

framatome

March 11, 2019
YRS:19:002

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk (03-H8)
Director, Office of Nuclear Material Safety and Safeguards
One White Flint North
11555 Rockville Pike
Rockville, Maryland 20852-2738

License SNM-1227
Docket 70-1257

Subject: Required Reporting of Effluents per 10 CFR 70.59

As required by 10 CFR 70.59, Framatome is reporting discharges of radioactive materials in the effluents from its nuclear fuels fabrication plant on Horn Rapids Road in Richland, Washington for the period from July 1 through December 31, 2018.

The total exposure from all stacks is 2.05E-05 mrem. Doses were determined using CAP88 Version 4.

If there are any questions, please contact me at (509) 375-8355

Very truly yours,



Y.R. Sakach
Radiation Protection
Attachments

cc: L. A. Dudes, U.S. Nuclear Regulatory Commission, Region II
P. J. Martell, State of Washington Department of Health
R. Gibson, U. S. Nuclear Regulatory Commission, Region II
M. Elsen, Director, Office of Radiation Protection (WDOH)

I. Gaseous Effluents (Continuously Sampled Stacks)
Reporting Period: July 1 – December 31, 2018

Stack: **UO₂ Building – Room 100 (K03)**
 Average Flow Rate: 15.90 cubic meters/second

| <u>Radionuclide</u> | <u>Concentration (µCi/ml)</u> | <u>Uncertainty Estimate (µCi/ml)</u> | <u>MDC (µCi/ml)</u> | <u>Quantity Released (µCi)</u> | <u>Estimated Exposure (mrem)</u> |
|---------------------|-------------------------------|--------------------------------------|---------------------|--------------------------------|----------------------------------|
| Gross alpha | 8.00E-16 | 4.00E-15 | 3.00E-17 | 2.02E-01 | NA |
| Gross beta | 9.00E-15 | 1.00E-14 | 9.00E-17 | 2.15E+00 | NA |
| U-232 | 2.00E-24 | 7.00E-24 | 6.00E-26 | 4.05E-10 | 2.64E-15 |
| U-234 | 2.00E-18 | 7.00E-18 | 6.00E-20 | 4.05E-04 | 2.64E-09 |
| U-235 | 4.00E-17 | 2.00E-16 | 1.00E-18 | 1.01E-02 | 6.60E-08 |
| U-236 | 2.00E-17 | 9.00E-17 | 7.00E-19 | 5.06E-03 | 3.30E-08 |
| U-238 | 8.00E-16 | 3.00E-15 | 3.00E-17 | 1.87E-01 | 1.22E-06 |

Stack: **SF Building – NAF(K06)**
 Average Flow Rate: 5.94 cubic meters/second

| <u>Radionuclide</u> | <u>Concentration (µCi/ml)</u> | <u>Uncertainty Estimate (µCi/ml)</u> | <u>MDC (µCi/ml)</u> | <u>Quantity Released (µCi)</u> | <u>Estimated Exposure (mrem)</u> |
|---------------------|-------------------------------|--------------------------------------|---------------------|--------------------------------|----------------------------------|
| Gross alpha | 6.00E-16 | 5.00E-15 | 8.00E-17 | 5.98E-02 | NA |
| Gross beta | 7.00E-15 | 2.00E-14 | 2.00E-16 | 6.60E-01 | NA |
| U-232 | 1.00E-24 | 1.00E-23 | 2.00E-25 | 1.20E-10 | 8.48E-16 |
| U-234 | 1.00E-18 | 1.00E-17 | 2.00E-19 | 1.20E-04 | 8.48E-10 |
| U-235 | 3.00E-17 | 3.00E-16 | 4.00E-18 | 2.99E-03 | 2.12E-08 |
| U-236 | 2.00E-17 | 1.00E-16 | 2.00E-18 | 1.50E-03 | 1.06E-08 |
| U-238 | 6.00E-16 | 5.00E-15 | 7.00E-17 | 5.52E-02 | 3.91E-07 |

Stack: **UO₂ Building – Room 182 (K21)**
 Average Flow Rate: 3.94 cubic meters/second

| <u>Radionuclide</u> | <u>Concentration (µCi/ml)</u> | <u>Uncertainty Estimate (µCi/ml)</u> | <u>MDC (µCi/ml)</u> | <u>Quantity Released (µCi)</u> | <u>Estimated Exposure (mrem)</u> |
|---------------------|-------------------------------|--------------------------------------|---------------------|--------------------------------|----------------------------------|
| Gross alpha | 2.00E-15 | 1.00E-14 | 1.00E-16 | 1.34E-01 | NA |
| Gross beta | 5.00E-14 | 6.00E-14 | 4.00E-16 | 2.80E+00 | NA |
| U-232 | 4.00E-24 | 2.00E-23 | 2.00E-25 | 2.68E-10 | 2.88E-15 |
| U-234 | 4.00E-18 | 2.00E-17 | 2.00E-19 | 2.68E-04 | 2.88E-09 |
| U-235 | 1.00E-16 | 6.00E-16 | 6.00E-18 | 6.71E-03 | 7.20E-08 |
| U-236 | 5.00E-17 | 3.00E-16 | 3.00E-18 | 3.35E-03 | 3.60E-08 |
| U-238 | 2.00E-15 | 1.00E-14 | 1.00E-16 | 1.24E-01 | 1.33E-06 |

I. Gaseous Effluents (Continuously Sampled Stacks)
Reporting Period: July 1 – December 31, 2018

Stack: **ELO Building – Shop (K25)**
 Average Flow Rate: 1.24 cubic meters/second

| <u>Radionuclide</u> | <u>Concentration (µCi/ml)</u> | <u>Uncertainty Estimate (µCi/ml)</u> | <u>MDC (µCi/ml)</u> | <u>Quantity Released (µCi)</u> | <u>Estimated Exposure (mrem)</u> |
|---------------------|-------------------------------|--------------------------------------|---------------------|--------------------------------|----------------------------------|
| Gross alpha | 7.00E-16 | 1.00E-14 | 4.00E-16 | 1.55E-02 | NA |
| Gross beta | 1.00E-14 | 5.00E-14 | 1.00E-15 | 1.90E-01 | NA |
| U-232 | 1.00E-24 | 3.00E-23 | 8.00E-25 | 3.10E-11 | 1.63E-15 |
| U-234 | 1.00E-18 | 3.00E-17 | 8.00E-19 | 3.10E-05 | 1.63E-09 |
| U-235 | 4.00E-17 | 7.00E-16 | 2.00E-17 | 7.75E-04 | 4.09E-08 |
| U-236 | 2.00E-17 | 3.00E-16 | 9.00E-18 | 3.87E-04 | 2.04E-08 |
| U-238 | 7.00E-16 | 1.00E-14 | 3.00E-16 | 1.43E-02 | 7.54E-07 |

Stack: **UO₂ Building – ADU (K31)**
 Average Flow Rate: 3.69 cubic meters/second
 * There are several sampled effluent streams discharged via this stack.

| <u>Radionuclide</u> | <u>Concentration (µCi/ml)</u> | <u>Uncertainty Estimate (µCi/ml)</u> | <u>MDC (µCi/ml)</u> | <u>Quantity Released (µCi)</u> | <u>Estimated Exposure (mrem)</u> |
|---------------------|-------------------------------|--------------------------------------|---------------------|--------------------------------|----------------------------------|
| Gross alpha | 9.00E-15 | 7.00E-15 | 1.00E-16 | 1.40E-01 | NA |
| Gross beta | 4.00E-14 | 2.00E-14 | 4.00E-16 | 1.63E+00 | NA |
| U-232 | 2.00E-23 | 1.00E-23 | 3.00E-25 | 2.79E-10 | 1.20E-15 |
| U-234 | 2.00E-17 | 1.00E-17 | 3.00E-19 | 2.79E-04 | 1.20E-09 |
| U-235 | 4.00E-16 | 3.00E-16 | 6.00E-18 | 6.98E-03 | 3.00E-08 |
| U-236 | 2.00E-16 | 2.00E-16 | 3.00E-18 | 3.49E-03 | 1.50E-08 |
| U-238 | 8.00E-15 | 6.00E-15 | 1.00E-16 | 1.29E-01 | 5.53E-07 |

Stack: **UO₂ Building – U₃O₈ (K37)**
 Average Flow Rate: 6.47 cubic meters/second

| <u>Radionuclide</u> | <u>Concentration (µCi/ml)</u> | <u>Uncertainty Estimate (µCi/ml)</u> | <u>MDC (µCi/ml)</u> | <u>Quantity Released (µCi)</u> | <u>Estimated Exposure (mrem)</u> |
|---------------------|-------------------------------|--------------------------------------|---------------------|--------------------------------|----------------------------------|
| Gross alpha | 9.00E-16 | 6.00E-15 | 7.00E-17 | 8.93E-02 | NA |
| Gross beta | 9.00E-15 | 2.00E-14 | 2.00E-16 | 9.32E-01 | NA |
| U-232 | 2.00E-24 | 1.00E-23 | 1.00E-25 | 1.79E-10 | 1.55E-15 |
| U-234 | 2.00E-18 | 1.00E-17 | 1.00E-19 | 1.79E-04 | 1.55E-09 |
| U-235 | 4.00E-17 | 3.00E-16 | 4.00E-18 | 4.46E-03 | 3.87E-08 |
| U-236 | 2.00E-17 | 2.00E-16 | 2.00E-18 | 2.23E-03 | 1.93E-08 |
| U-238 | 8.00E-16 | 6.00E-15 | 7.00E-17 | 8.24E-02 | 7.13E-07 |

I. Gaseous Effluents (Continuously Sampled Stacks)
Reporting Period: July 1 – December 31, 2018

Stack: **Laundry Facility (K42)**
 Average Flow Rate: 1.85 cubic meters/second

| <u>Radionuclide</u> | <u>Concentration ($\mu\text{Ci/ml}$)</u> | <u>Uncertainty Estimate ($\mu\text{Ci/ml}$)</u> | <u>MDC ($\mu\text{Ci/ml}$)</u> | <u>Quantity Released (μCi)</u> | <u>Estimated Exposure (mrem)</u> |
|---------------------|---|--|---|--|--|
| Gross alpha | 4.00E-16 | 8.00E-15 | 3.00E-16 | 1.14E-02 | NA |
| Gross beta | 8.00E-15 | 3.00E-14 | 8.00E-16 | 2.29E-01 | NA |
| U-232 | 8.00E-25 | 2.00E-23 | 5.00E-25 | 2.29E-11 | 8.26E-16 |
| U-234 | 8.00E-19 | 2.00E-17 | 5.00E-19 | 2.29E-05 | 8.26E-10 |
| U-235 | 2.00E-17 | 4.00E-16 | 1.00E-17 | 5.72E-04 | 2.07E-08 |
| U-236 | 1.00E-17 | 2.00E-16 | 6.00E-18 | 2.86E-04 | 1.03E-08 |
| U-238 | 4.00E-16 | 7.00E-15 | 2.00E-16 | 1.06E-02 | 3.81E-07 |

Stack: **ELO Building – Labs (K46)**
 Average Flow Rate: 6.15 cubic meters/second

| <u>Radionuclide</u> | <u>Concentration ($\mu\text{Ci/ml}$)</u> | <u>Uncertainty Estimate ($\mu\text{Ci/ml}$)</u> | <u>MDC ($\mu\text{Ci/ml}$)</u> | <u>Quantity Released (μCi)</u> | <u>Estimated Exposure (mrem)</u> |
|---------------------|---|--|---|--|--|
| Gross alpha | 5.00E-15 | 1.00E-14 | 8.00E-17 | 4.78E-01 | NA |
| Gross beta | 3.00E-14 | 4.00E-14 | 2.00E-16 | 3.42E+00 | NA |
| U-232 | 1.00E-23 | 3.00E-23 | 2.00E-25 | 9.56E-10 | 1.52E-14 |
| U-234 | 1.00E-17 | 3.00E-17 | 2.00E-19 | 9.56E-04 | 1.52E-08 |
| U-235 | 2.00E-16 | 7.00E-16 | 4.00E-18 | 2.39E-02 | 3.81E-07 |
| U-236 | 1.00E-16 | 4.00E-16 | 2.00E-18 | 1.20E-02 | 1.91E-07 |
| U-238 | 4.00E-15 | 1.00E-14 | 7.00E-17 | 4.41E-01 | 7.03E-06 |

Stack: **ARF (K47)**
 Average Flow Rate: 1.05 cubic meters/second

| <u>Radionuclide</u> | <u>Concentration ($\mu\text{Ci/ml}$)</u> | <u>Uncertainty Estimate ($\mu\text{Ci/ml}$)</u> | <u>MDC ($\mu\text{Ci/ml}$)</u> | <u>Quantity Released (μCi)</u> | <u>Estimated Exposure (mrem)</u> |
|---------------------|---|--|---|--|--|
| Gross alpha | 6.00E-15 | 4.00E-14 | 4.00E-16 | 9.76E-02 | NA |
| Gross beta | 7.00E-14 | 1.00E-13 | 1.00E-15 | 1.20E+00 | NA |
| U-232 | 1.00E-23 | 8.00E-23 | 9.00E-25 | 1.95E-10 | 2.80E-15 |
| U-234 | 1.00E-17 | 8.00E-17 | 9.00E-19 | 1.95E-04 | 2.80E-09 |
| U-235 | 3.00E-16 | 2.00E-15 | 2.00E-17 | 4.88E-03 | 7.00E-08 |
| U-236 | 1.00E-16 | 1.00E-15 | 1.00E-17 | 2.44E-03 | 3.50E-08 |
| U-238 | 5.00E-15 | 4.00E-14 | 4.00E-16 | 9.01E-02 | 1.29E-06 |

I. Gaseous Effluents (Continuously Sampled Stacks)
Reporting Period: July 1 – December 31, 2018

Stack: **SF Building – SWUR Room (K49)**
 Average Flow Rate: 4.11 cubic meters/second

| <u>Radionuclide</u> | <u>Concentration ($\mu\text{Ci/ml}$)</u> | <u>Uncertainty Estimate ($\mu\text{Ci/ml}$)</u> | <u>MDC ($\mu\text{Ci/ml}$)</u> | <u>Quantity Released (μCi)</u> | <u>Estimated Exposure (mrem)</u> |
|---------------------|---|--|---|--|--|
| Gross alpha | 8.00E-16 | 7.00E-15 | 1.00E-16 | 5.24E-02 | NA |
| Gross beta | 4.00E-15 | 2.00E-14 | 3.00E-16 | 3.07E-01 | NA |
| U-232 | 2.00E-24 | 1.00E-23 | 2.00E-25 | 1.05E-10 | 9.74E-16 |
| U-234 | 2.00E-18 | 1.00E-17 | 2.00E-19 | 1.05E-04 | 9.74E-10 |
| U-235 | 4.00E-17 | 4.00E-16 | 6.00E-18 | 2.62E-03 | 2.44E-08 |
| U-236 | 2.00E-17 | 2.00E-16 | 3.00E-18 | 1.31E-03 | 1.22E-08 |
| U-238 | 8.00E-16 | 7.00E-15 | 1.00E-16 | 4.84E-02 | 4.50E-07 |

Stack: **SF Building – SWUR POG (K50)**
 Average Flow Rate: 0.00 cubic meters/second
 ** Stack did not operate during the second half of 2018

| <u>Radionuclide</u> | <u>Concentration ($\mu\text{Ci/ml}$)</u> | <u>Uncertainty Estimate ($\mu\text{Ci/ml}$)</u> | <u>MDC ($\mu\text{Ci/ml}$)</u> | <u>Quantity Released (μCi)</u> | <u>Estimated Exposure (mrem)</u> |
|---------------------|---|--|---|--|--|
| Gross alpha | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | NA |
| Gross beta | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | NA |

Stack: **Building 9 (K52)**
 Average Flow Rate: 2.73 cubic meters/second

| <u>Radionuclide</u> | <u>Concentration ($\mu\text{Ci/ml}$)</u> | <u>Uncertainty Estimate ($\mu\text{Ci/ml}$)</u> | <u>MDC ($\mu\text{Ci/ml}$)</u> | <u>Quantity Released (μCi)</u> | <u>Estimated Exposure (mrem)</u> |
|---------------------|---|--|---|--|--|
| Gross alpha | 7.00E-16 | 8.00E-15 | 2.00E-16 | 2.86E-02 | NA |
| Gross beta | 6.00E-15 | 2.00E-14 | 5.00E-16 | 2.53E-01 | NA |
| U-232 | 1.00E-24 | 2.00E-23 | 3.00E-25 | 5.73E-11 | 9.30E-16 |
| U-234 | 1.00E-18 | 2.00E-17 | 3.00E-19 | 5.73E-05 | 9.30E-10 |
| U-235 | 3.00E-17 | 4.00E-16 | 9.00E-18 | 1.43E-03 | 2.33E-08 |
| U-236 | 2.00E-17 | 2.00E-16 | 4.00E-18 | 7.16E-04 | 1.16E-08 |
| U-238 | 6.00E-16 | 8.00E-15 | 2.00E-16 | 2.64E-02 | 4.29E-07 |

I. Gaseous Effluents (Continuously Sampled Stacks)
Reporting Period: July 1 – December 31, 2018

Stack: **SF Building – SWUR Shroud (K55)**
 Average Flow Rate: 0.00 cubic meters/second
 ** Stack did not operate during the second half of 2018

| <u>Radionuclide</u> | <u>Concentration ($\mu\text{Ci/ml}$)</u> | <u>Uncertainty Estimate ($\mu\text{Ci/ml}$)</u> | <u>MDC ($\mu\text{Ci/ml}$)</u> | <u>Quantity Released (μCi)</u> | <u>Estimated Exposure (mrem)</u> |
|---------------------|---|--|---|--|--|
| Gross alpha | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | NA |
| Gross beta | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | NA |

Stack: **ELO Building – GSUR (K56)**
 Average Flow Rate: 0.30 cubic meters/second

| <u>Radionuclide</u> | <u>Concentration ($\mu\text{Ci/ml}$)</u> | <u>Uncertainty Estimate ($\mu\text{Ci/ml}$)</u> | <u>MDC ($\mu\text{Ci/ml}$)</u> | <u>Quantity Released (μCi)</u> | <u>Estimated Exposure (mrem)</u> |
|---------------------|---|--|---|--|--|
| Gross alpha | 1.00E-15 | 3.00E-14 | 2.00E-15 | 5.31E-03 | NA |
| Gross beta | 8.00E-15 | 9.00E-14 | 5.00E-15 | 3.73E-02 | NA |
| U-232 | 2.00E-24 | 7.00E-23 | 3.00E-24 | 1.06E-11 | 1.09E-16 |
| U-234 | 2.00E-18 | 7.00E-17 | 3.00E-18 | 1.06E-05 | 1.09E-10 |
| U-235 | 5.00E-17 | 2.00E-15 | 8.00E-17 | 2.66E-04 | 2.73E-09 |
| U-236 | 3.00E-17 | 8.00E-16 | 4.00E-17 | 1.33E-04 | 1.37E-09 |
| U-238 | 1.00E-15 | 3.00E-14 | 1.00E-15 | 4.90E-03 | 5.04E-08 |

Stack: **UO₂ Building – Labs (K58)**
 Average Flow Rate: 7.72 cubic meters/second

| <u>Radionuclide</u> | <u>Concentration ($\mu\text{Ci/ml}$)</u> | <u>Uncertainty Estimate ($\mu\text{Ci/ml}$)</u> | <u>MDC ($\mu\text{Ci/ml}$)</u> | <u>Quantity Released (μCi)</u> | <u>Estimated Exposure (mrem)</u> |
|---------------------|---|--|---|--|--|
| Gross alpha | 4.00E-16 | 4.00E-15 | 6.00E-17 | 5.50E-02 | NA |
| Gross beta | 5.00E-15 | 1.00E-14 | 2.00E-16 | 6.20E-01 | NA |
| U-232 | 9.00E-25 | 8.00E-24 | 1.00E-25 | 1.10E-10 | 9.94E-16 |
| U-234 | 9.00E-19 | 8.00E-18 | 1.00E-19 | 1.10E-04 | 9.94E-10 |
| U-235 | 2.00E-17 | 2.00E-16 | 3.00E-18 | 2.75E-03 | 2.49E-08 |
| U-236 | 1.00E-17 | 1.00E-16 | 2.00E-18 | 1.38E-03 | 1.24E-08 |
| U-238 | 4.00E-16 | 4.00E-15 | 6.00E-17 | 5.08E-02 | 4.59E-07 |

I. Gaseous Effluents (Continuously Sampled Stacks)
Reporting Period: July 1 – December 31, 2018

Stack: **SF Building – NAF Furnace (K60)**
 Average Flow Rate: 6.96 cubic meters/second

| <u>Radionuclide</u> | <u>Concentration (µCi/ml)</u> | <u>Uncertainty Estimate (µCi/ml)</u> | <u>MDC (µCi/ml)</u> | <u>Quantity Released (µCi)</u> | <u>Estimated Exposure (mrem)</u> |
|---------------------|-------------------------------|--------------------------------------|---------------------|--------------------------------|----------------------------------|
| Gross alpha | 9.00E-16 | 6.00E-15 | 7.00E-17 | 1.08E-01 | NA |
| Gross beta | 9.00E-15 | 2.00E-14 | 2.00E-16 | 9.67E-01 | NA |
| U-232 | 2.00E-24 | 1.00E-23 | 1.00E-25 | 2.17E-10 | 1.95E-15 |
| U-234 | 2.00E-18 | 1.00E-17 | 1.00E-19 | 2.17E-04 | 1.95E-09 |
| U-235 | 5.00E-17 | 3.00E-16 | 3.00E-18 | 5.41E-03 | 4.87E-08 |
| U-236 | 2.00E-17 | 2.00E-16 | 2.00E-18 | 2.71E-03 | 2.43E-08 |
| U-238 | 9.00E-16 | 6.00E-15 | 6.00E-17 | 1.00E-01 | 8.98E-07 |

Stack: **Dry Conversion Facility (K62)**
 Average Flow Rate: 23.30 cubic meters/second

| <u>Radionuclide</u> | <u>Concentration (µCi/ml)</u> | <u>Uncertainty Estimate (µCi/ml)</u> | <u>MDC (µCi/ml)</u> | <u>Quantity Released (µCi)</u> | <u>Estimated Exposure (mrem)</u> |
|---------------------|-------------------------------|--------------------------------------|---------------------|--------------------------------|----------------------------------|
| Gross alpha | 9.00E-16 | 3.00E-15 | 2.00E-17 | 3.15E-01 | NA |
| Gross beta | 7.00E-15 | 9.00E-15 | 6.00E-17 | 2.71E+00 | NA |
| U-232 | 2.00E-24 | 6.00E-24 | 4.00E-26 | 6.30E-10 | 2.44E-15 |
| U-234 | 2.00E-18 | 6.00E-18 | 4.00E-20 | 6.30E-04 | 2.44E-09 |
| U-235 | 4.00E-17 | 2.00E-16 | 1.00E-18 | 1.57E-02 | 6.10E-08 |
| U-236 | 2.00E-17 | 8.00E-17 | 5.00E-19 | 7.87E-03 | 3.05E-08 |
| U-238 | 8.00E-16 | 3.00E-15 | 2.00E-17 | 2.91E-01 | 1.13E-06 |

Stack: **BDU Facility (K65)**
 Average Flow Rate: 0.94 cubic meters/second

| <u>Radionuclide</u> | <u>Concentration (µCi/ml)</u> | <u>Uncertainty Estimate (µCi/ml)</u> | <u>MDC (µCi/ml)</u> | <u>Quantity Released (µCi)</u> | <u>Estimated Exposure (mrem)</u> |
|---------------------|-------------------------------|--------------------------------------|---------------------|--------------------------------|----------------------------------|
| Gross alpha | 7.00E-16 | 1.00E-14 | 5.00E-16 | 1.00E-02 | NA |
| Gross beta | 5.00E-15 | 4.00E-14 | 2.00E-15 | 7.04E-02 | NA |
| U-232 | 1.00E-24 | 3.00E-23 | 1.00E-24 | 2.00E-11 | 2.34E-16 |
| U-234 | 1.00E-18 | 3.00E-17 | 1.00E-18 | 2.00E-05 | 2.34E-10 |
| U-235 | 3.00E-17 | 7.00E-16 | 2.00E-17 | 5.01E-04 | 5.85E-09 |
| U-236 | 2.00E-17 | 4.00E-16 | 1.00E-17 | 2.51E-04 | 2.93E-09 |
| U-238 | 6.00E-16 | 1.00E-14 | 5.00E-16 | 9.25E-03 | 1.08E-07 |

I. Gaseous Effluents (Continuously Sampled Stacks)
Reporting Period: July 1 – December 31, 2018

Stack: **Cylinder Recertification Facility (K67)**
 Average Flow Rate: 0.44 cubic meters/second

| <u>Radionuclide</u> | <u>Concentration (µCi/ml)</u> | <u>Uncertainty Estimate (µCi/ml)</u> | <u>MDC (µCi/ml)</u> | <u>Quantity Released (µCi)</u> | <u>Estimated Exposure (mrem)</u> |
|---------------------|-------------------------------|--------------------------------------|---------------------|--------------------------------|----------------------------------|
| Gross alpha | 8.00E-16 | 2.00E-14 | 1.00E-15 | 5.08E-03 | NA |
| Gross beta | 8.00E-15 | 8.00E-14 | 3.00E-15 | 6.35E-02 | NA |
| U-232 | 2.00E-24 | 4.00E-23 | 2.00E-24 | 1.02E-11 | 3.16E-16 |
| U-234 | 2.00E-18 | 4.00E-17 | 2.00E-18 | 1.02E-05 | 3.16E-10 |
| U-235 | 4.00E-17 | 1.00E-15 | 5.00E-17 | 2.54E-04 | 7.90E-09 |
| U-236 | 2.00E-17 | 5.00E-16 | 3.00E-17 | 1.27E-04 | 3.95E-09 |
| U-238 | 7.00E-16 | 2.00E-14 | 1.00E-15 | 4.69E-03 | 1.46E-07 |

Stack: **MERF Building (K69)**
 Average Flow Rate: 1.77 cubic meters/second

| <u>Radionuclide</u> | <u>Concentration (µCi/ml)</u> | <u>Uncertainty Estimate (µCi/ml)</u> | <u>MDC (µCi/ml)</u> | <u>Quantity Released (µCi)</u> | <u>Estimated Exposure (mrem)</u> |
|---------------------|-------------------------------|--------------------------------------|---------------------|--------------------------------|----------------------------------|
| Gross alpha | 6.00E-16 | 9.00E-15 | 3.00E-16 | 1.59E-02 | NA |
| Gross beta | 7.00E-15 | 3.00E-14 | 8.00E-16 | 1.94E-01 | NA |
| U-232 | 1.00E-24 | 2.00E-23 | 5.00E-25 | 3.17E-11 | 7.56E-16 |
| U-234 | 1.00E-18 | 2.00E-17 | 5.00E-19 | 3.17E-05 | 7.56E-10 |
| U-235 | 3.00E-17 | 5.00E-16 | 1.00E-17 | 7.94E-04 | 1.89E-08 |
| U-236 | 1.00E-17 | 2.00E-16 | 7.00E-18 | 3.97E-04 | 9.45E-09 |
| U-238 | 5.00E-16 | 9.00E-15 | 2.00E-16 | 1.46E-02 | 3.49E-07 |

Stack: **UO₂ Building – BLEU Facility (K72)**
 Average Flow Rate: 12.59 cubic meters/second

| <u>Radionuclide</u> | <u>Concentration (µCi/ml)</u> | <u>Uncertainty Estimate (µCi/ml)</u> | <u>MDC (µCi/ml)</u> | <u>Quantity Released (µCi)</u> | <u>Estimated Exposure (mrem)</u> |
|---------------------|-------------------------------|--------------------------------------|---------------------|--------------------------------|----------------------------------|
| Gross alpha | 1.00E-15 | 5.00E-15 | 4.00E-17 | 1.96E-01 | NA |
| Gross beta | 9.00E-15 | 1.00E-14 | 1.00E-16 | 1.85E+00 | NA |
| U-232 | 2.00E-24 | 9.00E-24 | 7.00E-26 | 3.92E-10 | 2.58E-15 |
| U-234 | 2.00E-18 | 9.00E-18 | 7.00E-20 | 3.92E-04 | 2.58E-09 |
| U-235 | 5.00E-17 | 2.00E-16 | 2.00E-18 | 9.79E-03 | 6.45E-08 |
| U-236 | 2.00E-17 | 1.00E-16 | 9.00E-19 | 4.90E-03 | 3.23E-08 |
| U-238 | 9.00E-16 | 4.00E-15 | 3.00E-17 | 1.81E-01 | 1.19E-06 |

I. **Gaseous Effluents (Continuously Sampled Stacks)**
Reporting Period: July 1 – December 31, 2018

Stack: **UNB Building (K75)**
Average Flow Rate: 0.47 cubic meters/second

| <u>Radionuclide</u> | <u>Concentration</u> <u>(μCi/ml)</u> | <u>Uncertainty</u> <u>Estimate</u> <u>(μCi/ml)</u> | <u>MDC</u> <u>(μCi/ml)</u> | <u>Quantity</u> <u>Released</u> <u>(μCi)</u> | <u>Estimated</u> <u>Exposure</u> <u>(mrem)</u> |
|---------------------|--|---|--|---|--|
| Gross alpha | 3.00E-16 | 1.00E-14 | 1.00E-15 | 2.20E-03 | NA |
| Gross beta | 3.00E-15 | 5.00E-14 | 3.00E-15 | 2.61E-02 | NA |
| U-232 | 6.00E-25 | 3.00E-23 | 2.00E-24 | 4.40E-12 | 4.56E-17 |
| U-234 | 6.00E-19 | 3.00E-17 | 2.00E-18 | 4.40E-06 | 4.56E-11 |
| U-235 | 1.00E-17 | 7.00E-16 | 5.00E-17 | 1.10E-04 | 1.14E-09 |
| U-236 | 7.00E-18 | 3.00E-16 | 2.00E-17 | 5.50E-05 | 5.70E-10 |
| U-238 | 3.00E-16 | 1.00E-14 | 9.00E-16 | 2.03E-03 | 2.10E-08 |

II. Liquid Effluent
Reporting Period: July 1 – December 31, 2018

| <u>Constituent</u> | <u>Concentration ($\mu\text{Ci}/\text{ml}$)</u> | <u>LLD ($\mu\text{Ci}/\text{ml}$)</u> | <u>Quantity (Ci)</u> | <u>Liquid Volume (m^3)</u> |
|--------------------|--|--|----------------------|--|
| Soluble U | 8.60E-08 | *** | 0.0026 | |
| Insoluble U** | 1.44E-07 | *** | 0.0043 | |
| Tc-99 | 1.23E-07 | *** | 0.0037 | 3.02E+04 |
| Total Ci | | | 0.0106 | |

* Combined liquid effluent released to City of Richland sewer system.

** The average concentration of insoluble uranium for the 6-month period was less than 50 ppb.

*** These constituents are analyzed chemically via Inductively Coupled Plasma/Mass Spectroscopy (ICP/MS) as opposed to radiation counting. Laboratory detection limits for uranium and Tc-99 are generally 1 ppb and 5 ppt, respectively

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