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December 17, 2002

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Ms. Elizabeth Ullrich U.S. Nuclear Regulatory Commission Region I 475 Allendale Road King of Prussia, PA 19406

#### SUBJECT: ANALYTICAL RESULTS FOR SAMPLES COLLECTED DURING THE PERIOD JUNE 2002 THROUGH AUGUST 2002 AT THE ROYERSFORD WASTEWATER TREATMENT FACILITY ROYERSFORD, PENNSYLVANIA (TAC NO. U01050, RFTA NO. 02-005 AND 03-001)

OAK RIDGE INSTITUTE FOR SCIENCE AND EDU

Dear Ms. Ullrich:

The Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) received ten samples from the Royersford Wastewater Treatment Facility in Royersford, Pennsylvania. The samples were received without proper chain-of-custody (C-o-C) and sample identification. As a result, ESSAP initiated a C-o-C and assigned an identification number to each sample. Percent solids (Procedure SP3, Revision 0), gamma spectroscopy (Procedure CP1, Revision 11), and strontium-90 (Procedure AP4, Revision 11) analyses were performed on the eight sludge and two digester samples. In addition, tritium (Procedure AP2, Revision 12) analysis was performed on the digester samples. The results are presented in pCi/L for the digester samples, whereas the results for the sludge samples are presented as pCi/g dry weight for strontium-90 and pCi/g wet weight for gamma spectroscopy. The results are presented in Tables 1 through 4.

ESSAP's Quality Control (QC) procedures were followed for these analyses. Analytical and instrumentation QC for these analyses were within acceptable limits. The QC files are available for your review upon request.

Please contact me at (865) 241-3242 or Wade Ivey at (865) 576-9184 with any questions or comments.

Sincerely,

ale Condra.

Dale Condra Laboratory Manager Environmental Survey and Site Assessment Program

RDC:WPI:ar

cc: G. Purdy, NRC/NMSS/TWFN/7F27 E. Knox-Davin, NRC/NMSS/TWFN/8A23 J. Kottan, NRC/Region I File/816 E. Abelquist, ORISE/ESSAP T. Vitkus, ORISE/ESSAP W. Beck, ORISE/ESSAP

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## PERCENT MOISTURE IN SLUDGE AND DIGESTER SAMPLES SP3, REVISION 0 ROYERSFORD WASTEWATER TREATMENT FACILITY ROYERSFORD, PENNSYLVANIA

| ESSAP Sample ID | NRC Region I<br>Sample ID | Percent Solids <sup>a</sup> |
|-----------------|---------------------------|-----------------------------|
| 816M001         | Sludge #1                 | 40.74                       |
| 816M002         | Sludge #2                 | 44.51                       |
| 816M003         | Sludge #3                 | 45.51                       |
| 816M004         | Sludge #4                 | 24.71                       |
| 816M005         | Sludge #5                 | 30.59                       |
| 816M006         | Sludge #6                 | 41.75                       |
| 816M007         | Sludge #7                 | 33.21                       |
| 816M008         | Sludge #8                 | 42.86                       |
| 816M009         | Secondary Digester #1     | 4.63                        |
| 816M010         | Secondary Digester #2     | 6.23                        |

<sup>a</sup>Percent solids was calculated by:

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Percent Solids = 
$$\left(\frac{dry \ weight}{wet \ weight}\right) \times 100$$

### CONCENTRATIONS OF SELECTED GAMMA EMITTING RADIONUCLIDES IN SLUDGE AND DIGESTER SAMPLES BY GAMMA SPECTROSCOPY CP1, REVISION 11 ROYERSFORD WASTEWATER TREATMENT FACILITY ROYERSFORD, PENNSYLVANIA

| ESSAP Sample<br>ID | NRC Region I<br>Sample ID | Radionuclide Concentrations and MDCs (pCi/g <sup>a</sup> or pCi/L <sup>b</sup> ) |                      |                      |                      |                       |
|--------------------|---------------------------|--|----------------------|----------------------|----------------------|-----------------------|
|                    |                           | Mn-54  | Co-58                | <u>Co-60</u>         | Zn-65                | Nb-95                 |
| 816M001            | Sludge #1                 | $78.1 \pm 3.0^{\rm c} (0.96)^{\rm d}$  | 3.11 ± 0.77 (0.98)   | 596 ± 18 (0.91)      | $14.8 \pm 2.4$ (2.4) | 0.94 ± 0.60 (0.98)    |
| 816M002            | Sludge #2                 | 40.6 ± 1.9 (0.88)  | 3.50 ± 0.78 (0.89)   | 443 ± 14 (0.86)      | 7.1 ± 2.2 (2.1)      | 1.06 ± 0.55 (0.90)    |
| 816M003            | Sludge #3                 | 64.1 ± 2.5 (0.76)  | 2.65 ± 0.57 (0.77)   | 612 ± 19 (0.81)      | 12.9 ± 1.8 (2.0)     | 1.01 ± 0.46 (0.76)    |
| 816M004            | Sludge #4                 | 4.96 ± 0.28 (0.19)   | 0.19 ± 0.12 (0.20)   | 77.4 ± 2.4 (0.20)    | 0.98 ± 0.41 (0.47)   | 0.08 ± 0.11 (0.19)    |
| 816M005            | Sludge #5                 | 8.16 ± 0.49 (0.37)   | 0.16 ± 0.23 (0.38)   | 142.6 ± 4.5 (0.34)   | 1.84 ± 0.89 (0.96)   | 0.07 ± 0.23 (0.37)    |
| 816M006            | Sludge #6                 | 43.7 ± 1.9 (0.98)  | 1.01 ± 0.61 (1.0)    | 566 ± 18 (0.95)      | 9.1 ± 2.1 (2.4)      | 0.03 ± 0.59 (0.96)    |
| 816M007            | Sludge #7                 | 25.4 ± 1.1 (0.47)  | 0.70 ± 0.29 (0.48)   | 310.5 ± 9.6 (0.49)   | 5.6 ± 1.1 (1.2)      | 0.19 ± 0.28 (0.46)    |
| 816M008            | Sludge #8                 | 91.7 ± 3.5 (1.1)   | 2.44 ± 0.88 (1.1)    | 745 ± 23 (1.0)       | 15.2 ± 2.3 (2.8)     | 0.91 ± 0.70 (1.1)     |
| 816M009            | Secondary Digester #1     | 28,300 ± 1,200 (310)   | 10,000 ± 1,000 (710) | 59,200 ± 2,100 (240) | 3,550 ± 810 (810)    | 8,500 ± 2,600 (2,100) |
| 816M010            | Secondary Digester #2     | 23,920 ± 990 (270)   | 8,130 ± 720 (640)    | 50,500 ± 1,700 (210) | 3,840 ± 700 (770)    | 6,000 ± 2,200 (1,900) |

#### **ORISE TABLE 2 (Continued)**

#### CONCENTRATIONS OF SELECTED GAMMA EMITTING RADIONUCLIDES IN SLUDGE AND DIGESTER SAMPLES BY GAMMA SPECTROSCOPY CP1, REVISION 11 ROYERSFORD WASTEWATER TREATMENT FACILITY ROYERSFORD, PENNSYLVANIA

| ESSAP Sample<br>ID | NRC Region I<br>Sample ID | Radionuclide Concentrations and MDCs (pCi/g <sup>a</sup> or pCi/L <sup>b</sup> ) |                          |                    |                        |                     |
|--------------------|---------------------------|--|--------------------------|--------------------|------------------------|---------------------|
|                    |                           | Ag-110m  | Sb-124                   | Sb-125             | Cs-134                 | Cs-137              |
| 816M001            | Sludge #1                 | 3.01 ± 0.64 (0.79)   | 2.64 ± 0.77 (0.78)       | 7.6 ± 1.5 (1.6)    | 3.34 ± 0.93 (1.0)      | 48.3 ± 2.1 (0.78)   |
| 816M002            | Sludge #2                 | 1.80 ± 0.49 (0.74)   | $1.47 \pm 0.70 \ (0.70)$ | 4.9 ± 1.3 (1.6)    | 2.45 ± 0.80 (0.93)     | 49.5 ± 2.2 (0.71)   |
| 816M003            | Sludge #3                 | 2.19 ± 0.46 (0.60)   | 2.72 ± 0.58 (0.59)       | 6.3 ± 1.2 (1.2)    | 2.77 ± 0.69 (0.79)     | 50.8 ± 2.2 (0.60)   |
| 816M004            | Sludge #4                 | 0.28 ± 0.10 (0.15)   | 0.24 ± 0.10 (0.15)       | 0.68 ± 0.25 (0.35) | 0.25 ± 0.15 (0.20)     | 15.05 ± 0.66 (0.16) |
| 816M005            | Sludge #5                 | 0.19 ± 0.19 (0.28)   | 0.32 ± 0.20 (0.29)       | 1.19 ± 0.49 (0.67) | 0.77 ± 0.33 (0.38)     | 21.69 ± 0.98 (0.30) |
| 816M006            | Sludge #6                 | 1.94 ± 0.52 (0.76)   | $1.88 \pm 0.74 \ (0.75)$ | 3.2 ± 1.2 (1.6)    | $2.09 \pm 0.80$ (1.0)  | 49.3 ± 2.4 (0.76)   |
| 816M007            | Sludge #7                 | 0.89 ± 0.27 (0.36)   | 1.07 ± 0.21 (0.35)       | 2.06 ± 0.58 (0.74) | $1.01 \pm 0.35 (0.48)$ | 26.4 ± 1.1 (0.37)   |
| 816M008            | Sludge #8                 | $2.69 \pm 0.67 (0.89)$   | $2.62 \pm 0.89 \ (0.89)$ | 7.3 ± 1.5 (1.8)    | $3.16 \pm 0.85 (1.2)$  | 50.9 ± 2.3 (0.90)   |
| 816M009            | Secondary Digester #1     | 1,600 ± 220 (340)  | 830 ± 550 (810)          | 970 ± 500 (550)    | 540 ± 220 (290)        | 4,910 ± 310 (220)   |
| 816M010            | Secondary Digester #2     | 1,210 ± 210 (240)  | 800 ± 470 (710)          | 880 ± 350 (480)    | 380 ± 230 (260)        | 4,280 ± 260 (190)   |

<sup>a</sup>The concentrations of the sludge samples are in pCi/g.

<sup>b</sup>The concentrations of the digester samples are in pCi/L.

<sup>c</sup>Uncertainties represent the 95% confidence level, based on total propagated uncertainties.

<sup>d</sup>MDC values are in parenthesis.

# CONCENTRATIONS OF STRONTIUM-90 IN SLUDGE AND DIGESTER SAMPLES BY LOW BACKGROUND BETA COUNTING AP4, REVISION 11; CP3, REVISION 1 ROYERSFORD WASTEWATER TREATMENT FACILITY ROYERSFORD, PENNSYLVANIA

| ESSAP Sample<br>ID | NRC Region I<br>Sample ID | Sr-90 Concentrations<br>(pCi/g <sup>a</sup> or pCi/L <sup>b</sup> ) |
|--------------------|---------------------------|---|
| 816M001            | Sludge #1                 | $2.26 \pm 0.36^{\circ}$   |
| 816M002            | Sludge #2                 | $1.73 \pm 0.30$   |
| 816M003            | Sludge #3                 | $2.83 \pm 0.37$   |
| 816M004            | Sludge #4                 | $4.35 \pm 0.43$   |
| 816M005            | Sludge #5                 | $2.29 \pm 0.32$   |
| 816M006            | Sludge #6                 | $2.06 \pm 0.31$   |
| 816M007            | Sludge #7                 | $2.48 \pm 0.32$   |
| 816M008            | Sludge #8                 | $2.95 \pm 0.33$   |
| 816M009            | Secondary Digester #1     | 58.5 ± 8.0  |
| 816M010            | Secondary Digester #2     | 74.0 ± 9.7  |

<sup>a</sup>The concentrations of the sludge samples are in pCi/g. The average MDC for a one hour count of a 2 g sludge sample for Sr-90 is 0.33 pCi/L.

<sup>b</sup>The concentrations of the digester samples are in pCi/L. The average MDC for a one hour count of a 0.1 L digester sample for Sr-90 is 8.7 pCi/L.

<sup>c</sup>Uncertainties represent the 95% confidence level, based on total propagated uncertainties.

# CONCENTRATIONS OF TRITIUM IN DIGESTER SAMPLES BY LIQUID SCINTILLATION ANALYSIS AP2, REVISION 12; CP4, REVISION 1 ROYERSFORD WASTEWATER TREATMENT FACILITY ROYERSFORD, PENNSYLVANIA

| ESSAP Sample ID | NRC Region I<br>Sample ID | Tritium<br>Concentrations <sup>a</sup><br>(pCi/L) |  |
|-----------------|---------------------------|---|--|
| 816M009         | Secondary Digester #1     | $560\pm230^{b}$                                   |  |
| 816M010         | Secondary Digester #2     | $570 \pm 230$                                     |  |

<sup>a</sup>The average MDC for a one hour count of a 0.01 L digester sample for tritium is 370 pCi/L. <sup>b</sup>Uncertainties represent the 95% confidence level, based on total propagated uncertainties.