
 Cal Date: 11-17-05 Cal Due Date: 11-17-06

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

Background Value 6.4 cpm

MDCR_{static} 11.7 cpm

Efficiency Factor for Pipe Diameter 0.00026

(taken from detector efficiency determination calibration certificate) gn

MDC_{static} 7836 dpm/100cm²

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

Comments: INITIAL SURVEY - POSITIONS 1 & 2 TAKEN FROM ANNULUS

Pipe Interior Radiological Survey

Radiological Survey Commenced: Date: 1-26-06 Time: 0815

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
1	1	2	4	2	n/a	n/a
2	2	2	5	2.5	↓	↓
3						
4						
5						
6						
7						
8						
9						
10						

Package Page 1 of 1

Pipe Interior Radiological Survey Form

Date: 11.30.06 Time: 1350
 Building: REACTION Elevation: 0 Access Point: DELEV CABLE Trench
 System: 2" SLURPER DESIGN Pipe Diameter: 2" Area: Pipe ID Rx 143
 Type of Survey: Investigation Characterization: Final Survey # Other ✓
 Sled Size: 2" vinyl Pulley inch
 Detector: 44-62 Detector ID #: 204402-3NA 121
 Cal Date: 11.17.05 Cal Due Date: 11.17.06
 Instrument: 2350-1 Instrument ID #: 212223
 Cal Date: 11.17.05 Cal Due Date: 11.17.06

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

Background Value 5.9 cpm

MDCR_{static} 11.3 cpm

Efficiency Factor for Pipe 0.00026

(taken from detector efficiency determination calibration certificate) gn

Diameter MDC_{static} 7836 dpm/100cm²

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

Comments: acceptable?

CONTINUATION SURVEY
POSITION 1 TAKEN FROM CABLE TRENCH

COMPLETE

Pipe Interior Radiological Survey

Radiological Survey Commenced: Date: 11.30.06 Time: 1350

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
1	1	2	7	3.5	n/a	n/a
2	2	↓	2	1	↓	↓
3	3	↓	4	2	↓	↓
4	4	↓	4	2	↓	↓
5	5	↓	4	2	↓	↓
6	6	↓	5	2.5	↓	↓
7	7	↓	8	4	↓	↓
8	8	↓	4	2	↓	↓
9	9	↓	9	4.5	↓	↓
10	10	✓	1	3.5	↓	↓

Pipe Interior Radiological Survey Form (Continuation Form)

1.30.06

Rx 163

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
11	11	2	6	3	n/a	n/a
12	12	2	3	1.5		
13	13	2	4	2		
14	14	2	4	2		
15	15	2	6	3		
16	16	2	2	1		
17	17	2	2	1		
18	18	2	6	3		
19	19	2	8	4		
20	20	2	7	3.5		
n/a						

Package Page 2 of 4

REFERENCE COPY

REFERENCE COPY

BCO-2

4" c.c.

2" ϕ FROM SCUPPER DRAIN IN
INSTRUMENTATION DUCT
SEE DWG PF-00259

RX-163

20 FT
SURVEYED

-25'-0" FL. EL.

6"

SECTION

$\frac{1}{375}$

SCALE $\frac{1}{2}$ " = 1'-0"

Phos 30 ft 34

R EL. -25'-0"

PITCH 4" HOT DRAIN TC - 1" PER 10'-0"

Point C

-26'-10¹/₄" EL.

-26'-9¹/₂"

4" FLOOR DRAIN
-25'-5³/₈" EL.

PITCH 4" HOT-COLD DRAIN 1/8" FT.

1 1/2" ST. HD.
EL. -10'-0"

RK-163

51

Sump A

-25'-11" EL.

JOSAM #5586 WITH
CHROME GATE

2" DRAIN RISER - FOR CONTINUATION
SEE DWG PF-00259

3" QEC RECIRC-PURGE QUAD "D"

10" QEC PUMP OUT-DRAIN QUAD "D"

31

32

Sump B

SEE 376 FOR TYPICAL PURGE

-25'-11" EL.

JOSAM TYPE 0412
ANGLE DRAIN

18 x 32" ELECTRICAL PIT
BOTTOM ELEVATION -25'-6"

Elect.
Junction
Box - pt. D

Elect.
Junction
Box

SEE DET. A
Q-C SUMP PUMP

FROM ITHCS PANEL #2
SEE PF-00428

INUATION
PF-00406

DOWN PUMPS
SX DRAINS

REFERENCE COPY

QUADRANT "C"

FILE 4/24

Pipe Interior Radiological Survey Form

Date: 2-6-06 Time: 1250
 Building: 12x Elevation: 125 Access Point Area: ANNUAL
 System: D-C TO 1-51 Pipe Diameter: 2" Pipe ID #: 2X103 COKE BOLT
 Type of Survey Investigation Characterization Final Survey Other ✓ DRAIN LINE
 Sled Size NO SLED inch
 Detector: 44-67 Detector ID #: 204402
 Cal Date: 11-17-05 Cal Due Date: 11-17-06
 Instrument: 2350-1 Instrument ID #: 217203
 Cal Date: 11-17-05 Cal Due Date: 11-17-06

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

Background Value 5-1 cpm

MDCR_{static} 10.7 cpm

Efficiency Factor for Pipe Diameter 0.00021

(taken from detector calibration certificate)

MDC_{static} 9701 dpm/100cm²

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

Comments: CONTINUATION SURVEY

Pipe Interior Radiological Survey

Radiological Survey Commenced: Date: 2-6-06 Time: 1250

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
1	<u>1</u>	<u>2</u>	<u>8</u>	<u>4</u>	<u>N/A</u>	<u>N/A</u>
2	<u>2</u>	<u>2</u>	<u>5</u>	<u>2.5</u>	<u>↓</u>	<u>↓</u>
3	<u>3</u>	<u>2</u>	<u>6</u>	<u>3</u>	<u>↓</u>	<u>↓</u>
4						
5						
6						
7						
8						
9						
10						

Package Page 1 of 2

Pipe Interior Radiological Survey Form

Date: 2.6.06 Time: 1317
 Building: Rx Elevation: -25 Access Point Area: Access
 System: Cable Tied D-C T. 1.51 Pipe Diameter: 2" Pipe ID # Rx 163 DRAIN LINE TO COME BORE
 Type of Survey Investigation Characterization Final Survey Other ✓
 Sled Size No Sleds inch
 Detector: 44-62 Detector ID #: 204402
 Cal Date: 11-17-05 Cal Due Date: 11-17-06
 Instrument: 2350-1 Instrument ID #: 212223
 Cal Date: 11-17-05 Cal Due Date: 11-17-06

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

Background Value 5.1 cpm
 MDCR_{static} 10.7 cpm
 Efficiency Factor for Pipe Diameter 0.00021 (taken from detector efficiency determination calibration certificate)
 MDC_{static} 9701 dpm/100cm²
 Is the MDC_{static} acceptable? Yes No (if no, adjust sample count time and recalculate MDCR_{static})

Comments: CONTINUATION SURVEY

Complete

Pipe Interior Radiological Survey

Radiological Survey Commenced: Date: 2.6.06 Time: 1317

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

Package Page 1 of 2

GENERAL NOTES

- 1- FOR SCHEDULE OF DWGS SEE DWG PF-00100.
- 2- ALL 4" FLOOR DRAINS SHALL BE JOSAM #204-37R WITH CHROME GRATE.
- 3- ALL DRAIN PIPING BELOW CONCRETE FLOOR SHALL BE WROUGHT IRON SCH. 80
- 4- ALL PIPING PIERCING 3/4" CONTAINMENT VESSEL SKIN SHALL BE SEAL WELDED FOR PRESSURE TIGHT CONNECTION.

SECTION 1/315
SCALE 1/2"=1'-0"

PF-00375

Rx163

= PPE Surveyed
1 FT

2-7-06

4" FLOOR DRAIN
FOR EL. -15'-0"

RBCO-2

2" FROM SCUPPER DRAIN IN
INSTRUMENTATION DUCT
SEE DWG PF-00259

-25'-0" PL. EL.

REFERENCE COPY

I

VESSEL SHEET

FLOOR EL. -25'-0"

Point C

PITCH 4" HOT DRAIN - 1" PER 10'-0"

-26'-10 1/2" EL.

4" FLOOR DRAIN
-25'-5 3/8" EL.

1 1/2" ST. HD.
EL. -10'-0"

PITCH 1" FACTORY

Sump A

51

31

2" DRAIN RISER - FOR CONTINUATION
SEE DWG PF-00259

3" Q&C RECIRC-PURGE QUAND

10" Q&C PUMP OUT DRAIN QUAND

JOSAM #5586 WITH
CHROME GRATE

SEE 1/315 FOR TYPICAL PURGE

Sump B

JOSAM TYPE 0412
ANGLE DRAIN

CONTINUATION
DWG. PF-00406

Page 2 of 2

2 1/2" UP TO EL. 7'-6"
1 1/2" DRIP RISER TO AIR
CONDITIONER #12 EL. 8'-0"
SEE DWG # PF-00377
FOR CONTINUATION

4" FLOOR DRAIN
FOR EL. -15'-0"

-2 1/2" EL. -21'-6"

-15'-0" EL. -4" C.C.

RBCO-1

SECTION 7
ATTACHMENT 3
1 PAGE(S)




DQA Check Sheet

Design #	EP Rx 163	Revision #	Original						
Survey Unit #	EP Rx 163								
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, for WRS Test) ≥ the critical value?								X	
Comments:									
FSS/Characterization Engineer (print/sign)						<i>Dale R. Anderson</i>		Date	7-15-07
FSS/ Characterization Manager (print/sign)						<i>[Signature]</i>		Date	7/25/07

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SECTION 7
ATTACHMENT 4
1 DISC

Survey Unit Release Record

Design #	EP-1.37	Revision #	Original	Page 1 of 3
Survey Unit #(s)	1.37			
Description	<p>1) Embedded Pipe (EP) Survey Unit 1.37 meets the definition of embedded pipe for Plum Brook Reactor Facility (PBRF).</p> <p>2) EP 1.37 is a Class 1, Group 2 survey unit as per the PBRF Final Status Survey Plan (FSSP) and Technical Basis Document (TBD)-06-004.</p> <p>3) Surveys in EP 1.37 were performed using a scintillation detector optimized to measure gamma energies representative of Co-60. Sample #EP 2-1 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			6-12-07	
Technical Reviewer (FSS/Characterization Engineer)			6-29-07	
FSS/Characterization Manager	 R. Case		7/18/07	

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FSS Design # EP 1.37	Revision # Original	Page 2 of 3
Survey Unit: 1.37		

1.0 History/Description

- 1.1 The subject pipe system is the 3" purge line for Canal "E". The function of this pipe was to convey water from the one 3 inch riser in Canal "E" to the HD sump in Pump Room #22 on the Rx Building -25 ft, where the pipe is currently breached.
- 1.2 EP 1.37 consists of approximately 32 feet in length from the pump room to the riser in Canal "E". The pipe section has an approximately three mitered elbows ranging from 45° to 90°.

2.0 Survey Design Information

- 2.1 EP 1.37 was surveyed IAW Procedure #BSI/LVS-002.
- 2.2 100% of the 3" ID pipe was accessible for survey. The accessible 3" ID pipe was surveyed by static measurement at one foot increments, for a total of 36 survey measurements.
- 2.3 Surface area for the 3" ID piping is 729.7 cm² for each foot of piping, corresponding to a total 3" ID piping surface area of 26,280.6 cm² (2.6 m²) for the entire length of (36') of 3" 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 1.37 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 Statistical Summary Table

Statistical Parameter	3" Pipe
Total Number of Survey Measurements	36
Number of Measurements >MDC	31
Number of Measurements Above 50% of DCGL	0
Number of Measurements Above DCGL	0
Mean	0.018
Median	0.020
Standard Deviation	0.007
Maximum	0.034
Minimum	0.004

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 1.37 to be less than 1 mrem/yr. The dose contribution is estimated to be 0.018 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 1.37 & Spreadsheet

SECTION 7
ATTACHMENT 1
3 PAGE(S)



BSI EP/BP SURVEY REPORT

Pipe ID	1.37	Survey Location	-27 TRENCH
Survey Date	12-13-05/12-15-05	2350-1 #	212223
Survey Time	1305/1100	Detector-Sled #	44-62/204402-101
Pipe Size	3"	Detector Efficiency	0.00014
DCGL (dpm/100cm ²)	240800	Pipe Area Incorporated by Detector Efficiency (ln cm ²)	730
Pipe Area Incorporated by Survey Data (m ²)	2.6	Field BKG (cpm)	5.2/5.1
Routine Survey	X	Field MDCR (counts)	10.8/10.7
QA Survey		Nominal MDC (dpm/100cm ²)	2,842
Survey Measurement Results			
Total Number of Survey Measurements		36	
Number of Measurements >MDC		31	
Number of Measurements Above 50% DCGL		0	
Number of Measurements Above DCGL		0	
Mean		0.018	
Median		0.020	
Standard Deviation		0.007	
Maximum		0.034	
Minimum		0.004	
Survey Technician(s)	ROSENHAGEN		
Survey Unit Classification		1	
TBD 06-004 Piping Group		2	
SR-13 Radionuclide Distribution Sample		EP 2-1	
Measured Nuclide		Co60	
Area Factor/EMC Used		No	
Pass/Fail FSS		Pass	
MREM/YR Contribution		<1	
COMMENTS: ACTIVITY VALUES NOT BACKGROUND CORRECTED			
RP Engineer Date		Owl Roubell 6-12-07	

EP 1.37
3" 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	2	2	14,286	1,958	1,016	16	12	1	57	0.008
2	4	4	28,571	3,916	2,032	32	23	2	114	0.017
3	3.3	3.3	23,571	3,230	1,677	27	19	2	94	0.014
4	4.3	4.3	30,714	4,209	2,185	35	25	2	122	0.018
5	4.6	4.6	32,857	4,503	2,337	37	27	2	131	0.020
6	3.3	3.3	23,571	3,230	1,677	27	19	2	94	0.014
7	4.3	4.3	30,714	4,209	2,185	35	25	2	122	0.018
8	3	3	21,429	2,937	1,524	24	17	1	85	0.013
9	5.3	5.3	37,857	5,188	2,693	43	31	3	150	0.022
10	5	5	35,714	4,894	2,540	41	29	2	142	0.021
11	3	3	21,429	2,937	1,524	24	17	1	85	0.013
12	2.3	2.3	16,429	2,251	1,168	19	13	1	65	0.010
13	3.6	3.6	25,714	3,524	1,829	29	21	2	102	0.015
14	1	1	7,143	979	508	8	6	0	28	0.004
15	4.6	4.6	32,857	4,503	2,337	37	27	2	131	0.020
16	2.6	2.6	18,571	2,545	1,321	21	15	1	74	0.011
17	3.3	3.3	23,571	3,230	1,677	27	19	2	94	0.014
18	5.3	5.3	37,857	5,188	2,693	43	31	3	150	0.022
19	4.6	4.6	32,857	4,503	2,337	37	27	2	131	0.020
20	5.3	5.3	37,857	5,188	2,693	43	31	3	150	0.022
21	4.6	4.6	32,857	4,503	2,337	37	27	2	131	0.020
22	8	8	57,143	7,831	4,064	65	46	4	227	0.034
23	6	6	42,857	5,873	3,048	49	35	3	170	0.025
24	6	6	42,857	5,873	3,048	49	35	3	170	0.025
25	5	5	35,714	4,894	2,540	41	29	2	142	0.021
26	6.3	6.3	45,000	6,167	3,201	51	36	3	179	0.027
27	5.3	5.3	37,857	5,188	2,693	43	31	3	150	0.022
28	7	7	50,000	6,852	3,556	57	40	3	199	0.030
29	4	4	28,571	3,916	2,032	32	23	2	114	0.017
30	6.3	6.3	45,000	6,167	3,201	51	36	3	179	0.027
31	5.7	5.7	40,714	5,580	2,896	46	33	3	162	0.024
32	5.3	5.3	37,857	5,188	2,693	43	31	3	150	0.022

EP 1.37
3" 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
33	4.6	4.6	32,857	4,503	2,337	37	27	2	131	0.020
34	3	3	21,429	2,937	1,524	24	17	1	85	0.013
35	1.7	1.7	12,143	1,664	864	14	10	1	48	0.007
36	3	3	21,429	2,937	1,524	24	17	1	85	0.013
									MEAN	0.018
									MEDIAN	0.020
									STD DEV	0.007
									MAX	0.034
									MIN	0.004

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

Pipe Interior Radiological Survey Form

Date: 12-13-05 Time: 1305
 Building: RX BLDG Elevation: -25 Access Point Area: CANAL E
 System: PURGE DRAIN Pipe Diameter: 3" Pipe ID # 1.37
 Type of Survey Investigation Characterization Final Survey Other ☒
 Sled Size 3" inch
 Detector: 44-62 Detector ID #: 204402-101
 Cal Date: 11-17-05 Cal Due Date: 11-17-06
 Instrument: 2350-1 Instrument ID #: 212223
 Cal Date: 11-17-05 Cal Due Date: 11-17-06

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

Background Value 5.2 cpm

MDCR_{static} 10.8 cpm

Efficiency Factor for Pipe Diameter .00014

(taken from detector *efficiency determination* calibration certificate *for*)

MDC_{static} 2842 dpm/100cm²

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

Comments: INITIAL SURVEY

Pipe Interior Radiological Survey

Radiological Survey Commenced: Date: 12-13-05 Time: 1305

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
1	1	3	6	2	n/a	n/a
2	2	3	12	4		
3	3	3	10	3.3		
4	4	3	13	4.3		
5	5	3	14	4.6		
6	6	3	10	3.3		
7	7	3	13	4.3		
8	8	3	9	3		
9	9	3	16	5.3		
10	10	3	15	5		

Package Page 1 of 3

REFERENCE COPY

Pipe Interior Radiological Survey Form (Continuation Form)

1D ~~2~~ 1.37

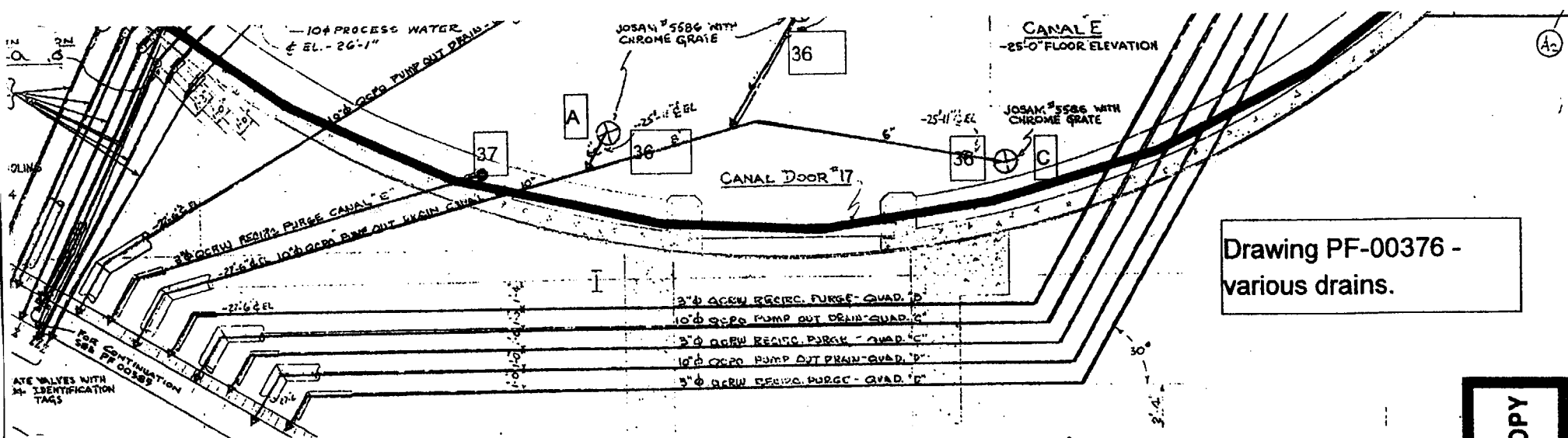
CANAL E

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
11	11	3	9	3	n/a	n/a
12	12	3	7	2.3	↓	↓
13	13	3	11	3.6	↓	↓
14	14	3	3	1	↓	↓
n/a						

Package Page 2 of 3

REFERENCE COPY

Attachment 3, Page 2



Drawing PF-00376 -
various drains.

REFERENCE COPY

= PIPE SURVEYED

ID # 1.37

12-13-05

Pipe Interior Radiological Survey Form

Date: 12-15-05 Time: 1100
 Building: REACTOR Elevation: -25 Access Point Area: TRENCH
 System: CANAL E PURGE Pipe Diameter: 3" Pipe ID #: 1-37
 Type of Survey Investigation Characterization Final Survey Other ✓
 Sled Size 3" inch
 Detector: 44-62 Detector ID #: 204402-101
 Cal Date: 11-17-05 Cal Due Date: 11-17-06
 Instrument: 2350-1 Instrument ID #: 212223
 Cal Date: 11-17-05 Cal Due Date: 11-17-06

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

Background Value 5.1 cpm

MDCR_{static} 10.7 cpm

Efficiency Factor for Pipe Diameter 0.00014 (taken from detector ~~calibration certificate~~ *efficiency determination*)

MDC_{static} 2842 dpm/100cm²

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

Comments: CONTINUATION SURVEY

COMPLETE

Pipe Interior Radiological Survey

Radiological Survey Commenced: Date: 12-15-05 Time: 1100

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
1	1	3	14	4.6	n/a	n/a
2	2	3	8	2.6		
3	3	3	10	3.3		
4	4	3	16	5.3		
5	5	3	14	4.6		
6	6	3	16	5.3		
7	7	3	14	4.6		
8	8	3	24	8		
9	9	3	18	6		
10	10	3	18	6		

Package Page 1 of 3

12-15-05

Pipe Interior Radiological Survey Form (Continuation Form)

10⁴ 1.37 CANAL E PURGE

720 NCH 25'

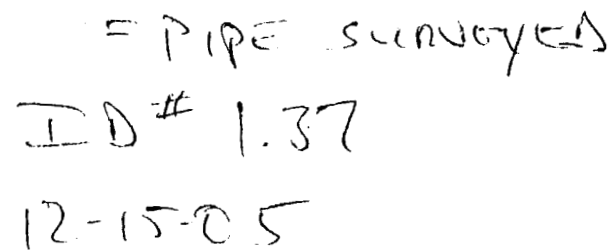
Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
11	11	3	15	5	n/a	n/a
12	12	3	19	6.3		
13	13	3	16	5.3		
14	14	3	21	7		
15	15	3	12	4		
16	16	3	19	6.3		
17	17	3	17	5.7		
18	18	3	16	5.3		
19	19	3	14	4.6		
20	20	3	9	3		
21	21	3	5	1.7		
22	22	3	9	3		
n/a						

Package Page 2 of 3



REFERENCE COPY

Attachment 3, Page 2



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

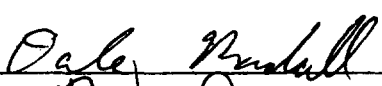
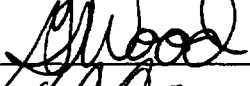

DQA Check Sheet

Design #	EP 1.37	Revision #	Original						
Survey Unit #	EP 1.37								
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>Dale Randall / Dale Randall</i>		Date	6-12-07
FSS/ Characterization Manager (print/sign)						<i>R. Case</i>		Date	7/18/07

Form
CS-09/2
Rev 0

SECTION 7
ATTACHMENT 4
1 DISC

Survey Unit Release Record

Design #	EP-1.81	Revision #	Original	Page 1 of 3
Survey Unit #(s)	1.81			
Description	<p>1) Embedded Pipe (EP) Survey Unit 1.81 meets the definition of embedded pipe for Plum Brook Reactor Facility (PBRF).</p> <p>2) EP 1.81 is a Class 1, Group 2 survey unit as per the PBRF Final Status Survey Plan (FSSP) and Technical Basis Document (TBD)-06-004.</p> <p>3) Surveys in EP 1.81 were performed using a scintillation detector optimized to measure gamma energies representative of Co-60. Sample #EP 2-1 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			6-12-07	
Technical Reviewer (FSS/Characterization Engineer)			6-25-07	
FSS/Characterization Manager	 R. Case		7-18-07	



COPY

Form
CS-09/1
Rev 0

Survey Unit: 1.81

1.0 History/Description

- 1.1 The subject pipe is the floor drain line from Canals "J" & "K" to the -25 ft of the Rx Building in Pump Room #22. The function of this pipe was to convey water from floor drains located in Canals "J" & "K" to the HD sump in Pump Room #22 on the Rx Building -25 ft, where the pipe is currently breached.
- 1.2 EP 1.81 consists of approximately 30 feet in length from the valve pit in the Hot Laboratory Building to the Pump Room #22. The pipe section has at least 5 mitered elbows ranging between 30o and 50o.

2.0 Survey Design Information

- 2.1 EP 1.81 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 20 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 29,180 cm² (2.9 m²) for the entire length of (20') 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 Cesium-137/Cobalt-60 ratios, provided in TBD-06-004, the survey unit that is constituted by EP 1.81 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.

FSS Design # EP 1.81	Revision # Original	Page 3 of 3
Survey Unit: 1.81		

5.5 Statistical Summary Table

Statistical Parameter	6" Pipe
Total Number of Survey Measurements	20
Number of Measurements >MDC	19
Number of Measurements Above 50% of DCGL	0
Number of Measurements Above DCGL	0
Mean	0.005
Median	0.003
Standard Deviation	0.004
Maximum	0.018
Minimum	0.001

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 1.81 to be less than 1 mrem/yr. The dose contribution is estimated to be 0.005 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 1.81 & Spreadsheet

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



BSI EP/BP SURVEY REPORT

Pipe ID	1.81		Survey Location	-27 TRENCH
Survey Date	04-Jan-06		2350-1 #	134708
Survey Time	0750		Detector-Sled #	BICRON 1MG1
Pipe Size	6"		Detector Efficiency	0.002
DCGL (dpm/100cm ²)	240800		Pipe Area Incorporated by Detector Efficiency (in cm ²)	1459
Pipe Area Incorporated by Survey Data (m ²)	2.9		Field BKG (cpm)	18
Routine Survey	X		Field MDCR (counts)	18
QA Survey			Nominal MDC (dpm/100cm ²)	333

Survey Measurement Results

Total Number of Survey Measurements	20
Number of Measurements >MDC	19
Number of Measurements Above 50% DCGL	0
Number of Measurements Above DCGL	0
Mean	0.005
Median	0.003
Standard Deviation	0.004
Maximum	0.018
Minimum	0.001

Survey Technician(s)

ROSENHAGEN

Survey Unit Classification	1
TBD 06-004 Piping Group	2
SR-13 Radionuclide Distribution Sample	EP 2-1
Measured Nuclide	Co60
Area Factor/EMC Used	No
Pass/Fail FSS	Pass
MREM/YR Contribution	<1

COMMENTS:

ACTIVITY VALUES NOT BACKGROUND CORRECTED

RP Engineer | Date

Oral Reinhold

6-12-07

EP 1.81
3" 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	18	18	9,000	617	320	5	4	0	18	0.003
2	19	19	9,500	651	338	5	4	0	19	0.003
3	21	21	10,500	720	374	6	4	0	21	0.003
4	17	17	8,500	583	302	5	3	0	17	0.003
5	13	13	6,500	446	231	4	3	0	13	0.002
6	28	28	14,000	960	498	8	6	0	28	0.004
7	62	62	31,000	2,125	1,103	18	13	1	62	0.009
8	25	25	12,500	857	445	7	5	0	25	0.004
9	15	15	7,500	514	267	4	3	0	15	0.002
10	8	8	4,000	274	142	2	2	0	8	0.001
11	13	13	6,500	446	231	4	3	0	13	0.002
12	20	20	10,000	685	356	6	4	0	20	0.003
13	14	14	7,000	480	249	4	3	0	14	0.002
14	45	45	22,500	1,542	800	13	9	1	45	0.007
15	62	62	31,000	2,125	1,103	18	13	1	62	0.009
16	35	35	17,500	1,199	623	10	7	1	35	0.005
17	33	33	16,500	1,131	587	9	7	1	33	0.005
18	32	32	16,000	1,097	569	9	6	1	32	0.005
19	53	53	26,500	1,816	943	15	11	1	53	0.008
20	123	123	61,500	4,215	2,188	35	25	2	122	0.018
									MEAN	0.005
									MEDIAN	0.003
									STD DEV	0.004
									MAX	0.018
									MIN	0.001

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

Pipe Interior Radiological Survey Form

Date: 1-4-06 Time: 0750
 Building: REACTOR BLDG Elevation: -25 Access Point Area: -27 TRENCH
 System: PRIMARY DRAIN Pipe Diameter: 6" Pipe ID #: 1.81
 Type of Survey Investigation Characterization Final Survey Other ✓
 Sled Size 6" inch
 Detector: BICRON 1M61 Detector ID #: LVS-1-107
 Cal Date: 12-20-05 Cal Due Date: 12-20-06
 Instrument: 2350-1 Instrument ID #: 134704
 Cal Date: 12-20-05 Cal Due Date: 12-20-06

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

Background Value 18 cpm
 MDCR_{static} 18 cpm
 Efficiency Factor for Pipe Diameter 0.002 (taken from detector efficiency determination calibration certificate)
 MDC_{static} 333 dpm/100cm²
 Is the MDC_{static} acceptable? Yes No (if no, adjust sample count time and recalculate MDCR_{static})
 Comments: INITIAL SURVEY

SSP / COMPLETE

Pipe Interior Radiological Survey

Radiological Survey Commenced: Date: 1-4-06 Time: 0750

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
1	1ft	1	18	18	n/a	n/a
2	2ft	1	19	19		
3	3ft	1	21	21		
4	4ft	1	17	17		
5	5ft	1	13	13		
6	6ft	1	28	28		
7	7ft	1	62	62		
8	8ft	1	25	25		
9	9ft	1	15	15		
10	10ft	1	8	8		

Package Page 1 of 2

Pipe Interior Radiological Survey Form (Continuation Form)

1.8'

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
11	11ft	1	13	13	n/a	n/a
12	12ft	1	20	20		
13	13ft	1	14	14		
14	14ft	1	45	45		
15	15ft	1	62	62		
16	16ft	1	35	35		
17	17ft	1	33	33		
18	18ft	1	32	32		
19	19ft	1	53	53		
20	20ft	1	123	123		
n/a						

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REFERENCE COPY

Attachment 3, Page 2

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20' = PIPE SURVIVED
ID 1.81
1-4-08

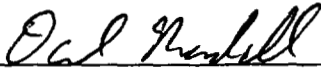

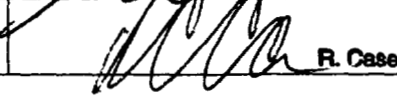
SECTION 7
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DQA Check Sheet

Design #	EP 1.81	Revision #	Original					
Survey Unit #	EP 1.81							
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>Dale Randall / Dal Randall</i>		Date	6-12-07	
FSS/ Characterization Manager (print/sign)				<i>[Signature]</i>		R. Case	Date	7-18-07

Form
CS-09/2
Rev 0

SECTION 7
ATTACHMENT 4
1 DISC

Survey Unit Release Record			
Design #	EP-Rx 127	Revision #	Original
		Page 1 of 3	
Survey Unit #(s)	Rx 127		
Description	<p>1) Embedded Pipe (EP) Survey Unit Rx 127 meets the definition of embedded pipe for Plum Brook Reactor Facility (PBRF).</p> <p>2) EP Rx 127 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 127 were performed using a scintillation detector optimized to measure gamma energies representative of Co-60. Sample #EP 3-8 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		7-14-07	
Technical Reviewer (FSS/Characterization Engineer)		7-16-07	
FSS/Characterization Manager	 R. Case	7/18/07	

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Survey Unit: Rx 127

1.0 History/Description

- 1.1 The subject pipe is the drain line on the Rx Building -25 foot elevation. The function of this pipe was to convey waste water from the drain openings to the drain trench on the Rx building -27ft.
- 1.2 EP Rx 127 consists of 4" diameter piping that is approximately 21 feet in length.

2.0 Survey Design Information

- 2.1 EP Rx 127 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 21 survey measurements.
- 2.3 Surface area for the 4" ID piping is 973 cm^2 for each foot of piping, corresponding to a total 4" ID piping surface area of $20,430 \text{ cm}^2$ (2.0 m^2) for the entire length of (approximately 21') 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 Rx 127 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 Statistical Summary Table

Statistical Parameter	4" Pipe
Total Number of Survey Measurements	21
Number of Measurements >MDC	17
Number of Measurements Above 50% of DCGL	0
Number of Measurements Above DCGL	0
Mean	0.0177
Median	0.0141
Standard Deviation	0.0184
Maximum	0.0943
Minimum	0.0059

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 127 to be less than 1 mrem/yr. The dose contribution is estimated to be 0.018 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 – EP RX 127 SURR & Spreadsheet Disc

SECTION 7
ATTACHMENT 1
2 PAGE(S)



BSI EP/BP SURVEY REPORT

Pipe ID	Rx 127	Survey Location	-27 el. RBDL-1
Survey Date	08-Feb-06	2350-1 #	203488
Survey Time	08:05	Detector-Sled #	LVS-1/101
Pipe Size	4"	Detector Efficiency	0.00052
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)	2.0	Field BKG (cpm)	16.3
Routine Survey	X	Field MDCR (cpm)	16.9
QA Survey		Nominal MDC (dpm/100cm ²)	1,557
Survey Measurement Results			
Total Number of Survey Measurements		21	
Number of Measurements >MDC		17	
Number of Measurements Above 50% DCGL		0	
Number of Measurements Above DCGL		0	
Mean		0.0177	
Median		0.0141	
Standard Deviation		0.0184	
Maximum		0.0943	
Minimum		0.0059	
Survey Technician(s)		ROSENHAGEN	
Survey Unit Classification		1	
TBD 06-004 Piping Group		1	
SR-13 Radionuclide Distribution Sample		EP 3-8	
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		Orel Rutall 7-14-07	

EP Rx 127
4" 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
1	15	15	28,846	2,965	118	2,813	748	87	21	0.018
2	11	11	21,154	2,174	86	2,063	548	63	15	0.013
3	5	5	9,615	988	39	938	249	29	7	0.006
4	10	10	19,231	1,977	78	1,875	498	58	14	0.012
5	7	7	13,462	1,384	55	1,313	349	40	10	0.008
6	8	8	15,385	1,581	63	1,500	399	46	11	0.009
7	14	14	26,923	2,767	110	2,625	698	81	19	0.017
8	80	80	153,846	15,813	627	15,001	3,988	461	110	0.094
9	14	14	26,923	2,767	110	2,625	698	81	19	0.017
10	6	6	11,538	1,186	47	1,125	299	35	8	0.007
11	12	12	23,077	2,372	94	2,250	598	69	17	0.014
12	12	12	23,077	2,372	94	2,250	598	69	17	0.014
13	9	9	17,308	1,779	71	1,688	449	52	12	0.011
14	10	10	19,231	1,977	78	1,875	498	58	14	0.012
15	12	12	23,077	2,372	94	2,250	598	69	17	0.014
16	16	16	30,769	3,163	125	3,000	798	92	22	0.019
17	7	7	13,462	1,384	55	1,313	349	40	10	0.008
18	13	13	25,000	2,570	102	2,438	648	75	18	0.015
19	11	11	21,154	2,174	86	2,063	548	63	15	0.013
20	26	26	50,000	5,139	204	4,875	1,296	150	36	0.031
21	17	17	32,692	3,360	133	3,188	847	98	23	0.020
									MEAN	0.018
									MEDIAN	0.014
									STD DEV	0.018
									MAX	0.094
									MIN	0.006

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

Pipe Interior Radiological Survey Form

Date: 2-8-06 Time: 0805
 Pipe (-25 R40L-1) Pipe Access Point
 ID#: Rx 127 Diameter: 4" Area: TRENCH
 Building: Rx Elevation: -27 System: Rx-25 HOT COLD DRAIN
 Type of Survey Investigation _____ Characterization _____ Final Survey X Other /
 Gross _____ Co60 ✓ Cs _____
 Detector ID# / Sled ID# LV5-1 / 101
 Detector Cal Date: 11-17-05 Detector Cal Due Date: 11-17-06
 Instrument: 2350-1 Instrument ID #: 203433
 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 16.3 cpm

MDCR_{static} 16.9 cpm

Efficiency Factor for Pipe 0.00052 (from detector efficiency determination)
 Diameter _____

MDC_{static} 1557 dpm/ 100 cm²

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

Comments: _____

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	15	n/a	n/a	n/a
2	2	1	11	↓	↓	↓
3	3	1	5	↓	↓	↓
4	4	1	10	↓	↓	↓
5	5	1	7	↓	↓	↓
6	6	1	8	↓	↓	↓
7	7	1	14	↓	↓	↓
8	8	1	80	↓	↓	↓
9	9	1	14	↓	↓	↓
10	10	1	6	↓	↓	↓

Pipe Interior Radiological Survey Form (Continuation Form)

Date: 2-8-06
 Pipe ID#: RX127 (25R901-1) Pipe Diameter: 4" Access Point Area: 772 CM²
 Building: RX Elevation: -27 System: RX25 HOT GAS OIL LINE

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
11	11	1	12	n/a	n/a	n/a
12	12	1	12			
13	13	1	9			
14	14	1	10			
15	15	1	12			
16	16	1	16			
17	17	1	7			
18	18	1	13			
19	19	1	11			
20	20	1	26			
21	21	1	17			
n/a						

Package Page 2 of 3

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Drawing PF-00376 -
various drains.

FLOOR DRAIN
JOSAM #264-37R

RBDL-1

-25'-0" FLOOR ELEVATION

1" HOT DRAIN OPENING
EL. -24'-0"

GLASS COOLING SYS.
SEE DWG. PF-00413

RBDL-2

Drawing PF-00376 -
various drains.

JOSAM #204-37R
FLOOR COOLING

1. IF CHANGE WITH A PIPE TAPING
LOCATED VALVES MOUNTED IN
SHIELD OR CAP (VALVE 5)
ON 10" 55 PIPE - FLOOR 55 SHIELD
18" 10" 1832 ON FULLY
SOME TAPING.

UNEXCAVATED 2

-22'-6" TOP OF 7" THK STEEL SH

SECTION (5)

DETAIL (2)
FLOOR TIE
SCALE 1/4" = 1'-0"

FLOOR TIE
1. IF CHANGE WITH A PIPE TAPING
LOCATED VALVES MOUNTED IN
SHIELD OR CAP (VALVE 5)
ON 10" 55 PIPE - FLOOR 55 SHIELD
18" 10" 1832 ON FULLY
SOME TAPING.

5" RCPP REPAIR PURGE CANAL
6" RCPP PUMP OUT DRAIN CANAL

SECTION 7
ATTACHMENT 3
1 PAGE(S)

DQA Check Sheet

Design #	Rx 127	Revision #	Original	
Survey Unit #	Rx 127			

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

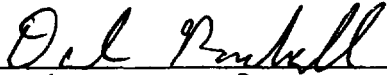


Comments:

FSS/Characterization Engineer (print/sign)	<i>Dale Randall</i> Dale Randall	Date	7-14-07
FSS/ Characterization Manager (print/sign)	<i>R. Case</i> R. Case	Date	7/18/07

Form
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SECTION 7
ATTACHMENT 4
1 DISC

Survey Unit Release Record

Design #	EP-Rx 148	Revision #	Original	Page 1 of 3
Survey Unit #(s)	Rx 148			
Description	<p>1) Embedded Pipe (EP) Survey Unit Rx 148 meets the definition of embedded pipe for Plum Brook Reactor Facility (PBRF).</p> <p>2) EP Rx 148 is a Class 1, Group 2 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 148 were performed using a scintillation detector optimized to measure gamma energies representative of Co-60. Sample #EP 2-1 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				7-15-07
Technical Reviewer (FSS/Characterization Engineer)				7-17-07
FSS/Characterization Manager	 R. Case			7/18/07

Form
CS-09/1
Rev 0



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Survey Unit: Rx 148

1.0 History/Description

- 1.1 The subject pipe system is the 4" Quad "B" system line.
- 1.2 EP Rx 148 consists of approximately 21 feet in length from the Reactor Building -25' elevation to Quad "B".

2.0 Survey Design Information

- 2.1 EP Rx 148 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 21 survey measurements.
- 2.3 Surface area for the 4" ID piping is 973 cm^2 for each foot of piping, corresponding to a total 4" ID piping surface area of $20,430 \text{ cm}^2$ (2.0 m^2) for the entire length of (21') 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 Rx 148 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 148

5.5 Statistical Summary Table

Statistical Parameter	4" Pipe
Total Number of Survey Measurements	21
Number of Measurements >MDC	2
Number of Measurements Above 50% of DCGL	0
Number of Measurements Above DCGL	0
Mean	0.0098
Median	0.0094
Standard Deviation	0.0019
Maximum	0.0129
Minimum	0.0060

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 148 to be less than 1 mrem/yr. The dose contribution is estimated to be 0.010 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

Attachment 3 – DQA Worksheet

Attachment 4 – EP RX 148 SURR & Spreadsheet Disc

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ATTACHMENT 1
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BSI EP/BP SURVEY REPORT

Pipe ID	Rx 148	Survey Location	Quad B
Survey Date	11-Jan-06	2350-1 #	134738
Survey Time	10:55	Detector-Sled #	1MG1 LVS-1/101
Pipe Size	4"	Detector Efficiency	0.00052
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)	2.0	Field BKG (cpm)	22.2
Routine Survey	X	Field MDCR (cpm)	19.3
QA Survey		Nominal MDC (dpm/100cm ²)	1,557
Survey Measurement Results			
Total Number of Survey Measurements			21
Number of Measurements >MDC			2
Number of Measurements Above 50% DCGL			0
Number of Measurements Above DCGL			0
Mean			0.0098
Median			0.0094
Standard Deviation			0.0019
Maximum			0.0129
Minimum			0.0060
Survey Technician(s)		ROSENHAGEN	
Survey Unit Classification			1
TBD 06-004 Piping Group			2
SR-13 Radionuclide Distribution Sample			EP 2-1
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		Orel Penhall 7-15-07	

EP Rx 148
4" 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	10	10	19,231	1,977	1,025	16	12	1	57	0.009
2	13	13	25,000	2,570	1,332	21	15	1	74	0.011
3	11	11	21,154	2,174	1,127	18	13	1	63	0.009
4	14	14	26,923	2,767	1,435	23	16	1	80	0.012
5	10	10	19,231	1,977	1,025	16	12	1	57	0.009
6	8	8	15,385	1,581	820	13	9	1	46	0.007
7	13	13	25,000	2,570	1,332	21	15	1	74	0.011
8	9	9	17,308	1,779	922	15	10	1	51	0.008
9	11	11	21,154	2,174	1,127	18	13	1	63	0.009
10	11	11	21,154	2,174	1,127	18	13	1	63	0.009
11	14	14	26,923	2,767	1,435	23	16	1	80	0.012
12	13	13	25,000	2,570	1,332	21	15	1	74	0.011
13	9	9	17,308	1,779	922	15	10	1	51	0.008
14	15	15	28,846	2,965	1,537	25	17	1	85	0.013
15	7	7	13,462	1,384	717	11	8	1	40	0.006
16	12	12	23,077	2,372	1,230	20	14	1	68	0.010
17	10	10	19,231	1,977	1,025	16	12	1	57	0.009
18	15	15	28,846	2,965	1,537	25	17	1	85	0.013
19	10	10	19,231	1,977	1,025	16	12	1	57	0.009
20	13	13	25,000	2,570	1,332	21	15	1	74	0.011
21	13	13	25,000	2,570	1,332	21	15	1	74	0.011
									MEAN	0.010
									MEDIAN	0.009
									STD DEV	0.002
									MAX	0.013
									MIN	0.006

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ATTACHMENT 2
3 PAGE(S)

Pipe Interior Radiological Survey Form

Date: 1-11-06 Time: 1055
 Building: RX Elevation -25 Access Point QUAD B
 System: 2nd cooling tower tests Pipe Diameter: 4" Area: Pipe ID RX 148
 Type of Survey Investigation Characterization Final Survey # Other X
 Sled Size DOG BONE 101 inch
 Detector: BICRON IMG1 Detector ID #: LVS-1
 Cal Date: 12-20-05 Cal Due Date: 12-20-06
 Instrument: 2350-1 Instrument ID #: 134738
 Cal Date: 12-20-05 Cal Due Date: 12-20-06

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

Background Value 22.3 cpm
 MDCR_{static} 19.3 cpm
 Efficiency Factor for Pipe 0.00052 (taken from detector efficiency determination calibration certificate) gw
 Diameter 1557 dpm/100cm²
 MDC_{static} 1557
 Is the MDC_{static} Yes No (if no, adjust sample count time and recalculate MDCR_{static})
 acceptable?
 Comments:

Pipe Interior Radiological Survey

Radiological Survey Commenced: Date: 1-11-06 Time: 1055

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
1	1	1	10	10	n/a	n/a
2	2	1	13	13		
3	3	1	11	11		
4	4	1	14	14		
5	5	1	10	10		
6	6	1	8	8		
7	7	1	13	13		
8	8	1	9	9		
9	9	1	11	11		
10	10	1	11	11		

Package Page 1 of 2

Pipe Interior Radiological Survey Form (Continuation Form)

RX 148 QUAD B

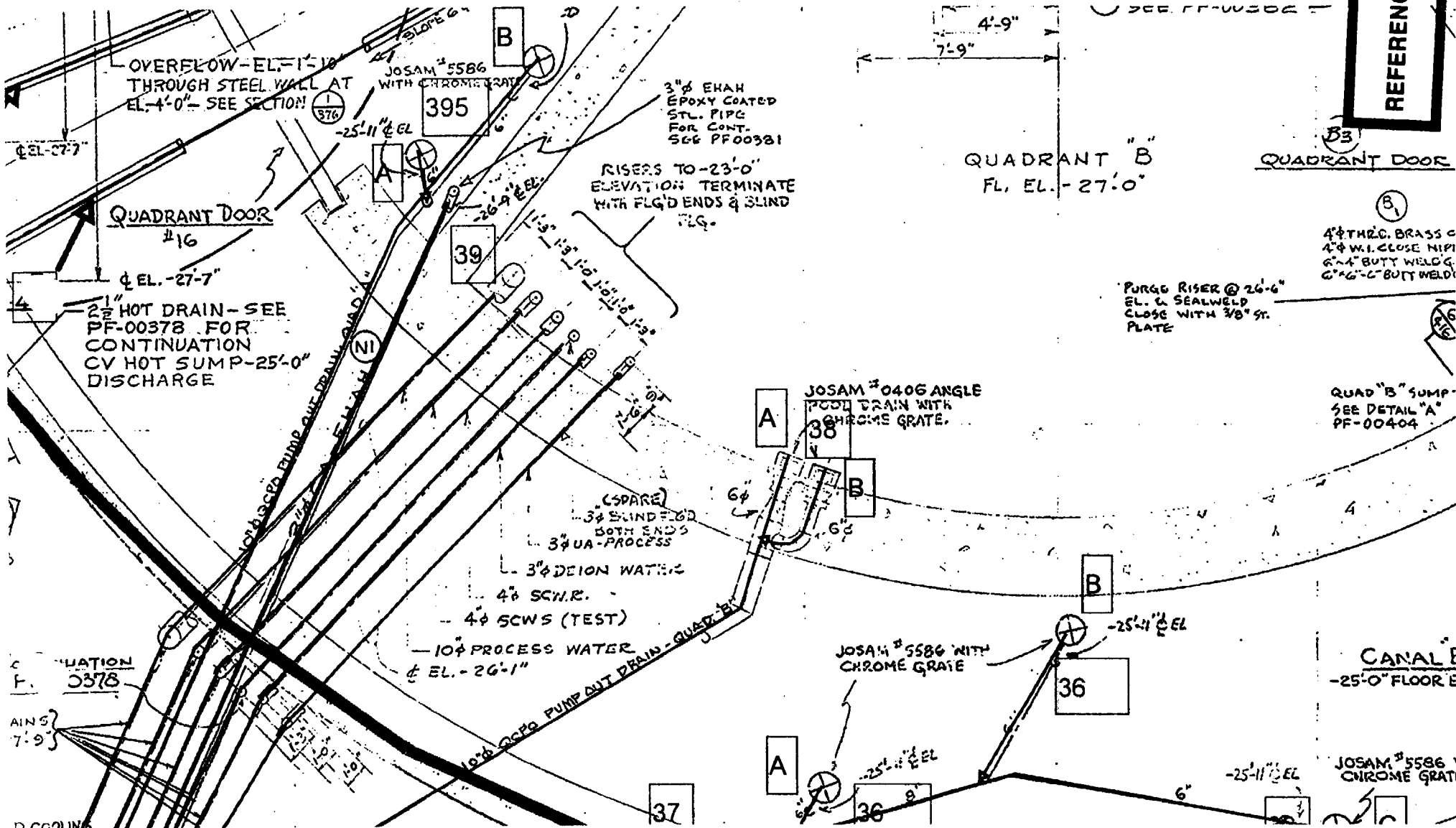
1-11-06

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
11	11	1	14	14	n/a	n/a
12	12	1	13	13	↓	↓
13	13	1	9	9	↓	↓
14	14	1	15	15	↓	↓
15	15	1	7	7	↓	↓
16	16	1	12	12	↓	↓
17	17	1	10	10	↓	↓
18	18	1	15	15	↓	↓
19	19	1	10	10	↓	↓
20	20	1	13	13	↓	↓
21	21	1	13	13	↓	↓
n a						

Package Page 2 of 2

REFERENCE COPY

REFERENCE COPY



= PIPE SURVEYED
21'
ID RX 148
1-11-06

SECTION 7
ATTACHMENT 3
1 PAGE(S)

DQA Check Sheet				
Design #	EP Rx 148	Revision #	Original	
Survey Unit #	EP Rx 148			
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, for WRS Test) ≥ the critical value?				X
Comments:				
FSS/Characterization Engineer (print/sign)			<i>Dale Raymond Del Nardulli</i>	
FSS/ Characterization Manager (print/sign)			<i>[Signature]</i>	
			R. Case	
			Date	7-15-07
			Date	7/18/07

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SECTION 7
ATTACHMENT 4
1 DISC

Survey Unit Release Record				
Design #	EP-Rx 152	Revision #	Original	Page 1 of 3
Survey Unit #(s)	Rx 152			
Description	<p>1) Embedded Pipe (EP) Survey Unit Rx 152 meets the definition of embedded pipe for Plum Brook Reactor Facility (PBRF).</p> <p>2) EP Rx 152 is a Class 1, Group 2 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 152 were performed using a scintillation detector optimized to measure gamma energies representative of Co-60. Sample #EP 2-1 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	<i>Paul Penhall</i>		6-12-07	
Technical Reviewer (FSS/Characterization Engineer)	<i>R. Wood</i>		6-29-07	
FSS/Characterization Manager	<i>R. Case</i> R. Case		7-18-07	

Form
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Survey Unit: Rx 152

1.0 History/Description

- 1.1 The subject pipe system is the 3" Quad "B" De-ionized (DI) water line. The function of this pipe was to convey DI.
- 1.2 EP Rx 152 consists of approximately 21 feet in length from the Reactor Building -25' elevation to Quad "B".

2.0 Survey Design Information

- 2.1 EP Rx 152 was surveyed IAW Procedure #BSI/LVS-002.
- 2.2 100% of the 3" ID pipe was accessible for survey. The accessible 3" ID pipe was surveyed by static measurement at one foot increments, for a total of 21 survey measurements.
- 2.3 Surface area for the 3" ID piping is 729.7 cm^2 for each foot of piping, corresponding to a total 3" ID piping surface area of $15,330 \text{ cm}^2 (1.5 \text{ m}^2)$ for the entire length of (21') of 3" 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 152 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.

FSS Design # EP Rx 152	Revision # Original	Page 3 of 3
Survey Unit: Rx 152		

5.5 Statistical Summary Table

Statistical Parameter	3" Pipe
Total Number of Survey Measurements	21
Number of Measurements >MDC	8
Number of Measurements Above 50% of DCGL	0
Number of Measurements Above DCGL	0
Mean	0.011
Median	0.011
Standard Deviation	0.003
Maximum	0.018
Minimum	0.007

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 152 to be less than 1 mrem/yr. The dose contribution is estimated to be 0.011 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

Attachment 3 – DQA Worksheet

Attachment 4 – Disc containing RR for EP Rx 152 & Spreadsheet

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



BSI EP/BP SURVEY REPORT

Pipe ID	Rx 152	Survey Location	-27 TRENCH
Survey Date	12-12-05/12-13-06	2350-1 #	212223
Survey Time	1245/1050	Detector-Sled #	44-62/204402-101
Pipe Size	3"	Detector Efficiency	0.00014
DCGL (dpm/100cm ²)	240800	Pipe Area Incorporated by Detector Efficiency (in cm ²)	730
Pipe Area Incorporated by Survey Data (m ²)	1.5	Field BKG (cpm)	5.2/5.2
Routine Survey	X	Field MDCR (counts)	10.8/10.8
QA Survey		Nominal MDC (dpm/100cm ²)	2,842
Survey Measurement Results			
Total Number of Survey Measurements		21	
Number of Measurements >MDC		8	
Number of Measurements Above 50% DCGL		0	
Number of Measurements Above DCGL		0	
Mean		0.011	
Median		0.011	
Standard Deviation		0.003	
Maximum		0.018	
Minimum		0.007	
Survey Technician(s)	ROSENHAGEN		
Survey Unit Classification		1	
TBD 06-004 Piping Group		2	
SR-13 Radionuclide Distribution Sample		EP 2-1	
Measured Nuclide		Co60	
Area Factor/EMC Used		No	
Pass/Fail FSS		Pass	
MREM/YR Contribution		<1	
COMMENTS: ACTIVITY VALUES NOT BACKGROUND CORRECTED			
RP Engineer Date		Ocal Penhall 6-12-07	

EP Rx 152
3" 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	2.3	2.3	16,429	2,251	1,168	19	13	1	65	0.010
2	2.6	2.6	18,571	2,545	1,321	21	15	1	74	0.011
3	1.6	1.6	11,429	1,566	813	13	9	1	45	0.007
4	2.6	2.6	18,571	2,545	1,321	21	15	1	74	0.011
5	2	2	14,286	1,958	1,016	16	12	1	57	0.008
6	4	4	28,571	3,916	2,032	32	23	2	114	0.017
7	4.3	4.3	30,714	4,209	2,185	35	25	2	122	0.018
8	3	3	21,429	2,937	1,524	24	17	1	85	0.013
9	2.3	2.3	16,429	2,251	1,168	19	13	1	65	0.010
10	3	3	21,429	2,937	1,524	24	17	1	85	0.013
11	2.6	2.6	18,571	2,545	1,321	21	15	1	74	0.011
12	1.6	1.6	11,429	1,566	813	13	9	1	45	0.007
13	2.3	2.3	16,429	2,251	1,168	19	13	1	65	0.010
14	3.3	3.3	23,571	3,230	1,677	27	19	2	94	0.014
15	4.3	4.3	30,714	4,209	2,185	35	25	2	122	0.018
16	2	2	14,286	1,958	1,016	16	12	1	57	0.008
17	3.3	3.3	23,571	3,230	1,677	27	19	2	94	0.014
18	2	2	14,286	1,958	1,016	16	12	1	57	0.008
19	3	3	21,429	2,937	1,524	24	17	1	85	0.013
20	2	2	14,286	1,958	1,016	16	12	1	57	0.008
21	2.7	2.7	19,286	2,643	1,372	22	16	1	77	0.011
									MEAN	0.011
									MEDIAN	0.011
									STD DEV	0.003
									MAX	0.018
									MIN	0.007

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

Pipe Interior Radiological Survey Form

Date: 12-12-05 Time: 1245
 Building: RX Bldg Elevation: -25 Access Point Area: QUAD B
 System: DE WATERS QUAD B Pipe Diameter: 3" Pipe ID #: RX 152
 Type of Survey Investigation Characterization Final Survey Other ✓
 Sled Size 3" inch
 Detector: 44-62 Detector ID #: 204407-101
 Cal Date: 11-17-05 Cal Due Date: 11-17-06
 Instrument: 2350-1 Instrument ID #: 212223
 Cal Date: 11-17-05 Cal Due Date: 11-17-06

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

Background Value 5.2 cpm
 MDCR_{static} 10.8 cpm
 Efficiency Factor for Pipe Diameter .00014 (taken from detector efficiency determination calibration certificate)
 MDC_{static} 2842 dpm/100cm²
 Is the MDC_{static} acceptable? Yes No (if no, adjust sample count time and recalculate MDCR_{static})
 Comments: _____

Pipe Interior Radiological Survey

Radiological Survey Commenced: Date: 12-12-05 Time: 1245

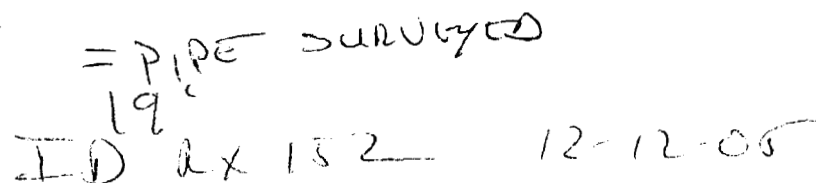
Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
1	1	3	7	2.3	-2.9	n/a
2	2	3	8	2.6	-2.6	
3	3	3	5	1.6	-3.6	
4	4	3	8	2.6	-2.6	
5	5	3	6	2	-3.2	
6	6	3	12	4	-1.2	
7	7	3	13	4.3	-1.8	
8	8	3	9	3	-2.2	
9	9	3	7	2.3	-2.9	
10	10	3	9	3	-2.2	

Package Page 1 of 2

Pipe Interior Radiological Survey Form (Continuation Form)

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
11	11	3	8	2.6	-2.6	n/a ↓
12	12	3	5	1.6	-3.6	
13	13	3	7	2.3	-2.9	
14	14	3	10	3.3	-1.9	
15	15	3	13	4.3	-.9	
16	16	3	6	2	-3.2	
17	17	3	10	3.3	-1.9	
18	18	3	6	2	-3.2	
19	19	3	9	3	-2.2	↓
n/a						

Package Page 2 of 2



Pipe Interior Radiological Survey Form

Date: 12-13-05 Time: 1050
 Building: RX BLDG Elevation: -25 Access Point Area: QUAD B
 System: DI WATER ~~VENT DRAINS~~ Pipe Diameter: 3" Pipe ID #: RX 152
 Type of Survey Investigation Characterization Final Survey Other
 Sled Size 3" inch
 Detector: 44-62 Detector ID #: 204402-101
 Cal Date: 11-17-05 Cal Due Date: 11-17-06
 Instrument: 2350-1 Instrument ID #: 212223
 Cal Date: 11-17-05 Cal Due Date: 11-17-06

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

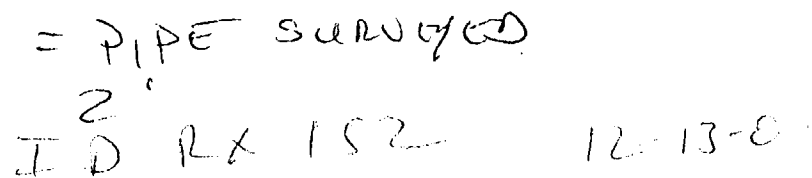
Background Value 5.2 cpm
 MDCR_{static} 10.8 cpm
 Efficiency Factor for Pipe Diameter .00014 (taken from detector ^{efficiency determination} calibration certificate)
 MDC_{static} 2842 dpm/100cm²
 Is the MDC_{static} acceptable? Yes No (if no, adjust sample count time and recalculate MDCR_{static})
 Comments: CONTINUATION OF PIPE SURVEY FROM 12-12-05

Pipe Interior Radiological Survey

Radiological Survey Commenced: Date: 12-13-05 Time: 1050

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
1	20	3	6	2	n/a	n/a
2	21	3	8	2.7		
3	n/a	n/a	n/a	n/a		
4						
5						
6						
7						
8						
9						
10						

Package Page 1 of 1






SECTION 7
ATTACHMENT 3
____/____ PAGE(S)

DQA Check Sheet

Design #	EP Rx152	Revision #	Original			
Survey Unit #	EP Rx152					
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, for WRS Test) ≥ the critical value?						X
Comments:						
FSS/Characterization Engineer (print/sign)				<i>Dale Raydell / Don Probst</i>		
FSS/ Characterization Manager (print/sign)				<i>[Signature]</i> R. Case		
				Date	6-12-07	
				Date	7/18/07	

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SECTION 7
ATTACHMENT 4
1 DISC

Survey Unit Release Record				
Design #	EP-Rx 157	Revision #	Original	Page 1 of 3
Survey Unit #(s)	Rx 157			
Description	<p>1) Embedded Pipe (EP) Survey Unit Rx 157 meets the definition of embedded pipe for Plum Brook Reactor Facility (PBRF).</p> <p>2) EP Rx 157 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 157 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>			
Approval Signatures			Date:	
FSS/Characterization Engineer			7-15-07	
Technical Reviewer (FSS/Characterization Engineer)			7-17-07	
FSS/Characterization Manager	 R. Case		7/18/07	

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Survey Unit: Rx 157

1.0 History/Description

- 1.1 The subject pipe is the drain line from the dry annulus inside the CV to the drain trench on the Rx Building -25 foot elevation.
- 1.2 EP Rx 157 consists of 4" diameter piping that is approximately 5 feet in length.

2.0 Survey Design Information

- 2.1 EP Rx 157 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 5 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 4,864 cm² (0.5 m²) for the entire length of (approximately 5') 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 Rx 157 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 Statistical Summary Table

Statistical Parameter	4" Pipe
Total Number of Survey Measurements	5
Number of Measurements >MDC	4
Number of Measurements Above 50% of DCGL	0
Number of Measurements Above DCGL	0
Mean	0.0288
Median	0.0307
Standard Deviation	0.0064
Maximum	0.0337
Minimum	0.0184

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 157 to be less than 1 mrem/yr. The dose contribution is estimated to be 0.029 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 – EP RX 157 SURR & Spreadsheet Disc

SECTION 7
ATTACHMENT 1
2 PAGE(S)



BSI EP/BP SURVEY REPORT

Pipe ID	Rx 157	Survey Location	CV -25el.
Survey Date	28-Jul-06	2350-1 #	189094
Survey Time	13:17	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)	0.5	Field BKG (cpm)	12.3
Routine Survey	X	Field MDCR (cpm)	15.1
QA Survey		Nominal MDC (dpm/100cm ²)	4,049
Survey Measurement Results			
Total Number of Survey Measurements		5	
Number of Measurements >MDC		4	
Number of Measurements Above 50% DCGL		0	
Number of Measurements Above DCGL		0	
Mean		0.0288	
Median		0.0307	
Standard Deviation		0.0064	
Maximum		0.0337	
Minimum		0.0184	
Survey Technician(s)	STOCK		
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	Dal Powell 7-15-07		

EP Rx 157
4" 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
1	9	9	45,000	4,625	183	4,388	1,166	135	32	0.028
2	10	10	50,000	5,139	204	4,875	1,296	150	36	0.031
3	11	11	55,000	5,653	224	5,363	1,426	165	39	0.034
4	11	11	55,000	5,653	224	5,363	1,426	165	39	0.034
5	6	6	30,000	3,084	122	2,925	778	90	21	0.018
									MEAN	0.029
									MEDIAN	0.031
									STD DEV	0.006
									MAX	0.034
									MIN	0.018

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

Pipe Interior Radiological Survey Form

Date: 7/28/06 Time: 1317
Pipe ID#: R1.57 Pipe Diameter: 4" Access Point Area: CU-25' ANNULUS
Building: CV Elevation: -25' System: DRAIN LINE

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 #: 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 12.3 cpm

MDCR_{static} 15.1 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 MDCR_{static})

Comments: INITIAL SURVEY; EP3-9 COMPLETE

Technician Signature [Signature]

Pipe Interior Radiological Survey

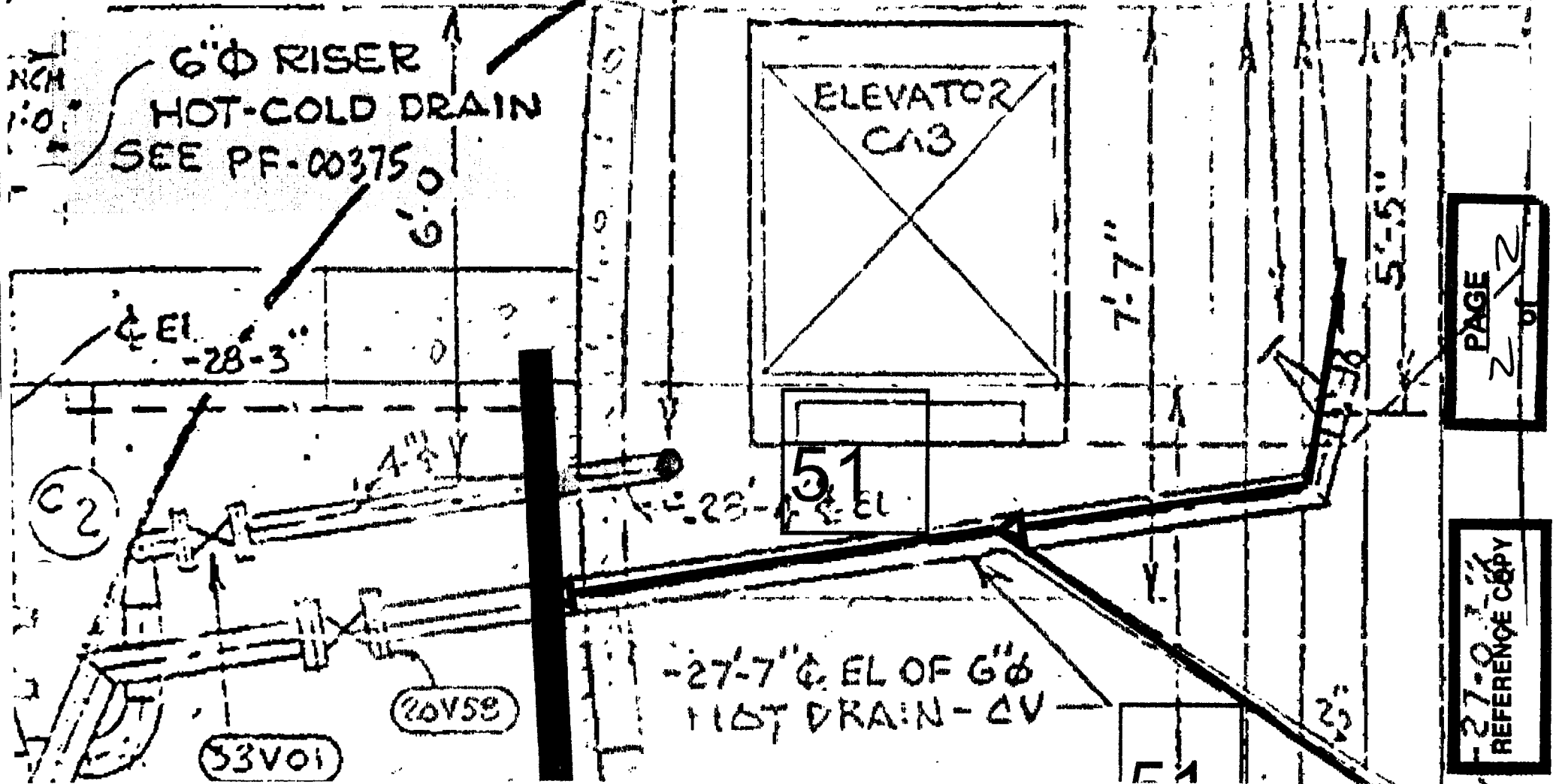
Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
1	1	1	9	9	n/a	n/a
2	2		10	10		
3	3		11	11		
4	4		11	11		
5	5		6	6		
6	6	N/A	N/A	N/A		
7			N			
8						
9			A			
10						

DRAWING PF-00376

PIPE SURVEYED
R 157

UP RETURN
00378

CORRIL
SEEDING



SECTION 7
ATTACHMENT 3
1 PAGE(S)

DQA Check Sheet

Design #	EP Rx 157	Revision #	Original	
Survey Unit #	EP 157			

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, R. Case / D. L. R. Case</i>	Date	7-15-07
FSS/ Characterization Manager (print/sign)	<i>[Signature]</i>	Date	7/18/07

Form
CS-09/2
Rev 0

SECTION 7
ATTACHMENT 4
1 DISC

Survey Unit Release Record

Design #	EP-1.31	Revision #	Original	Page 1 of 3
Survey Unit #(s)	1.31			
Description	<p>1) Embedded Pipe (EP) Survey Unit 1.31 meets the definition of embedded pipe for Plum Brook Reactor Facility (PBRF).</p> <p>2) EP 1.31 is a Class 1, Group 2 survey unit as per the PBRF Final Status Survey Plan (FSSP) and Technical Basis Document (TBD)-06-004.</p> <p>3) Surveys in EP 1.31 were performed using a scintillation detector optimized to measure gamma energies representative of Co-60. Sample #EP 2-1 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	<i>Dal Marshall</i>		6-11-07	
Technical Reviewer (FSS/Characterization Engineer)	<i>Wood</i>		6-28-07	
FSS/Characterization Manager	<i>R. Case</i>		7/3/07	

Form
CS-09/1
Rev 0



COPY

FSS Design # EP 1.31	Revision # Original	Page 2 of 3
Survey Unit: 1.31		

1.0 History/Description

- 1.1 The subject pipe system is the 3" purge line for Quad "D". The function of this pipe was to convey water from the one 3 inch riser in Quad "D" to the HD sump in Pump Room #22 on the Rx Building -25 ft, where the pipe is currently breached.
- 1.2 EP 1.31 consists of approximately 150 feet in length from the pump room to the riser in Quad "D". The pipe section has approximately eight elbows ranging from 45° to 90°.

2.0 Survey Design Information

- 2.1 EP 1.31 was surveyed IAW Procedure #BSI/LVS-002.
- 2.2 100% of the 3" ID pipe was accessible for survey. The accessible 3" ID pipe was surveyed by static measurement at one foot increments, for a total of 141 survey measurements.
- 2.3 Surface area for the 3" ID piping is 729.7 cm² for each foot of piping, corresponding to a total 3" ID piping surface area of 102,930 cm² (10.3 m²) for the entire length of (141') of 3" 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 1.31 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 Statistical Summary Table

Statistical Parameter	3" Pipe
Total Number of Survey Measurements	141
Number of Measurements >MDC	0
Number of Measurements Above 50% of DCGL	0
Number of Measurements Above DCGL	0
Mean	0.020
Median	0.020
Standard Deviation	0.006
Maximum	0.038
Minimum	0.008

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 1.31 to be less than 1 mrem/yr. The dose contribution is estimated to be 0.020 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 1.31 & Spreadsheet

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ATTACHMENT 1
6 **PAGE(S)**



BSI EP/BP SURVEY REPORT

Pipe ID	1.31	Survey Location	-27 TRENCH
Survey Date	07-05-06/07-05-06/07-06-06	2350-1 #	189094
Survey Time	1025/1313/0800	Detector-Sled #	44-159/238369
Pipe Size	3"	Detector Efficiency	0.0003
DCGL (dpm/100cm ²)	240800	Pipe Area Incorporated by Detector Efficiency (in cm ²)	730
Pipe Area Incorporated by Survey Date (in")	10.3	Field BKG (cpm)	13.9/13.9/11.7
Routine Survey	X	Field MDCR (counts)	15.9/15.9/14.8
QA Survey		Nominal MDC (dpm/100cm ²)	12,683
Survey Measurement Results			
Total Number of Survey Measurements		141	
Number of Measurements >MDC		0	
Number of Measurements Above 50% DCGL		0	
Number of Measurements Above DCGL		0	
Mean		0.020	
Median		0.020	
Standard Deviation		0.006	
Maximum		0.038	
Minimum		0.008	
Survey Technician(s)	ROSENHAGEN		
Survey Unit Classification		1	
TBD 06-004 Piping Group		2	
SR-13 Radionuclide Distribution Sample		EP 2-1	
Measured Nuclide		Co60	
Area Factor/EMC Used		No	
Pass/Fail FSS		Pass	
MREM/YR Contribution		<1	
COMMENTS: ACTIVITY VALUES NOT BACKGROUND CORRECTED			
RP Engineer Date		Oul Runkall 6-11-07	

EP 1.31
3" 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	19	19	63,333	8,679	4,505	72	51	4	252	0.038
2	9	9	30,000	4,111	2,134	34	24	2	119	0.018
3	13	13	43,333	5,939	3,082	49	35	3	172	0.026
4	9	9	30,000	4,111	2,134	34	24	2	119	0.018
5	13	13	43,333	5,939	3,082	49	35	3	172	0.026
6	8	8	26,667	3,654	1,897	30	22	2	106	0.016
7	16	16	53,333	7,309	3,793	61	43	4	212	0.032
8	9	9	30,000	4,111	2,134	34	24	2	119	0.018
9	14	14	46,667	6,395	3,319	53	38	3	185	0.028
10	15	15	50,000	6,852	3,556	57	40	3	199	0.030
11	14	14	46,667	6,395	3,319	53	38	3	185	0.028
12	11	11	36,667	5,025	2,608	42	30	2	146	0.022
13	7	7	23,333	3,198	1,660	27	19	2	93	0.014
14	8	8	26,667	3,654	1,897	30	22	2	106	0.016
15	12	12	40,000	5,482	2,845	45	32	3	159	0.024
16	8	8	26,667	3,654	1,897	30	22	2	106	0.016
17	11	11	36,667	5,025	2,608	42	30	2	146	0.022
18	11	11	36,667	5,025	2,608	42	30	2	146	0.022
19	6	6	20,000	2,741	1,423	23	16	1	79	0.012
20	11	11	36,667	5,025	2,608	42	30	2	146	0.022
21	12	12	40,000	5,482	2,845	45	32	3	159	0.024
22	10	10	33,333	4,568	2,371	38	27	2	132	0.020
23	5	5	16,667	2,284	1,185	19	13	1	66	0.010
24	11	11	36,667	5,025	2,608	42	30	2	146	0.022
25	16	16	53,333	7,309	3,793	61	43	4	212	0.032
26	8	8	26,667	3,654	1,897	30	22	2	106	0.016
27	10	10	33,333	4,568	2,371	38	27	2	132	0.020
28	14	14	46,667	6,395	3,319	53	38	3	185	0.028
29	11	11	36,667	5,025	2,608	42	30	2	146	0.022
30	11	11	36,667	5,025	2,608	42	30	2	146	0.022
31	8	8	26,667	3,654	1,897	30	22	2	106	0.016
32	6	6	20,000	2,741	1,423	23	16	1	79	0.012

EP 1.31
3" 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
33	6	6	20,000	2,741	1,423	23	16	1	79	0.012
34	11	11	36,667	5,025	2,608	42	30	2	146	0.022
35	9	9	30,000	4,111	2,134	34	24	2	119	0.018
36	14	14	46,667	6,395	3,319	53	38	3	185	0.028
37	9	9	30,000	4,111	2,134	34	24	2	119	0.018
38	9	9	30,000	4,111	2,134	34	24	2	119	0.018
39	9	9	30,000	4,111	2,134	34	24	2	119	0.018
40	7	7	23,333	3,198	1,660	27	19	2	93	0.014
41	13	13	43,333	5,939	3,082	49	35	3	172	0.026
42	13	13	43,333	5,939	3,082	49	35	3	172	0.026
43	18	18	60,000	8,223	4,268	68	49	4	238	0.036
44	11	11	36,667	5,025	2,608	42	30	2	146	0.022
45	18	18	60,000	8,223	4,268	68	49	4	238	0.036
46	6	6	20,000	2,741	1,423	23	16	1	79	0.012
47	7	7	23,333	3,198	1,660	27	19	2	93	0.014
48	9	9	30,000	4,111	2,134	34	24	2	119	0.018
49	14	14	46,667	6,395	3,319	53	38	3	185	0.028
50	12	12	40,000	5,482	2,845	45	32	3	159	0.024
51	11	11	36,667	5,025	2,608	42	30	2	146	0.022
52	13	13	43,333	5,939	3,082	49	35	3	172	0.026
53	13	13	43,333	5,939	3,082	49	35	3	172	0.026
54	5	5	16,667	2,284	1,185	19	13	1	66	0.010
55	14	14	46,667	6,395	3,319	53	38	3	185	0.028
56	8	8	26,667	3,654	1,897	30	22	2	106	0.016
57	10	10	33,333	4,568	2,371	38	27	2	132	0.020
58	13	13	43,333	5,939	3,082	49	35	3	172	0.026
59	4	4	13,333	1,827	948	15	11	1	53	0.008
60	8	8	26,667	3,654	1,897	30	22	2	106	0.016
61	5	5	16,667	2,284	1,185	19	13	1	66	0.010
62	12	12	40,000	5,482	2,845	45	32	3	159	0.024
63	12	12	40,000	5,482	2,845	45	32	3	159	0.024

EP 1.31
3" 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
64	9	9	30,000	4,111	2,134	34	24	2	119	0.018
65	9	9	30,000	4,111	2,134	34	24	2	119	0.018
66	6	6	20,000	2,741	1,423	23	16	1	79	0.012
67	7	7	23,333	3,198	1,660	27	19	2	93	0.014
68	7	7	23,333	3,198	1,660	27	19	2	93	0.014
69	12	12	40,000	5,482	2,845	45	32	3	159	0.024
70	12	12	40,000	5,482	2,845	45	32	3	159	0.024
71	4	4	13,333	1,827	948	15	11	1	53	0.008
72	12	12	40,000	5,482	2,845	45	32	3	159	0.024
73	12	12	40,000	5,482	2,845	45	32	3	159	0.024
74	10	10	33,333	4,568	2,371	38	27	2	132	0.020
75	4	4	13,333	1,827	948	15	11	1	53	0.008
76	9	9	30,000	4,111	2,134	34	24	2	119	0.018
77	9	9	30,000	4,111	2,134	34	24	2	119	0.018
78	10	10	33,333	4,568	2,371	38	27	2	132	0.020
79	10	10	33,333	4,568	2,371	38	27	2	132	0.020
80	9	9	30,000	4,111	2,134	34	24	2	119	0.018
81	8	8	26,667	3,654	1,897	30	22	2	106	0.016
82	11	11	36,667	5,025	2,608	42	30	2	146	0.022
83	9	9	30,000	4,111	2,134	34	24	2	119	0.018
84	6	6	20,000	2,741	1,423	23	16	1	79	0.012
85	9	9	30,000	4,111	2,134	34	24	2	119	0.018
86	9	9	30,000	4,111	2,134	34	24	2	119	0.018
87	9	9	30,000	4,111	2,134	34	24	2	119	0.018
88	6	6	20,000	2,741	1,423	23	16	1	79	0.012
89	14	14	46,667	6,395	3,319	53	38	3	185	0.028
90	13	13	43,333	5,939	3,082	49	35	3	172	0.026
91	8	8	26,667	3,654	1,897	30	22	2	106	0.016
92	13	13	43,333	5,939	3,082	49	35	3	172	0.026
93	8	8	26,667	3,654	1,897	30	22	2	106	0.016

EP 1.31
3" 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
94	9	9	30,000	4,111	2,134	34	24	2	119	0.018
95	9	9	30,000	4,111	2,134	34	24	2	119	0.018
96	12	12	40,000	5,482	2,845	45	32	3	159	0.024
97	11	11	36,667	5,025	2,608	42	30	2	146	0.022
98	14	14	46,667	6,395	3,319	53	38	3	185	0.028
99	13	13	43,333	5,939	3,082	49	35	3	172	0.026
100	5	5	16,667	2,284	1,185	19	13	1	66	0.010
101	7	7	23,333	3,198	1,660	27	19	2	93	0.014
102	11	11	36,667	5,025	2,608	42	30	2	146	0.022
103	11	11	36,667	5,025	2,608	42	30	2	146	0.022
104	9	9	30,000	4,111	2,134	34	24	2	119	0.018
105	7	7	23,333	3,198	1,660	27	19	2	93	0.014
106	9	9	30,000	4,111	2,134	34	24	2	119	0.018
107	6	6	20,000	2,741	1,423	23	16	1	79	0.012
108	12	12	40,000	5,482	2,845	45	32	3	159	0.024
109	11	11	36,667	5,025	2,608	42	30	2	146	0.022
110	10	10	33,333	4,568	2,371	38	27	2	132	0.020
111	13	13	43,333	5,939	3,082	49	35	3	172	0.026
112	7	7	23,333	3,198	1,660	27	19	2	93	0.014
113	8	8	26,667	3,654	1,897	30	22	2	106	0.016
114	8	8	26,667	3,654	1,897	30	22	2	106	0.016
115	11	11	36,667	5,025	2,608	42	30	2	146	0.022
116	15	15	50,000	6,852	3,556	57	40	3	199	0.030
117	11	11	36,667	5,025	2,608	42	30	2	146	0.022
118	6	6	20,000	2,741	1,423	23	16	1	79	0.012
119	9	9	30,000	4,111	2,134	34	24	2	119	0.018
120	8	8	26,667	3,654	1,897	30	22	2	106	0.016
121	9	9	30,000	4,111	2,134	34	24	2	119	0.018
122	8	8	26,667	3,654	1,897	30	22	2	106	0.016
123	12	12	40,000	5,482	2,845	45	32	3	159	0.024
124	10	10	33,333	4,568	2,371	38	27	2	132	0.020

EP 1.31
3" 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
125	6	6	20,000	2,741	1,423	23	16	1	79	0.012
126	7	7	23,333	3,198	1,660	27	19	2	93	0.014
127	7	7	23,333	3,198	1,660	27	19	2	93	0.014
128	13	13	43,333	5,939	3,082	49	35	3	172	0.026
129	6	6	20,000	2,741	1,423	23	16	1	79	0.012
130	5	5	16,667	2,284	1,185	19	13	1	66	0.010
131	6	6	20,000	2,741	1,423	23	16	1	79	0.012
132	6	6	20,000	2,741	1,423	23	16	1	79	0.012
133	12	12	40,000	5,482	2,845	45	32	3	159	0.024
134	15	15	50,000	6,852	3,556	57	40	3	199	0.030
135	9	9	30,000	4,111	2,134	34	24	2	119	0.018
136	9	9	30,000	4,111	2,134	34	24	2	119	0.018
137	17	17	56,667	7,766	4,030	64	46	4	225	0.034
138	11	11	36,667	5,025	2,608	42	30	2	146	0.022
139	10	10	33,333	4,568	2,371	38	27	2	132	0.020
140	16	16	53,333	7,309	3,793	61	43	4	212	0.032
141	14	14	46,667	6,395	3,319	53	38	3	185	0.028
									MEAN	0.020
									MEDIAN	0.020
									STD DEV	0.006
									MAX	0.038
									MIN	0.008

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Pipe Interior Radiological Survey Form

Date: 7/5/06 Time: 1025
 Pipe ID#: 1.31 Pipe Diameter: 3.0" Access Point Area: 27' TRENCH
 Building: Rx Elevation: -27' System: DRAINS

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

Gross _____ Co60 ✓ Cs _____

Detector ID# / Sled ID# 44-159 #238369 / 121

Detector Cal Date: 3/6/06 Detector Cal Due Date: 3/6/07

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 13.9 cpm

MDCR_{static} 15.9 cpm

Efficiency Factor for Pipe Diameter 0.0003 (from detector efficiency determination)

MDC_{static} 12683 dpm/ 100 cm²

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

Comments: INITIAL SURVEY ; EP2-3

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	19	19	n/a	n/a
2	2		9	9		
3	3		13	13		
4	4		9	9		
5	5		13	13		
6	6		8	8		
7	7		16	16		
8	8		9	9		
9	9		14	14		
10	10		15	15		

REFERENCE COPY

Package Page 1 of 3

Attachment 3, Page 1

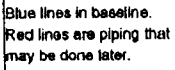
Pipe Interior Radiological Survey Form (Continuation Form)

Date: 7/5/06
 Pipe ID#: 1.31 Pipe Diameter: 30" Access Point Area: -27' TRENCH
 Building: Rx Elevation: -27' System: DRAINS

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
11	11	1	14	14	N/A	N/A
12	12		11	11		
13	13		7	7		
14	14		8	8		
15	15		12	12		
16	16		8	8		
17	17		11	11		
18	18		11	11		
19	19		6	6		
20	20		11	11		
21	21		12	12		
22	22		10	10		
23	23		5	5		
24	24		11	11		
25	25		16	16		
26	26		8	8		
27	27		10	10		
28	28		14	14		
29	29		11	11		
30	30		11	11		
31	31		8	8		
32	32		6	6		
33	33		6	6		
34	34		11	11		
35	35		9	9		
36	36		14	14		
37	37		9	9		
38	38		9	9		
39	39		9	9		
40	40		7	7		
41	41		13	13		
42	42		13	13		
43	43		18	18		
44	44		11	11		
45	45		18	18		

Package Page 2 of 3

REFERENCE COPY



REFERENCE COPY

Pipe Interior Radiological Survey Form

Date: 7/5/06 Time: 1313
Pipe ID#: 1.31 Pipe Diameter: 3.0" Access Point Area: E-CANAL
Building: CV Elevation: -25' System: DRAINS

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

Detector ID# / Sled ID# 44-159 238369 / 121
Detector Cal Date: 3/6/06 Detector Cal Due Date: 3/6/07
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 13.9 cpm

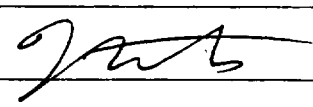
MDCR_{static} 15.9 cpm

Efficiency Factor for Pipe Diameter 0.0003 (from detector efficiency determination)

MDC_{static} 12683 dpm/ 100 cm²

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

Comments: CONTINUATION SURVEY EP2-3

Technician 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	6	6	n/a	n/a
2	2		7	7		
3	3		9	9		
4	4		14	14		
5	5		12	12		
6	6		11	11		
7	7		13	13		
8	8		13	13		
9	9		5	5		
10	10	✓	14	14	↓	↓

Package Page 1 of 3

REFERENCE COPY

Pipe Interior Radiological Survey Form (Continuation Form)

Date: 7/5/06
 Pipe ID#: 1.31 Pipe Diameter: 3.0" Access Point Area: E-CANAL
 Building: CV Elevation: -25' System: DRAINS

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
11	11	1	8	8	n/a	n/a
12	12		10	10		
13	13		13	13		
14	14		4	4		
15	15		8	8		
16	16		5	5		
17	17		12	12		
18	18		12	12		
19	19		9	9		
20	20		9	9		
21	21		6	6		
22	22		7	7		
23	23		7	7		
24	24		12	12		
25	25		12	12		
26	26		4	4		
27	27		12	12		
28	28		12	12		
29	29		10	10		
30	30		4	4		
31	31		9	9		
32	32		9	9		
33	33		10	10		
34	34		10	10		
35	35		9	9		
36	36		8	8		
37	37		11	11		
38	38		9	9		
39	39		6	6		
40	40		9	9		
41	41		9	9		
42	42		9	9		
43	43		6	6		
44	44		14	14		
45	45		13	13		

Package Page 2 of 3

REFERENCE COPY

PIPE SURVEYED 1.31

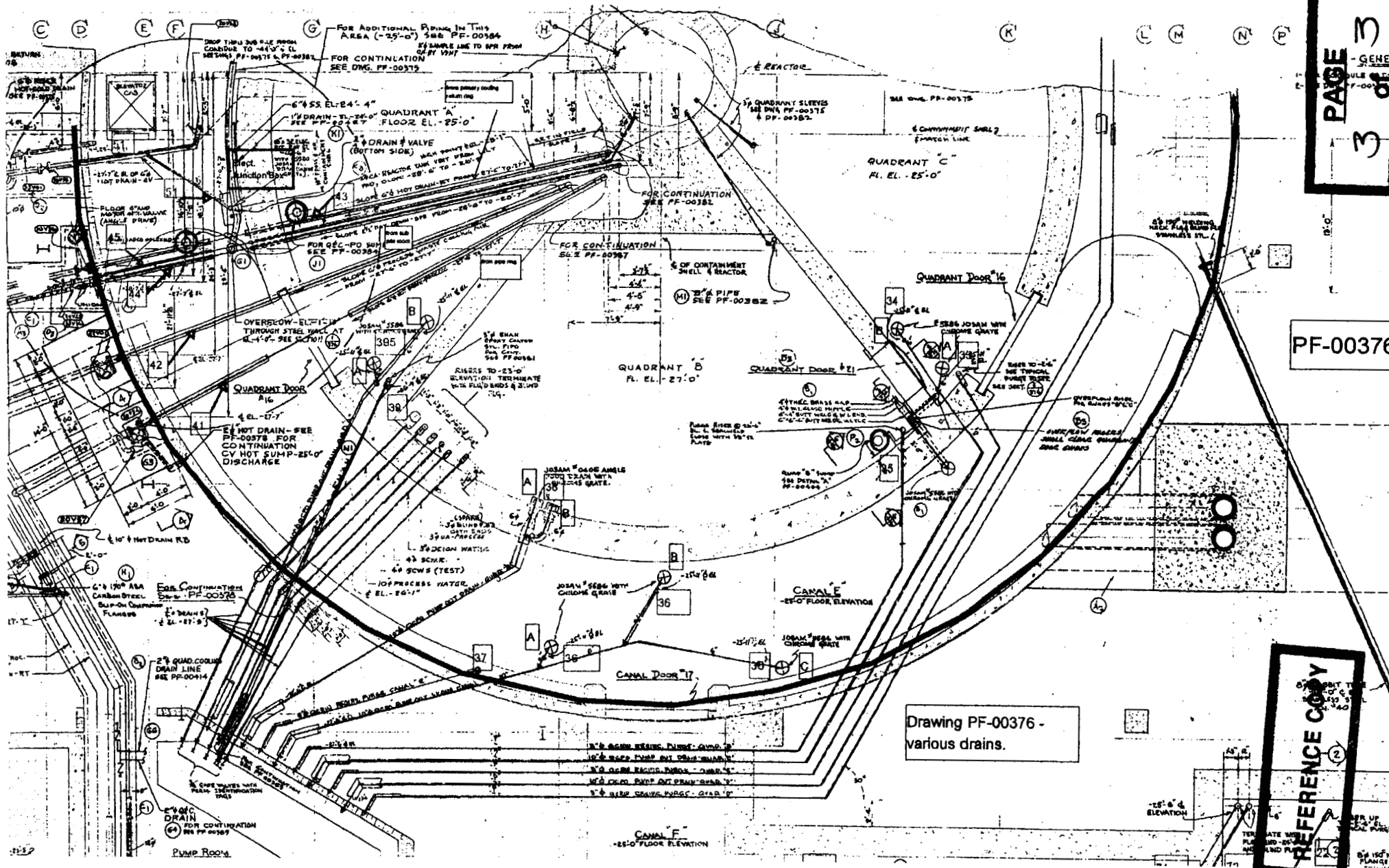
PAGE

3

PF-00376

Drawing PF-00376 -
various drains.

REFERENCE COPY



Pipe Interior Radiological Survey Form

Date: 7/6/06 Time: 0800
Pipe ID#: 1.31 Pipe Diameter: 3.0" Access Point Area: QUAD D
Building: CV Elevation: -25' System: DRAINS

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

Detector ID# / Sled ID# 44-159 # 238369 / 121
Detector Cal Date: 3/6/06 Detector Cal Due Date: 3/6/07
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 11.7 cpm

MDCR_{static} 14.8 cpm

Efficiency Factor for Pipe Diameter 0.0003 (from detector efficiency determination)

MDC_{static} 12683 dpm/ 100 cm²

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

Comments: CONTINUATION SURVEY: EP2-3 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	8	8	N/A	N/A
2	2	1	13	13		
3	3	1	8	8		
4	4	1	9	9		
5	5	1	9	9		
6	6	1	12	12		
7	7	1	11	11		
8	8	1	14	14		
9	9	1	13	13		
10	10	✓	5	5		

REFERENCE COPY

Package Page 1 of 5

Attachment 3, Page 1

Pipe Interior Radiological Survey Form (Continuation Form)

Date: 7/6/06
Pipe ID#: 1.31 Pipe Diameter: 3.0" Access Point Area: Quad D
Building: CV Elevation: -25' System: DRAINS

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
11	11	1	7	7	n/a	n/a
12	12		11	11		
13	13		11	11		
14	14		9	9		
15	15		7	7		
16	16		9	9		
17	17		6	6		
18	18		12	12		
19	19		11	11		
20	20		10	10		
21	21		13	13		
22	22		7	7		
23	23		8	8		
24	24		8	8		
25	25		11	11		
26	26		15	15		
27	27		11	11		
28	28		6	6		
29	29		9	9		
30	30		8	8		
31	31		9	9		
32	32		8	8		
33	33		12	12		
34	34		10	10		
35	35		6	6		
36	36		7	7		
37	37		7	7		
38	38		13	13		
39	39		6	6		
40	40		5	5		
41	41		6	6		
42	42		6	6		
43	43		12	12		
44	44		15	15		
45	45		9	9		

Package Page 2 of 5

REFERENCE COPY

- PIPE SURVEYED
1,31

PAGE
4 of 5

1- FOR JEN
2- SEE DWG

SEE DWG. PF-00375

& CONTAINMENT SHELL?
& MATCH LINE:

QUADRANT "C"
FL. EL. - 25'-0"

8" 150# WELDING
NECK FLG & BLIND FLO
STAINLESS STL.

QUADRANT DOOR #16

34

25'-11" @ EL

#5586 JOSAM WITH
CHROME GRATE

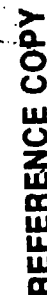
← CORE CORES

13'-0"

REFERENCE COPY

PF 00376

PAGE
5 of 5



DRAWING # 00375

SECTION 7
ATTACHMENT 3
—|— PAGE(S)

DQA Check Sheet

Design #	EP 1.31	Revision #	Original			
Survey Unit #	EP 1.31					
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, for WRS Test) ≥ the critical value?						X
Comments:						
FSS/Characterization Engineer (print/sign)			<i>Dale Randall</i>		Date	6-11-07
FSS/ Characterization Manager (print/sign)			<i>R. Case</i>		Date	7/3/07

Form
CS-09/2
Rev 0

SECTION 7
ATTACHMENT 4
1 DISC

Survey Unit Release Record				
Design #	EP-1.33	Revision #	Original	Page 1 of 3
Survey Unit #(s)	1.33			
Description	<p>1) Embedded Pipe (EP) Survey Unit 1.33 meets the definition of embedded pipe for Plum Brook Reactor Facility (PBRF).</p> <p>2) EP 1.33 is a Class 1, Group 2 survey unit as per the PBRF Final Status Survey Plan (FSSP) and Technical Basis Document (TBD)-06-004.</p> <p>3) Surveys in EP 1.33 were performed using a scintillation detector optimized to measure gamma energies representative of Co-60. Sample #EP 2-1 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	<i>Dal Randall</i>		6-11-07	
Technical Reviewer (FSS/Characterization Engineer)	<i>Wood</i>		6-26-07	
FSS/Characterization Manager	<i>R. Case</i>		7/3/07	

Form
CS-09/1
Rev 0

 COPY

Survey Unit: 1.33

1.0 History/Description

- 1.1 The subject pipe system is the 3" purge line for Quad "C". The function of this pipe was to convey water from the one 3 inch riser in Quad "C" to the HD sump in Pump Room #22 on the Rx Building -25 ft, where the pipe is currently breached.
- 1.2 EP 1.33 consists of approximately 90 feet in length from the pump room to the riser in Quad "C". The pipe section has a approximately six mitered elbows ranging from 45° to 90°.

2.0 Survey Design Information

- 2.1 EP 1.33 was surveyed IAW Procedure #BSI/LVS-002.
- 2.2 100% of the 3" ID pipe was accessible for survey. The accessible 3" ID pipe was surveyed by static measurement at one foot increments, for a total of 90 survey measurements.
- 2.3 Surface area for the 3" ID piping is 729.7 cm² for each foot of piping, corresponding to a total 3" ID piping surface area of 65,700 cm² (6.6 m²) for the entire length of (90') of 3" 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 1.33 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 Statistical Summary Table

Statistical Parameter	3" Pipe
Total Number of Survey Measurements	90
Number of Measurements >MDC	71
Number of Measurements Above 50% of DCGL	0
Number of Measurements Above DCGL	0
Mean	0.020
Median	0.018
Standard Deviation	0.019
Maximum	0.184
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 EP 1.33 to be less than 1 mrem/yr. The dose contribution is estimated to be 0.020 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 1.33 & Spreadsheet

SECTION 7
ATTACHMENT 1
5 PAGE(S)



BSI EP/BP SURVEY REPORT

Pipe ID	1.33	Survey Location	-27 TRENCH
Survey Date	12-13-05/12-16-05/1-3-06/1-4-06	2350-1 #	212223
Survey Time	1430/0900/1030/0810	Detector-Sled #	44-62/204402-101
Pipe Size	3"	Detector Efficiency	0.00013
DCGL (dpm/100cm ²)	240800	Pipe Area Incorporated by Detector Efficiency (in cm ²)	730
Pipe Area Incorporated by Survey Data (m ²)	6.6	Field BKG (cpm)	5.2/5.1/6.4/7.0
Routine Survey	X	Field MDCR (counts)	10.8/10.7/11.7/13.0
QA Survey		Nominal MDC (dpm/100cm ²)	2842/2842/2779/2779

Survey Measurement Results

Total Number of Survey Measurements	90
Number of Measurements >MDC	71
Number of Measurements Above 50% DCGL	0
Number of Measurements Above DCGL	0
Mean	0.020
Median	0.018
Standard Deviation	0.019
Maximum	0.184
Minimum	0.006

Survey Technician(s)	ROSENHAGEN
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Survey Unit Classification	1
TBD 06-004 Piping Group	2
SR-13 Radionuclide Distribution Sample	EP 2-1
Measured Nuclide	Co60
Area Factor/EMC Used	No
Pass/Fail FSS	Pass
MREM/YR Contribution	<1

COMMENTS:
ACTIVITY VALUES NOT BACKGROUND CORRECTED

RP Engineer Date	<i>Paul Marshall</i> 6-11-07
--------------------	------------------------------

EP 1.33
3" 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	6	6	46,154	6,325	3,283	52	37	3	183	0.027
2	4.3	4.3	33,077	4,533	2,353	38	27	2	131	0.020
3	4	4	30,769	4,217	2,188	35	25	2	122	0.018
4	3.6	3.6	27,692	3,795	1,970	31	22	2	110	0.016
5	3.3	3.3	25,385	3,479	1,805	29	21	2	101	0.015
6	2.3	2.3	17,692	2,425	1,258	20	14	1	70	0.011
7	4	4	30,769	4,217	2,188	35	25	2	122	0.018
8	3	3	23,077	3,163	1,641	26	19	2	92	0.014
9	5	5	38,462	5,271	2,736	44	31	3	153	0.023
10	4	4	30,769	4,217	2,188	35	25	2	122	0.018
11	3.3	3.3	25,385	3,479	1,805	29	21	2	101	0.015
12	3.6	3.6	27,692	3,795	1,970	31	22	2	110	0.016
13	5.3	5.3	40,769	5,587	2,900	46	33	3	162	0.024
14	3.3	3.3	25,385	3,479	1,805	29	21	2	101	0.015
15	5.6	5.6	43,077	5,903	3,064	49	35	3	171	0.026
16	3	3	23,077	3,163	1,641	26	19	2	92	0.014
17	2.3	2.3	17,692	2,425	1,258	20	14	1	70	0.011
18	4	4	30,769	4,217	2,188	35	25	2	122	0.018
19	6	6	46,154	6,325	3,283	52	37	3	183	0.027
20	5.3	5.3	40,769	5,587	2,900	46	33	3	162	0.024
21	3.3	3.3	25,385	3,479	1,805	29	21	2	101	0.015
22	4.6	4.6	35,385	4,849	2,517	40	29	2	141	0.021
23	6	6	46,154	6,325	3,283	52	37	3	183	0.027
24	5	5	38,462	5,271	2,736	44	31	3	153	0.023
25	5.3	5.3	40,769	5,587	2,900	46	33	3	162	0.024
26	5.3	5.3	40,769	5,587	2,900	46	33	3	162	0.024
27	2.6	2.6	20,000	2,741	1,423	23	16	1	79	0.012
28	4	4	30,769	4,217	2,188	35	25	2	122	0.018
29	3	3	23,077	3,163	1,641	26	19	2	92	0.014
30	3	3	23,077	3,163	1,641	26	19	2	92	0.014
31	3.6	3.6	27,692	3,795	1,970	31	22	2	110	0.016
32	2.6	2.6	20,000	2,741	1,423	23	16	1	79	0.012

EP 1.33
3" 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
33	2	2	15,385	2,108	1,094	17	12	1	61	0.009
34	2.3	2.3	17,692	2,425	1,258	20	14	1	70	0.011
35	3	3	23,077	3,163	1,641	26	19	2	92	0.014
36	2.6	2.6	20,000	2,741	1,423	23	16	1	79	0.012
37	4	4	30,769	4,217	2,188	35	25	2	122	0.018
38	3.6	3.6	27,692	3,795	1,970	31	22	2	110	0.016
39	4.3	4.3	33,077	4,533	2,353	38	27	2	131	0.020
40	2.3	2.3	17,692	2,425	1,258	20	14	1	70	0.011
41	2.6	2.6	20,000	2,741	1,423	23	16	1	79	0.012
42	4.6	4.6	35,385	4,849	2,517	40	29	2	141	0.021
43	2	2	15,385	2,108	1,094	17	12	1	61	0.009
44	3	3	23,077	3,163	1,641	26	19	2	92	0.014
45	3.6	3.6	27,692	3,795	1,970	31	22	2	110	0.016
46	1.6	1.6	12,308	1,687	875	14	10	1	49	0.007
47	4	4	30,769	4,217	2,188	35	25	2	122	0.018
48	3.3	3.3	25,385	3,479	1,805	29	21	2	101	0.015
49	2.7	2.7	20,769	2,846	1,477	24	17	1	83	0.012
50	3.3	3.3	25,385	3,479	1,805	29	21	2	101	0.015
51	2.3	2.3	17,692	2,425	1,258	20	14	1	70	0.011
52	5	5	38,462	5,271	2,736	44	31	3	153	0.023
53	4	4	30,769	4,217	2,188	35	25	2	122	0.018
54	6.7	6.7	51,538	7,063	3,666	59	42	3	205	0.031
55	7.3	7.3	56,154	7,695	3,994	64	45	4	223	0.033
56	6.3	6.3	48,462	6,641	3,447	55	39	3	193	0.029
57	5.7	5.7	43,846	6,009	3,119	50	35	3	174	0.026
58	6.3	6.3	48,462	6,641	3,447	55	39	3	193	0.029
59	4.7	4.7	36,154	4,955	2,571	41	29	2	144	0.021
60	4.7	4.7	36,154	4,955	2,571	41	29	2	144	0.021
61	5	5	38,462	5,271	2,736	44	31	3	153	0.023
62	5.7	5.7	43,846	6,009	3,119	50	35	3	174	0.026
63	2	2	15,385	2,108	1,094	17	12	1	61	0.009

EP 1.33
3" 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
64	5	5	38,462	5,271	2,736	44	31	3	153	0.023
65	3	3	23,077	3,163	1,641	26	19	2	92	0.014
66	4.3	4.3	33,077	4,533	2,353	38	27	2	131	0.020
67	4.7	4.7	36,154	4,955	2,571	41	29	2	144	0.021
68	7	7	53,846	7,379	3,830	61	44	4	214	0.032
69	4.7	4.7	36,154	4,955	2,571	41	29	2	144	0.021
70	2.3	2.3	17,692	2,425	1,258	20	14	1	70	0.011
71	4.3	4.3	33,077	4,533	2,353	38	27	2	131	0.020
72	4.3	4.3	33,077	4,533	2,353	38	27	2	131	0.020
73	2.3	2.3	17,692	2,425	1,258	20	14	1	70	0.011
74	3	3	23,077	3,163	1,641	26	19	2	92	0.014
75	2.7	2.7	20,769	2,846	1,477	24	17	1	83	0.012
76	1.3	1.3	10,000	1,370	711	11	8	1	40	0.006
77	4	4	30,769	4,217	2,188	35	25	2	122	0.018
78	2.3	2.3	17,692	2,425	1,258	20	14	1	70	0.011
79	3.3	3.3	25,385	3,479	1,805	29	21	2	101	0.015
80	3.7	3.7	28,462	3,900	2,024	32	23	2	113	0.017
81	4.7	4.7	36,154	4,955	2,571	41	29	2	144	0.021
82	1.7	1.7	13,077	1,792	930	15	11	1	52	0.008
83	2.7	2.7	20,769	2,846	1,477	24	17	1	83	0.012
84	4.7	4.7	36,154	4,955	2,571	41	29	2	144	0.021
85	5.3	5.3	40,769	5,587	2,900	46	33	3	162	0.024
86	2.3	2.3	17,692	2,425	1,258	20	14	1	70	0.011
87	4	4	30,769	4,217	2,188	35	25	2	122	0.018
88	4.3	4.3	33,077	4,533	2,353	38	27	2	131	0.020
89	3	3	23,077	3,163	1,641	26	19	2	92	0.014
90	40.3	40.3	310,000	42,483	22,049	353	251	21	1,232	0.184

EP 1.33
3" 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
									MEAN	0.020
									MEDIAN	0.018
									STD DEV	0.019
									MAX	0.184
									MIN	0.006

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

Pipe Interior Radiological Survey Form

Date: 12-13-05 Time: 1430
 Building: REACTION Elevation: <25 Access Point Area: Quadrant C
 System: PURGE Pipe Diameter: 3" Pipe ID #: 1-33
 Type of Survey Investigation Characterization Final Survey Other ✓
 Sled Size 3" inch
 Detector: 44-62 Detector ID #: 204452-101
 Cal Date: 11-17-05 Cal Due Date: 11-17-06
 Instrument: LI00UM 2350-1 Instrument ID #: 212223
 Cal Date: 11-17-05 Cal Due Date: 11-17-06

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

Background Value 5.2 cpm

MDCR_{static} 10.8 cpm

Efficiency Factor for Pipe Diameter 0.00014

(taken from detector efficiency determination calibration certificate) fu

MDC_{static} 2842 dpm/100cm²

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

Comments: INITIAL SURVEY

Pipe Interior Radiological Survey

Radiological Survey Commenced: Date: 12-13-05 Time: 1430

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
1	<u>1</u>	<u>3</u>	<u>9</u>	<u>3</u>	<u>n/a</u>	<u>n/a</u>
2	<u>2</u>	<u>3</u>	<u>121</u>	<u>40.3</u>	<u>↓</u>	<u>↓</u>
3						
4						
5						
6						
7						
8						
9						
10						

Package Page 1 of 2

Pipe Interior Radiological Survey Form

Date: 12.16.05 Time: 0900
 Building: REACTOR Elevation: -25 Access Point Area: -27 TRENCH
 System: QUAD C PURGE Pipe Diameter: 3' Pipe ID #: 1-33
 Type of Survey Investigation Characterization Final Survey Other ✓
 Sled Size 3" inch
 Detector: 44-62 Detector ID #: 204402-101
 Cal Date: 11.17.05 Cal Due Date: 11-17-06
 Instrument: 2350-1 Instrument ID #: 212223
 Cal Date: 11.17.05 Cal Due Date: 11-17-06

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

Background Value 5.1 cpm
 MDCR_{static} 10.7 cpm
 Efficiency Factor for Pipe Diameter 0.00014 (taken from detector efficiency determination calibration certificate)
 MDC_{static} 2842 dpm/100cm²
 Is the MDC_{static} acceptable? Yes No (if no, adjust sample count time and recalculate MDCR_{static})

Comments: CONTINUATION survey

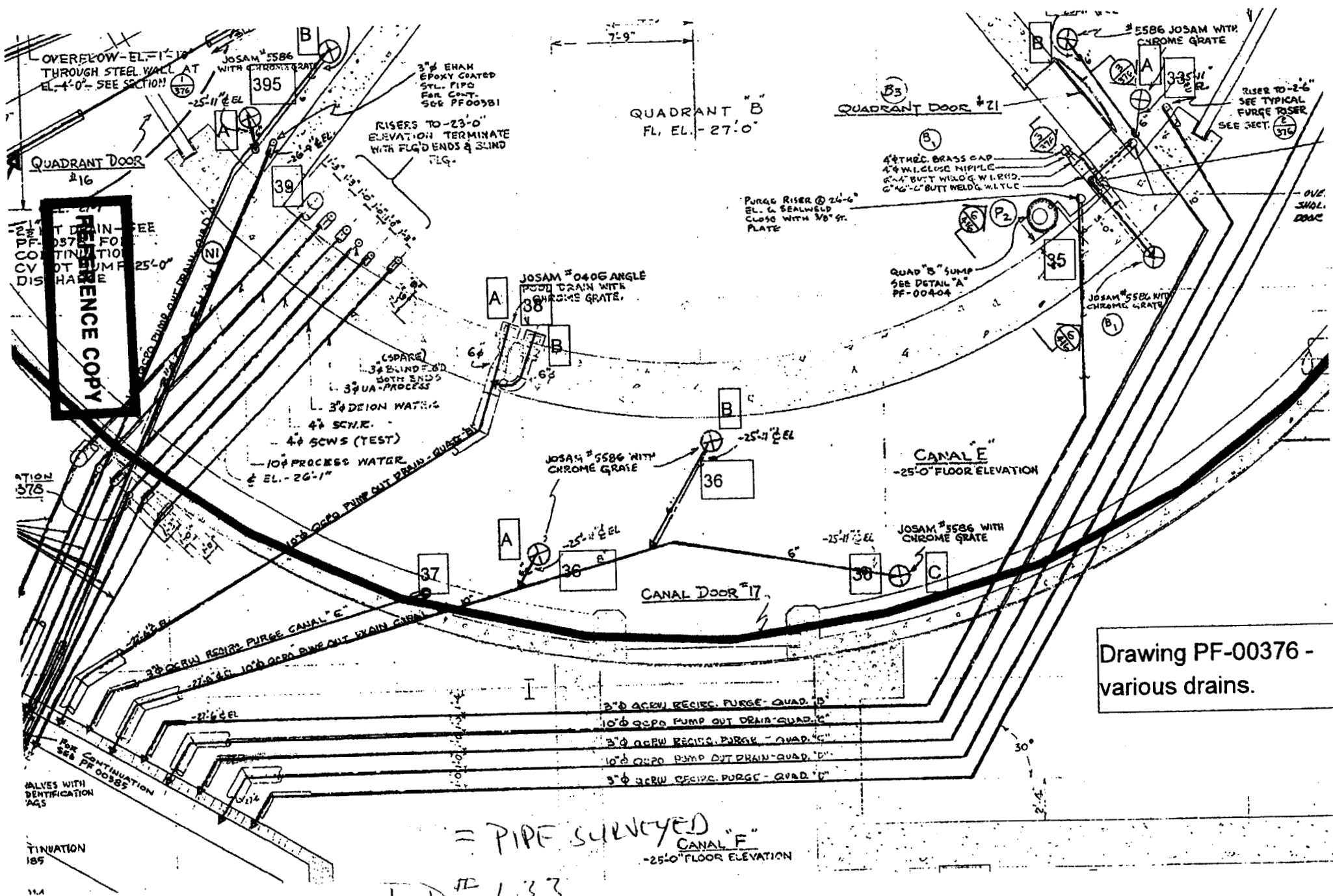
Pipe Interior Radiological Survey

Radiological Survey Commenced: Date: 12.16.05 Time: 0900

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
1	1	3	18	6	n/a	n/a
2	2	3	13	4.3	↓	↓
3	3	3	12	4	↓	↓
4	4	3	11	3.6	↓	↓
5	5	3				
6	6	3				
7	7	3				
8	8	3				
9	9	3				
10	10	3				

Package Page 1 of 1

REFERENCE COPY



Drawing PF-00376 - various drains.

= PIPE SURVEYED
CANAL "F"
-25'-0" FLOOR ELEVATION
ID # 1.33
4/11/12 16:03

Pipe Interior Radiological Survey Form

Date: 1-3-06 Time: 1030
 Building: REACTOR Elevation: -25 Access Point Area: -27 TRENCH
 System: QUAD C PARGE Pipe Diameter: 3" Pipe ID #: 1.33
 Type of Survey Investigation Characterization Final Survey Other ✓
 Sled Size 3" vinyl pulled inch
 Detector: 44-67 Detector ID #: 212201-121
 Cal Date: 17-Nov-05 Cal Due Date: 17-Nov-06
 Instrument: 2350-1 Instrument ID #: 212223
 Cal Date: 17-Nov-05 Cal Due Date: 17-Nov-06

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

Background Value 6.4 cpm
 MDCR_{static} 11.7 cpm
 Efficiency Factor for Pipe Diameter 0.00013 (taken from detector calibration certificate) *efficiency determination*
 MDC_{static} 2779 dpm/100cm²
 Is the MDC_{static} acceptable? Yes No (if no, adjust sample count time and recalculate MDCR_{static})
 Comments: CONTINUATION SURVEY

Pipe Interior Radiological Survey

Radiological Survey Commenced: Date: 1-3-06 Time: 1030

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
1	5 14 ft	3	10	3.3	n/a	n/a
2	6 8 ft	3	7	2.3		
3	7 3 ft	3	12	4		
4	8 4 ft	3	6	3		
5	9 5 ft	3	15	5		
6	10 6 ft	3	12	4		
7	11 2 ft	3	10	3.3		
8	12 8 ft	3	11	3.6		
9	13 7 ft	3	16	5.3		
10	14 10 ft	3	10	3.3		

Package Page 1 of 2

REFERENCE COPY



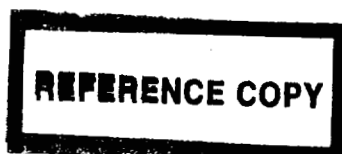
Attachment 3, Page 1

Pipe Interior Radiological Survey Form (Continuation Form)

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
11	15 11FT0	3	17	5.6	n/a	n/a
12	16 12FT0	7+13	9	3		
13	17 13FT0	3	7	2.3		
14	18 14FT0	3	12	4		
15	19 15FT0	3	18	6		
16	20 16FT0	3	16	5.3		
17	21 17FT0	3	10	3.3		
18	22 18FT0	3	14	4.6		
19	23 19FT0	3	18	6		
20	24 20FT0	3	15	5		
21	25 21FT0	3	16	5.3		
22	26 22FT0	3	16	5.3		
23	27 23FT0	3	8	2.6		
24	28 24FT0	3	12	4		
25	29 25FT0	3	9	3		
26	30 26FT0	3	9	3		
27	31 27FT0	3	11	3.6		
28	32 28FT0	3	8	2.6		
29	33 29FT0	3	6	2		
30	34 30FT0	3	7	2.3		
31	35 31FT0	3	9	3		
32	36 32FT0	3	8	2.6		
33	37 33FT0	3	12	4		
34	38 34FT0	3	11	3.6		
35	39 35FT0	3	13	4.3		
36	40 36FT0	3	7	2.3		
37	41 37FT0	3	8	2.6		
38	42 38FT0	3	14	4.6		
39	43 39FT0	3	6	2		
40	44 40FT0	3	9	3		
41	45 41FT0	3	11	3.6		
42	46 42FT0	3	5	1.6		
43	47 43FT0	3	12	4		
			n	a		

Package Page 2 of 2

Attachment 3, Page 2



Pipe Interior Radiological Survey Form

Date: 1.4.06 Time: 0810
 Building: REACTOR Elevation: -25 Access Point Area: -27 Trench
 System: GEA C Purge Pipe Diameter: 3" Pipe ID #: 1.33
 Type of Survey Investigation Characterization Final Survey Other ✓
 Sled Size 3' vinyl studded pulk inch
 Detector: 44-62 Detector ID #: 217705-121
 Cal Date: 11-17-05 Cal Due Date: 11-17-06
 Instrument: 2350-1 Instrument ID #: 212223
 Cal Date: 11-17-05 Cal Due Date: 11-17-06

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

Background Value 7 cpm

MDCR_{static} 13 cpm

Efficiency Factor for Pipe Diameter 0.00013 (taken from detector efficiency determination calibration certificate) ✓

MDC_{static} 2779 dpm/100cm²

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

Comments: CONTINUATION SURVEY

SSP / Complete

Pipe Interior Radiological Survey

Radiological Survey Commenced: Date: 1.4.06 Time: 0810

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
1	48 44 ft	3	10	3.3	n/a	n/a
2	49 45 ft	3	8	2.7		
3	50 46 ft	3	10	3.3		
4	51 47 ft	3	7	2.3		
5	52 48 ft	3	15	5		
6	53 49 ft	3	12	4		
7	54 50 ft	3	20	6.7		
8	55 51 ft	3	22	7.3		
9	56 52 ft	3	19	6.3		
10	57 53 ft	3	12	4.0		

Package Page 1 of 2

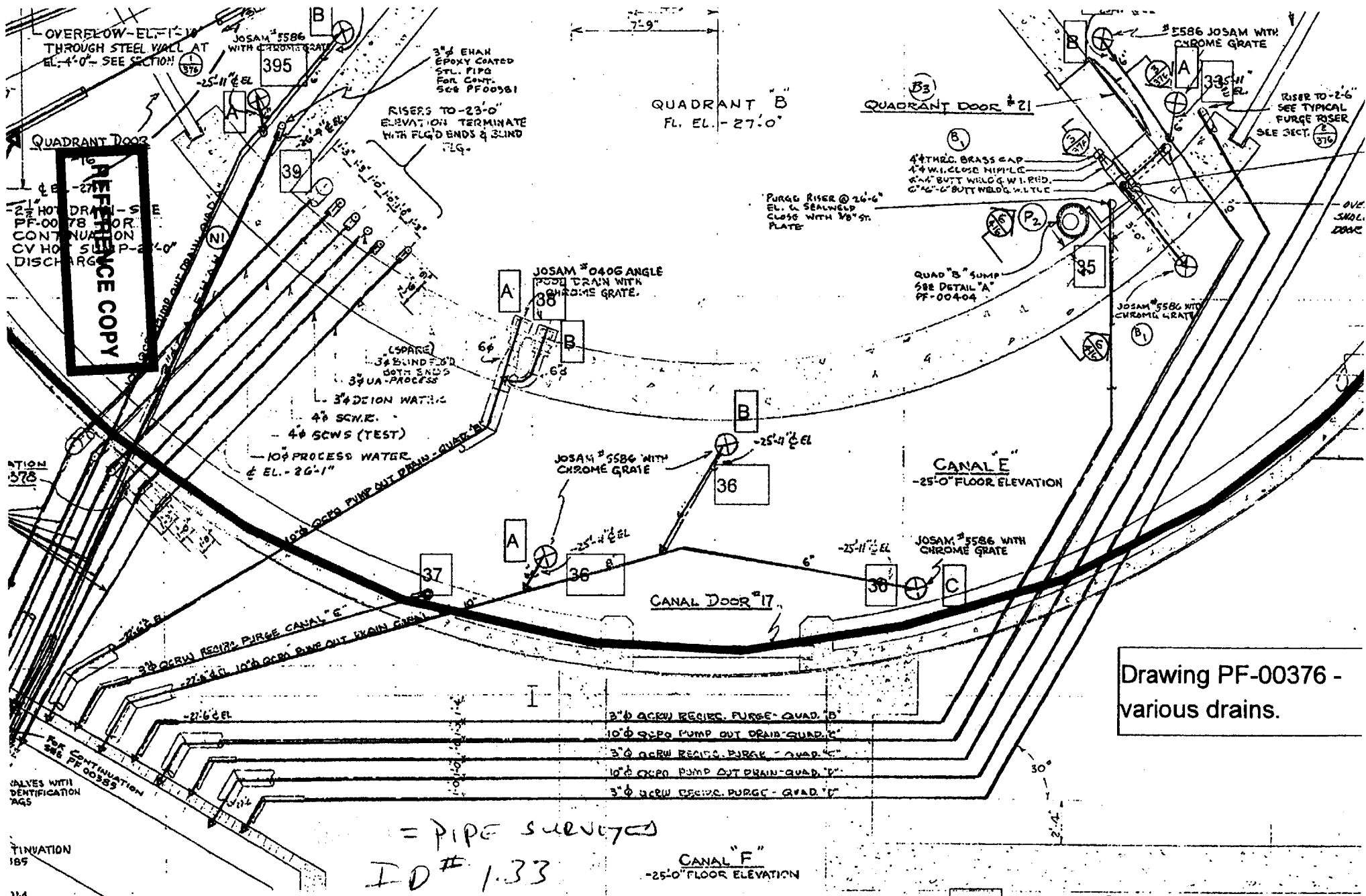
Pipe Interior Radiological Survey Form (Continuation Form)

1.33

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
11	58 540	3	19	6.3	n/a	n/a
12	59 550	3	14	4.7		
13	60 560	3	14	4.7		
14	61 570	3	15	5		
15	62 580	3	17	5.7		
16	63 590	3	6	2		
17	64 600	3	15	5		
18	65 610	3	9	3		
19	66 620	3	13	4.3		
20	67 630	3	14	4.7		
21	68 640	3	21	7		
22	69 650	3	14	4.7		
23	70 660	3	7	2.3		
24	71 670	3	13	4.3		
25	72 680	3	13	4.3		
26	73 690	3	7	2.3		
27	74 700	3	9	3		
28	75 710	3	8	2.7		
29	76 720	3	7	1.3		
30	77 730	3	12	4		
31	78 740	3	7	2.3		
32	79 750	3	10	3.3		
33	80 760	3	11	3.7		
34	81 770	3	14	4.7		
35	82 780	3	5	1.7		
36	83 790	3	8	2.7		
37	84 800	3	14	4.7		
38	85 810	3	16	5.3		
39	86 820	3	7	2.3		
40	87 830	3	12	4		
41	88 840	3	13	4.3		
n			a			

Package Page 2 of 2

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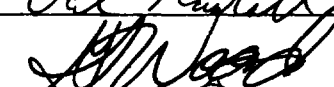

SECTION 7
ATTACHMENT 3
PAGE(S)

DQA Check Sheet

Design #	EP 1.33	Revision #	Original			
Survey Unit #	EP 1.33					
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, for WRS Test) ≥ the critical value?						X
Comments:						
FSS/Characterization Engineer (print/sign)			Dale Randall / <i>[Signature]</i>		Date	6-11-07
FSS/ Characterization Manager (print/sign)			R. Case / <i>[Signature]</i>		Date	7/3/07

Form
CS-09/2
Rev 0

SECTION 7
ATTACHMENT 4
1 DISC

Survey Unit Release Record				
Design #	EP-1.82	Revision #	Original	Page 1 of 3
Survey Unit #(s)	1.82			
Description	<p>1) Embedded Pipe (EP) Survey Unit 1.82 meets the definition of embedded pipe for Plum Brook Reactor Facility (PBRF).</p> <p>2) EP 1.82 is a Class 1, Group 2 survey unit as per the PBRF Final Status Survey Plan (FSSP) and Technical Basis Document (TBD)-06-004.</p> <p>3) Surveys in EP 1.82 were performed using a scintillation detector optimized to measure gamma energies representative of Co-60. Sample #EP 2-1 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			6-12-07	
Technical Reviewer (FSS/Characterization Engineer)			6-26-07	
FSS/Characterization Manager	 R. Case		7/3/07	

Form
CS-09/1
Rev 0



COPY

Survey Unit: 1.82

1.0 History/Description

- 1.1 The subject pipe system is the 3" purge line for Interim Storage Area. The function of this pipe was to convey water from the one 3 inch riser in Interim Storage Area to the HD sump in Pump Room #22 on the Rx Building -25 ft, where the pipe is currently breached.
- 1.2 EP 1.82 consists of approximately 34 feet in length from the pump room to the riser in Interim Storage Area. The pipe section has an approximately five mitered elbows ranging from 45° to 90°.

2.0 Survey Design Information

- 2.1 EP 1.82 was surveyed IAW Procedure #BSI/LVS-002.
- 2.2 100% of the 3" ID pipe was accessible for survey. The accessible 3" ID pipe was surveyed by static measurement at one foot increments, for a total of 16 survey measurements.
- 2.3 Surface area for the 3" ID piping is 729.7 cm² for each foot of piping, corresponding to a total 3" ID piping surface area of 11,680 cm² (1.1 m²) for the entire length of (16') of 3" 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 1.82 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 Statistical Summary Table

Statistical Parameter	3" Pipe
Total Number of Survey Measurements	16
Number of Measurements >MDC	14
Number of Measurements Above 50% of DCGL	0
Number of Measurements Above DCGL	0
Mean	0.019
Median	0.018
Standard Deviation	0.008
Maximum	0.037
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 EP 1.82 to be less than 1 mrem/yr. The dose contribution is estimated to be 0.019 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 1.82 & Spreadsheet

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



BSI EP/BP SURVEY REPORT

Pipe ID	1.82	Survey Location	-27 TRENCH
Survey Date	21-Dec-05	2350-1 #	212223
Survey Time	0815	Detector-Sled #	44-62/204402-101
Pipe Size	3"	Detector Efficiency	0.00014
DCGL (dpm/100cm2)	240800	Pipe Area Incorporated by Detector Efficiency (in cm2)	730
Pipe Area Incorporated by Survey Date (m2)	1.1	Field BKG (cpm)	5.9
Routine Survey	X	Field MDCR (counts)	11.3
QA Survey		Nominal MDC (dpm/100cm2)	2,842
Survey Measurement Results			
Total Number of Survey Measurements		16	
Number of Measurements >MDC		14	
Number of Measurements Above 50% DCGL		0	
Number of Measurements Above DCGL		0	
Mean		0.019	
Median		0.018	
Standard Deviation		0.008	
Maximum		0.037	
Minimum		0.006	
Survey Technician(s)	ROSENHAGEN		
Survey Unit Classification		1	
TBD 06-004 Piping Group		2	
SR-13 Radionuclide Distribution Sample		EP 2-1	
Measured Nuclide		Co60	
Area Factor/EMC Used		No	
Pass/Fail FSS		Pass	
MREM/YR Contribution		<1	
COMMENTS: ACTIVITY VALUES NOT BACKGROUND CORRECTED			
RP Engineer Date	Darl Runkell 6-12-07		

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

Pipe Interior Radiological Survey Form

Date: 12-21-05 Time: 0815
 Building: Rx Elevation: -25 Access Point Area: TRENCH
 System: HQS VALVE BOX HEAD Pipe Diameter: 3" Pipe ID #: 1.82
 Type of Survey Investigation Characterization Final Survey Other ✓
 Sled Size 3 inch
 Detector: 44-62 Detector ID #: 204402-101
 Cal Date: 11-17-05 Cal Due Date: 11-17-06
 Instrument: 2350-1 Instrument ID #: 212223
 Cal Date: 11-17-05 Cal Due Date: 11-17-06

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

Background Value 5.9 cpm
 MDCR_{static} 11.3 cpm
 Efficiency Factor for Pipe Diameter 0.00014 (taken from detector efficiency determination calibration certificate) for
 MDC_{static} 2842 dpm/100cm²
 Is the MDC_{static} acceptable? Yes No (if no, adjust sample count time and recalculate MDCR_{static})
 Comments: INITIAL SURVEY SSP/complete

Pipe Interior Radiological Survey

Radiological Survey Commenced: Date: 12-21-05 Time: 0815

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
1	1	3	11	3.7	n/a	n/a
2	2	3	11	3.7		
3	3	3 3	10	3.3		
4	4	3	21	7		
5	5	3	18	6		
6	6	3	10	3.3		
7	7	3	15	5		
8	8	3	26	8.7		
9	9	3	16	5.3		
10	10	3	8	2.7		

Package Page 1 of 3

Pipe Interior Radiological Survey Form (Continuation Form)

HDS VALVE BOX HEAD02 FO² 1.82

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
11	8 11	3	4	1.3	n/a	n/a
12	12	3	15	5		
13	13	3	10	3.3		
14	14	3	14	4.7		
15	15	3	10	3.3		
16	16	3	16	5.3		
n a						

Package Page 2 of 3



Blue lines in baseline.
Red lines are piping that
may be done later.

16' = Pipe surveyed
ID 1.82
12-21-05

REFERENCE COPY

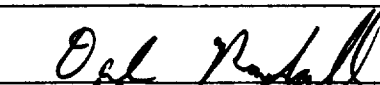


SECTION 7
ATTACHMENT 3
1 PAGE(S)

DQA Check Sheet

Design #	EP 1.82	Revision #	Original			
Survey Unit #	EP 1.82					
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>Dale Randolph</i>			Date	6-12-07
FSS/ Characterization Manager (print/sign)		<i>R. Case</i>			Date	7/3/07

Form
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SECTION 7
ATTACHMENT 4
1 DISC

Survey Unit Release Record			
Design #	EP-Rx 150	Revision #	Original
Survey Unit #(s)	EP-Rx 150		
Description	<p>1) Embedded Pipe (EP) Survey Unit 150 meets the definition of embedded pipe for Plum Brook Reactor Facility (PBRF).</p> <p>2) EP 150 is a Class 1, Group 2 survey unit as per the PBRF Final Status Survey Plan (FSSP) and Technical Basis Document (TBD)-06-004.</p> <p>3) Surveys in EP 150 were performed using a scintillation detector optimized to measure gamma energies representative of Co-60. Sample #EP 2-1 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		6-20-07	
Technical Reviewer (FSS/Characterization Engineer)		6-28-07	
FSS/Characterization Manager	 R. Case	7/3/07	

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COPY

Survey Unit: EP Rx 150

1.0 History/Description

- 1.1 The subject piping described in this report is an air supply line for equipment and accessories utilized in Quad B. This survey unit involves ~ 20' of air supply piping.

2.0 Survey Design Information

- 2.1 EP Rx 150 was surveyed IAW Procedure #BSI/LVS-002.
- 2.2 100% of the 3" ID pipe was accessible for survey. The accessible 3" ID pipe was surveyed by static measurement at one foot increments, for a total of 21 survey measurements.
- 2.3 Surface area for the 3" ID piping is 729.7 cm^2 for each foot of piping, corresponding to a total 3" ID piping surface area of $14,594 \text{ cm}^2$ (1.5 m^2) for the entire length of (20') of 3" 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 150 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 Statistical Summary Table

Statistical Parameter	3" Pipe
Total Number of Survey Measurements	21
Number of Measurements >MDC	12
Number of Measurements Above 50% of DCGL	0
Number of Measurements Above DCGL	0
Mean	0.012
Median	0.013
Standard Deviation	0.004
Maximum	0.022
Minimum	0.004

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 repeat QA survey was performed on this survey unit. It was concluded that the QA comparison results were acceptable based on the fact that all results differing by more than 20% were calculated to be less than 3% of the DCGL.

6.2 A review of the survey results has shown that the dose contribution for EP Rx 150 to be less than 1 mrem/yr. The dose contribution is estimated to be 0.012 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 150 & Spreadsheet

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



BSI EP/BP SURVEY REPORT

Pipe ID	Rx 150	Survey Location	-25 TRENCH
Survey Date	12/12/05 12/13/05	2350-1 #	212223
Survey Time	1350/ 0756	Detector-Sled #	44-62/204402-101
Pipe Size	3"	Detector Efficiency	0.00014
DCGL (dpm/100cm2)	240800	Pipe Area Incorporated by Detector Efficiency (in cm2)	730
Pipe Area Incorporated by Survey Data (m2)	1.5	Field BKG (cpm)	5.2
Routine Survey	X	Field MDCR (counts)	10.8
QA Survey		Nominal MDC (dpm/100cm2)	2,842
Survey Measurement Results			
Total Number of Survey Measurements		21	
Number of Measurements >MDC		12	
Number of Measurements Above 50% DCGL		0	
Number of Measurements Above DCGL		0	
Mean		0.012	
Median		0.013	
Standard Deviation		0.004	
Maximum		0.022	
Minimum		0.004	
Survey Technician(s)	ROSENHAGEN		
Survey Unit Classification		1	
TBD 06-004 Piping Group		2	
SR-13 Radionuclide Distribution Sample		EP 2-1	
Measured Nuclide		Co60	
Area Factor/EMC Used		No	
Pass/Fail FSS		Pass	
MREM/YR Contribution		<1	
COMMENTS: ACTIVITY VALUES NOT BACKGROUND CORRECTED			
RP Engineer Date		Oal Penell 6-20-07	

EP Rx 150
3" 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	3.3	3.3	23,571	3,230	1,677	27	19	2	94	0.014
2	3	3	21,429	2,937	1,524	24	17	1	85	0.013
3	3.3	3.3	23,571	3,230	1,677	27	19	2	94	0.014
4	2.3	2.3	16,429	2,251	1,168	19	13	1	65	0.010
5	2.3	2.3	16,429	2,251	1,168	19	13	1	65	0.010
6	1.6	1.6	11,429	1,566	813	13	9	1	45	0.007
7	2.3	2.3	16,429	2,251	1,168	19	13	1	65	0.010
8	5.3	5.3	37,857	5,188	2,693	43	31	3	150	0.022
9	3	3	21,429	2,937	1,524	24	17	1	85	0.013
10	3.6	3.6	25,714	3,524	1,829	29	21	2	102	0.015
11	3.7	3.7	26,429	3,622	1,880	30	21	2	105	0.016
12	3	3	21,429	2,937	1,524	24	17	1	85	0.013
13	2	2	14,286	1,958	1,016	16	12	1	57	0.008
14	1	1	7,143	979	508	8	6	0	28	0.004
15	2.7	2.7	19,286	2,643	1,372	22	16	1	77	0.011
16	3.7	3.7	26,429	3,622	1,880	30	21	2	105	0.016
17	3.7	3.7	26,429	3,622	1,880	30	21	2	105	0.016
18	2.3	2.3	16,429	2,251	1,168	19	13	1	65	0.010
19	3	3	21,429	2,937	1,524	24	17	1	85	0.013
20	3.3	3.3	23,571	3,230	1,677	27	19	2	94	0.014
21	2	2	14,286	1,958	1,016	16	12	1	57	0.008
									MEAN	0.012
									MEDIAN	0.013
									STD DEV	0.004
									MAX	0.022
									MIN	0.004

Survey Unit EP Rx 150 QA Worksheet

QA					ORIG						
Ft Into Pipe from Access	gcpm	net cpm	Co-60 activity (total dpm)	Co-60 activity (dpm/100cm ²)	Ft Into Pipe from Access	gcpm	net cpm	Co-60 activity (total dpm)	Co-60 activity (dpm/100cm ²)	% DIFF	Unity Value
1	1.7	1.7	12,143	1,664	1	3.3	3.3	23,571	3,230	48.5	0.014
2	2	2	14,286	1,958	2	3	3	21,429	2,937	33.3	0.013
3	3.7	3.7	26,429	3,622	3	3.3	3.3	23,571	3,230	12.1	0.014
4	1.3	1.3	9,286	1,273	4	2.3	2.3	16,429	2,251	43.5	0.010
5	4.3	4.3	30,714	4,209	5	2.3	2.3	16,429	2,251	87.0	0.010
6	3	3	21,429	2,937	6	1.6	1.6	11,429	1,566	87.5	0.007
7	4.7	4.7	33,571	4,601	7	2.3	2.3	16,429	2,251	104.3	0.010
8	3	3	21,429	2,937	8	5.3	5.3	37,857	5,188	43.4	0.022
9	4	4	28,571	3,916	9	3	3	21,429	2,937	33.3	0.013
10	2.3	2.3	16,429	2,251	10	3.6	3.6	25,714	3,524	36.1	0.015
11	4.3	4.3	30,714	4,209	11	3.7	3.7	26,429	3,622	16.2	0.016
12	2.7	2.7	19,286	2,643	12	3	3	21,429	2,937	10.0	0.013
13	3	3	21,429	2,937	13	2	2	14,286	1,958	50.0	0.008
14	4	4	28,571	3,916	14	1	1	7,143	979	300.0	0.004
15	1.7	1.7	12,143	1,664	15	2.7	2.7	19,286	2,643	37.0	0.011
16	2.7	2.7	19,286	2,643	16	3.7	3.7	26,429	3,622	27.0	0.016
17	2.3	2.3	16,429	2,251	17	3.7	3.7	26,429	3,622	37.8	0.016
18	2.3	2.3	16,429	2,251	18	2.3	2.3	16,429	2,251	0.0	0.010
19	3.3	3.3	23,571	3,230	19	3	3	21,429	2,937	10.0	0.013
20	3.3	3.3	23,571	3,230	20	3.3	3.3	23,571	3,230	0.0	0.014
21	4.3	4.3	30,714	4,209	21	2	2	14,286	1,958	115.0	0.008

NOTE: ALL QUALITY ASSURANCE RESULTS DIFFERING BY MORE THAN 20% WERE LESS THAN 3% OF THE DCGL

SECTION 7
ATTACHMENT 2
7 PAGE(S)

Pipe Interior Radiological Survey Form

Date: 12-12-05 Time: 1350
 Building: Rx Bldg Elevation: -25 Access Point Area: QUAD B
 System: QUAD B UTILITY AIR Pipe Diameter: 3" Pipe ID #: RX150
 Type of Survey Investigation Characterization Final Survey Other ✓
 Sled Size 3" inch
 Detector: 44-62 Detector ID #: 204402-101
 Cal Date: 11-17-05 Cal Due Date: 11-17-06
 Instrument: LUPLUM 8850-1 Instrument ID #: 212223
 Cal Date: 11-17-05 Cal Due Date: 11-17-06

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

Background Value 5.2 cpm

MDCR_{static} 10.8 cpm

Efficiency Factor for Pipe Diameter 0.00014 (taken from detector calibration certificate) *efficiency determination*

MDC_{static} 2842 dpm/100cm²

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

Comments: INITIAL SURVEY

Pipe Interior Radiological Survey

Radiological Survey Commenced: Date: 12-12-05 Time: 1350

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
1	1	3	10	3.3	-1.9	N/A
2	2	3	9	3	-2.2	
3	3	3	10	3.3	-1.9	
4	4	3	7	2.3	-2.9	
5	5	3	7	2.3	-2.9	
6	6	3	5	1.6	-3.6	
7	7	3	7	2.3	-2.9	
8	8	3	16	5.3	.1	
9	9	3	9	3	-2.2	
10	10	3	11	3.6	-1.6	

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Package Page 1 of 2

Pipe Interior Radiological Survey Form

Date: 12-13-05 Time: 0756
 Building: RX BLDG Elevation: -25 Access Point Area: QUAD B
 System: UTILITY AIR ~~VENT ORIGIN AIR~~ Pipe Diameter: 3" Pipe ID # RX 150
 Type of Survey Investigation Characterization Final Survey Other ✓
 Sled Size 3" inch
 Detector: 44-62 Detector ID #: 204402-101
 Cal Date: 11-17-05 Cal Due Date: 11-17-06
 Instrument: 2350-1 Instrument ID #: 212223
 Cal Date: 11-17-05 Cal Due Date: 11-17-06

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

Background Value 5.2 cpm
 MDCR_{static} 10.8 cpm
 Efficiency Factor for Pipe Diameter 0.00014 (taken from detector calibration certificate) *efficiency determination*
 MDC_{static} 2842 dpm/100cm²
 Is the MDC_{static} acceptable? Yes No (if no, adjust sample count time and recalculate MDCR_{static})
 Comments: CONTINUATION OF PIPE SURVEY FROM 12-12-05

Pipe Interior Radiological Survey

Radiological Survey Commenced: Date: 12-13-05 Time: 0756

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
1	11	3	11	3.7	-1.5	N/A
2	12	3	9	3	-2.2	
3	13	3	12 6	2	-3.2	
4	14	3	3	1	-4.2	
5	15	3	8	2.7	-2.5	
6	16	3	11	3.7	-1.5	
7	17	3	11	3.7	-1.5	
8	18	3	7	2.3	-2.9	
9	19	3	9	3	-2.2	
10	20	3 3	10	3.3	N/A	

Package Page 1 of 2

REFERENCE COPY

11
ID 12 x 15 12-13-05

Pipe Interior Radiological Survey Form

Date: 1-6-05 Time: 0900
 Building: RK Elevation: -25 Access Point Area: QUAD B
 System: Quadrant B Utility Area Pipe Diameter: 3 Pipe ID # RK 150
 Type of Survey Investigation Characterization Final Survey Other QA
 Sled Size 3" Vinyl Pelican inch
 Detector: 44-62 Detector ID #: 212701-121
 Cal Date: 11-17-05 Cal Due Date: 11-17-06
 Instrument: 2350-1 Instrument ID #: 212223
 Cal Date: 11-17-05 Cal Due Date: 11-17-06

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

Background Value 5.2 cpm
 MDCR_{static} 10.8 cpm
 Efficiency Factor for Pipe Diameter 0.00013 (taken from detector efficiency determination calibration certificate)
 MDC_{static} 2779 dpm/100cm²
 Is the MDC_{static} acceptable? Yes No (if no, adjust sample count time and recalculate MDCR_{static})

Comments: _____

Pipe Interior Radiological Survey

Radiological Survey Commenced: Date: 1-6-06 Time: 0900

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
1	1	3	5	1.7	n/a	n/a
2	2	3	6	2		
3	3	3	11	3.7		
4	4	3	4	1.3		
5	5	3	13	4.3		
6	6	3	9	3		
7	7	3	14	4.7		
8	8	3	9	3		
9	9	3	12	4		
10	10	3	7	2.3		

Package Page 1 of 1

1-6-06

Pipe Interior Radiological Survey Form (Continuation Form)

2x 150 QUAD B QA

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
11	11	3	13	4.3	n/a	n/a
12	12	3	8	2.7		
13	13	3	9	3		
14	14	3	12	4		
15	15	3	5	1.7		
16	16	3	8	2.7		
17	17	3	7	2.3		
18	18	3	7	2.2		
19	19	3	10	3.3		
20	20	3	10	3.3		
21	21	3	13	4.3		
n/a						

Package Page 2 of 2

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OVERFLOW EL. 1'-10"
THROUGH STEEL WALL AT
EL. 4'-0" SEE SECTION

QUADRANT DOOR
#16

EL. -27'-7"

1" HOT DRAIN - SEE
PF-00378 FOR
CONTINUATION
TO HOT SUMP -25'-0"
DISCHARGE

JOSAM #5586
WITH CHROME GRATE

376

395

39

3" EHAH
EPOXY COATED
STL. PIPE
FOR CONT.
SEE PF00381

RISERS TO -23'-0"
ELEVATION TERMINATE
WITH FLD ENDS & BLIND
FLG.

QUADRANT "B"
FL. EL. -27'-0"

(M1) 3" PIPE
SEE PF-00282

QUADRANT DOOR #21

4" TH2C BRASS CAP
4" W.I. CLOSE NIPPLE
6" 4" BUTT WELD G.W.I. RFD.
6" 4" 6" BUTT WELD G.W.I. T.C.

PURGE RISER @ 26'-6"
EL. & SEALWELD
CLOSE WITH 3/8" ST.
PLATE

QUAD "B" SUMP
SEE DETAIL "A"
PF-00404

JOSAM #0406 ANGLE
POOD DRAIN WITH
CHROME GRATE

38

38

(SPARE)
3" BLIND-6D
BOTH ENDS
3" UA-PROCESS

3" DEION WATER

4" SCH. R.

4" SCWS (TEST)

10" PROCESS WATER

EL. -26'-1"

JOSAM #5586 WITH
CHROME GRATE

36

36

CANAL "E"
-25'-0" FLOOR ELEVATION

JOSAM #5586 WITH
CHROME GRATE

38

38

CANAL DOOR #17

= PIPE SURVEYED

10'
ID RX 150

12-12-05




SECTION 7
ATTACHMENT 3
1 PAGE(S)

DQA Check Sheet

Design #	EP Rx150	Revision #	Original			
Survey Unit #	EP Rx 150					
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 (<i>S</i> + for Sign Test or <i>W</i> _r for WRS Test) ≥ the critical value?						X
Comments:						
FSS/Characterization Engineer (print/sign)		Date Randall / <i>[Signature]</i>		Date	6-20-07	
FSS/ Characterization Manager (print/sign)		B. Case <i>[Signature]</i>		Date	7/3/07	

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SECTION 7
ATTACHMENT 4
1 DISC

Survey Unit Release Record				
Design #	EP-Rx160	Revision #	Original	Page 1 of 3
Survey Unit #(s)	Rx160			
Description	<p>1) Embedded Pipe (EP) Survey Unit Rx160 meets the definition of embedded pipe for Plum Brook Reactor Facility (PBRF).</p> <p>2) EP RX160 is a Class 1, Group 2 survey unit as per the PBRF Final Status Survey Plan (FSSP) and Technical Basis Document (TBD)-06-004.</p> <p>3) Surveys in EP Rx160 were performed using a scintillation detector optimized to measure gamma energies representative of Co-60. Sample #EP 2-1 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			6-12-07	
Technical Reviewer (FSS/Characterization Engineer)			6-28-07	
FSS/Characterization Manager			7/3/07	

Form
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Survey Unit: Rx160

1.0 History/Description

- 1.1 EP Rx160 is a RT drain that terminates in the sump. The subject piping described in this report is integral to the drain system for the Reactor Building. The purpose of the system is to convey waste water from the RT to the sump. This system involves approximately 2 liner feet of drain system piping.
- 1.2 EP Rx160 consists of 2 linear feet (') of 8 inch (") Inside Diameter (ID) piping starting in the -25 foot elevation RT to the sump. The total piping for EP Rx160 is 2'.

2.0 Survey Design Information

- 2.1 EP Rx160 was surveyed IAW Procedure #BSI/LVS-002.
- 2.2 100% of the 8" ID pipe was accessible for survey. The accessible 8" ID pipe was surveyed by static measurement at one foot increments, for a total of 2 survey measurements.
- 2.3 Surface area for the 8" ID piping is 1,946 cm² for each foot of piping, corresponding to a total 8" ID piping surface area of 3.982 cm² (0.4 m²) for the entire length of (2') of 8" 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 Rx160 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 Statistical Summary Table

Statistical Parameter	8" Pipe
Total Number of Survey Measurements	2
Number of Measurements >MDC	2
Number of Measurements Above 50% of DCGL	0
Number of Measurements Above DCGL	0
Mean	0.016
Median	0.016
Standard Deviation	0.000
Maximum	0.016
Minimum	0.016

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 160 to be less than 1 mrem/yr. The dose contribution is estimated to be 0.016 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 Rx160 & Spreadsheet

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



BSI EP/BP SURVEY REPORT

Pipe ID	Rx160	Survey Location	-25 Rx
Survey Date	05-Apr-06	2350-1 #	203488
Survey Time	1250	Detector-Sled #	BICRON 1MG1
Pipe Size	8"	Detector Efficiency	0.00015
DCGL (dpm/100cm ²)	240,800	Pipe Area Incorporated by Detector Efficiency (in cm ²)	1946
Pipe Area Incorporated by Survey Data (m ²)	0.4	Field BKG (cpm)	20.3
Routine Survey	X	Field MDCR (counts)	18.5
QA Survey		Nominal MDC (dpm/100cm ²)	3394

Survey Measurement Results

Total Number of Survey Measurements	2
Number of Measurements >MDC	2
Number of Measurements Above 50% DCGL	0
Number of Measurements Above DCGL	0
Mean	0.016
Median	0.016
Standard Deviation	0.000
Maximum	0.016
Minimum	0.016

Survey Technician(s)

Rosenhagen

Survey Unit Classification	1
TBD 06-004 Piping Group	2
SR-13 Radionuclide Distribution Sample	EP 2-1
Measured Nuclide	Co60
Area Factor/EMC Used	No
Pass/Fail FSS	Pass
MREM/YR Contribution	<1

COMMENTS:

Activity values are not background corrected.

RP Engineer | Date

Oral Parkhill 6-12-07

EP Rx160
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	11	11	73,333	3,768	1,956	31	22	2	109	0.016
2	11	11	73,333	3,768	1,956	31	22	2	109	0.016
									MEAN	0.016
									MEDIAN	0.016
									STD DEV	0.000
									MAX	0.016
									MIN	0.016

SECTION 7
ATTACHMENT 2
PAGE(S)

Pipe Interior Radiological Survey Form

Date: 4-5-06 Time: 12:50
 Pipe ID#: RX160 Pipe Diameter: 8" Access Point Area: -27 TRENCH
 Building: RX Elevation: -27 System: _____
 Type of Survey Investigation _____ Characterization _____ Final Survey ☒ Other ☒
 Gross _____ Co60 ☒ Cs _____
 Detector ID# / Sled ID# 1M61 / LVS-1 / 107
 Detector Cal Date: 20-DEC-05 Detector Cal Due Date: 20-DEC-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 20.3 cpm
 MDCR_{static} 18.5 cpm
 Efficiency Factor for Pipe Diameter .00015 (from detector efficiency determination)
 MDC_{static} 3394 dpm/ 100 cm²
 Is the MDC_{static} acceptable? Yes No (if no, adjust sample count time and recalculate MDCR_{static})
 Comments: INITIAL SURVEY

NO MAP AVAILABLE

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	<u>1</u>	<u>1</u>	<u>11</u>	<u>11</u>	<u>n/a</u>	<u>n/a</u>
2	<u>2</u>	<u>1</u>	<u>11</u>	<u>11</u>		
3	<u>n/a</u>	<u>n/a</u>	<u>n/a</u>	<u>n/a</u>		
4						
5						
6						
7						
8						
9						
10						

Package Page 1 of 1

REFERENCE COPY

SECTION 7.
ATTACHMENT 3
____/____ PAGE(S)

DQA Check Sheet

Design #	EP Rx160	Revision #	Original			
Survey Unit #	EP Rx160					
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, for WRS Test) ≥ the critical value?						X
Comments:						
FSS/Characterization Engineer (print/sign)				<i>Dele R. ...</i>		Date 6-12-07
FSS/ Characterization Manager (print/sign)				<i>[Signature]</i>		Date 7/3/07

Form
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SECTION 7
ATTACHMENT 4
1 DISC

Survey Unit Release Record

Design #	EP-Rx 204	Revision #	Original	Page 1 of 3
Survey Unit #(s)	EP-Rx 204			
Description	<p>1) Embedded Pipe (EP) Survey Unit EP Rx-204 meets the definition of embedded pipe for Plum Brook Reactor Facility (PBRF).</p> <p>2) EP 204 is a Class 1, Group 2 survey unit as per the PBRF Final Status Survey Plan (FSSP) and Technical Basis Document (TBD)-06-004.</p> <p>3) Surveys in EP 204 were performed using a scintillation detector optimized to measure gamma energies representative of Co-60. Sample #EP 2-1 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	<i>Earl Randall</i>		6-21-07	
Technical Reviewer (FSS/Characterization Engineer)	<i>[Signature]</i>		6-29-07	
FSS/Characterization Manager	<i>[Signature]</i>		7/3/07	

Form
CS-09/1
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Survey Unit: EP-Rx 204

1.0 History/Description

- 1.1 The subject piping described in this report is an instrumentation line for equipment and accessories utilized in Quad B. This survey unit involves ~ 10' of instrument piping.

2.0 Survey Design Information

- 2.1 EP Rx 204 was surveyed IAW Procedure #BSI/LVS-002.
- 2.2 100% of the 2.5" ID pipe was accessible for survey. The accessible 2.5" ID pipe was surveyed by static measurement at one foot increments, for a total of 10 survey measurements.
- 2.3 Surface area for the 2.5" ID piping is 608 cm² for each foot of piping, corresponding to a total 3" ID piping surface area of 6,080 cm² (0.61 m²) for the entire length of (10') of 2.5" 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 204 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 Statistical Summary Table

Statistical Parameter	2.5" Pipe
Total Number of Survey Measurements	10
Number of Measurements >MDC	10
Number of Measurements Above 50% of DCGL	1
Number of Measurements Above DCGL	0
Mean	0.257
Median	0.227
Standard Deviation	0.123
Maximum	0.521
Minimum	0.078

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 204 to be less than 1 mrem/yr. The dose contribution is estimated to be 0.257 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 204 & Spreadsheet

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



BSI EP/BP SURVEY REPORT

Pipe ID	Rx 204	Survey Location	-25 el.
Survey Date	02-Mar-08	2350-1 #	203488
Survey Time	0825/ 1042	Detector-Sled #	44-62/212701-121
Pipe Size	2.5"	Detector Efficiency	0.00015
DCGL (dpm/100cm ²)	240800	Pipe Area Incorporated by Detector Efficiency (ln cm ²)	608
Pipe Area Incorporated by Survey Data (m ²)	0.61	Field BKG (cpm)	4.7
Routine Survey	X	Field MDCR (counts)	10.4
QA Survey		Nominal MDC (dpm/100cm ²)	4,099

Survey Measurement Results

Total Number of Survey Measurements	10
Number of Measurements >MDC	10
Number of Measurements Above 50% DCGL	1
Number of Measurements Above DCGL	0
Mean	0.257
Median	0.227
Standard Deviation	0.123
Maximum	0.521
Minimum	0.078

Survey Technician(s)

DEBRAUX

Survey Unit Classification	1
TBD 06-004 Piping Group	2
SR-13 Radionuclide Distribution Sample	EP 2-1
Measured Nuclide	Co60
Area Factor/EMC Used	No
Pass/Fail FSS	Pass
MREM/YR Contribution	<1

COMMENTS:

ACTIVITY VALUES NOT BACKGROUND CORRECTED

RP Engineer | Date

Paul Marshall 6-21-07

EP Rx 204
2.5" 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	51.5	51.5	343,333	56,469	29,308	469	333	28	1,638	0.245
2	16.5	16.5	110,000	18,092	9,390	150	107	9	525	0.078
3	109.5	109.5	730,000	120,066	62,314	997	708	59	3,482	0.521
4	70	70	466,667	76,754	39,836	637	453	38	2,226	0.333
5	42	42	280,000	46,053	23,901	382	272	23	1,336	0.200
6	44	44	293,333	48,246	25,039	400	285	24	1,399	0.209
7	33.5	33.5	223,333	36,732	19,064	305	217	18	1,065	0.159
8	73.5	73.5	490,000	80,592	41,827	669	475	39	2,337	0.349
9	59	59	393,333	64,693	33,576	537	382	32	1,876	0.281
10	40	40	266,667	43,860	22,763	364	259	21	1,272	0.190
									MEAN	0.257
									MEDIAN	0.227
									STD DEV	0.123
									MAX	0.521
									MIN	0.078

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

Pipe Interior Radiological Survey Form

Date: 3-2-06 Time: 0825
 Pipe ID#: RX 204 Pipe Diameter: 2.5" Access Point Area: QUAD B Access
 Building: RX Elevation: -25 System: STAINLESS BOX-LOT
INSTRUMENT LINE
 Type of Survey Investigation _____ Characterization _____ Final Survey X Other ✓
 Gross _____ Co60 ✓ Cs _____
 Detector ID# / Sled ID# 44-62 #2127011 121
 Detector Cal Date: 11-17-05 Detector Cal Due Date: 11-17
 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 4.7 cpm
 MDCR_{static} 10.4 cpm
 Efficiency Factor for Pipe Diameter 0.00015 (from detector efficiency determination)
 MDC_{static} 4099 dpm/ 100 cm²
 Is the MDC_{static} acceptable? Yes No (if no, adjust sample count time and recalculate MDCR_{static})
 Comments: POS #1 = RX 204 RIGHT
POS #2 = RX 204 LEFT

INITIAL SURVEY Complete

Technician Signature

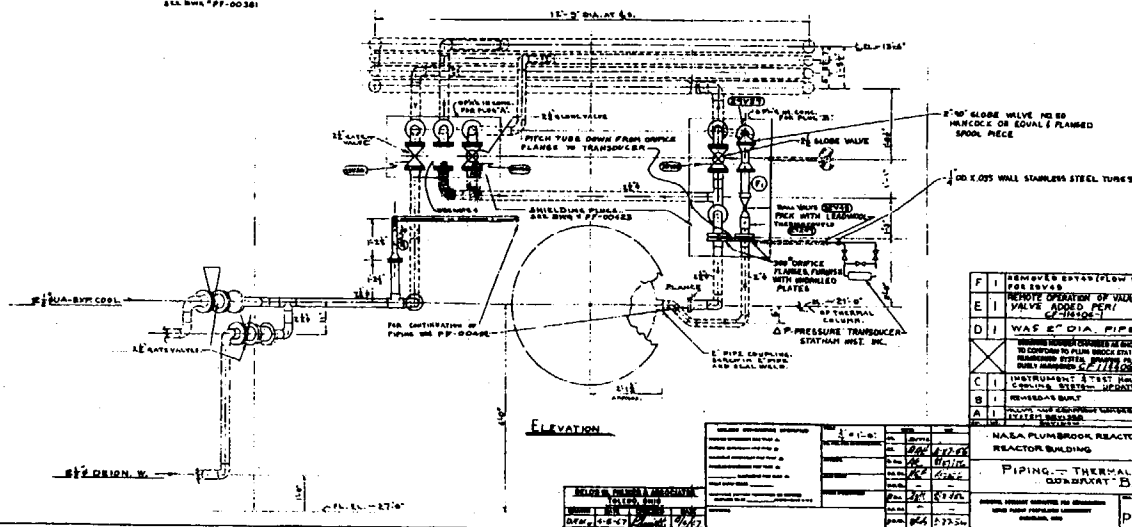
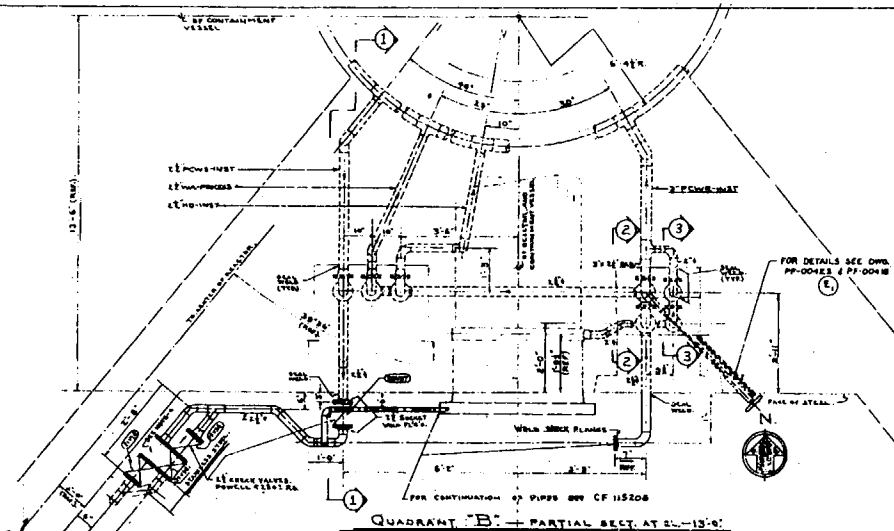
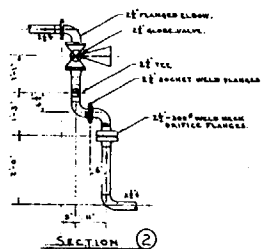
C. DEBRAUP

Pipe Interior Radiological Survey

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
1	1	2	103	51.5	n/a	n/a
2	1	2	33	16.5		
3	n/a	n/a	n/a	n/a		
4						
5						
6						
7						
8						
9						
10						

Package Page 1 of 1

REFERENCE COPY



GENERAL NOTES.

1. FOR SCHEDULE OF BWS SEE "PF-00100"
2. SEAL WELD ALL PIPES WHERE THEY PIERCE STEEL SHELL.
3. ALL PIPING SHALL BE SCHEDULE 40 STAINLESS STEEL. SEE SPECS AND VALVE SCHEDULE.
4. LINES SEALED BY GUNWELDING, SEALING BOTH LINE SECTIONS.

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[illegible]

Rx 204

Pipe Interior Radiological Survey Form

Date: 3-2-06 Time: 1042 Access Point Area: QUAD B
Pipe ID#: RX204 Pipe Diameter: 2.5" STAINLESS STEEL
Building: RX Elevation: -25 System: BOX-RIGHT
Type of Survey Investigation _____ Characterization _____ Final Survey X Other ✓
Gross _____ Co60 ✓ Cs _____
Detector ID# / Sled ID# 44-62 #2127011 121
Detector Cal Date: 11-7-05 Detector Cal Due Date: 11-17-06
Instrument: 2350-1 Instrument ID #: 203488
Instrument Cal Date: 242 11-17-05 Instrument Cal Due Date: 11-17-06

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

Background Value 4.7 cpm

MDCR_{static} 10.4 cpm

Efficiency Factor for Pipe Diameter 0.00015 (from detector efficiency determination)

MDC_{static} 4099 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

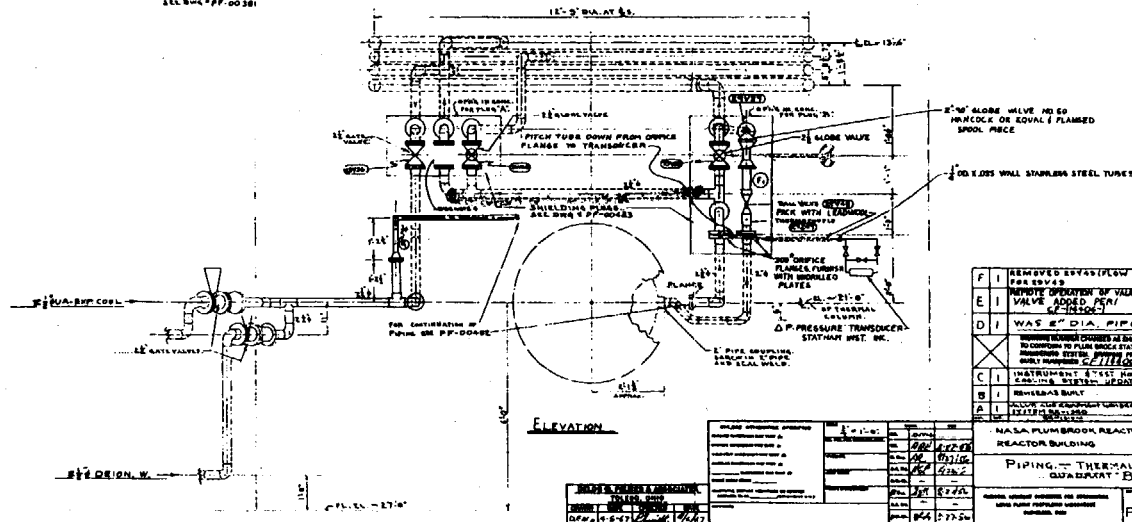
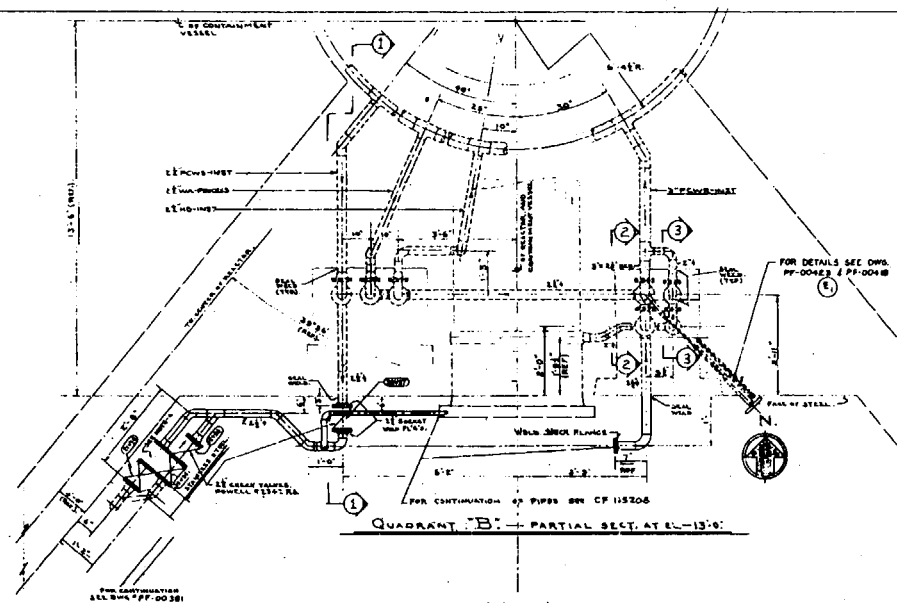
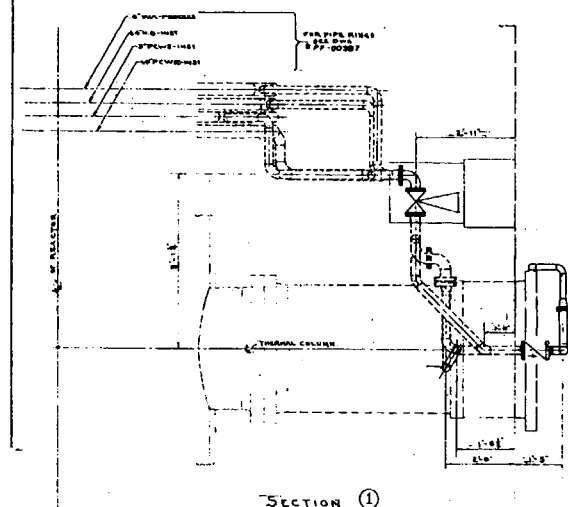
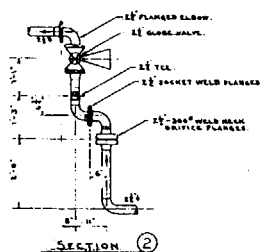
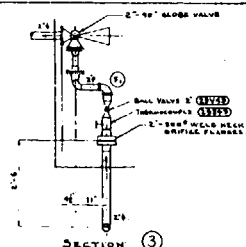
C. DEBIAUX

Pipe Interior Radiological Survey

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
1	1	2	219	109.5 cpm	n/a	n/a
2	2	2	140	70		
3	3	2	84	42		
4	4	2	88	44		
5	5	2	67	33.5		
6	6	2	147	73.5		
7	7	2	118	59		
8	8	2	80	40		
9	n/a	n/a	n/a	n/a		
10	↓	↓	↓	↓	↓	↓

Package Page 1 of 1

REFERENCE COPY



GENERAL NOTES

1. FOR SCHEDULE OF BIDS SEE PP-00100
2. SHALL WELD ALL PIPES WHERE THEY PIERCE STEEL SHELL
3. ALL PIPING SHALL BE SCHEDULE 40 STAINLESS STEEL. SEE SPEC'S AND VALVE SCHEDULE.
4. LINES SHOWN BY 0.005 WALL THICKNESS, INCLUDING BUT NOT LIMITED TO:

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F	REMOVED ELEVATION (FLOW IN)	10/1/60
E	REMOVED ELEVATION (FLOW OUT)	10/1/60
D	WAS 2" DIA. PIPE	10/1/60
C	INSTRUMENT 2" DIA. PIPE	10/1/60
B	REMOVED BENT	10/1/60
A	REMOVED BENT	10/1/60

NASA PLUMBROOK REACTOR NO. 1111

REACTOR BUILDING

PIPING - THERMAL COLUMN

QUADRANT 'B'

PP-00392

R 204

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

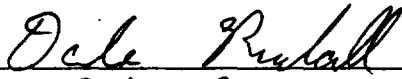

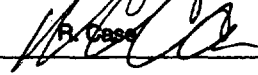
DQA Check Sheet

Design #	EP Rx 204	Revision #	Original			
Survey Unit #	EP Rx 204					
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, for WRS Test) ≥ the critical value?						X
Comments:						
FSS/Characterization Engineer (print/sign)			<i>Dale Randolph</i>		Date	6-21-07
FSS/ Characterization Manager (print/sign)			<i>R. Case</i>		Date	7/3/07

Form
CS-09/2
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SECTION 7
ATTACHMENT 4
1 DISC

Survey Unit Release Record

Design #	EP-Rx 207	Revision #	Original	Page 1 of 3
Survey Unit #(s)	EP-Rx 207			
Description	<p>1) Embedded Pipe (EP) Survey Unit EP Rx-207 meets the definition of embedded pipe for Plum Brook Reactor Facility (PBRF).</p> <p>2) EP 207 is a Class 1, Group 2 survey unit as per the PBRF Final Status Survey Plan (FSSP) and Technical Basis Document (TBD)-06-004.</p> <p>3) Surveys in EP 207 were performed using a scintillation detector optimized to measure gamma energies representative of Co-60. Sample #EP 2-1 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			6-21-07	
Technical Reviewer (FSS/Characterization Engineer)			6-28-07	
FSS/Characterization Manager			7/3/07	

Form
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Survey Unit: EP-Rx 207

1.0 History/Description

- 1.1 The subject piping described in this report is an instrumentation line for equipment and accessories utilized in Quad B. This survey unit involves ~ 3' of instrument piping.

2.0 Survey Design Information

- 2.1 EP Rx 207 was surveyed IAW Procedure #BSI/LVS-002.
- 2.2 100% of the 2" ID pipe was accessible for survey. The accessible 2.5" ID pipe was surveyed by static measurement at one foot increments, for a total of 3 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 1,459 cm² (0.15 m²) for the entire length of (3') 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 Rx 207 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 Statistical Summary Table

Statistical Parameter	2" Pipe
Total Number of Survey Measurements	3
Number of Measurements >MDC	1
Number of Measurements Above 50% of DCGL	0
Number of Measurements Above DCGL	0
Mean	0.153
Median	0.125
Standard Deviation	0.084
Maximum	0.248
Minimum	0.086

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 207 to be less than 1 mrem/yr. The dose contribution is estimated to be 0.153 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 207 & Spreadsheet

SECTION 7
ATTACHMENT 1
2 PAGE(S)



BSI EP/BP SURVEY REPORT

Pipe ID	Rx 207	Survey Location	-25 el. Quad B	
Survey Date	02-Mar-06	2350-1 #	203488	
Survey Time	1034	Detector-Sled #	44-62/212701-121	
Pipe Size	2"	Detector Efficiency	0.00016	
DCGL (dpm/100cm ²)	240800	Pipe Area Incorporated by Detector Efficiency (in cm ²)	486	
Pipe Area Incorporated by Survey Data (m ²)	0.15	Field BKG (cpm)	4.7	
Routine Survey	X	Field MDCR (counts)	10.4	
QA Survey		Nominal MDC (dpm/100cm ²)	33,268	
Survey Measurement Results				
Total Number of Survey Measurements			3	
Number of Measurements >MDC			1	
Number of Measurements Above 50% DCGL			0	
Number of Measurements Above DCGL			0	
Mean			0.153	
Median			0.125	
Standard Deviation			0.084	
Maximum			0.248	
Minimum			0.086	
Survey Technician(s)		DEBRAUX		
Survey Unit Classification				1
TBD 06-004 Piping Group				2
SR-13 Radionuclide Distribution Sample				EP 2-1
Measured Nuclide				Co60
Area Factor/EMC Used				No
Pass/Fail FSS				Pass
MREM/YR Contribution				<1
COMMENTS: ACTIVITY VALUES NOT BACKGROUND CORRECTED				
RP Engineer Date		Dal Russell 6-21-07		

EP Rx 207
2" 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	22.5	22.5	140,625	28,911	15,005	240	171	14	838	0.125
2	15.5	15.5	96,875	19,917	10,337	165	118	10	578	0.086
3	44.5	44.5	278,125	57,180	29,677	475	337	28	1,658	0.248
									MEAN	0.153
									MEDIAN	0.125
									STD DEV	0.084
									MAX	0.248
									MIN	0.086

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

Pipe Interior Radiological Survey Form

Date: 3-2-06 Time: 1034 Access Point Area: QUAD B ACCESS R
 Pipe ID#: RX 207 Pipe Diameter: 2" STAINLESS STEEL
 Building: RX Elevation: -25 BOX - RIGHT
 System: INSTRUMENT LINE TO
 Type of Survey Investigation _____ Characterization _____ Final Survey A Other ✓
 Gross _____ Co60 ✓ Cs _____
 Detector ID# / Sled ID# 44-62 #212701 / 121
 Detector Cal Date: 11-17-05 Detector Cal Due Date: 11-17-06
 Instrument: 2350Y 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 4.7 cpm
 MDCR_{static} 10.4 cpm
 Efficiency Factor for Pipe Diameter .00016 (from detector efficiency determination)
 MDC_{static} 33268 dpm/ 100 cm²
 Is the MDC_{static} acceptable? Yes No (if no, adjust sample count time and recalculate MDCR_{static})
 Comments: INITIAL SURVEY

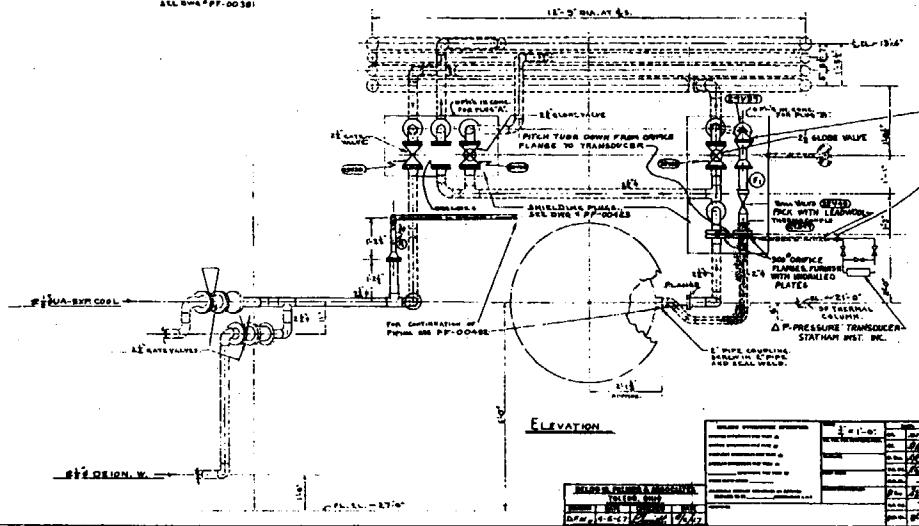
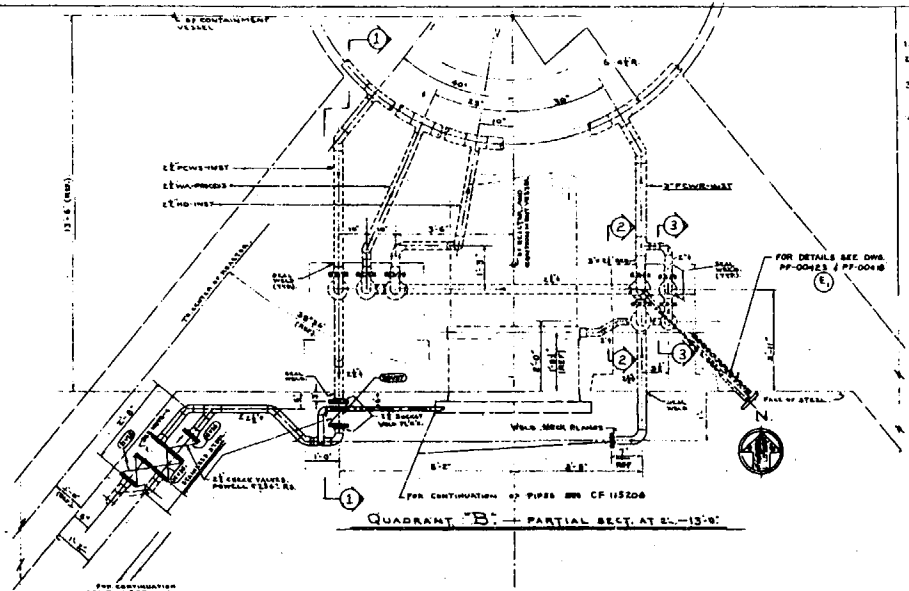
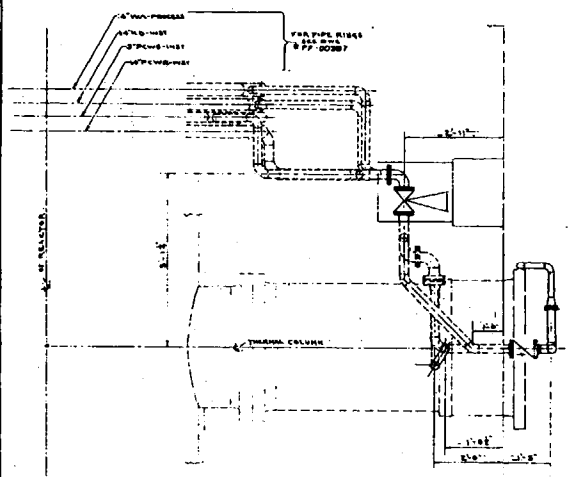
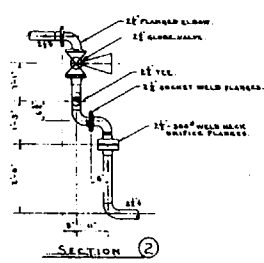
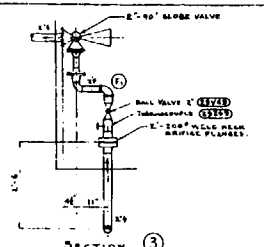
Technician Signature

C. DEBANEY Complete

Pipe Interior Radiological Survey

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
1	1	2	45	22.5	n/a	n/a
2	2	2	31	15.5		
3	3	2	89	44.5		
4						
5						
6						
7						
8						
9						
10						

Package Page 1 of 1



- GENERAL NOTES**
1. FOR SCHEDULE OF WORK SEE PF-80100
 2. SEAL WELD ALL PIPES WHERE THEY PIERCE STEEL ANVILS
 3. ALL PIPING SHALL BE SCHEDULE 40 STAINLESS STEEL. SEE SPEC AND VALVE SCHEDULE
 4. UNITS MEASURED BY S.W. PLUMBERS, SEALING BOTH DIRECTIONS

REFERENCE COPY

F	REMOVED SYSTEM/FLW SW		
E	REMOVED SYSTEM/FLW SW		
D	WAS 2" DIA. PIPE		
C	INSTRUMENT SYSTEM		
B	REMOVED SYSTEM		
A	REMOVED SYSTEM		

NASA PLUMBROOK REACTOR FAC. 11112
REACTOR BUILDING
PIPING - THERMAL COLUMN.
QUADRANT "B".
PF-00392

Rx 207

SECTION 7
ATTACHMENT 3
1 PAGE(S)

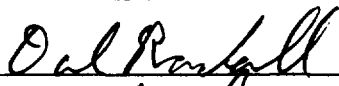
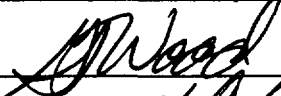
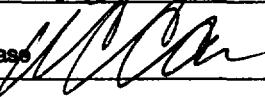
DQA Check Sheet

Design #	EP Rx207	Revision #	Original					
Survey Unit #	EP Rx 207							
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>Dale Randall</i>		Date	6-21-07	
FSS/ Characterization Manager (print/sign)				<i>B. Case</i>		Date	7/3/07	

Form
CS-09/2
Rev 0

SECTION 7
ATTACHMENT 4
1 DISC

Survey Unit Release Record

Design #	EP-Rx 208	Revision #	Original	Page 1 of 3
Survey Unit #(s)	EP-Rx 208			
Description	<p>1) Embedded Pipe (EP) Survey Unit EP Rx-208 meets the definition of embedded pipe for Plum Brook Reactor Facility (PBRF).</p> <p>2) EP 208 is a Class 1, Group 2 survey unit as per the PBRF Final Status Survey Plan (FSSP) and Technical Basis Document (TBD)-06-004.</p> <p>3) Surveys in EP 208 were performed using a scintillation detector optimized to measure gamma energies representative of Co-60. Sample #EP 2-1 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			6-21-07	
Technical Reviewer (FSS/Characterization Engineer)			6-28-07	
FSS/Characterization Manager	R. Case 		7/3/07	

Form
CS-09/1
Rev 0

 COPY

Survey Unit: EP-Rx 208

1.0 History/Description

- 1.1 The subject piping described in this report is an instrumentation line for equipment and accessories utilized in Quad B. This survey unit involves ~ 4' of instrument piping.

2.0 Survey Design Information

- 2.1 EP Rx 208 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 4 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 1,944 cm² (0.19 m²) for the entire 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 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 208 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 Statistical Summary Table

Statistical Parameter	2" Pipe
Total Number of Survey Measurements	4
Number of Measurements >MDC	0
Number of Measurements Above 50% of DCGL	0
Number of Measurements Above DCGL	0
Mean	0.042
Median	0.046
Standard Deviation	0.017
Maximum	0.056
Minimum	0.020

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 208 to be less than 1 mrem/yr. The dose contribution is estimated to be 0.042 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 208 & Spreadsheet

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



BSI EP/BP SURVEY REPORT

Pipe ID	Rx 208	Survey Location	-25 el. Quad B
Survey Date	02-Mar-06	2350-1 #	203488
Survey Time	1300	Detector-Sled #	44-62/212701-121
Pipe Size	2"	Detector Efficiency	0.00016
DCGL (dpm/100cm2)	240800	Pipe Area Incorporated by Detector Efficiency (in cm2)	486
Pipe Area Incorporated by Survey Data (m2)	0.19	Field BKG (cpm)	4.7
Routine Survey	X	Field MDCR (counts)	10.4
QA Survey		Nominal MDC (dpm/100cm2)	33,268
Survey Measurement Results			
Total Number of Survey Measurements		4	
Number of Measurements >MDC		0	
Number of Measurements Above 50% DCGL		0	
Number of Measurements Above DCGL		0	
Mean		0.042	
Median		0.046	
Standard Deviation		0.017	
Maximum		0.056	
Minimum		0.020	
Survey Technician(s)		Rosenhagen	
Survey Unit Classification		1	
TBD 06-004 Piping Group		2	
SR-13 Radionuclide Distribution Sample		EP 2-1	
Measured Nuclide		Co60	
Area Factor/EMC Used		No	
Pass/Fail FSS		Pass	
MREM/YR Contribution		<1	
COMMENTS: ACTIVITY VALUES NOT BACKGROUND CORRECTED			
RP Engineer Date		Dal Russell 6-21-07	

EP Rx 208
2" 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	3.5	3.5	21,875	4,497	2,334	37	27	2	130	0.020
2	10	10	62,500	12,850	6,669	107	76	6	373	0.056
3	7	7	43,750	8,995	4,668	75	53	4	261	0.039
4	9.5	9.5	59,375	12,207	6,335	101	72	6	354	0.053
									MEAN	0.042
									MEDIAN	0.046
									STD DEV	0.017
									MAX	0.056
									MIN	0.020

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

Pipe Interior Radiological Survey Form

Date: 3-2-06 Time: 1300
 Pipe ID#: RX 208 Pipe Diameter: 2" Access Point Area: ACCESS R STEEL BOX
 Building: RX Elevation: -25 QUAD B System: INSTRUMENT LINE
 Type of Survey Investigation _____ Characterization _____ Final Survey X Other ✓
 Gross _____ Co60 ✓ Cs _____
 Detector ID# / Sled ID# 44-62 / 212701 / 121
 Detector Cal Date: 17-NOV-05 Detector Cal Due Date: 17-NOV-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 4.7 cpm
 MDCR_{static} 10.4 cpm
 Efficiency Factor for Pipe Diameter .00016 (from detector efficiency determination)
 MDC_{static} 33268 dpm/ 100 cm²
 Is the MDC_{static} acceptable? Yes No (if no, adjust sample count time and recalculate MDCR_{static})

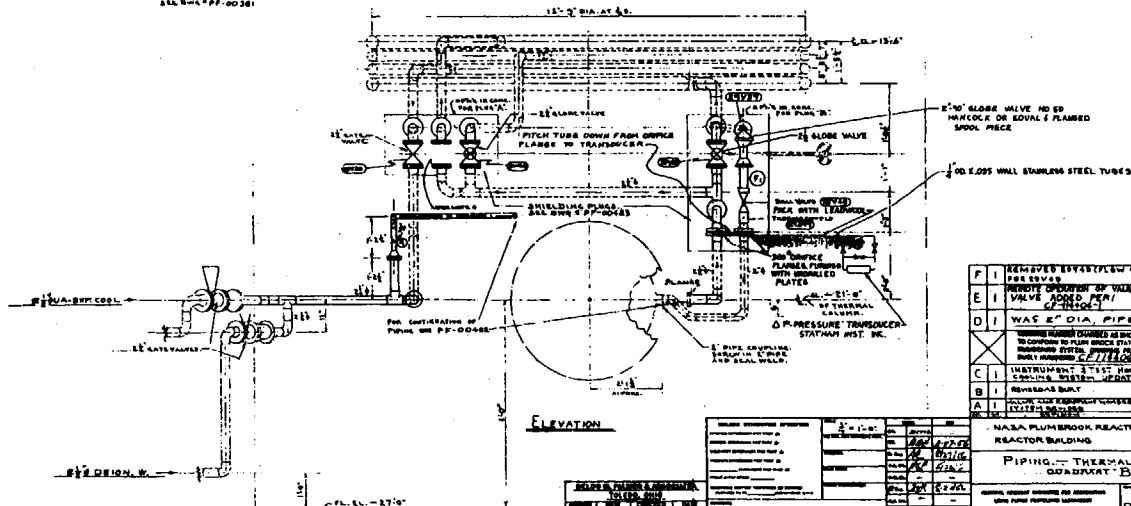
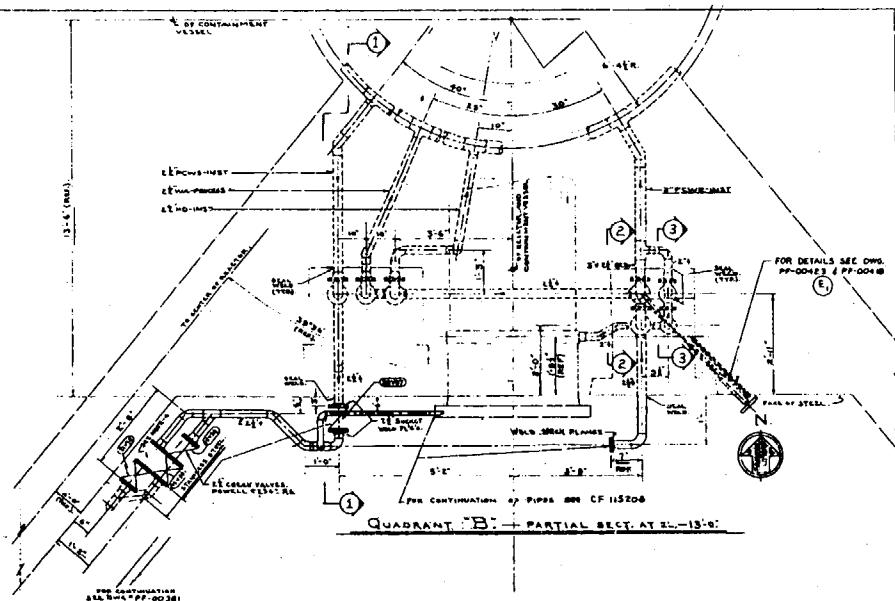
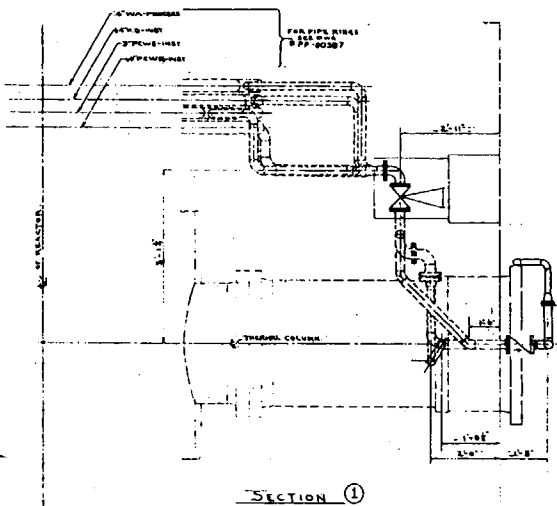
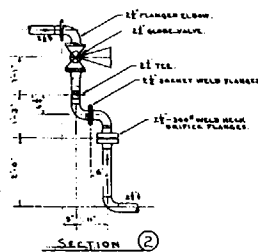
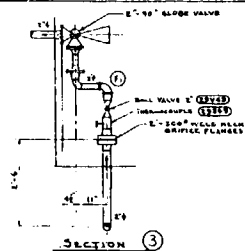
Comments: INITIAL SURVEY NOTE: POSITION # 1 & 2 ARE IN BOX
SURVEYING DOWN TO HORIZONTAL PIPE NOTE: POSITION # 3 & 4 ARE IN WALL
RUNNING HORIZONTAL COMPLETE

Technician Signature Jimi Dwyer

Pipe Interior Radiological Survey

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
1	1	2	7	3.5	n/a	n/a
2	2	2	20	10		
3	1	2	14	7		
4	2	2	19	9.5		
5	n/a	n/a	n/a	n/a		
6						
7						
8						
9						
10						

Package Page 1 of 2



GENERAL NOTES

1. FOR SCHEDULE OF WORK SEE "PF-00100"
2. SEAL WELD ALL PIPES WHERE THEY PIERCE STEEL SHELL.
3. ALL PIPING SHALL BE SCHEDULE 40 STAINLESS STEEL. SEE SPEC AND VALVE SCHEDULE.
4. LINES BEARING 8" JUMP FLANGES, SEALING BOTH LINE SECTIONS.

REFERENCE COPY

F	REMOVED EXISTING PIPING FOR EXISTING	
E	REMOVED EXISTING PIPING FOR EXISTING	
D	WAS 2" DIA. PIPE	
C	REMOVED EXISTING PIPING FOR EXISTING	
B	REMOVED EXISTING PIPING FOR EXISTING	
A	REMOVED EXISTING PIPING FOR EXISTING	

NASA PLUMBROOK REACTOR BLDG. 11112

REACTOR BUILDING

PIPING - THERMAL COLUMN, QUADRANT "B"

PF-00392

Rx 208

PAGE 1 of 2

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

DQA Check Sheet

Design #	EP Rx208	Revision #	Original					
Survey Unit #	EP Rx 208							
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, for WRS Test) ≥ the critical value?								X
Comments:								
FSS/Characterization Engineer (print/sign)				<i>Date Randall G. [Signature]</i>		Date	6-21-07	
FSS/ Characterization Manager (print/sign)				R. Case <i>[Signature]</i>		Date	7/3/07	

Form
CS-09/2
Rev 0

SECTION 7
ATTACHMENT 4
1 DISC