Development of EAL Threshold values from NEE-323-CALC-003

Calculated values are shown in Calc-003 as shown below.

Values for the RU1 Gaseous EALs were determined and are shown below.

Table 1 – Gaseous Effluent Setpoints

Location	Detector	RU1 Threshold (µCi/cc)
Offgas Stack	Kaman 10	1.97E-01
Turbine Building Vent	Kaman 2	7.74E-04
Reactor Building Vent	Kaman 4	6.00E-04
Reactor Building Vent	Kaman 6	9.60E-04
Reactor Building Vent	Kaman 8	9.60E-04
LLRPSF Building Vent	Kaman 12	1.19E-03

Values for the Liquid Effluent RU1 EALs were determined and are shown below.

Table 2 – Liquid Effluent Setpoints

Location	Equipment ID	RU1 Unusual Event Level (cps)
GSW	RE-4767	1.53E+03
RHRSW/ESW	RE-1997	8.42E+02
RHRSW Dilution Line*	RE-4268	1.06E+03

The values are rounded for ease of operator use and to provide a step-wise progression through the emergency classification levels. The resulting values used in the DAEC RU1.1 EAL are shown in the NOUE column below:

Table R-1 - Effluent Monitor Classification Thresholds

	Monitor	GE	SAE	Alert	NOUE
Gaseous	Reactor Building ventilation rad monitor (Kaman 3/4, 5/6, 7/8)	1.0E+00 uci/cc	1.0E-01 uci/cc	1.0E-02 uci/cc	1.0E-03 uci/cc
Gaseous	Turbine Building ventilation rad monitor (Kaman 1/2)	1.0E+00 uci/cc	1.0E-01 uci/cc	1.0E-02 uci/cc	1.0E-03 uci/cc
Gaseous	Offgas Stack rad monitor (Kaman 9/10)	4.5E+03 uci/cc	4.5E+02 uci/cc	4.5E+01 uci/cc	2.0E-01 uci/cc
Gaseous	LLRPSF rad monitor (Kaman 12)	---	1.0E-01 uci/cc	1.0E-02 uci/cc	1.0E-03 uci/cc
Liquid	GSW rad monitor (RIS-4767)	---	---	2.0E+04 cps	2.0E+03 cps
Liquid	RHRSW & ESW rad monitor (RM-1997)	---	---	1.0E+04 cps	8.0E+02 cps
Liquid	RHRSW & ESW Rupture Disc rad monitor (RM-4268)	---	---	2.0E+04 cps	1.0E+03 cps

ENERCON Excellence—Every project. Every day.	CALCULATION COVER SHEET	CALC NO. NEE-323-CALC-003
		REV. 00
		PAGE NO. 1 of 9

Title:	Documentation of the RU1 Emergency Action Levels	Client: Duane Arnold Energy Center
		Project Identifier: NEE-323

Item	Cover Sheet Items	Yes	No
1	Does this calculation contain any open assumptions, including preliminary information, that require confirmation? (If **YES**, identify the assumptions.)	☒	☐
2	Does this calculation serve as an "Alternate Calculation"? (If **YES**, identify the design verified calculation.) **Design Verified Calculation No.** _____	☐	☒
3	Does this calculation supersede an existing Calculation? (If **YES**, identify the design verified calculation.) **Superseded Calculation No.** _____	☐	☒

Scope of Revision:
Initial Issue

Revision Impact on Results:
Initial Issue

Study Calculation ☐ **Final Calculation** ☒

Safety-Related ☐ **Non-Safety-Related** ☒

(Print Name and Sign)

Originator: Jay Bhatt	**Date: 12/12/17**
Design Verifier[1] (Reviewer if NSR): Ryan Skaggs	**Date: 12/12/17**
Approver: Aaron Holloway	**Date: 12/12/17**

Note 1: For non-safety-related calculation, design verification can be substituted by review.

ENERCON Excellence—Every project. Every day.	CALCULATION REVISION STATUS SHEET	CALC NO. NEE-323-CALC-003 REV. 00

CALCULATION REVISION STATUS

REVISION	DATE	DESCRIPTION
00	12/12/17	Initial Issue

PAGE REVISION STATUS

PAGE NO.	REVISION	PAGE NO.	REVISION
All	00		

APPENDIX/ATTACHMENT REVISION STATUS

APPENDIX NO.	NO. OF PAGES	REVISION NO.	ATTACHMENT NO.	NO. OF PAGES	REVISION NO.
			1	4	00
			2	18	00
			3	9	00

1.0 Purpose and Scope

The Duane Arnold Energy Center site is implementing the guidance of Revision 6 to the Document NEI 99-01, "Development of Emergency Action Levels for Non-Passive Reactors," which is the industry-developed methodology for emergency classification for the current operating fleet. Changes to the definitions of the condition for entry into the Emergency Action Level (EAL) RU1 result in the development of a new entry threshold value for this EAL.

This calculation provides calculated threshold values for the following EALs (from NEI 99-01, Rev. 6). Note that NEI 99-01 designates abnormal radiological conditions as "AU," NEE has adopted the "RU" designation permitted under the guidance.

(1) Reading on ANY effluent radiation monitor greater than 2 times the (site-specific effluent release controlling document) limits for 60 minutes or longer.

(2) Reading on ANY effluent radiation monitor greater than 2 times the alarm setpoint established by a current radioactivity discharge permit for 60 minutes or longer.

This calculation uses the latest radiation monitor setpoints to determine the resultant EAL thresholds.

2.0 Summary of Results and Conclusions

Values for the RU1 Gaseous EALs were determined and are shown below.

Table 1 – Gaseous Effluent Setpoints

Location	Detector	RU1 Threshold (μCi/cc)
Offgas Stack	Kaman 10	1.97E-01
Turbine Building Vent	Kaman 2	7.74E-04
Reactor Building Vent	Kaman 4	6.00E-04
Reactor Building Vent	Kaman 6	9.60E-04
Reactor Building Vent	Kaman 8	9.60E-04
LLRPSF Building Vent	Kaman 12	1.19E-03

Values for the Liquid Effluent RU1 EALs were determined and are shown below.

Table 2 – Liquid Effluent Setpoints

Location	Equipment ID	RU1 Unusual Event Level (cps)
GSW	RE-4767	1.53E+03
RHRSW/ESW	RE-1997	8.42E+02
RHRSW Dilution Line*	RE-4268	1.06E+03

*RE-4268 was previously known as the RHRSW Rupture Disk

3.0 References

3.1 NEI 99-01, Revision 6, "Development of Emergency Action Levels for Non-Passive Reactors." November 2012.

3.2 DAEC Offsite Dose Assessment Manual (ODAM), Rev. 37.

3.3 Plant Chemistry Procedure PCP 8.3, Alarm Setpoints and Background Determination for KAMAN Normal Range Monitors.

3.4 Plant Chemistry Procedure PCP 8.7, Alarm Setpoints For Liquid Rad Monitors.

3.5 Technical Specifications, Section 5.5.4, Radioactive Effluent Controls Program.

3.6 DAEC Emergency Plan, Section 'I', Rev. 27

4.0 Assumptions

It is assumed that the current setpoint for the Kaman 4 monitor is 3.00E-04 μCi/cc. The latest setpoint determination received is from 3/4/2016 which exceeds the 18 month frequency specified by PCP 8.3.

5.0 Design Inputs

5.1 The setpoint determinations from Attachment 2 and Attachment 3, represent the latest responses at the associated gaseous and liquid effluent monitors. While the three most recent surveillances for each monitor are included for information, only the latest setpoint is used to determine the EAL threshold. It should be noted that the "RM" equipment designations are equivalent to the "RE" equipment IDs.

5.2 The gaseous effluent equipment ID number, monitor common name and range are taken from DAEC Emergency Plan Section "I" and ODAM Figure 3-1, and are presented in Table 3.

Table 3 – Gaseous Effluent Design Inputs

Location	Monitor Common Name	Equipment ID	Monitor Range (μCi/cc)
Offgas Stack	KAMAN 9/10	RE-4176, RE-4175	1E-07 - 1E+05
Turbine Building Vent	KAMAN 1/2	RE-5945 / RE-5946	1E-07 - 1E+05
Reactor Building Vent	KAMAN 3/4 KAMAN 5/6 KAMAN 7/8	RE-7645, RE-7644 RE-7647, RE-7646 RE-7649, RE-7648	1E-07 - 1E+05
LLRPSF Building Vent	KAMAN 12	RE-8801	1E-07 - 3E-01

5.3 The liquid effluent equipment ID number, and range are taken from ODAM Table I-2, and are presented in Table 4.

Table 4 – Liquid Effluent Design Inputs

Location	Equipment ID	Monitor Range (cps)
GSW	RE-4767	1E-01 - 1E+06
RHRSW/ESW	RE-1997	1E-01 - 1E+06
RHRSW Dilution Line	RE-4268	1E-01 - 1E+06

6.0 Methodology

The alarm setpoint of a radioactive noble gas effluent monitor is calculated on the basis of whole body dose equivalent rate offsite of 500 mrem/yr per the ODAM. The alarm setpoint for liquid radwaste effluent line provides automatic isolation when 10 times the water effluent concentration listed in 10 CFR 20 Appendix B, Table 2, is being exceeded in the unrestricted area per the ODAM. These setpoints are in accordance with Technical Specifications limits specified in 5.5.4b and 5.5.4g. This calculation considers historical setpoint determination for gaseous release (PCP 8.3) and liquid effluent (PCP 8.7). The latest three setpoints for each monitor were reviewed. Due to the high variance for some of the monitors, the latest alarm setpoint is used to determine the EAL thresholds.

7.0 Calculation

7.1 Gaseous Setpoints

Plant Chemistry Procedure PCP 8.3 is used by Chemistry Technicians to calculate setpoints for building vent KAMAN monitors at least once every 18 months. The three latest setpoint determinations for each location are shown in Attachment 2 for information. It should be noted that where the original PCP 8.3 setpoint calculation sheet is unavailable, the value is taken from the associated monitor calibration procedure.

Thresholds corresponding to the latest setpoints are calculated and presented here. For example the latest PCP 8.3 setpoint for Offgas stack is 9.84E-02 µCi/cc. This value is doubled to 1.97E-01 µCi/cc to correspond to the RU1 threshold. The remaining threshold values are shown in Table 5.

Table 5 – Gaseous Effluent Setpoints and Thresholds

Location	Detector	Latest PCP 8.3 Setpoint (µCi/cc)	RU1 Threshold (µCi/cc)
Offgas Stack	Kaman 10	9.84E-02	1.97E-01
Turbine Building Vent	Kaman 2	3.87E-04	7.74E-04
Reactor Building Vent	Kaman 4	3.00E-04	6.00E-04
Reactor Building Vent	Kaman 6	4.80E-04	9.60E-04
Reactor Building Vent	Kaman 8	4.80E-04	9.60E-04
LLRPSF Building Vent	Kaman 12	5.95E-04	1.19E-03

7.2 Liquid Setpoints

As a result of variability in the isotopic mix of reactor water, background radiation levels and detector efficiencies, the calculated liquid effluent setpoints will fluctuate over time.

Chemistry Technicians perform effluent liquid radiation monitor setpoint calculations at least once per 18 months with guidance provided by Plant

Chemistry Procedure PCP 8.7. The three latest setpoint determinations for each location are shown in Attachment 3. It should be noted that where the original PCP 8.7 setpoint calculation sheet is unavailable, the value is taken from the associated monitor calibration procedure.

Thresholds corresponding to the latest setpoints are calculated and presented here. For example the latest PCP 8.7 setpoint for the RHRSW Dilution Line is 421 cps. This value is doubled to 842 cps to correspond to the RU1 threshold. The remaining threshold values are shown in Table 6.

Table 6 – Liquid Effluent Setpoints and Thresholds

Location	Latest PCP 8.7 Setpoint (cps)	RU1 Threshold (cps)
GSW	7.65E+02	1.53E+03
RHRSW/ESW	4.21E+02	8.42E+02
RHRSW Dilution Line	5.30E+02	1.06E+03

8.0 Computer Software

None.

9.0 Impact Assessment

This calculation is based on "realistic" conditions for the purpose of declaring EALs, rather than typical conservative "bounding" type design basis analyses. The calculation documents the order of magnitude setpoints to assist Operations and Emergency Response personnel in determining an unusual event in accordance with NEI 99-01 Rev. 6.

CHECKLIST ITEMS[1]		YES	NO	N/A
GENERAL REQUIREMENTS				
1.	If the calculation is being performed to a client procedure, is the procedure being used the latest revision?	☐	☐	☒
The calculation is being prepared to ENERCON's procedures.				
2.	Are the proper forms being used and are they the latest revision?	☒	☐	☐
3.	Have the appropriate client review forms/checklists been completed?	☐	☐	☒
The calculation is being prepared to ENERCON's procedures.				
4.	Are all pages properly identified with a calculation number, calculation revision and page number consistent with the requirements of the client's procedure?	☒	☐	☐
5.	Is all information legible and reproducible?	☒	☐	☐
6.	Is the calculation presented in a logical and orderly manner?	☒	☐	☐
7.	Is there an existing calculation that should be revised or voided?	☐	☒	☐
This is a new calculation to support implementing NEI 99-01 Rev. 6				
8.	Is it possible to alter an existing calculation instead of preparing a new calculation for this situation?	☐	☒	☐
9.	If an existing calculation is being used for design inputs, are the key design inputs, assumptions and engineering judgments used in that calculation valid and do they apply to the calculation revision being performed.	☒	☐	☐
10.	Is the format of the calculation consistent with applicable procedures and expectations?	☒	☐	☐
11.	Were design input/output documents properly updated to reference this calculation?	☐	☐	☒
12.	Can the calculation logic, methodology and presentation be properly understood without referring back to the originator for clarification?	☒	☐	☐
OBJECTIVE AND SCOPE				
13.	Does the calculation provide a clear concise statement of the problem and objective of the calculation?	☒	☐	☐
14.	Does the calculation provide a clear statement of quality classification?	☒	☐	☐
15.	Is the reason for performing and the end use of the calculation understood?	☒	☐	☐
16.	Does the calculation provide the basis for information found in the plant's license basis?	☒	☐	☐
17.	If so, is this documented in the calculation?	☐	☐	☒
18.	Does the calculation provide the basis for information found in the plant's design basis documentation?	☐	☒	☐

	CHECKLIST ITEMS[1]	YES	NO	N/A
19.	If so, is this documented in the calculation?	☐	☐	☒
20.	Does the calculation otherwise support information found in the plant's design basis documentation?	☐	☒	☐
21.	If so, is this documented in the calculation?	☐	☐	☒
22.	Has the appropriate design or license basis documentation been revised, or has the change notice or change request documents being prepared for submittal?	☐	☐	☒
DESIGN INPUTS				
23.	Are design inputs clearly identified?	☒	☐	☐
24.	Are design inputs retrievable or have they been added as attachments?	☒	☐	☐
25.	If Attachments are used as design inputs or assumptions are the Attachments traceable and verifiable?	☒	☐	☐
26.	Are design inputs clearly distinguished from assumptions?	☒	☐	☐
27.	Does the calculation rely on Attachments for design inputs or assumptions? If yes, are the attachments properly referenced in the calculation?	☒	☐	☐
28.	Are input sources (including industry codes and standards) appropriately selected and are they consistent with the quality classification and objective of the calculation?	☒	☐	☐
29.	Are input sources (including industry codes and standards) consistent with the plant's design and license basis?	☒	☐	☐
30.	If applicable, do design inputs adequately address actual plant conditions?	☒	☐	☐
31.	Are input values reasonable and correctly applied?	☒	☐	☐
32.	Are design input sources approved?	☒	☐	☐
33.	Does the calculation reference the latest revision of the design input source?	☒	☐	☐
34.	Were all applicable plant operating modes considered?	☒	☐	☐
ASSUMPTIONS				
35.	Are assumptions reasonable/appropriate to the objective?	☐	☐	☒
36.	Is adequate justification/basis for all assumptions provided?	☐	☐	☒
37.	Are any engineering judgments used?	☐	☒	☐
38.	Are engineering judgments clearly identified as such?	☐	☐	☒
39.	If engineering judgments are utilized as design inputs, are they reasonable and can they be quantified or substantiated by reference to site or industry standards, engineering principles, physical laws or other appropriate criteria?	☐	☐	☒

CHECKLIST ITEMS[1]		YES	NO	N/A
METHODOLOGY				
40.	Is the methodology used in the calculation described or implied in the plant's licensing basis?	☐	☒	☐
41.	If the methodology used differs from that described in the plant's licensing basis, has the appropriate license document change notice been initiated?	☐	☐	☒
42.	Is the methodology used consistent with the stated objective?	☒	☐	☐
43.	Is the methodology used appropriate when considering the quality classification of the calculation and intended use of the results?	☒	☐	☐
BODY OF CALCULATION				
44.	Are equations used in the calculation consistent with recognized engineering practice and the plant's design and license basis?	☒	☐	☐
45.	Is there reasonable justification provided for the use of equations not in common use?	☐	☐	☒
46.	Are the mathematical operations performed properly and documented in a logical fashion?	☒	☐	☐
47.	Is the math performed correctly?	☒	☐	☐
48.	Have adjustment factors, uncertainties and empirical correlations used in the analysis been correctly applied?	☒	☐	☐
49.	Has proper consideration been given to results that may be overly sensitive to very small changes in input?	☒	☐	☐
SOFTWARE/COMPUTER CODES				
50.	Are computer codes or software languages used in the preparation of the calculation?	☐	☒	☐
51.	Have the requirements of CSP 3.09 for use of computer codes or software languages, including verification of accuracy and applicability been met?	☐	☐	☒
52.	Are the codes properly identified along with source vendor, organization, and revision level?	☐	☐	☒
53.	Is the computer code applicable for the analysis being performed?	☐	☐	☒
54.	If applicable, does the computer model adequately consider actual plant conditions?	☐	☐	☒
55.	Are the inputs to the computer code clearly identified and consistent with the inputs and assumptions documented in the calculation?	☐	☐	☒
56.	Is the computer output clearly identified?	☐	☐	☒
57.	Does the computer output clearly identify the appropriate units?	☐	☐	☒

CHECKLIST ITEMS[1]		YES	NO	N/A
58.	Are the computer outputs reasonable when compared to the inputs and what was expected?	☐	☐	☒
59.	Was the computer output reviewed for ERROR or WARNING messages that could invalidate the results?	☐	☐	☒
RESULTS AND CONCLUSIONS				
60.	Is adequate acceptance criteria specified?	☒	☐	☐
61.	Are the stated acceptance criteria consistent with the purpose of the calculation, and intended use?	☒	☐	☐
62.	Are the stated acceptance criteria consistent with the plant's design basis, applicable licensing commitments and industry codes, and standards?	☒	☐	☐
63.	Do the calculation results and conclusions meet the stated acceptance criteria?	☒	☐	☐
64.	Are the results represented in the proper units with an appropriate tolerance, if applicable?	☒	☐	☐
65.	Are the calculation results and conclusions reasonable when considered against the stated inputs and objectives?	☒	☐	☐
66.	Is sufficient conservatism applied to the outputs and conclusions?	☒	☐	☐
67.	Do the calculation results and conclusions affect any other calculations?	☐	☒	☐
68.	If so, have the affected calculations been revised?	☐	☐	☒
69.	Does the calculation contain any conceptual, unconfirmed or open assumptions requiring later confirmation?	☐	☒	☐
70.	If so, are they properly identified?	☐	☐	☒
DESIGN REVIEW				
71.	Have alternate calculation methods been used to verify calculation results?	☐	☐	☒
No, a Design Review was performed.				

Note:

1. Where required, provide clarification/justification for answers to the questions in the space provided below each question. An explanation is required for any questions answered as "No' or "N/A".

Originator: Jay Bhatt — 12/12/17

Print Name and Sign — Date

PLANT CHEMISTRY PROCEDURES 3200 MANUAL	PCP 8.3
ALARM SETPOINTS AND BACKGROUND DETERMINATION FOR KAMAN NORMAL RANGE MONITORS	Rev. 33 Page 14 of 14

ATTACHMENT 2

KAMAN OFFGAS STACK GASEOUS DETECTOR HI HI SETPOINT

1. Sample I.D. K10 CHARMAR
2. Sample No. 17-5560
3. Sample Date 8-30-17
4. Sample Time 0854
5. MWT 1906
6. Count Date 8-30-17
7. Count Time 0915
8. Monitor Reading (μCi/cc) ~~770e-6~~ 7.70e-7
9. Process Flow Rate (CFM) ~~5.17e-3~~ 10,000
10. Sample Volume (mL) 4.50e4 cc

Flow meter ID # L729 Cal Due Date 10-6-17

Isotope	11 μCi/mL k_i	12 Dose Factor Stack * $\frac{\text{mrem sec}}{\text{yr - μCi}}$	13 k_i x DFSi
Xe 133		4.09E-5	
Kr 85m		1.81E-4	
Kr 88		1.91E-3	
Xe 135		2.84E-4	
Kr 87		6.97E-4	
Xe 138		1.08E-3	
Xe 135m		3.39E-4	
Xe 133m		3.61E-5	
Ar 41		1.32E-3	
N 13	1.41e-7 ✓	1.08E-3 **	1.52e-10 ✓

14. Bkg = instrument background
Bkg = 2.15e-7 μCi/cc

* These dose factors are from ODAM: stack release at a distance of 1260 meters NNW of DAEC

** Arbitrarily set equal to Xe-138

15. $\sum k_i$ = 1.41e-7 ✓

15a. $\sum_i (k_i \cdot DFS_i)$ 1.52e-10 ✓

15b. $\frac{\sum ki}{\sum (ki \cdot DFSi)} = \frac{(\#15)}{(\#15a)} = \frac{1.41e^{-7}}{1.52e^{-10}} = 9.28e^2$ ✓

16. Limit = $L = \frac{1.06}{F} \times \frac{\sum k_i}{\sum (k_i \cdot DFS_i)} = \frac{1.06}{(\#9)}$ x (The Less of **#15b** OR 3436)

Limit = L = $\frac{1.06}{(10,000)}$ (928) = 9.84e-2 ✓

17. Hi Hi ALARM = A x (**#16**) = (1.0) (9.84e-2) = 9.84e-2 μCi/cc ✓

The radioactive gas flow corresponding to the HI Hi setpoint:

Performed by: [signature] Date: 8-30-17

Independent Verification by: [signature] Date: 8-30-17

PLANT CHEMISTRY PROCEDURES 3200 MANUAL	PCP 8.3
ALARM SETPOINTS AND BACKGROUND DETERMINATION FOR KAMAN NORMAL RANGE MONITORS	Rev. 33 Page 14 of 14

ATTACHMENT 2

KAMAN OFFGAS STACK GASEOUS DETECTOR HI HI SETPOINT

1. Sample I.D. K10 Char Mar
2. Sample No. 16-1390
3. Sample Date 2-26-16
4. Sample Time 1520
5. MWT 1911
6. Count Date 2-26-16
7. Count Time 1558
8. Monitor Reading (μCi/cc) 6.61e-7
9. Process Flow Rate (CFM) 10,000
10. Sample Volume (mL) 45,000 mL

Flow meter ID # L729 Cal Due Date 10-6-17

Isotope	11 μCi/mL k_i	12 Dose Factor Stack * mrem sec / yr - μCi	13 k_i x DFSi
Xe 133	4.27e-9	4.09E-5	1.75e-13
Kr 85m	2.02e-9	1.81E-4	3.66e-13
Kr 88		1.91E-3	
Xe 135	3.35e-9	2.84E-4	9.51e-13
Kr 87	2.93e-9	6.97E-4	2.04e-12
Xe 138		1.08E-3	
Xe 135m		3.39E-4	
Xe 133m		3.61E-5	
Ar 41	3.07e-9	1.32E-3	4.05e-12
N 13	9.75e-8	1.08E-3 **	1.05e-10

14. Bkg = instrument background
Bkg = 1.08e-6 μCi/cc

* These dose factors are from ODAM: stack release at a distance of 1260 meters NNW of DAEC

** Arbitrarily set equal to Xe-138

15. $\sum k_i$ = 1.13e-7

15a. $\sum_i (k_i \bullet DFS_i)$ 1.13e-10

15b. $\frac{\sum ki}{\sum (ki \bullet DFSi)} = \frac{(\#15)}{(\#15a)} = \frac{1.13e-7}{1.13e-10} =$ 1.00e3

16. Limit = $L = \frac{1.06}{F} \times \frac{\sum k_i}{\sum (k_i \bullet DFS_i)} = \frac{1.06}{(\#9)}$ x (The Less of **#15b** OR 3436)

Limit = L = $\frac{1.06}{(10000)}$ (1000) = ~~0.106~~ JAA 2-26-16 1.06e-1

17. Hi Hi ALARM = A x (**#16**) = (1.0) (1.06e-1) = 1.06e-1 μCi/cc

The radioactive gas flow corresponding to the HI Hi setpoint:

Performed by: [signature] / [signature] Date: 2-26-16

Independent Verification by: [signature] Date: 2-26-16

DAEC DUANE ARNOLD ENERGY CENTER	SURVEILLANCE TEST PROCEDURE TITLE: **K10 CALIBRATION**	STP NS791013 Page 10 of 68 Rev. 17
Prerequisites	Performance Date: 18-APR-2014	INITIALS

4-21-14

6.0 PREREQUISITES

6.1 Make a copy of the EMS database display. JKM (CHEM)

6.2 From the Chemistry Supervisor or designee, obtain and record the following alarm setpoints. (Values will be used to confirm AS FOUND data.)

6.2.1 HI 8.60 E-6 μCi/cc JK (CHEM)

6.2.2 HIHI 3.64 E-1 μCi/cc JK (CHEM)

6.3 From the Chemistry Supervisor or designee, obtain and record the desired New HI alarm setpoint. (Value will be used for the AS LEFT setpoint.)

6.3.1 Desired HI 8.60 E-6 μCi/cc JK (CHEM)

6.4 Verify Sr-90 0.09 μCi source (UID #687) is available for use. JK (CHEM)

6.5 Verify the KAMAN/EMS IDT time and the HPGe System Computer time are within ± 30 seconds. JK (CHEM) TM

JK

NOTE

When Kaman point sources are decay corrected, decay is to be from the date marked on the source to the test date.

6.6 Decay correct permissible range (8.5E4 – 9.0E4 cpm) for UID #687 and record below. JK (CHEM)

PERMISSIBLE DECAY CORRECTED RANGE:

3.88 E4 cpm to 4.11 E4 cpm SF (IV)

PLANT CHEMISTRY PROCEDURES 3200 MANUAL	PCP 8.3
ALARM SETPOINTS AND BACKGROUND DETERMINATION FOR KAMAN NORMAL RANGE MONITORS	Rev. 33 Page 13 of 14

ATTACHMENT 1

VENT MONITORS GASEOUS DETECTOR HI HI SETPOINT

1. Sample I.D. K-2 Charmar
2. Sample No. 17-2746
3. Sample Date 5-5-17
4. Sample Time 1342-1410
5. MWT 1911
6. Count Date 5-5-17
7. Count Time 1415
8. Monitor Reading (μCi/cc) 2.70E-7
9. Process Flow Rate (CFM) 72000
10. Sample Volume (mL) 47,600

Isotope	11 k_i μCi/mL	12 Dose Factor Vent DFV_i $\frac{mrem}{yr}$ $\frac{m^3}{\mu Ci}$	13 Product $k_i \times DFV_i$
Xe 133		294	
Kr 85m		1.17E3	
Kr 88		1.47E4	
Xe 135		1.81E3	
Kr 87		5.92E3	
Xe 138		8.83E3	
Xe 135m		3.12E3	
Xe 133m		2.51E2	
Ar 41		8.84E3	
N 13	4.71 E-9	8.83E3 **	4.16 E-5
16. $\sum k_i$ = 4.71 E-9		**16a.** $\sum(k_i\ DFV_i)$ = 4.16 E-5	

Flow Meter ID# L-729

Cal Due Date: 10-06-17

14. Bkg = Instrument background
Bkg = 1.76 E-7 μCi/cc

15. X/Q = 4.3 x 10^{-6} sec/m^3 (atmospheric dispersion)

** Arbitrarily set equal to Xe-138

16b. $\frac{\sum k_i}{\sum(k_i \cdot DFV_i)} = \frac{(\#16)}{(\#16a)} = \frac{4.71\ E-9}{4.16\ E-5} =$ 1.13 E-4

17. Limit = L = $\frac{1.06}{(F)(X/Q)} \times \frac{\sum ki}{\sum (ki \bullet DFVi)} = \frac{1.06}{(\#9)(\#15)}$ x (The lesser of **#16b** OR 1.81E-4) =

Limit = L = $\frac{1.06}{(72000)(4.3\ E-6)}$ (1.13 E-4) = 3.87 E-4

18. Hi Hi ALARM = A x (**#17**) = (1.0) (3.87 E-4) = 3.87 E-4 μCi/cc
The radioactive gas flow corresponding to the Hi Hi setpoint:

Performed by: JCM Date: 05-05-17

Independent Verification by: RK Date: 5-5-17

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ATTACHMENT 1

VENT MONITORS GASEOUS DETECTOR HI HI SETPOINT

1. Sample I.D. Kaman 2 2. Sample No. 16-841
3. Sample Date 2-5-16 4. Sample Time 11:13 5. MWT 1911
6. Count Date 2-5-16 7. Count Time 11:19
8. Monitor Reading (μCi/cc) 4.65e-8 **9.** Process Flow Rate (CFM) 72,000
10. Sample Volume (mL) 45,000

Isotope	11 k_i μCi/mL	12 Dose Factor Vent DFV_i mrem/yr · m³/μCi	13 Product $k_i \times DFV_i$
Xe 133	none identified	294	none identified
Kr 85m	↓	1.17E3	↓
Kr 88		1.47E4	
Xe 135		1.81E3	
Kr 87		5.92E3	
Xe 138		8.83E3	
Xe 135m		3.12E3	
Xe 133m		2.51E2	
Ar 41		8.84E3	
N 13	7.05e-9	8.83E3 **	6.23e-5
16. Σk_i =	7.05e-9	**16a.** $\Sigma(k_i DFV_i)$ =	6.23e-5

Flow Meter ID# L729

Cal Due Date: 10-6-17

14. Bkg = Instrument background
Bkg = 6.35e-7 μCi/cc

15. X/Q = 4.3 x 10⁻⁶ sec/m³ (atmospheric dispersion)

** Arbitrarily set equal to Xe-138

16b $\frac{\Sigma k_i}{\Sigma(k_i \bullet DFV_i)} = \frac{(\#16)}{(\#16a)} = \frac{7.05e^{-9}}{6.23e^{-5}} = 1.13e^{-4}$

17. Limit = L = $\frac{1.06}{(F)(X/Q)} \times \frac{\Sigma\ ki}{\Sigma\ (ki \bullet DFVi)} = \frac{1.06}{(\#9)(\#15)}$ x (The lesser of **#16b** OR 1.81E-4) =

Limit = L = $\frac{1.06}{(72{,}000)(4.3 \times 10^{-6})}$ (1.13e⁻⁴) = 3.87e⁻⁴

18. Hi Hi ALARM = A x (**#17**) = (1.0) (3.87e⁻⁴) = 3.87e⁻⁴ μCi/cc
The radioactive gas flow corresponding to the Hi Hi setpoint:

Performed by: [signature] Date: 2-5-16

Independent Verification by: [signature] Date: 2-5-16

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ATTACHMENT 1

VENT MONITORS GASEOUS DETECTOR HI HI SETPOINT

1. Sample I.D. Kaman 2
2. Sample No. 14-2682
3. Sample Date 5-8-14
4. Sample Time 12:37 – 13:03
5. MWT 1907
6. Count Date 5-8-14
7. Count Time 1324
8. Monitor Reading (μCi/cc) 2.18e-7
9. Process Flow Rate (CFM) 72000
10. Sample Volume (mL) 49400

Isotope	11 k_i μCi/mL	12 Dose Factor Vent DFV_i $\frac{mrem}{yr}$ $\frac{m^3}{\mu Ci}$	13 Product k_i x DFV_i
Xe 133	NONE	294	NONE
Kr 85m	|	1.17E3	|
Kr 88	|	1.47E4	|
Xe 135	|	1.81E3	|
Kr 87	|	5.92E3	|
Xe 138	|	8.83E3	|
Xe 135m	|	3.12E3	|
Xe 133m	|	2.51E2	|
Ar 41	NONE	8.84E3	NONE
N 13	7.84e-9	8.83E3 **	6.92e-5
16. Σk_i =	7.84e-9	**16a.** $\Sigma (k_i\ DFV_i)$ =	6.92e-5

Flow Meter ID# L715

Cal Due Date: 7-22-16

14. Bkg = Instrument background
Bkg = 1.10e-6 μCi/cc

15. X/Q = 4.3 x 10^{-6} sec/m^3 (atmospheric dispersion)

** Arbitrarily set equal to Xe-138

16b. $\frac{\Sigma k_i}{\Sigma(k_i \cdot DFV_i)} = \frac{(\ \#16\ )}{(\ \#16a\ )} = \frac{7.84e\text{-}9}{6.92e\text{-}5} = 1.13e\text{-}4$

17. Limit = L = $\frac{1.06}{(F)(X/Q)}$ x $\frac{\Sigma\ ki}{\Sigma\ (ki \cdot DFVi)} = \frac{1.06}{(\ \#9\ )(\ \#15\ )}$ x (The lesser of **#16b** OR 1.81E-4) =

Limit = L = $\frac{1.06}{(\ 72000\ )(\ 4.3e\text{-}6\ )}$ (1.13e-4) = 3.87e-4 ✓

18. Hi Hi ALARM = A x (**#17**) = (1.0) (3.87e-4) = 3.87e-4 μCi/cc
The radioactive gas flow corresponding to the Hi Hi setpoint:

Performed by: Kelly Date: 5-8-14

Independent Verification by: Tom Morr Date: 5-8-14

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ATTACHMENT 1

VENT MONITORS GASEOUS DETECTOR HI HI SETPOINT

1. Sample I.D. Kamen 4
2. Sample No. 16-1551
3. Sample Date 3-4-16
4. Sample Time 1147
5. MWT 1911
6. Count Date 3-4-16
7. Count Time 1156
8. Monitor Reading (μCi/cc) 4.48e-8
9. Process Flow Rate (CFM) 93,000
10. Sample Volume (mL) 45,000

Isotope	11 k_i μCi/mL	12 Dose Factor Vent DFV_i mrem/yr · m³/μCi	13 Product k_i x DFV_i
Xe 133	None identified	294 NONE IDENTIFIED	
Kr 85m	↓	1.17E3 ↓	↓
Kr 88		1.47E4	
Xe 135		1.81E3	
Kr 87		5.92E3	
Xe 138		8.83E3	
Xe 135m		3.12E3	
Xe 133m		2.51E2	
Ar 41		8.84E3	
N 13	6.19e-9	8.83E3 **	5.47e-5
16. Σk_i = 6.19e-9		16a. $\Sigma(k_i DFV_i)$ = 5.47e-5	

Flow Meter ID# L729

Cal Due Date: 10/6/17

14. Bkg = Instrument background
Bkg = 6.19e-9 μCi/cc

15. X/Q = 4.3 x 10⁻⁶ sec/m³ (atmospheric dispersion)

** Arbitrarily set equal to Xe-138

16b. $\frac{\Sigma k_i}{\Sigma(k_i \cdot DFV_i)} = \frac{(\#16)}{(\#16a)} = \frac{6.19e-9}{5.47e-5} = 1.13e-4$

17. Limit = L = $\frac{1.06}{(F)(X/Q)} \times \frac{\Sigma k_i}{\Sigma(k_i \bullet DFV_i)} = \frac{1.06}{(\#9)(\#15)}$ x (The lesser of **#16b** OR 1.81E-4) =

Limit = L = $\left(\frac{1.06}{(93000)(4.3e-6)}\right)(1.13e-4)$ = 3.00e-4

18. Hi Hi ALARM = A x (**#17**) = (1.0) (3.00e-4) = 3.00e-4 μCi/cc
The radioactive gas flow corresponding to the Hi Hi setpoint:

Performed by: [signature] (JM) Date: 3-4-6

Independent Verification by: [signature] Date: 3-4-6

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ATTACHMENT 1

VENT MONITORS GASEOUS DETECTOR HI HI SETPOINT

1. Sample I.D. KAMAN 4 CHARMAN 2. Sample No. 14-7631
3. Sample Date 12-9-14 4. Sample Time 1130 5. MWT 1036
6. Count Date 12-9-14 7. Count Time 1138 (Z 12-9-14)
8. Monitor Reading (μCi/cc) 5.47E-9 **9.** Process Flow Rate (CFM) ~~5.70E4~~ 93000
10. Sample Volume (mL) ~~46600~~

Isotope	11 k_i μCi/mL	12 Dose Factor Vent DFV_i $\frac{mrem}{yr}$ $\frac{m^3}{\mu Ci}$	13 Product k_i x DFV_i
Xe 133	None Identified	294	None Identified
Kr 85m		1.17E3	
Kr 88		1.47E4	
Xe 135		1.81E3	
Kr 87		5.92E3	
Xe 138		8.83E3	
Xe 135m		3.12E3	
Xe 133m		2.51E2	
Ar 41		8.84E3	
N 13		8.83E3 **	
16. Σk_i =	N/A	**16a.** $\Sigma(k_i\ DFV_i)$ =	N/A

Flow Meter ID# L-760

Cal Due Date: 7-11-17

14. Bkg = Instrument background
Bkg = 5.45E-7 μCi/cc

15. $X/Q = 4.3 \times 10^{-6}$ sec/m³ (atmospheric dispersion)

** Arbitrarily set equal to Xe-138

16b. $\frac{\Sigma k_i}{\Sigma(k_i \cdot DFV_i)} = \frac{(\#16)}{(\#16a)} = \frac{N/A}{N/A} = N/A$

17. Limit = L = $\frac{1.06}{(F)(X/Q)} \times \frac{\Sigma\ ki}{\Sigma\ (ki \cdot DFVi)} = \frac{1.06}{(\#9)(\#15)}$ x (The lesser of **#16b** OR 1.81E-4) =

Limit = L = $\frac{1.06}{(93000)(4.3E-6)}$ (1.81E-4) = 4.80E-4

18. Hi Hi ALARM = A x (**#17**) = (1.0) (4.80E-4) = 4.80E-4 μCi/cc
The radioactive gas flow corresponding to the Hi Hi setpoint:

Performed by: ZALESKY Date: 12-9-14

Independent Verification by: Tom Morri Date: 12-9-14

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ATTACHMENT 1

VENT MONITORS GASEOUS DETECTOR HI HI SETPOINT

1. Sample I.D. K-4 ~~13-1159~~ cal
2. Sample No. 13-1159
3. Sample Date 3-1-13
4. Sample Time 1330
5. MWT 1910
6. Count Date 3-1-13
7. Count Time 1338
8. Monitor Reading (µCi/cc) 1.76 E-8
9. Process Flow Rate (CFM) ~~5.79 E~~ 3-1-13 93,000
10. Sample Volume (mL) 4.18 E4

Isotope	11 k_i µCi/mL	12 Dose Factor Vent DFV_i $\frac{mrem}{yr}$ $\frac{m^3}{\mu Ci}$	13 Product $k_i \times DFV_i$
Xe 133	NONE	294	NONE
Kr 85m	IDENTIFIED	1.17E3	IDENTIFIED
Kr 88	↓	1.47E4	↓
Xe 135		1.81E3	
Kr 87		5.92E3	
Xe 138		8.83E3	
Xe 135m		3.12E3	
Xe 133m		2.51E2	
Ar 41		8.84E3	
N 13		8.83E3 **	
16. Σk_i = N/A		**16a.** $\Sigma(k_i\ DFV_i)$ = N/A	

Flow Meter ID# L760

Cal Due Date: 5-7-14

14. Bkg = Instrument background
Bkg = 5.62 E-7 µCi/cc

15. X/Q = 4.3 x 10^{-6} sec/m^3 (atmospheric dispersion)

** Arbitrarily set equal to Xe-138

16b. $\frac{\Sigma k_i}{\Sigma(k_i \cdot DFV_i)} = \frac{(\#16)}{(\#16a)} = \frac{N/A}{N/A} = N/A$

17. Limit = L = $\frac{1.06}{(F)(X/Q)} \times \frac{\Sigma\ ki}{\Sigma\ (ki \bullet DFVi)} = \frac{1.06}{(\#9)(\#15)}$ x (The lesser of **#16b** OR 1.81E-4) =

Limit = L = $\frac{1.06}{(93000)(4.3\times10^{-6})}$ (1.81 E-4) = 4.80 E-4

18. Hi Hi ALARM = A x (**#17**) = (1.0)(4.80E-4) = 4.80 E-4 µCi/cc
The radioactive gas flow corresponding to the Hi Hi setpoint:

19. Q = 472 (A · **#17**)**#9**
Q = 472 (1.0)(4.80 E-4) (93000)
Q = ~~2.11 E~~ µCi/sec 2.11 E4 uCi/sec

Performed by: [signature] / [signature] Date: 3-1-13

Independent Verification by: [signature] Date: 3-1-13

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ATTACHMENT 1

VENT MONITORS GASEOUS DETECTOR HI HI SETPOINT

1. Sample I.D. K-6 Chanmar
2. Sample No. 16-8841
3. Sample Date 11-30-16
4. Sample Time 1514
5. MWT 1911
6. Count Date 11-30-16
7. Count Time 1537
8. Monitor Reading (µCi/cc) 2.78E-7
9. Process Flow Rate (CFM) 93000
10. Sample Volume (mL) 48000

Isotope	11 k_i µCi/mL	12 Dose Factor Vent DFV_i $\frac{mrem}{yr}$ $\frac{m^3}{\mu Ci}$	13 Product $k_i \times DFV_i$
Xe 133	None Identified	294	None Identified
Kr 85m	↓	1.17E3	↓
Kr 88		1.47E4	
Xe 135		1.81E3	
Kr 87		5.92E3	
Xe 138		8.83E3	
Xe 135m		3.12E3	
Xe 133m		2.51E2	
Ar 41		8.84E3	
N 13		8.83E3 **	
16. Σk_i =	N/A	**16a.** $\Sigma (k_i\ DFV_i)$ =	N/A

Flow Meter ID# L-729

Cal Due Date 10-6-17

14. Bkg = Instrument background
Bkg = 7.67E-7 µCi/cc

15. $X/Q = 4.3 \times 10^{-6}$ sec/m^3 (atmospheric dispersion)

** Arbitrarily set equal to Xe-138

16b. $\frac{\Sigma k_i}{\Sigma(k_i \bullet DFV_i)} = \frac{(\#16)}{(\#16a)} = \_\_\_\_ =$ N/A

17. Limit = L = $\frac{1.06}{(F)(X/Q)} \times \frac{\Sigma\ ki}{\Sigma\ (ki \bullet DFVi)} = \frac{1.06}{(\#9)(\#15)}$ x (The lesser of **#16b** OR (1.81E-4)) =

Limit = L = $\frac{1.06}{(93000)(4.3E\text{-}6)}$ (1.81E-4) = 4.80E-4

18. Hi Hi ALARM = A x (**#17**) = (1.0) (4.80E-4) = 4.80E-4 µCi/cc
The radioactive gas flow corresponding to the Hi Hi setpoint:

Performed by: [signature] Date: 11-30-16

Independent Verification by: [signature] Date: 11-30-16

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ATTACHMENT 1

VENT MONITORS GASEOUS DETECTOR HI HI SETPOINT

1. Sample I.D. NS791009 K-6 2. Sample No. 15-2125
3. Sample Date 4-16-15 4. Sample Time 1600 5. MWT 1911
6. Count Date 4-16-15 7. Count Time 1614
8. Monitor Reading (μCi/cc) 1.70E-7 **9.** Process Flow Rate (CFM) 93,000
10. Sample Volume (mL) 4.25E4

Isotope	11 k_i μCi/mL	12 Dose Factor Vent DFV_i $\frac{mrem}{yr}$ $\frac{m^3}{\mu Ci}$	13 Product k_i x DFV_i
Xe 133	None Identified	294	None Identified
Kr 85m	↓	1.17E3	↓
Kr 88		1.47E4	
Xe 135		1.81E3	
Kr 87		5.92E3	
Xe 138		8.83E3	
Xe 135m		3.12E3	
Xe 133m		2.51E2	
Ar 41		8.84E3	
N 13		8.83E3 **	
16. Σk_i = N/A		**16a.** $\Sigma (k_i\ DFV_i)$ =	N/A

Flow Meter ID# L729

Cal Due Date: 10-6-17

14. Bkg = Instrument background
Bkg = ________ μCi/cc

15. X/Q = 4.3 x 10^{-6} sec/m^3 (atmospheric dispersion)

** Arbitrarily set equal to Xe-138

16b. $\frac{\Sigma k_i}{\Sigma(k_i \bullet DFV_i)} = \frac{(\#16)}{(\#16a)} =$ ________ = N/A

17. Limit = L = $\frac{1.06}{(F)(X/Q)} \times \frac{\Sigma\ ki}{\Sigma\ (ki \bullet DFVi)} = \frac{1.06}{(\#9)(\#15)}$ x (The lesser of **#16b** OR 1.81E-4) =

Limit = L = $\frac{1.06}{(93{,}000)(4.3E-6)}$ (1.81E-4) = 4.80E-4

18. Hi Hi ALARM = A x (**#17**) = (1.0) (4.80E-4) = 4.80E-4 μCi/cc
The radioactive gas flow corresponding to the Hi Hi setpoint:

Performed by: [signature] Date: 4-16-15

Independent Verification by: ZALESKY Date: 4-16-15

DAEC DUANE ARNOLD ENERGY CENTER	SURVEILLANCE TEST PROCEDURE TITLE: K6 CALIBRATION	STP NS791009 Page 64 of 66 Rev. 14
	Performance Date: 9-6-13	INITIALS

7.15.6 Record the following AS LEFT values:

a. AS LEFT HI-HI ALARM SETPOINT (from Step 7.15.4): B/Rd

4.80E-4 ~~4.80 E~~ (Rd 9-6-13 -4) μCi/cc

b. AS LEFT HI ALARM SETPOINT (from Prerequisite 6.3.1): Rd

3.5E-6 μCi/cc

c. AS LEFT BACKGROUND (from Step 7.13.50 or 7.14.49): Rd

7.84E-7 μCi/cc

7.15.7 At the Kaman EMS IDT, verify the following has been correctly entered into the EMS database:

a. HI-HI alarm setpoint (from Step 7.15.6.a) Rd

b. HI alarm setpoint (from Step 7.15.6.b) Rd

c. Background concentration (from Step 7.15.6.c) Rd

7.15.8 Update database values on the status board and in Labstats. ✓ Rd

7.15.9 Attach completed setpoint calculation documentation (Step 7.15.4) to this STP. Rd

(PRINT / SIGN)

Performed by:		Date:	Time:	Init.
Larry Isaacs	[signature]	9-6-13	1309	Rd
Richard Potter	[signature]	9-6-13	1312	B

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ATTACHMENT 1

VENT MONITORS GASEOUS DETECTOR HI HI SETPOINT

1. Sample I.D. K8 Char Mar 2. Sample No. 17-2246
3. Sample Date 4-13-17 4. Sample Time 1249 5. MWT 1900
6. Count Date 4-13-17 7. Count Time 1254
8. Monitor Reading (μCi/cc) 8.76e-9 **9.** Process Flow Rate (CFM) 93000
10. Sample Volume (mL) 47500

Isotope	11 k_i μCi/mL	12 Dose Factor Vent DFV_i $\frac{mrem}{yr}$ $\frac{m^3}{\mu Ci}$	13 Product k_i x DFV_i
Xe 133	none identified	294	none identified
Kr 85m	↓	1.17E3	↓
Kr 88		1.47E4	
Xe 135		1.81E3	
Kr 87		5.92E3	
Xe 138		8.83E3	
Xe 135m		3.12E3	
Xe 133m		2.51E2	
Ar 41		8.84E3	
N 13		8.83E3 **	
16. Σk_i =	N/A	**16a.** $\Sigma(k_i\ DFV_i)$ =	N/A

Flow Meter ID# L-729

Cal Due Date: 10-6-17

14. Bkg = Instrument background
Bkg = 4.47e-7 μCi/cc

15. X/Q = 4.3 x 10^{-6} sec/m^3 (atmospheric dispersion)

** Arbitrarily set equal to Xe-138

16b. $\frac{\Sigma k_i}{\Sigma(k_i \bullet DFV_i)} = \frac{(\#16)}{(\#16a)} =$ N/A = N/A

17. Limit = L = $\frac{1.06}{(F)(X/Q)} \times \frac{\Sigma\ ki}{\Sigma\ (ki \bullet DFVi)} = \frac{1.06}{(\#9)(\#15)}$ x (The lesser of **#16b** OR 1.81E-4) =

Limit = L = $\frac{1.06}{(93{,}000)(4.3 \times 10^{-6})}$ ($1.81e^{-4}$) = $4.80e^{-4}$

18. Hi Hi ALARM = A x(**#17**) = (1.0) ($4.80e^{-4}$) = $4.80e^{-4}$ μCi/cc
The radioactive gas flow corresponding to the Hi Hi setpoint:

Performed by: [signature] Date: 4-13-17

Independent Verification by: Rany Isaacs Date: 4-13-17

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ATTACHMENT 1

VENT MONITORS GASEOUS DETECTOR HI HI SETPOINT

1. Sample I.D. Kaman 8
2. Sample No. 15-5934
3. Sample Date 10-8-15
4. Sample Time 1130
5. MWT 1911
6. Count Date 10-8-15
7. Count Time 1139
8. Monitor Reading (µCi/cc) 7.59e-8
9. Process Flow Rate (CFM) 93000
10. Sample Volume (mL) 4.5e4

Isotope	11 k_i µCi/mL	12 Dose Factor Vent DFV_i mrem/yr m³/µCi	13 Product k_i x DFV_i
Xe 133	None Ident.	294	None
Kr 85m	↓	1.17E3	Identified
Kr 88		1.47E4	↓
Xe 135		1.81E3	
Kr 87		5.92E3	
Xe 138		8.83E3	
Xe 135m		3.12E3	
Xe 133m		2.51E2	
Ar 41	↓	8.84E3	↓
N 13	4.62e-9	8.83E3 **	4.08e-5
16. Σk_i = 4.62e-9		**16a.** $\Sigma (k_i\ DFV_i)$ = 4.08 e-5	

Flow Meter ID# 4729

Cal Due Date: 10-6-17

14. Bkg = Instrument background
Bkg = 3.33e-7 µCi/cc

15. X/Q = 4.3 x 10^{-6} sec/m³ (atmospheric dispersion)

** Arbitrarily set equal to Xe-138

16b. $\frac{\Sigma k_i}{\Sigma(k_i \cdot DFV_i)} = \frac{(\#16)}{(\#16a)} = \frac{4.62e^{-9}}{4.08e^{-5}} = 1.13e^{-4}$

17. Limit = L = $\frac{1.06}{(F)(X/Q)} \times \frac{\Sigma\ ki}{\Sigma\ (ki \bullet DFVi)} = \frac{1.06}{(\#9)(\#15)}$ x (The lesser of **#16b** OR 1.81E-4) =

Limit = L = $\frac{1.06}{(93000)(4.3e^{-6})}$ ($1.13e^{-4}$) = ~~2.99~~ 10-8-15 $3.00e^{-4}$

18. Hi Hi ALARM = A x (**#17**) = (1.0) ($3.00e^{-4}$) = $3.00e^{-4}$ µCi/cc

The radioactive gas flow corresponding to the Hi Hi setpoint:

Performed by: [signature] Date: 10-8-15

Independent Verification by: [signature] Date: 10-8-15

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ATTACHMENT 1

VENT MONITORS GASEOUS DETECTOR HI HI SETPOINT

1. Sample I.D. Kaman 8 2. Sample No. 14 - 2491
3. Sample Date 4-29-14 4. Sample Time 1103 5. MWT 1901
6. Count Date 4-29-14 7. Count Time 1110
8. Monitor Reading (μCi/cc) 1.22 E-7 9. Process Flow Rate (CFM) 93000 ✓
10. Sample Volume (mL) 48600

Isotope	11 k_i μCi/mL	12 Dose Factor Vent DFV_i mrem/yr · m³/μCi	13 Product k_i x DFV_i
Xe 133	NONE	294	NONE
Kr 85m	IDentified	1.17E3	Identified
Kr 88	|	1.47E4	|
Xe 135	|	1.81E3	|
Kr 87	|	5.92E3	|
Xe 138	|	8.83E3	|
Xe 135m	|	3.12E3	|
Xe 133m	|	2.51E2	|
Ar 41	|	8.84E3	|
N 13	|	8.83E3 **	|
16. $\sum k_i$ = N/A		**16a.** $\sum (k_i\, DFV_i)$ = N/A	

Flow Meter ID# L 760

Cal Due Date: 5-7-14

14. Bkg = Instrument background
Bkg = N/A μCi/cc

15. X/Q = 4.3 x 10^{-6} sec/m³
(atmospheric dispersion)

** Arbitrarily set equal to Xe-138

16b. $\frac{\sum k_i}{\sum(k_i \cdot DFV_i)} = \frac{(\#16)}{(\#16a)} = \frac{N/A}{} = N/A$

17. Limit = L = $\frac{1.06}{(F)(X/Q)}$ x $\frac{\sum k_i}{\sum (k_i \cdot DFV_i)} = \frac{1.06}{(\#9)(\#15)}$ x (The lesser of **#16b** OR 1.81E-4) =

Limit = L = $\frac{1.06}{(93000)(4.3E^{-6})}$ (1.81e^{-4}) = 4.80e^{-4} ✓

18. Hi Hi ALARM = A x (**#17**) = (1.0) (4.80e^{-4}) = 4.80e^{-4} μCi/cc ✓
The radioactive gas flow corresponding to the Hi Hi setpoint:

Performed by: [signature] Date: 4-29-14

Independent Verification by: [signature] Date: 4-29-14

[signature] 4-29-14

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ATTACHMENT 1

VENT MONITORS GASEOUS DETECTOR HI HI SETPOINT

1. Sample I.D. K-12 Charmar
2. Sample No. 17-2396
3. Sample Date 4-20-17
4. Sample Time 1322
5. MWT 1910
6. Count Date 4-20-17
7. Count Time 1345
8. Monitor Reading (µCi/cc) 2.61E-8
9. Process Flow Rate (CFM) 75000
10. Sample Volume (mL) 48,000

Isotope	11 k_i µCi/mL	12 Dose Factor Vent DFV_i mrem/yr · m³/µCi	13 Product k_i x DFV_i
Xe 133	None Ident	294	None Ident
Kr 85m	↓	1.17E3	↓
Kr 88		1.47E4	
Xe 135		1.81E3	
Kr 87		5.92E3	
Xe 138		8.83E3	
Xe 135m		3.12E3	
Xe 133m		2.51E2	
Ar 41		8.84E3	
N 13		8.83E3 **	
16. $\sum k_i$ =	N/A	**16a.** $\sum (k_i DFV_i)$ =	N/A

Flow Meter ID# L-729

Cal Due Date: 10-6-17

14. Bkg = Instrument background
Bkg = 4.05E-7 µCi/cc

15. X/Q = 4.3×10^{-6} sec/m³ (atmospheric dispersion)

** Arbitrarily set equal to Xe-138

16b. $\frac{\sum k_i}{\sum(k_i \cdot DFV_i)} = \frac{(\#16)}{(\#16a)} =$ N/A = N/A

17. Limit = L = $\frac{1.06}{(F)(X/Q)} \times \frac{\sum ki}{\sum (ki \bullet DFVi)} = \frac{1.06}{(\#9)(\#15)}$ x (The lesser of **#16b** OR 1.81E-4) =

Limit = L = $\frac{1.06}{(75000)(4.3E-6)}$ (1.81E-4) = 5.95E-4

18. Hi Hi ALARM = A x (**#17**) = (1.0) (5.95E-4) = 5.95E-4 µCi/cc
The radioactive gas flow corresponding to the Hi Hi setpoint:

Performed by: [signature] Date: 4-20-17

Independent Verification by: [signature] Date: 4-20-17

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VENT MONITORS GASEOUS DETECTOR HI HI SETPOINT

1. Sample I.D. Kaman 12 2. Sample No. 15-6930
3. Sample Date 11-19-15 4. Sample Time 13:18 5. MWT 1910
6. Count Date 11-19-15 7. Count Time 13:27
8. Monitor Reading (μCi/cc) 5.3e-7 **9.** Process Flow Rate (CFM) 75000
10. Sample Volume (mL) 3.99e4

Isotope	11 k_i μCi/mL	12 Dose Factor Vent DFV_i mrem/yr · m³/μCi	13 Product k_i x DFV_i
Xe 133	None Identified	294	None Identified
Kr 85m		1.17E3	
Kr 88		1.47E4	
Xe 135		1.81E3	
Kr 87		5.92E3	
Xe 138		8.83E3	
Xe 135m		3.12E3	
Xe 133m		2.51E2	
Ar 41		8.84E3	
N 13	5.44e-9	8.83E3 **	4.80e-5
16. Σk_i =	5.44e-9	**16a.** $\Sigma(k_i\ DFV_i)$ =	4.80e-5

Flow Meter ID# L715

Cal Due Date: 9-12-17

14. Bkg = Instrument background
Bkg = 5.99e-7 μCi/cc

15. X/Q = 4.3×10^{-6} sec/m³ (atmospheric dispersion)

** Arbitrarily set equal to Xe-138

16b. $\frac{\Sigma k_i}{\Sigma(k_i \cdot DFV_i)} = \frac{(\#16)}{(\#16a)} = \frac{5.44e\text{-}9}{4.80e\text{-}5} = 1.13e\text{-}4$

17. Limit = L = $\frac{1.06}{(F)(X/Q)} \times \frac{\Sigma\ ki}{\Sigma\ (ki \bullet DFVi)} = \frac{1.06}{(\#9)(\#15)}$ x (The lesser of **#16b** OR 1.81E-4) =

Limit = L = $\frac{1.06}{(75000)(4.3\times10^{-6})}$ (1.13e-4) = 3.71e-4

18. Hi Hi ALARM = A x (**#17**) = (1.0) (3.71e-4) = 3.71e-4 μCi/cc
The radioactive gas flow corresponding to the Hi Hi setpoint:

Performed by: [signature] Date: 11-19-15

Independent Verification by: [signature] Date: 11-19-15

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VENT MONITORS GASEOUS DETECTOR HI HI SETPOINT

1. Sample I.D. K12 Charmer 2. Sample No. 14-438
3. Sample Date 1-22-14 4. Sample Time ______ 5. MWT 1911
6. Count Date 1-22-14 7. Count Time 1232
8. Monitor Reading (μCi/cc) 1.44e-7 **9.** Process Flow Rate (CFM) 75000
10. Sample Volume (mL) 48600

Isotope	11 k_i μCi/mL	12 Dose Factor Vent DFV_i $\frac{mrem}{yr}$ $\frac{m^3}{\mu Ci}$	13 Product k_i x DFV_i
Xe 133	N/A	294 N/A	N/A
Kr 85m		1.17E3	
Kr 88		1.47E4	
Xe 135		1.81E3	
Kr 87		5.92E3	
Xe 138		8.83E3	
Xe 135m		3.12E3	
Xe 133m		2.51E2	
Ar 41		8.84E3	
N 13		8.83E3 **	NA
16. Σk_i = NA		**16a.** $\Sigma (k_i DFV_i)$ = NA	

Flow Meter ID# 6729

Cal Due Date: 10-9-14

14. Bkg = Instrument background
Bkg = 4.61E-7 μCi/cc

15. X/Q = 4.3 x 10^{-6} sec/m^3 (atmospheric dispersion)

** Arbitrarily set equal to Xe-138

16b. $\frac{\Sigma k_i}{\Sigma(k_i \cdot DFV_i)} = \frac{(\#16)}{(\#16a)}$ = NA = NA

17. Limit = L = $\frac{1.06}{(F)(X/Q)} \times \frac{\Sigma\ ki}{\Sigma\ (ki \cdot DFVi)} = \frac{1.06}{(\#9)(\#15)}$ x (The lesser of **#16b** OR 1.81E-4) =

Limit = L = $\frac{1.06}{(75000)(4.3\times10^{-6})}$ (1.81e-4) = ~~5.95e-5~~ 5.95e-4

18. Hi Hi ALARM = A x (**#17**) = (1.0) (5.95e-5) = ~~5.95e-5~~ 5.95e-4 μCi/cc
The radioactive gas flow corresponding to the Hi Hi setpoint:

Performed by: Kelly Date: 1-22-14

Independent Verification by: Sicma Date: 1-22-14

Start 1159
STOP 1225
46800 — 1.80 LPM

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LIQUID EFFLUENT RADIOACTIVITY MONITOR SETPOINT

1. Sample No. 17-5499 2. Sample Date & Time 8-28-17 / 0035
3. Stream/Monitor Description GSW Rm -4767
4. Effluent Monitor Reading (cps) 10
5. Effluent Flow (gpm) 9600.
6. Average effluent flow during time represented by sample, F_1 (gpm) N/A
7. Average dilution (discharge canal) flow during time represented by sample, F_2 (gpm) N/A
8. Monitor calibration factor, g, (cps/µCi/mL) 2.19e6
9. Previous alarm value setpoint (cps) 765
10. Fraction to apply as a safety margin, A = 0.5

$$\textbf{Setpoint} = 10\times\left[\frac{\Sigma_i K_i}{\Sigma_i(K_i \div WEC_i)}\times g\times\frac{F_2}{F_1}\times A\right]+Bkg \quad = \quad \text{Setpoint}=10\times\left[\frac{(15)(8)(7)}{(16)(6)}\times(10)\right]+(4)$$

$$\text{Setpoint} = 5\times\left[\frac{(15)(8)(7)}{(16)(6)}\right]+(4)$$

$$\text{Setpoint} = 5\times\left[\frac{(\ 1.06e^{-2}\ )(\ 2.19e^{6}\ )(\ N/A\ )}{(\ 219\ )(\ N/A\ )}\right]+(\ 10\ )$$

11. Setpoint = ~~1.06e-2~~ 8-28-17 540 ✓

Fractional Change = $\frac{\text{New value - Previous Value}}{\text{Previous Value}} = \frac{(11)-(9)}{(9)} = \frac{(\ 540\ )-(\ 765\ )}{(\ 765\ )}$

12. Fractional Change = - 0.294 ✓

If fractional change is greater than ±0.3, adopt a new monitor alarm setting.

Continuous Monitor Hi Alarm = Setpoint

13. Monitor Hi Alarm = 765 ✓

14. Radwaste Monitor Hi Alarm = .16 (11) = .16 ( ) = N/A cps ✓

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LIQUID EFFLUENT RADIOACTIVITY MONITOR SETPOINT

1. Sample No. 15 – 7198 ✓ 2. Sample Date & Time 12-1-15 / 11:03 ✓
3. Stream/Monitor Description GSW rad monitor RM-4767 ✓
4. Effluent Monitor Reading (cps) 10 ✓
5. Effluent Flow (gpm) 9600 gpm ✓
6. Average effluent flow during time represented by sample, F_1 (gpm) NR ✓
7. Average dilution (discharge canal) flow during time represented by sample, F_2 (gpm) NR ✓
8. Monitor calibration factor, g, (cps/µCi/mL) ~~[illegible]~~ 2.19 e6 ✓
9. Previous alarm value setpoint (cps) 765 cps ✓
10. Fraction to apply as a safety margin, A = 0.5

$$\textbf{Setpoint} = 10\times\left[\frac{\Sigma_i K_i}{\Sigma_i(K_i \div WEC_i)}\times g\times\frac{F_2}{F_1}\times A\right]+Bkg \quad = \quad \text{Setpoint}=10\times\left[\frac{(15)(8)(7)}{(16)(6)}\times(10)\right]+(4)$$

$$\text{Setpoint} = 5\text{x}\left[\frac{(15)(8)(7)}{(16)(6)}\right]+(4)$$

$$\text{Setpoint} = 5\times\left[\frac{(9.43e^{-3})(2.19e^{6})(\text{NR})}{(177.54)(\text{NR})}\right]+(10.)$$

11. Setpoint = 592 ✓

Fractional Change = New value - Previous Value / Previous Value = (11) - (9) / (9) = (592) - (765) / (765)

12. Fractional Change = -.226 ✓

If fractional change is greater than ±0.3, adopt a new monitor alarm setting.

Continuous Monitor Hi Alarm = Setpoint

13. Monitor Hi Alarm = 765 cps ✓

14. Radwaste Monitor Hi Alarm = .16 (11) = .16 (   ) = N/A cps ✓

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LIQUID EFFLUENT RADIOACTIVITY MONITOR SETPOINT

1. Sample No. 14-1787 ✓ 2. Sample Date & Time 3-28-14/0030 ✓
3. Stream/Monitor Description GSW 4767 ✓
4. Effluent Monitor Reading (cps) 9 ✓
5. Effluent Flow (gpm) 9600 ✓
6. Average effluent flow during time represented by sample, F_1 (gpm) N/A ✓
7. Average dilution (discharge canal) flow during time represented by sample, F_2 (gpm) N/A ✓
8. Monitor calibration factor, g, (cps/μCi/mL) 2.19E6 ✓ ✓
9. Previous alarm value setpoint (cps) 2254 ✓
10. Fraction to apply as a safety margin, A = 0.5 ✓

$$\textbf{Setpoint} = 10\times\left[\frac{\Sigma_i K_i}{\Sigma_i(K_i \div WEC_i)}\times g\times\frac{F_2}{F_1}\times A\right]+Bkg \quad = \quad \text{Setpoint}=10\times\left[\frac{(15)(8)(7)}{(16)(6)}\times(10)\right]+(4)$$

$$\text{Setpoint} = 5\times\left[\frac{(15)(8)(7)}{(16)(6)}\right]+(4)$$

$$\text{Setpoint} = 5\times\left[\frac{(7.69E\text{-}3)(2.19E6)(N/A)}{(111.32)(N/A)}\right]+(9)$$

11. Setpoint = 765 ✓

Fractional Change = New value - Previous Value / Previous Value = (11) - (9) / (9) = (765) - (2254) / (2254)

12. Fractional Change = -0.66 ✓

If fractional change is greater than ±0.3, adopt a new monitor alarm setting.

Continuous Monitor Hi Alarm = Setpoint

13. Monitor Hi Alarm = 765 ✓

14. Radwaste Monitor Hi Alarm = .16 (11) = .16 (N/A) = N/A cps ✓

DAEC DUANE ARNOLD ENERGY CENTER	SURVEILLANCE TEST PROCEDURE TITLE: RHRSW RADIATION MONITOR CALIBRATION RM-1997	STP NS790305 Page 6 of 18 Rev. 14
Prerequisites	Performance Date: 2-13-17	INITIALS

6.0 PREREQUISITES

6.1 From the Chemistry Supervisor, obtain the current UPSCALE HI alarm setpoint. Record below and in the trip column of the step indicated. ____ Chemistry

Step 7.1.10 614 cps

6.2 From the Chemistry Supervisor, obtain the current high voltage setting. Record below and in the step indicated. ____ Chemistry

Step 7.1.25 750 VDC

NOTE

Original Transfer Calibration Count Rate is the count rate of the 8 μCi source taken from the last time that the mockup was used to determine the detector efficiency. This can be found in the Effluent Monitor Alarm Setpoint book. It is then decay corrected to the date that this STP is being performed.

6.3 From the Chemistry Supervisor, obtain the following source information and record below:

6.3.1 Original Trans Cal Count Rate 2.29E4 cps ____ Chemistry

6.3.2 Source Number UID# 647 Cs-137 ____ Chemistry

6.3.3 Original Date of Cal Count Rate 8-24-15 ____ Chemistry

6.3.4 Geometry Point ____ Chemistry

6.3.5 Old Efficiency 6.62E-7 μCi/cc/cps ____ Chemistry

6.4 Decay correct the Original Transfer Calibration Count Rate. Record and transfer the value to the step indicated below: ____ Chemistry

Decay Corrected Transfer Count Rate 2.21E4 cps

(Transfer to Step 7.1.37.)

6.5 As directed by PCP 8.7, analyze a sample of unfiltered reactor water and calculate the UPSCALE HI setpoint. Record below and in the trip column of the table listed. ____ Chemistry

Step 7.1.28 421 cps

w/o 40328724

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LIQUID EFFLUENT RADIOACTIVITY MONITOR SETPOINT

1. Sample No. 15-4896 2. Sample Date & Time 8-24-15 / 0027
3. Stream/Monitor Description Rm-1997 (RHRSW/ESW)
4. Effluent Monitor Reading (cps) 30
5. Effluent Flow (gpm) 4800
6. Average effluent flow during time represented by sample, F_1 (gpm) N/A
7. Average dilution (discharge canal) flow during time represented by sample, F_2 (gpm) N/A
8. Monitor calibration factor, g, (cps/µCi/mL) 1.51e6
9. Previous alarm value setpoint (cps) 614
10. Fraction to apply as a safety margin, A = 0.5

$\frac{1}{.62e^{-7}}$

$$\textbf{Setpoint} = 10\times\left[\frac{\Sigma_i K_i}{\Sigma_i(K_i \div WEC_i)}\times g\times\frac{F_2}{F_1}\times A\right]+Bkg \quad = \quad \text{Setpoint}=10\times\left[\frac{(15)(8)(7)}{(16)(6)}\times(10)\right]+(4)$$

$$\text{Setpoint} = 5\text{x}\left[\frac{(15)(8)(7)}{(16)(6)}\right]+(4)$$

$$\text{Setpoint} = 5\text{x}\left[\frac{(\ \sout{1.01e^{-2}}\ 1.10e^{-2})(\ 1.51e^{6}\ )(\ N/A\ )}{(\ \sout{102.078}\ 153.84\ )(\ N/A\ )}\right]+(\ 30\ )$$

11. Setpoint = ~~735.6~~ 569.85

Fractional Change = New value - Previous Value / Previous Value = (11) - (9) / (9) = (~~735.6~~ 569.9) - (614) / (614) 8-24-15

12. Fractional Change = ~~0.20~~ -0.07

If fractional change is greater than ±0.3, adopt a new monitor alarm setting.

Continuous Monitor Hi Alarm = Setpoint

13. Monitor Hi Alarm = 614

14. Radwaste Monitor Hi Alarm = .16 (11) = .16 ( ) = N/A cps

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ATTACHMENT 1

LIQUID EFFLUENT RADIOACTIVITY MONITOR SETPOINT

1. Sample No. 14-884 2. Sample Date & Time 2-14-14 / 0021
3. Stream/Monitor Description RHRSW / ESW's Rm 1997
4. Effluent Monitor Reading (cps) 25
5. Effluent Flow (gpm) RHRSW 'A' = 4800gpm / RHRSW 'B' = 4800gpm
6. Average effluent flow during time represented by sample, F_1 (gpm) N/A
7. Average dilution (discharge canal) flow during time represented by sample, F_2 (gpm) N/A
8. Monitor calibration factor, g, (cps/μCi/mL) 1.51E6
9. Previous alarm value setpoint (cps) 614
10. Fraction to apply as a safety margin, A = 0.5

$$\textbf{Setpoint} = 10 \times \left[\frac{\Sigma_i K_i}{\Sigma_i (K_i \div WEC_i)} \times g \times \frac{F_2}{F_1} \times A \right] + Bkg \quad = \quad \text{Setpoint} = 10 \times \left[\frac{(15)(8)(7)}{(16)(6)} \times (10) \right] + (4)$$

$$\text{Setpoint} = 5\text{x} \left[\frac{(15)(8)(7)}{(16)(6)} \right] + (4)$$

$$\text{Setpoint} = 5 \times \left[\frac{(7.67E\text{-}3)(1.51E6)(N/A)}{(111.86)(N/A)} \right] + (25)$$

11. Setpoint = 543 ✓

Fractional Change = New value - Previous Value / Previous Value = (11) - (9) / (9) = (543) - (614) / (614)

12. Fractional Change = -0.12 ✓

If fractional change is greater than ±0.3, adopt a new monitor alarm setting.

Continuous Monitor Hi Alarm = Setpoint ⇒ OLD SETPOINT. ✓

13. Monitor Hi Alarm = 614 ✓

14. Radwaste Monitor Hi Alarm = .16 (11) = .16 (N/A) = N/A cps

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ATTACHMENT 1

LIQUID EFFLUENT RADIOACTIVITY MONITOR SETPOINT

1. Sample No. 17-316 2. Sample Date & Time 1-16-17 / 0016
3. Stream/Monitor Description RM-4268 RHRSW/ESW Dilution Line (Rupture)
4. Effluent Monitor Reading (cps) 10
5. Effluent Flow (gpm) 9600
6. Average effluent flow during time represented by sample, F_1 (gpm) N/A
7. Average dilution (discharge canal) flow during time represented by sample, F_2 (gpm) N/A
8. Monitor calibration factor, g, (cps/µCi/mL) 1.92 e6
9. Previous alarm value setpoint (cps) 530
10. Fraction to apply as a safety margin, A = 0.5

$$\textbf{Setpoint} = 10\times\left[\frac{\Sigma_i K_i}{\Sigma_i(K_i \div WEC_i)}\times g\times\frac{F_2}{F_1}\times A\right]+Bkg \quad = \quad \text{Setpoint}=10\times\left[\frac{(15)(8)(7)}{(16)(6)}\times(10)\right]+(4)$$

$$\text{Setpoint} = 5\times\left[\frac{(15)(8)(7)}{(16)(6)}\right]+(4)$$

$$\text{Setpoint} = 5\times\left[\frac{(\ 8.34e^{-3}\ )(\ 1.92e^{6}\ )(\ N/A\ )}{(\ 139.13\ )(\ N/A\ )}\right]+(\ 10\ )$$

11. Setpoint = 585.5

Fractional Change = $\frac{\text{New value - Previous Value}}{\text{Previous Value}} = \frac{(11)-(9)}{(9)} = \frac{(\ 585.5\ )-(\ 530\ )}{(\ 530\ )}$

12. Fractional Change = 0.105

If fractional change is greater than ±0.3, adopt a new monitor alarm setting.

Continuous Monitor Hi Alarm = Setpoint

13. Monitor Hi Alarm = 530

14. Radwaste Monitor Hi Alarm = .16 (11) = .16 (   ) = N/A cps

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LIQUID EFFLUENT RADIOACTIVITY MONITOR SETPOINT

1. Sample No. 15-6175 2. Sample Date & Time 10-19-15/0019
3. Stream/Monitor Description RHRSW/ESW Rupture RM-4268
4. Effluent Monitor Reading (cps) 20
5. Effluent Flow (gpm) RHRSW A - 4800gpm, RHRSW B 4800gpm
6. Average effluent flow during time represented by sample, F_1 (gpm) N/A
7. Average dilution (discharge canal) flow during time represented by sample, F_2 (gpm) N/A
8. Monitor calibration factor, g, (cps/μCi/mL) 2.29E6
9. Previous alarm value setpoint (cps) 863
10. Fraction to apply as a safety margin, A = 0.5

Setpoint $= 10 \times \left[\frac{\Sigma_i K_i}{\Sigma_i (K_i \div WEC_i)} \times g \times \frac{F_2}{F_1} \times A \right] + Bkg$ = Setpoint $=10\times\left[\frac{(15)(8)(7)}{(16)(6)}\times(10)\right]+(4)$

Setpoint = $5\times\left[\frac{(15)(8)(7)}{(16)(6)}\right]+(4)$

Setpoint = $5\times\left[\frac{(9.90E\text{-}3)(2.29E6)(N/A)}{(174.97)(N/A)}\right]+(20)$

11. Setpoint = 668 ✓

Fractional Change = $\frac{\text{New value - Previous Value}}{\text{Previous Value}} = \frac{(11)-(9)}{(9)} = \frac{(668)-(863)}{(863)}$

12. Fractional Change = -0.226 ✓

If fractional change is greater than ±0.3, adopt a new monitor alarm setting.

Continuous Monitor Hi Alarm = Setpoint

13. Monitor Hi Alarm = 863 ✓

14. Radwaste Monitor Hi Alarm = .16 (11) = .16 ( ) = N/A cps ✓

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ATTACHMENT 1

LIQUID EFFLUENT RADIOACTIVITY MONITOR SETPOINT

1. Sample No. 14-884 2. Sample Date & Time 2-14-14 / 0021
3. Stream/Monitor Description RHRSW/ESW RUPTURE: RM 4268
4. Effluent Monitor Reading (cps) 20
5. Effluent Flow (gpm) RHRSW 'A' = 4800gpm, RHRSW 'B' - 4800gpm
6. Average effluent flow during time represented by sample, F_1 (gpm) N/A
7. Average dilution (discharge canal) flow during time represented by sample, F_2 (gpm) N/A
8. Monitor calibration factor, g, (cps/µCi/mL) 2.29E6 ✓
9. Previous alarm value setpoint (cps) 863 ✓
10. Fraction to apply as a safety margin, A = 0.5

$$\textbf{Setpoint} = 10\times\left[\frac{\Sigma_i K_i}{\Sigma_i(K_i \div WEC_i)}\times g\times\frac{F_2}{F_1}\times A\right]+Bkg \quad = \quad \text{Setpoint}=10\times\left[\frac{(15)(8)(7)}{(16)(6)}\times(10)\right]+(4)$$

$$\text{Setpoint} = 5\times\left[\frac{(15)(8)(7)}{(16)(6)}\right]+(4)$$

$$\text{Setpoint} = 5\times\left[\frac{(7.67E\text{-}3)(2.29E^{6})(N/A)}{(111.86)(N/A)}\right]+(20)$$

11. Setpoint = 805 ✓

Fractional Change = New value - Previous Value / Previous Value = (11) - (9) / (9) = (805) - (863) / (863)

12. Fractional Change = -0.07 ✓

If fractional change is greater than ±0.3, adopt a new monitor alarm setting.

Continuous Monitor Hi Alarm = Setpoint ⇒ OLD SETPOINT ✓

13. Monitor Hi Alarm = 863 ✓

14. Radwaste Monitor Hi Alarm = .16 (11) = .16 (N/A) = N/A cps

3.7 PLANT SYSTEMS

3.7.8 Spent Fuel Storage Pool Water Level

LCO 3.7.8 The spent fuel storage pool water level shall be ≥ 36 ft.

APPLICABILITY: During movement of irradiated fuel assemblies in the spent fuel storage pool.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Spent fuel storage pool water level not within limit.	A.1 -----------NOTE---------- LCO 3.0.3 is not applicable. ------------------------------ Suspend movement of irradiated fuel assemblies in the spent fuel storage pool.	Immediately

SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.7.8.1	Verify the spent fuel storage pool water level is ≥ 36 ft.	In accordance with the Surveillance Frequency Control Program

PROBABLE ANNUNCIATORS

1C03A	A1	FUEL POOL EXHAUST HIGH-HIGH RADIATION
	B1	FUEL POOL EXHAUST HIGH RADIATION
1C04B	B6	NEW FUEL STORAGE AREA ARM HI RAD
1C04B	C6	SPENT FUEL STORAGE AREA ARM HI RAD
1C05B	C8	PCIS GROUP "3" ISOLATION INITIATED
1C09A	A2	NW DRYWELL RADIATION LEVEL HI-HI
	B2	NW DRYWELL RADIATION LEVEL HI
1C09B	A2	SOUTH DRYWELL RADIATION LEVEL HI-HI
	B2	SOUTH DRYWELL RADIATION LEVEL HI
1C35A	A1	REFUELING FLOOR NORTH END HI RADIATION
	A2	REFUELING FLOOR SOUTH END HI RADIATION

PROBABLE INDICATIONS

1. Lowering cavity and/or Spent Fuel Pool level on the 5th floor. Visual
2. Lowering cavity level Floodup Range on level indicator, LI-4541 (at 1C04).
3. Lowering Skimmer Surge Tank level on level indicator, LI-3412 (at 1C04). not used in EAL
4. Lowering Fuel Pool level on level indicator, LI-3413 (at 1C04).
5. Rising radiation levels on any of the following ARMs:

   Spent Fuel Pool Area, RI-9178
   North Refuel Floor, RI-9163
   New Fuel Vault Area, RI-9153
   South Refuel Floor, RI-9164

6. Rising Drywell radiation levels on either of the following (at 1C09):

   NW Drywell Area Hi Range Rad Monitor, RIM-9184A
   South Drywell Area Hi Range Rad Monitor, RIM-9184B