

St. Louis Soil Samples, State Hygienic Laboratory at the University of Iowa

Nuclide	Median Activity (pCi/g)	Mean Activity (pCi/g)	Standard Deviation (pCi/g)	Max Activity (pCi/g)	Min Activity (pCi/g)
U-238	323.4	350.8	104.0	489.0	209.8
U-234	306.2	349.6	108.3	525.7	215
Th-230	18130	17610	6002	27010	9836

Nuclide	LCS Result (pCi)	LCS Known Value (pCi)	LCS % Recovery	LCS Tracer Yield	Sample Result (pCi/g)	Duplicate Result (pCi/g)	Relative % Difference	Duplicate Tracer Yield	Blank ≤ MDA + Uncertainty?	Blank Tracer Yield
U-234	1.993E+00	1.96	102%	60.92%	3.02E+02	3.038E+02	0.5943%	78.51%	Yes	75.08%
U-238	2.164E+00	2.03	107%	60.92%	3.07E+02	3.070E+02	0.1302%	78.51%	Yes	75.08%
Th-230	4.430E+00	4.00	111%	73.69%	1.49E+04	1.952E+04	26.98%	74.81%	No	73.69%

Comments:

Samples were then analyzed in accordance with published Eichrom methods for thorium, uranium, and plutonium in water. Samples were prepared by measuring 0.5 g of soil into a 50 mL centrifuge tube and adding 10.000 mL of 6N HCl. Samples were shaken on a wrist shaker for 45 minutes. A sub-sample of the 6N HCl leaching solution was taken and diluted. Radiochemical tracers were then added to the sub-sampled solution. Some Thorium-230 contamination was observed in the uranium fraction and ROIs were set for the uranium analysis to exclude Th-230. Results for Th-230 were blank subtracted due to tailing of Th-229 tracer into Th-230 ROI; additionally, the RPD for the duplicate is out of a recommended control limit of 20%; reproducibility of Th-230 results without full dissolution is questionable. No plutonium was conclusively observed in the samples; some counts above background were observed in the plutonium fractions, but this is likely from thorium and/or uranium contamination due to the extremely high levels of these nuclides present in the samples.

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SHL #	Sample	Tracer Nuclide	Tracer Yield	Nuclide	Activity (pCi/g)	Uncertainty @ 95% CI (pCi/g)	MDA (pCi/g)	Nuclide	Activity (pCi/g)	Uncertainty @ 95% CI (pCi/g)	MDA (pCi/g)	Tracer Nuclide	Tracer Yield	Nuclide	Activity (pCi/g)	Uncertainty @ 95% CI (pCi/g)	MDA (pCi/g)
346517	STL1	U-232	80.75%	U-238	409.7	61.26	3.719	U-234	394.9	59.74	3.726	Th-229	89.26%	Th-230	10830	1426	182
346518	STL2	U-232	79.54%	U-238	209.8	40.36	14.77	U-234	215.0	40.54	3.878	Th-229	81.22%	Th-230	21900	2241	210.7
346519	STL3	U-232	78.89%	U-238	323.4	53.38	10.48	U-234	306.2	51.45	3.998	Th-229	88.69%	Th-230	9836	1419	196.1
346520	STL4	U-232	84.90%	U-238	448.2	63.27	3.543	U-234	435.6	62.05	3.550	Th-229	83.15%	Th-230	27010	2570	210.3
346521	STL5	U-232	58.93%	U-238	489.0	80.04	17.16	U-234	460.5	76.64	13.68	Th-229	84.81%	Th-230	18130	1938	199.1
346522	STL6	U-232	77.47%	U-238	463.1	68.20	10.56	U-234	525.7	74.60	4.027	Th-229	82.17%	Th-230	24090	2359	208
346523	STL7	U-232	84.54%	U-238	239.8	43.08	17.06	U-234	261.8	44.93	9.682	Th-229	82.10%	Th-230	12770	1639	210
346524	STL8	U-232	79.69%	U-238	266.7	46.89	10.38	U-234	244.6	44.42	10.40	Th-229	76.14%	Th-230	19000	2129	227.8
346525	STL9	U-232	78.51%	U-238	307.4	49.99	14.55	U-234	302.0	49.08	3.665	Th-229	81.01%	Th-230	14880	1790	212.4

Analyzed By: Dustin May 2016-05-16

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Sample Name	OpenELIS Number	Sample Weight (g)	U Sample Weight (g)	1σ Rel Unc U Sample Weight	Th Sample Weight (g)	1σ Rel Unc Th Sample Weight
STL1		346517	0.5255	0.002102	0.30%	0.0001183
STL2		346518	0.4975	0.001990	0.30%	0.0001120
STL3		346519	0.4894	0.001958	0.30%	0.0001102
STL4		346521	0.4867	0.001947	0.30%	0.0001096
STL5		346521	0.5042	0.002017	0.30%	0.0001135
STL6		346522	0.4823	0.001929	0.30%	0.0001086
STL7		346523	0.4951	0.001980	0.30%	0.0001114
STL8		346524	0.4908	0.001963	0.30%	0.0001105
STL9		346525	0.4949	0.001980	0.30%	0.0001114
STL9 Dup		346525	0.4949	0.001980	0.30%	0.0001114
LCS	N/A		1	1	0.000000	1
Blk	N/A		1	1	0.000000	1

Reagent	Prepared Date/Lot #	Prepared By/Manufacturer	Expiration Date	Received	PO #
6N HCl	2016-04-30	dmay	2021-04-30		
1.25M Ca(NO3)2	2014-04-25	dmay	2019-04-25		
3.2M (NH4)2HPO4	2014-04-25(U) & 2016-04-30(Th)	dmay	2019-04-25(U) & 2021-04-30(Th)		
1% Phenolphthalein	2011-01-12	mmehrhof	2016-01-12		
6N NH4OH	2016-04-19	tirado	2021-04-19		
16N HNO3	157790	Fisher	N/A	2016-03-29	1001581090
3M HNO3-1M Al(NO3)3	2016-05-02	dmay	2021-05-02		
3M HNO3	2016-04-01(U) & 2016-05-09(Th)	tirado(U) & acarl(Th)	2021-04-01(U) & 2021-05-09(Th)		
8M Nitric acid	2015-09-16	acarl	2020-09-16		
9N HCl	2016-05-02(U) & 2016-05-12(Th)	dmay	2021-05-02(U) & 2021-05-12(Th)		
5N HCl-0.05M (COOH)2	2016-05-02	dmay	2021-05-02		
1M HCl	2016-05-03	dmay	2021-05-03		
Ti(III)Cl3	117021	Fisher	N/A	2013-06-13	UNK
0.5 mg/mL Ce(NO3)3 Carrier	2013-11-07	dmay	2018-11-07		
48% HF	5114100	Fisher	N/A	2015-10-13	UNK
30% H2O2	140440	Fisher	N/A	2014-01-01	UNK
TEVA Resin	TESR16A	Eichrom	N/A	2016-03-21	UNK
UTEVA Resin	UTSR12C	Eichrom	N/A	2012-06-13	UNK

Nuclide	Standard ID	Activity (pCi/mL)	Volume (mL)	Activity (pCi)
U-232	R11006		5.676	0.352
Nat U	64644-294		4.01	1.000
Th-230	92772 W5		11.2	0.357
Th-229	4328C		1.32	3.030