

January 12, 2012

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

**SUBJECT: ORISE CONTRACT NO. DE-AC05-06OR23100
LETTER REPORT FOR ANALYTICAL RESULTS FOR THREE SOIL
SAMPLES FROM THE MALLINCKRODT PLANT, ST. LOUIS, MISSOURI
[INSPECTION NO. 04006563/2011003] (RFTA NO. 12-001)
DCN: 5166-LR-01-0**

Dear Mr. Bonano:

The Oak Ridge Institute for Science and Education (ORISE) received three soil samples on December 23, 2011 from the Mallinckrodt Plant in St. Louis, Missouri. The samples were analyzed according to the NRC Form 303 supplied with the samples. Uranium-234 (U-234) cannot be measured by gamma spectroscopy under normal conditions. Therefore, the U-234 is assumed to be in secular equilibrium with the measureable uranium-238 since the samples have naturally occurring isotopic ratios. The sample identification numbers are presented in Table 1 and the gamma spectroscopy results for the requested radionuclides are provided in Table 2. The formulas used to calculate total uranium and total thorium are shown as a footnote in Table 2. The pertinent procedure references are included with 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 Dale Condra at 865.241.3242 with any questions or comments.

Sincerely,

Wade P. Ivey
Wade Ivey, Manager
Laboratory

WPI:RDC:bj

Enclosures

c: T. Carter, NRC/FSME/DWMEP T-8F5
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File 5166

Distribution approval and concurrence:		Initials
Technical Review		E'NB
Quality Review		SB

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TABLE 1
SAMPLE IDENTIFICATIONS
AND COLLECTION INFORMATION
MALLINCKRODT PLANT
ST. LOUIS, MISSOURI

ORISE Sample ID	NRC Region III Sample ID	Collection Date	Collection Time
5166S0001	M-11-1-01	12/15/2011	10:00 AM
5166S0002	M-11-1-02	12/15/2011	10:15 AM
5166S0003	M-11-1-03	12/15/2011	10:30 AM

TABLE 2
CONCENTRATIONS OF SELECTED GAMMA EMITTERS
IN SOIL SAMPLES
BY GAMMA SPECTROSCOPY CP1, REVISION 17
MALLINCKRODT PLANT
ST. LOUIS, MISSOURI

ORISE Sample ID	NRC Region III Sample ID	Radionuclide Concentrations, TPU ^a , and MDCs ^b (pCi/g)					
		Th-228 by Pb-212	Th-232 by Ac-228	Th-230	Ra-226 by Pb-214	Pb-210	Total Th ^c
5166S0001	M-11-1-01	1.13 ± 0.10 , 0.08	1.42 ± 0.20 , 0.17	-12.7 ± 8.3 , 15.0	1.05 ± 0.10 , 0.09	1.73 ± 0.40 , 0.78	2.55 ± 0.22
5166S0002	M-11-1-02	1.03 ± 0.09 , 0.08	1.18 ± 0.16 , 0.15	-0.6 ± 6.2 , 12.0	0.91 ± 0.08 , 0.07	1.48 ± 0.41 , 0.89	2.21 ± 0.18
5166S0003	M-11-1-03	1.78 ± 0.14 , 0.09	1.99 ± 0.25 , 0.21	10.1 ± 8.7 , 15.0	1.71 ± 0.13 , 0.10	2.65 ± 0.50 , 0.99	3.77 ± 0.29

ORISE Sample ID	NRC Region III Sample ID	Radionuclide Concentrations, TPU ^a , and MDCs ^b (pCi/g)			
		K-40	U-238 by Th-234	U-235	Total U ^d
5166S0001	M-11-1-01	15.9 ± 1.4 , 0.9	1.29 ± 0.47 , 1.00	0.02 ± 0.11 , 0.27	2.60 ± 0.95
5166S0002	M-11-1-02	18.1 ± 1.3 , 0.6	2.06 ± 0.41 , 0.80	0.08 ± 0.09 , 0.20	4.20 ± 0.82
5166S0003	M-11-1-03	14.9 ± 1.3 , 1.0	8.46 ± 0.90 , 1.40	0.49 ± 0.12 , 0.24	17.4 ± 1.8

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

^bMDCs are after the commas.

^cTotal thorium is calculated using Th-228 + Th-232 for natural thorium.

^dTotal uranium is calculated using U-238*2 + U-235 for natural uranium.