

ORISE
OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

December 7, 2007

Mr. Duane Schmidt
U.S. Nuclear Regulatory Commission
FSME/DWMEP/DURLD
TWFN 8 F5
Rockville, Maryland 20852

**SUBJECT: REPORT FOR ANALYSES OF SOIL SAMPLES FROM NUCLEAR FUEL SERVICES, ERWIN, TENNESSEE
[INSPECTION REPORT NUMBER 70/143-2007-006] [RFTA NO. 07-001]**

Dear Mr. Schmidt:

The Oak Ridge Institute for Science and Education (ORISE) received 16 soil samples from Nuclear Fuel Services on three separate dates. Four samples for technetium-99 (Tc-99) analysis were received on August 3, 2007. One sample for Tc-99 analysis was received on August 17, 2007. Eleven samples for gamma and alpha spectroscopy analyses were received on October 23, 2007. The analyses were performed based on a hand written note received from Jennifer Foster on October 9, 2007. Sample identification and collection data for the samples addressed in this report are presented in Table 1. Gamma spectroscopy and alpha spectroscopy data for ORISE sample numbers S0006-S00016 are provide in Tables 2 and 3. The technetium-99 data for ORISE sample numbers S0001-S0005 are provided in 4. The pertinent procedure references are provided in each specific table.

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, Manager
Laboratory

RDC:WPI:ar

Enclosures

c: T. Carter, NRC/FSME/DWMEP T-8F5
E. Knox-Davin, NRC/FSME/TWFN 8A23
J. Foster, NRC Region II
E. Abelquist, ORISE
S. Roberts, ORISE
File 0478

Distribution approval and concurrence :	Initials
Technical Management Team Member	<i>DSR</i>
Quality Manager	<i>GTP</i>

Voice: 865.241.3242

Fax: 865.241.3248

E-mail: Dale.Condra@oraui.org

TABLE 1**SAMPLE IDENTIFICATIONS
AND COLLECTION DATA
NUCLEAR FUEL SERVICES
ERWIN, TENNESSEE**

ORISE Sample ID	NRC Region I Sample ID	Collection Date	Collection Time
0478S0001	0118-AX-XE SU7	8/9/2007	12:51
0478S0002	0134-CX-XE SU7	7/31/2007	11:20
0478S0003	0138-BX-XE SU7	8/1/2007	10:04
0478S0004	0130-EX-XE SU7	8/1/2007	11:50
0478S0005	0110-AX-XE SU7	8/1/2007	16:02
0478S0006	0111-AX-XA SU7	8/2/2007	13:16
0478S0007	0118-AX-XA SU7	8/9/2007	12:51
0478S0008	0110-EX-XA SU7	8/1/2007	16:02
0478S0009	0125-DX-XA SU7	7/31/2007	13:48
0478S0010	0128-EX-XA SU7	7/31/2007	16:08
0478S0011	0130-EX-XA SU7	8/1/2007	11:50
0478S0012	0130-FX-XA SU7	8/1/2007	12:06
0478S0013	0134-CX-XA SU7	7/31/2007	11:25
0478S0014	0138-BX-XA SU7	8/1/2007	10:08
0478S0015	0139-BX-XA SU7	8/1/2007	14:08
0478S0016	0142-EX-XA SU7	7/31/2007	14:45

TABLE 2

**CONCENTRATIONS OF SELECTED
GAMMA EMITTING RADIONUCLIDES
IN SOIL SAMPLES
BY GAMMA SPECTROSCOPY CP1, REVISION 15.
NUCLEAR FUEL SERVICES
ERWIN, TENNESSEE**

ORISE Sample ID	NRC Region I Sample ID	Radionuclide Concentrations ^a (pCi/g)						
		Am-241	Th-228 by Pb-212	Th-232 by Ac-228	Total Th ^b	U-238	U-235	Total U ^c
0478S0006	0111-AX-XA SU7	3.20 ± 0.22 ^d , 0.23	16.09 ± 0.90, 0.11	14.9 ± 1.2, 0.21	31.0 ± 1.5	67.3 ± 3.1, 2.1	4.47 ± 0.48, 0.50	169 ± 11
0478S0007	0118-AX-XA SU7	1.25 ± 0.09, 0.10	2.68 ± 0.17, 0.05	2.48 ± 0.29, 0.11	5.16 ± 0.34	6.06 ± 0.72, 0.90	1.17 ± 0.26, 0.22	32.6 ± 5.7
0478S0008	0110-EX-XA SU7	0.28 ± 0.04, 0.06	1.67 ± 0.11, 0.05	1.50 ± 0.23, 0.15	3.17 ± 0.25	2.72 ± 0.45, 0.56	0.26 ± 0.18, 0.17	8.6 ± 3.9
0478S0009	0125-DX-XA SU7	0.04 ± 0.03, 0.05	0.75 ± 0.06, 0.03	0.64 ± 0.13, 0.08	1.39 ± 0.14	0.98 ± 0.44, 0.45	0.08 ± 0.10, 0.12	2.8 ± 2.2
0478S0010	0128-EX-XA SU7	-0.01 ± 0.04, 0.07	1.08 ± 0.09, 0.04	1.12 ± 0.18, 0.13	2.20 ± 0.20	0.91 ± 0.61, 0.67	-0.02 ± 0.10, 0.18	0.5 ± 2.3
0478S0011	0130-EX-XA SU7	0.05 ± 0.03, 0.05	0.68 ± 0.06, 0.03	0.72 ± 0.13, 0.10	1.40 ± 0.14	0.74 ± 0.50, 0.50	0.05 ± 0.08, 0.15	1.9 ± 1.8
0478S0012	0130-FX-XA SU7	-0.02 ± 0.03, 0.05	0.83 ± 0.06, 0.04	0.91 ± 0.15, 0.13	1.74 ± 0.16	0.53 ± 0.47, 0.47	-0.05 ± 0.08, 0.13	-0.6 ± 1.8
0478S0013	0134-CX-XA SU7	0.04 ± 0.03, 0.05	0.53 ± 0.05, 0.03	0.62 ± 0.12, 0.09	1.15 ± 0.13	0.61 ± 0.51, 0.48	0.01 ± 0.08, 0.13	0.8 ± 1.8
0478S0014	0138-BX-XA SU7	0.05 ± 0.03, 0.05	1.06 ± 0.07, 0.03	1.12 ± 0.14, 0.08	2.18 ± 0.16	0.76 ± 0.32, 0.49	0.05 ± 0.08, 0.14	1.9 ± 1.8
0478S0015	0139-BX-XA SU7	0.00 ^e ± 0.04, 0.07	0.89 ± 0.07, 0.04	0.98 ± 0.15, 0.10	1.87 ± 0.17	1.80 ± 0.64, 0.61	0.58 ± 0.16, 0.17	15.0 ± 3.5
0478S0016	0142-EX-XA SU7	0.01 ± 0.04, 0.05	0.71 ± 0.06, 0.04	0.80 ± 0.14, 0.09	1.51 ± 0.15	0.31 ± 0.49, 0.51	0.02 ± 0.08, 0.14	0.8 ± 1.8

^aThe MDCs are after the comma.

^bTotal Th is the sum of the concentrations of Th-228 + Th-232.

^cThe equation for Total U is U-238 + U-235 + (21.7*U-235).

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

^eZero value is due to rounding.

TABLE 3

**CONCENTRATIONS OF SELECTED
ALPHA EMITTING RADIONUCLIDES
IN SOIL SAMPLES
AP11, REVISION 4; CP2, REVISION 12
NUCLEAR FUEL SERVICES
ERWIN, TENNESSEE**

ORISE Sample ID	NRC Region I Sample ID	Radionuclide Concentrations ^a (pCi/g dry weight)		
		Am-241	Pu-238	Pu-239/240
0478S0006	0111-AX-XA SU7	2.20 ± 0.20 ^b , 0.04	1.10 ± 0.13, 0.04	6.97 ± 0.59, 0.03
0478S0007	0118-AX-XA SU7	0.53 ± 0.08, 0.03	0.06 ± 0.02, 0.03	1.32 ± 0.13, 0.01
0478S0008	0110-EX-XA SU7	0.23 ± 0.05, 0.03	0.01 ± 0.02, 0.03	0.58 ± 0.09, 0.03
0478S0009	0125-DX-XA SU7	0.01 ± 0.03, 0.04	0.02 ± 0.02, 0.03	0.01 ± 0.01, 0.02
0478S0010	0128-EX-XA SU7	0.02 ± 0.03, 0.05	-0.01 ± 0.01, 0.03	0.03 ± 0.02, 0.02
0478S0011	0130-EX-XA SU7	0.01 ± 0.03, 0.05	0.00 ^c ± 0.01, 0.02	0.01 ± 0.01, 0.01
0478S0012	0130-FX-XA SU7	0.02 ± 0.02, 0.03	0.00 ± 0.01, 0.02	0.00 ± 0.01, 0.02
0478S0013	0134-CX-XA SU7	0.01 ± 0.01, 0.02	0.01 ± 0.02, 0.03	0.00 ± 0.01, 0.01
0478S0014	0138-BX-XA SU7	0.01 ± 0.01, 0.02	0.00 ± 0.01, 0.02	0.01 ± 0.01, 0.02
0478S0015	0139-BX-XA SU7	0.03 ± 0.02, 0.03	0.00 ± 0.01, 0.02	0.01 ± 0.01, 0.02
0478S0016	0142-EX-XA SU7	0.01 ± 0.02, 0.03	0.00 ± 0.01, 0.02	0.002 ^d ± 0.004, 0.006

TABLE 3 (Continued)

CONCENTRATIONS OF SELECTED
ALPHA EMITTING RADIONUCLIDES
IN SOIL SAMPLES
AP11, REVISION 4; CP2, REVISION 12.
NUCLEAR FUEL SERVICES
ERWIN, TENNESSEE

ORISE Sample ID	NRC Region I Sample ID	Radionuclide Concentrations ^a (pCi/g dry weight)		
		Th-228	Th-230	Th-232
0478S0006	0111-AX-XA SU7	18.6 ± 1.3 , 0.0	11.16 ± 0.82 , 0.01	16.4 ± 1.2 , 0.0
0478S0007	0118-AX-XA SU7	2.43 ± 0.23 , 0.04	1.06 ± 0.12 , 0.02	2.07 ± 0.20 , 0.01
0478S0008	0110-EX-XA SU7	2.05 ± 0.19 , 0.03	1.45 ± 0.15 , 0.02	1.77 ± 0.17 , 0.01
0478S0009	0125-DX-XA SU7	0.90 ± 0.10 , 0.05	0.75 ± 0.09 , 0.01	0.74 ± 0.09 , 0.01
0478S0010	0128-EX-XA SU7	0.99 ± 0.11 , 0.04	0.90 ± 0.10 , 0.01	0.99 ± 0.11 , 0.01
0478S0011	0130-EX-XA SU7	0.87 ± 0.11 , 0.05	0.64 ± 0.09 , 0.03	0.83 ± 0.10 , 0.02
0478S0012	0130-FX-XA SU7	0.80 ± 0.10 , 0.03	0.69 ± 0.09 , 0.02	0.75 ± 0.09 , 0.01
0478S0013	0134-CX-XA SU7	0.61 ± 0.09 , 0.04	0.51 ± 0.08 , 0.02	0.51 ± 0.08 , 0.02
0478S0014	0138-BX-XA SU7	1.39 ± 0.15 , 0.03	1.22 ± 0.13 , 0.02	1.32 ± 0.14 , 0.01
0478S0015	0139-BX-XA SU7	0.96 ± 0.11 , 0.03	0.80 ± 0.10 , 0.02	0.89 ± 0.11 , 0.01
0478S0016	0142-EX-XA SU7	0.99 ± 0.12 , 0.03	0.83 ± 0.10 , 0.02	1.00 ± 0.12 , 0.01

TABLE 3 (Continued)

**CONCENTRATIONS OF SELECTED
ALPHA EMITTING RADIONUCLIDES
IN SOIL SAMPLES
AP11, REVISION 4; CP2, REVISION 12
NUCLEAR FUEL SERVICES
ERWIN, TENNESSEE**

ORISE Sample ID	NRC Region I Sample ID	Radionuclide Concentrations ^a (pCi/g dry weight)		
		U-233/234	U-235	U-238
0478S0006	0111-AX-XA SU7	157 ± 14 , 1	4.42 ± 0.98 , 0.43	61.8 ± 5.9 , 0.3
0478S0007	0118-AX-XA SU7	22.2 ± 1.6 , 0.0	0.65 ± 0.08 , 0.01	4.78 ± 0.37 , 0.02
0478S0008	0110-EX-XA SU7	8.91 ± 0.74 , 0.02	0.25 ± 0.05 , 0.01	2.88 ± 0.27 , 0.01
0478S0009	0125-DX-XA SU7	0.91 ± 0.11 , 0.02	0.04 ± 0.02 , 0.02	0.70 ± 0.09 , 0.01
0478S0010	0128-EX-XA SU7	0.87 ± 0.10 , 0.02	0.04 ± 0.02 , 0.01	0.66 ± 0.08 , 0.00
0478S0011	0130-EX-XA SU7	0.79 ± 0.10 , 0.01	0.02 ± 0.02 , 0.02	0.51 ± 0.07 , 0.02
0478S0012	0130-FX-XA SU7	0.70 ± 0.09 , 0.01	0.03 ± 0.02 , 0.01	0.45 ± 0.07 , 0.01
0478S0013	0134-CX-XA SU7	0.65 ± 0.08 , 0.01	0.01 ± 0.01 , 0.02	0.44 ± 0.06 , 0.01
0478S0014	0138-BX-XA SU7	1.50 ± 0.15 , 0.01	0.04 ± 0.02 , 0.02	1.19 ± 0.13 , 0.02
0478S0015	0139-BX-XA SU7	20.7 ± 1.6 , 0.0	0.56 ± 0.08 , 0.01	1.55 ± 0.16 , 0.01
0478S0016	0142-EX-XA SU7	0.97 ± 0.11 , 0.02	0.05 ± 0.02 , 0.02	0.74 ± 0.09 , 0.02

^aThe MDCs are after the comma.

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

^cZero values are due to rounding.

^dSignificant figures expanded to avoid reporting a TPU of zero at the request of the inspector.

TABLE 4

**CONCENTRATIONS OF TECHNETIUM-99
 IN SOIL SAMPLES
 BY LIQUID SCINTILLATION ANALYSIS
 AP5, REVISION 17; CP4, REVISION 3
 NUCLEAR FUEL SERVICES
 ERWIN, TENNESSEE**

ORISE Sample ID	NRC Region I Sample ID	Radionuclide Concentrations, TPUs, and MDCs ^a (pCi/g)
0478S0001	0118-AX-XE SU7	0.25 ± 0.16 ^b , 0.26
0478S0002	0134-CX-XE SU7	0.05 ± 0.16 , 0.27
0478S0003	0138-BX-XE SU7	0.05 ± 0.15 , 0.25
0478S0004	0130-EX-XE SU7	0.07 ± 0.13 , 0.23
0478S0005	0110-AX-XE SU7	0.32 ± 0.16 , 0.26

^aThe MDCs are after the comma.

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