

ORISE
OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

December 19, 2006

Mr. Mike McCann
U.S. Nuclear Regulatory Commission
Region III
2443 Warrenville Road
Lisle, IL 60532-4351

**SUBJECT: FINAL LETTER REPORT FOR ANALYTICAL RESULTS FOR EIGHT
WATER SAMPLES FROM BATTELLE, WEST JEFFERSON, OHIO
[TAC NO. W90175] (RFTA NO. 06-001)**

Dear Mr. McCann:

The Oak Ridge Institute for Science and Education (ORISE) received eight water samples on August 24, 2006 from Battelle in West Jefferson, Ohio. The samples were analyzed for gamma spectroscopy, gross alpha, gross beta, and for total radiostrontium. The results of these analyses were submitted to you in an interim letter report on October 6, 2006. The uranium and plutonium isotopic results are included with the previous data in this final letter report and are reported as a liquid and solid fraction for each sample.

Based on literature research and empirical data generated in this laboratory, any plutonium isotopes present in the sample would be found split between the solid and liquid fractions of the sample. The sample identifications are presented in Table 1. The data for gamma spectroscopy, gross alpha and gross beta, total radiostrontium, plutonium-238, 239/240, and uranium-234/238 are presented in Tables 2-5, respectively. The pertinent procedure references are in the data tables.

ORISE's Quality Control (QC) requirements were met for these analyses. The QC files are available for your review upon request.

My contact information is listed below. You may also contact Wade Ivey at 865.576.9184 with any questions or comments.

Sincerely,

Dale Condra

Dale Condra, Manager
Laboratory

RDC:WPI:km

Enclosures

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TABLE 1

**SAMPLE IDENTIFICATIONS
AND COLLECTION DATA
BATTELLE
WEST JEFFERSON, OHIO**

ORISE Sample ID	NRC Region III Sample ID	Collection Date	Collection Time
1717W0001	Well 3-805	8/22/2006	16:20
1717W0002	Well 4-805	8/21/2006	11:50
1717W0003	Well 2-855	8/21/2006	14:45
1717W0004	Well 3-855	8/22/2006	11:25
1717W0005	Well 4-855	8/21/2006	13:40
1717W0006	Well 2-885	8/22/2006	12:45
1717W0007	Well 4-885	8/22/2006	9:30
1717W0008	Well 2-805	8/21/2006	16:50

TABLE 2

**CONCENTRATIONS OF SELECTED
GAMMA EMITTING RADIONUCLIDES
IN WATER SAMPLES
BY GAMMA SPECTROSCOPY CP1, REVISION 15
BATTELLE
WEST JEFFERSON, OHIO**

ORISE Sample ID	NRC Region III Sample ID	Radionuclide Concentrations (pCi/L)				
		Co-60 ^a	Cs-137 ^a	Eu-152 ^a	Eu-154 ^b	Am-241 ^a
1717W0001	Well 3-805	3.0 ± 2.6 ^c	6.4 ± 3.3	-3.9 ± 5.3	4.6 ± 9.4	0.2 ± 3.1
1717W0002	Well 4-805	1.6 ± 2.2	0.0 ^d ± 2.1	0.3 ± 4.9	-6.1 ± 9.8	2.8 ± 3.2
1717W0003	Well 2-855	-0.8 ± 1.7	0.7 ± 1.6	-2.6 ± 4.1	-0.9 ± 7.2	0.6 ± 2.3
1717W0004	Well 3-855	2.4 ± 2.4	1.7 ± 2.1	0.0 ± 5.9	-4 ± 11	2.8 ± 3.2
1717W0005	Well 4-855	1.3 ± 2.1	0.4 ± 4.2	3.8 ± 5.5	-8.4 ± 9.3	0.0 ± 3.0
1717W0006	Well 2-885	2.9 ± 2.2	0.6 ± 2.1	1.3 ± 4.9	-6.6 ± 9.6	1.7 ± 3.2
1717W0007	Well 4-885	1.3 ± 1.8	-0.9 ± 1.6	0.1 ± 4.2	-6.0 ± 7.4	3.1 ± 2.4
1717W0008	Well 2-805	1.0 ± 2.3	1.8 ± 2.2	3.4 ± 5.4	-5 ± 12	-2.5 ± 2.5

^aThe range of MDCs for these radionuclides is 2.7 pCi/L to 9.0 pCi/L.

^bThe average MDC for Eu-154 was 15 pCi/L.

^cUncertainties represent the 95% confidence level, based on total propagated uncertainties.

^dZero values are due to rounding.

TABLE 3

CONCENTRATIONS OF

ALPHA AND BETA EMITTING RADIONUCLIDES

IN WATER SAMPLES

BY LOW BACKGROUND ALPHA AND BETA COUNTING

CP3, REVISION 2

BATTELLE

WEST JEFFERSON, OHIO

ORISE Sample ID	NRC Region III Sample ID	Radionuclide Concentrations ^a (pCi/L)	
		Gross Alpha	Gross Beta
1717W0001	Well 3-805	1.5 ± 2.7 ^b (4.9)	3.1 ± 2.4 (4.0)
1717W0002	Well 4-805	0.5 ± 1.9 (3.7)	3.7 ± 1.9 (3.0)
1717W0003	Well 2-855	2.8 ± 4.3 (7.6)	5.9 ± 3.8 (6.0)
1717W0004	Well 3-855	8.4 ± 3.1 (3.3)	7.9 ± 2.2 (3.0)
1717W0005	Well 4-855	2.0 ± 2.2 (3.6)	5.3 ± 2.0 (3.0)
1717W0006	Well 2-885	13.7 ± 6.8 (8.5)	18.5 ± 5.5 (7.5)
1717W0007	Well 4-885	18 ± 18 (30) ^c	376 ± 55 (30) ^c
1717W0008	Well 2-805	3.4 ± 2.7 (4.2)	7.6 ± 2.4 (3.4)

^aThe MDCs for each radionuclide are in parentheses.

^bUncertainties represent the 95% confidence level, based on total propagated uncertainties.

^cThe requested MDC's were not met due to the small volume of sample that could be used for this analysis.

TABLE 4

CONCENTRATIONS OF TOTAL RADIOSTRONTIUM
IN WATER SAMPLES
BY LOW BACKGROUND BETA COUNTING
AP4, REVISION 13; CP3, REVISION 2
BATTELLE
WEST JEFFERSON, OHIO

ORISE Sample ID	NRC Region III Sample ID	Radionuclide Concentrations, TPUs, and MDCs ^a (pCi/L)			
1717W0001	Well 3-805	-0.6	±	1.5 ^b	(2.7)
1717W0002	Well 4-805	-0.7	±	2.0	(3.6)
1717W0003	Well 2-855	0.4	±	1.9	(3.3)
1717W0004	Well 3-855	-0.3	±	2.1	(3.7)
1717W0005	Well 4-855	-0.3	±	1.5	(2.7)
1717W0006	Well 2-885	-1.1	±	1.5	(2.8)
1717W0007	Well 4-885	-0.9	±	1.5	(2.8)
1717W0008	Well 2-805	-0.6	±	1.5	(2.7)

^aMDCs are in parentheses.

^bUncertainties represent the 95% confidence level, based on total propagated uncertainties.

TABLE 5

**CONCENTRATIONS OF SELECTED
ALPHA EMITTING RADIONUCLIDES
IN WATER AND SEDIMENT SAMPLES
BY ALPHA SPECTROSCOPY
API1, REVISION 3; CP2, REVISION 12
BATTELLE
WEST JEFFERSON, OHIO**

ORISE Sample ID	NRC Region III Sample ID	Radionuclide Concentrations ^a (pCi/g of sediment in 100 mL or pCi/L for water)							
		Pu-238		Pu-239/240		U-234		U-238	
1717W0001 ^b	Well 3-805	-0.22	± 0.16 ^c (0.40)	0.00 ^d	± 0.10 (0.22)	0.51	± 0.19 (0.05)	0.27	± 0.15 (0.15)
1717M0001 ^c	Well 3-805	0.00	± 0.02 (0.04)	-0.01	± 0.01 (0.03)	-0.02	± 0.02 (0.05)	0.00	± 0.01 (0.01)
1717W0002	Well 4-805	-0.02	± 0.13 (0.27)	-0.08	± 0.08 (0.23)	0.46	± 0.20 (0.18)	0.26	± 0.14 (0.06)
1717M0002	Well 4-805	0.00	± 0.01 (0.02)	-0.01	± 0.01 (0.03)	0.03	± 0.02 (0.02)	0.03	± 0.02 (0.02)
1717W0003	Well 2-855	-0.16	± 0.16 (0.39)	-0.02	± 0.10 (0.25)	1.44	± 0.32 (0.05)	0.86	± 0.24 (0.12)
1717M0003	Well 2-855	0.01	± 0.01 (0.02)	-0.01	± 0.01 (0.03)	0.55	± 0.08 (0.04)	0.68	± 0.09 (0.02)
1717W0004	Well 3-855	0.02	± 0.12 (0.25)	0.00	± 0.06 (0.16)	9.4	± 1.1 (0.1)	4.11	± 0.62 (0.14)
1717M0004	Well 3-855	0.00	± 0.01 (0.03)	0.01	± 0.01 (0.01)	0.02	± 0.01 (0.01)	0.02	± 0.01 (0.01)
1717W0005	Well 4-855	-0.14	± 0.17 (0.41)	0.02	± 0.08 (0.18)	0.13	± 0.22 (0.38)	0.13	± 0.11 (0.15)
1717M0005	Well 4-855	-0.01	± 0.02 (0.04)	0.00	± 0.01 (0.02)	-0.02	± 0.03 (0.07)	-0.01	± 0.02 (0.04)
1717W0006	Well 2-885	-0.09	± 0.11 (0.29)	0.00	± 0.06 (0.17)	5.25	± 0.73 (0.18)	2.35	± 0.45 (0.14)
1717M0006	Well 2-885	0.01	± 0.02 (0.03)	-0.01	± 0.01 (0.03)	1.97	± 0.22 (0.05)	2.27	± 0.24 (0.04)
1717W0007	Well 4-885	-0.13	± 0.19 (0.44)	-0.03	± 0.17 (0.37)	10.8	± 1.3 (0.2)	5.80	± 0.81 (0.19)
1717M0007	Well 4-885	0.00	± 0.03 (0.05)	0.00	± 0.02 (0.04)	2.22	± 0.22 (0.05)	2.81	± 0.26 (0.03)
1717W0008	Well 2-805	0.04	± 0.15 (0.29)	-0.04	± 0.05 (0.18)	4.36	± 0.63 (0.13)	1.14	± 0.30 (0.17)
1717M0008	Well 2-805	-0.01	± 0.02 (0.04)	-0.01	± 0.01 (0.02)	0.01	± 0.01 (0.01)	0.01	± 0.01 (0.01)

^aThe MDCs are in parentheses.

^bWater concentrations, TPUs, and MDCs are in pCi/L.

^cUncertainties represent the 95% confidence level, based on total propagated uncertainties.

^dZero values are due to rounding.

^eSoil concentrations, TPUs, and MDCs are in pCi/g of sediment in 100 mL.