PROJECT NOTE WESTON SOLUTIONS, INC.

To: Canadian Radium & Uranium Corp. Site File

Date: June 5, 2014

W.O. No.: 20405.012.013.2222.00

From: Nels R. Johnson, CHP, and Denise Breen, Weston Solutions, Inc.

Subject: Review of Test America Analytical Report for the Canadian Radium and Uranium Site - Sediment

1. Data Verification

The subject data package was reviewed and the data appear valid. The data package contained analytical results for six sediment samples, one rinsate water sample, and appropriate laboratory control samples (LCS). Analytical methods employed are alpha spectrometry for isotopic thorium, isotopic uranium, and isotopic lead for sediment and water samples. Gamma spectrometry for Ra-226 and -228 was used for sediment samples, and gas flow proportional counting for Ra-226 and -228 on the water sample.

The analytical methods cited are generally accepted industry methods for the requested radioisotopes. Appropriate tracers for isotopic thorium and isotopic uranium were used and percent recoveries were within tolerances. The suite of LCS included blanks, duplicates, and spikes for all lab methods and most were within tolerances. The minimum detectable concentration (MDC) for each result was acceptable, with the exception of Ra-226. Analytical data complied with the requested detection limits (RL) of 1.0 picocurie per gram (pCi/g) for sediment, again with the exception of Ra-226, and 1.0 pCi/L for water.

Due to a contractual need to expedite these analyses, gamma spectrometry was performed on each sample within two days of drying and homogenization. The laboratory then quantified the Ra-226 activity in each sample based upon the 186 keV gamma line from Ra-226. This technique is generally considered inferior and results in a large relative counting error estimate and a large MDC. The performing laboratory provided the following additional clarification in the case narrative:

> Radium-226 by gamma spectroscopy is typically determined by inference from daughters (e.g., bismuth-214) after sealing the sample in an appropriate counting geometry/container and waiting 21 days to allow the radium-226 decay chain through radon-222 to reach secular equilibrium. Such an approach is considered to be the most reliable and representative means for establishing the true radium-226 concentration in the sample. The method requested by the client to report radium-226, using its own 186 keV gamma-ray emission, is subject to interference and potential bias due to the 185.7 keV uranium-235 gamma ray. Experience also indicates gamma spectroscopy software does not consistently assign accurate peak areas to radium-226 (186 keV), with the problem compounded by slight drift of the instrumentation. The laboratory considers radium-226 reported based upon the 186 keV gamma-ray emission to be best used by the client in a qualitative fashion.

2. Data Interpretation

2.1 Preliminary Interpretation

2.1.1 Sediment Samples

Two samples (2222-SD02 and -SD05) were collected upstream from the site and are considered to be background (i.e., not impacted by potential migration of contaminants from the site). One sample (2222-SD04) was collected at the probable point of entry (PPE) and two samples (2222-SD03 and -SD01) were collected downstream of the PPE; all three samples are considered to be potentially impacted by migration of contaminants from the site. One sample (2222-SD06) was collected as a field duplicate to 2222-SD03.

The sediment data as reported by the laboratory was first grouped into the radioisotopes included in the U-238 decay series (U-238, Th-230, U-233/234, Ra-226, Pb-210, and Pb-214) and the Th-232 decay series (Th-232, Ra-228, Th-228, and Pb-212). In typical sediment in the eastern U.S., the concentrations of the individual radioisotopes of the Th-232 and U-238 decay series range from approximately 0.5 to 1.5 pCi/g. These concentrations are considered to be general background values for these isotopes.

All analytical results reported for the Th-232 decay series ranged from 0.32 to 1.07 pCi/g, and are therefore considered to be at general regional background levels. In addition, all of the individual radioisotopes were observed to be in equilibrium in each sample. The maximum concentrations observed for each radionuclide in this decay series are:
Th-232: 0.604 +/- 0.181 (pCi/g) (2222-SD03)
Ra-228: 0.913 +/- 0.326 pCi/g (2222-SD03)
Th-228: 1.07 +/- 0.251 pCi/g (2222-SD03)
Pb-212 0.811 +/- 0.229 pCi/g (2222-SD06)

All analytical results reported for U-238, Th-230, U-233/234, and Pb-214 of the U-238 decay chain appeared to be consistent with general regional background levels ranging from 0.35 to 1.15 pCi/g. The maximum concentrations observed these radionuclides are:
U-238 1.08 +/- 0.244 pCi/g (2222-SD04)
Th-230 0.745 +/- 0.204 pCi/g (2222-SD03)
U-233/234 1.15 +/- 0.253 pCi/g (2222-SD04)
Pb-214 0.754 +/- 0.200 pCi/g (2222-SD03)

Analytical results reported for Ra-226 and Pb-210 are negatively impacted by large counting errors and MDCs. This is not a reflection on the laboratory's performance but on the limitations of the analytical technique contractually required for a short turn-around time by the client. Due to the large relative counting errors and large MDCs these data are inconclusive after the preliminary interpretation. Field duplicate samples (2222-SD03 and SD06) analytical results compared favorably.

2.1.2 Water Sample

The one water sample is the rinsate blank. Most of the analytical results were below the detection level for the method. The three positive results were for Th-230, U-234, and U-238. All three results are slightly above their respective minimum detectable concentrations, and therefore appear positive. However, the concentrations are very low and are not considered to be a significant contributor to the sediment analytical results.

2.2 Secondary Interpretation

The Hazard Ranking System (HRS) states that in order to establish observed release for a site-attributable

radionuclide: 1) value equals or exceeds a value 2 standard deviations above the mean site-specific background concentration for that radionuclide in that type of sample, or 2) value exceeds the upper-limit value of the range of regional background concentrations for that radionuclide in that type of sample.

In order to examine the data from the most conservative or stringent perspective, WESTON held to both criteria listed above and applied the total uncertainty value to each result. The total uncertainty was added to the results for background samples (2222-SD02 and -SD05), and the total uncertainty was subtracted from the release samples (2222-SD01, -SD03, -SD04, and -SD06). These adjusted results are presented in the attached Table 1. Next, in order to calculate the mean site-specific background concentration: the standard deviation was calculated for each adjusted background sample value. The standard deviation was then multiplied by two and added to the adjusted mean site-specific value for each specific radionuclide. This value was then compared to each adjusted analytical result for the release samples in order to determine if any result qualifies as an observed release.

To compare which values exceed the upper-limit value of the range of regional background concentrations, a range of approximately 0.5 pCi/g to 1.5 pCi/g was used to evaluate individual analytical results within each radionuclide. In typical soil in the eastern U.S., the concentration of the individual radioisotopes of the Th-232 and U-238 decay series range from approximately 0.5 to 1.5 pCi/g. These concentrations are considered to be general background values for these isotopes.

Employing the aforementioned criteria, significant values were established for the site.

One sample location (2222-SD04) exhibits a concentration of Ra-226 that meets the criteria listed above for establishing observed release. Adjusted Ra-226 concentration in sample 2222-SD04 exhibited a significantly elevated concentration of 2.74 pCi/g. The reported Ra-226 concentrations for duplicate samples 2222-SD03 and –SD06 also appeared to be elevated, but the adjusted concentrations did not meet the criteria for observed release due to high uncertainty. The adjusted concentrations of Pb-210 were also elevated in samples 2222-SD03, -SD04 and -SD06 (2.00 pCi/g, 1.38 pCi/g, and 2.01 pCi/g, respectively), but were slightly below criteria for establishing observed release. This elevation in Pb-210, a daughter product of Ra-226, further supports the presence of Ra-226 in the surface water pathway.

Field duplicate samples (2222-SD03 and -SD06) were collected and the adjusted analytical results compared favorably.

The maximum adjusted concentrations (results minus total uncertainty) were detected as follows:
U-238 at 0.836 pCi/g (2222-SD04)
Th-230 at 0.541 pCi/g (2222-SD03)
U-233/234 at 0.897 pCi/g (2222-SD04)
Ra-226 at 2.74 pCi/g (2222-SD04)
Pb-210 at 2.01 pCi/g (2222-SD06)
Pb-214 at 0.554 pCi/g (2222-SD03)
Th-232 at 0.423 pCi/g (2222-SD03)
Ra-228 at 0.597 pCi/g (2222-SD03)
Th-228 at 0.819 pCi/g (2222-SD03)
Pb-212 at 0.582 pCi/g (2222-SD06)
U-235/236 at 0.0128 pCi/g (2222-SD04)

Complete validated analytical data and adjusted concentrations for radionuclides can be found on Table 1 of this Project Note. Significant adjusted analytical results, established in accordance with the aforementioned criteria, can be found on Table 2 of this Project Note as well as on Figure 5, included in the report.

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Certified Health Physicist

Denise Breen
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Canadian Radium Uranium Corp. site - May 2014

Table 1. Complete Analytical Results for Sediment Samples

Location ID	SD01					SD02 Background					SD03				
	Result	Total Uncertainty	**Adjusted Result**	Qualifier	Unit	Result	Total Uncertainty	**Adjusted Result**	Qualifier	Unit	Result	Total Uncertainty	**Adjusted Result**	Qualifier	Unit
Uranium-238	0.352	+/- 0.156	**0.196**	V	pCi/g	0.459	+/- 0.151	**0.61**	V	pCi/g	0.591	+/- 0.169	**0.422**	V	pCi/g
Thorium-230	0.578	+/- 0.176	**0.402**	V	pCi/g	0.417	+/- 0.143	**0.56**	V	pCi/g	0.745	+/- 0.204	**0.541**	V	pCi/g
Uranium-233/234	0.585	+/- 0.205	**0.38**	V	pCi/g	0.369	+/- 0.134	**0.503**	V	pCi/g	0.666	+/- 0.181	**0.485**	V	pCi/g
Radium-226	0.780	+/- 1.08	**-0.3**	UV	pCi/g	0.231	+/- 0.800	**1.031**	UV	pCi/g	2.86	+/- 2.07	**0.79**	V	pCi/g
Lead-210	0.877	+/- 1.35	**-0.473**	UV	pCi/g	-0.270	+/- 1.54	**1.27**	UV	pCi/g	4.29	+/- 2.29	**2**	V	pCi/g
Lead-214	0.451	+/- 0.150	**0.301**	V	pCi/g	0.45	+/- 0.125	**0.575**	V	pCi/g	0.754	+/- 0.200	**0.554**	V	pCi/g
Location ID	SD01					SD02 Background					SD03				
Thorium-232	0.333	+/- 0.130	**0.203**	V	pCi/g	0.321	+/- 0.125	**0.446**	V	pCi/g	0.604	+/- 0.181	**0.423**	V	pCi/g
Radium-228	0.628	+/- 0.199	**0.429**	V	pCi/g	0.647	+/- 0.173	**0.82**	V	pCi/g	0.913	+/- 0.316	**0.597**	V	pCi/g
Thorium-228	0.320	+/- 0.136	**0.184**	V	pCi/g	0.314	+/- 0.126	**0.44**	V	pCi/g	1.07	+/- 0.251	**0.819**	V	pCi/g
Lead-212	0.586	+/- 0.176	**0.41**	V	pCi/g	0.472	+/- 0.126	**0.598**	V	pCi/g	0.619	+/- 0.213	**0.406**	V	pCi/g
Location ID	SD01					SD02 Background					SD03				
Uranium-235/236	0.0165	+/- 0.0413	**-0.0248**	UV	pCi/g	0.0230	+/- 0.0408	**0.0638**	UV	pCi/g	0.0110	+/- 0.0276	**-0.0166**	UV	pCi/g
Uranium-232	60.1			V	%	81.5			V	%	88.0			V	%
Thorium-229	78.2			V	%	83.0			V	%	72.2			V	%
Reference 42	p. 12, 13					p. 13-14					p. 15				

Location ID	SD04					SD05 Background					SD06				
	Result	Total Uncertainty	**Adjusted Result**	Qualifier	Unit	Result	Total Uncertainty	**Adjusted Result**	Qualifier	Unit	Result	Total Uncertainty	**Adjusted Result**	Qualifier	Unit
Uranium-238	1.08	+/- 0.244	**0.836**	V	pCi/g	0.243	+/- 0.109	**0.352**	V	pCi/g	0.588	+/- 0.170	**0.418**	V	pCi/g
Thorium-230	0.695	+/- 0.188	**0.507**	V	pCi/g	0.296	+/- 0.118	**0.414**	V	pCi/g	0.548	+/- 0.167	**0.381**	V	pCi/g
Uranium-233/234	1.15	+/- 0.253	**0.897**	V	pCi/g	0.289	+/- 0.122	**0.411**	V	pCi/g	0.859	+/- 0.211	**0.648**	V	pCi/g
Radium-226	4.76	+/- 2.02	**2.74**	V	pCi/g	0.109	+/- 1.09	**1.199**	UV	pCi/g	2.93	+/- 1.71	**1.22**	V	pCi/g
Lead-210	4.05	+/- 2.67	**1.38**	V	pCi/g	1.53	+/- 1.43	**2.96**	UV	pCi/g	3.67	+/- 1.66	**2.01**	V	pCi/g
Lead-214	0.690	+/- 0.200	**0.49**	V	pCi/g	0.353	+/- 0.113	**0.466**	V	pCi/g	0.664	+/- 0.174	**0.49**	V	pCi/g
Location ID	SD04					SD05 Background					SD06				
Thorium-232	0.445	+/- 0.148	**0.297**	V	pCi/g	0.282	+/- 0.113	**0.395**	V	pCi/g	0.586	+/- 0.173	**0.413**	V	pCi/g
Radium-228	0.763	+/- 0.255	**0.508**	V	pCi/g	0.554	+/- 0.229	**0.783**	V	pCi/g	0.608	+/- 0.229	**0.379**	V	pCi/g
Thorium-228	0.561	+/- 0.172	**0.389**	V	pCi/g	0.296	+/- 0.120	**0.416**	V	pCi/g	0.520	+/- 0.163	**0.357**	V	pCi/g
Lead-212	0.767	+/- 0.196	**0.571**	V	pCi/g	0.45	+/- 0.134	**0.584**	V	pCi/g	0.811	+/- 0.229	**0.582**	V	pCi/g
Location ID	SD04					SD05 Background					SD06				
Uranium-235/236	0.0854	+/- 0.0726	**0.0128**	V	pCi/g	-0.00545	+/- 0.00773	**0.00228**	UV	pCi/g	-0.00784	+/- 0.00908	**-0.01692**	UV	pCi/g
Uranium-232	83.5			V	%	85.0			V	%	87.3			V	%
Thorium-229	83.6			V	%	87.9			V	%	81.1			V	%
Reference 42	p. 16					p. 17-18					p. 18-19				

V = Verified by Certified Health Physicist

UV = Indicated the analyte was analyzed for but not detected and verified by a Certified Health Physicist

pCi/g = picocurie per gram

DCN: 2222-2A-BJMQ

Canadian Radium Uranium Corp. site - May 2014
Table 2. Interpreted Analytical Results for Sediment Samples

Location ID	SD02 Background					SD05 Background					2x Standard Deviation Above Mean Site-Specific Background	SD03					SD06 (Duplicate of SD03)				
	Result	Total Uncertainty	Adjusted Result	Qualifier	Unit	Result	Total Uncertainty	Adjusted Result	Qualifier	Unit		Result	Total Uncertainty	Adjusted Result	Qualifier	Unit	Result	Total Uncertainty	Adjusted Result	Qualifier	Unit
Uranium-238	0.459	+/- 0.151	0.61	V	pCi/g	0.243	+/- 0.109	0.352	V	pCi/g	**0.8458**	0.591	+/- 0.169	0.422	V	pCi/g	0.588	+/- 0.170	0.418	V	pCi/g
Thorium-230	0.417	+/- 0.143	0.56	V	pCi/g	0.296	+/- 0.118	0.414	V	pCi/g	**0.6934**	0.745	+/- 0.204	0.541	V	pCi/g	0.548	+/- 0.167	0.381	V	pCi/g
Uranium-233/234	0.369	+/- 0.134	0.503	V	pCi/g	0.289	+/- 0.122	0.411	V	pCi/g	**0.5872**	0.666	+/- 0.181	0.485	V	pCi/g	0.859	+/- 0.211	0.648	V	pCi/g
Radium-226	0.231	+/- 0.800	1.031	UV	pCi/g	0.109	+/- 1.09	1.199	UV	pCi/g	**1.3526**	2.86	+/- 2.07	0.79	V	pCi/g	2.93	+/- 1.71	1.22	V	pCi/g
Lead-210	-0.270	+/- 1.54	1.27	UV	pCi/g	1.53	+/- 1.43	2.96	UV	pCi/g	**4.505**	4.29	+/- 2.29	2.00	V	pCi/g	3.67	+/- 1.66	2.01	V	pCi/g
Lead-214	0.45	+/- 0.125	0.575	V	pCi/g	0.353	+/- 0.113	0.466	V	pCi/g	**0.6747**	0.754	+/- 0.200	0.554	V	pCi/g	0.664	+/- 0.174	0.49	V	pCi/g
Reference 42	p. 13-14					p. 17-18						p. 15					p. 18-19				

Location ID	SD02 Background					SD05 Background					2x Standard Deviation Above Mean Site-Specific Background	SD01					SD04				
	Result	Total Uncertainty	Adjusted Result	Qualifier	Unit	Result	Total Uncertainty	Adjusted Result	Qualifier	Unit		Result	Total Uncertainty	Adjusted Result	Qualifier	Unit	Result	Total Uncertainty	Adjusted Result	Qualifier	Unit
Uranium-238	0.459	+/- 0.151	0.61	V	pCi/g	0.243	+/- 0.109	0.352	V	pCi/g	**0.8458**	0.352	+/- 0.156	0.196	V	pCi/g	1.08	+/- 0.244	0.836	V	pCi/g
Thorium-230	0.417	+/- 0.143	0.56	V	pCi/g	0.296	+/- 0.118	0.414	V	pCi/g	**0.6934**	0.578	+/- 0.176	0.402	V	pCi/g	0.695	+/- 0.188	0.507	V	pCi/g
Uranium-233/234	0.369	+/- 0.134	0.503	V	pCi/g	0.289	+/- 0.122	0.411	V	pCi/g	**0.5872**	0.585	+/- 0.205	0.38	V	pCi/g	1.15	+/- 0.253	0.897	V	pCi/g
Radium-226	0.231	+/- 0.800	1.031	UV	pCi/g	0.109	+/- 1.09	1.199	UV	pCi/g	**1.3526**	0.780	+/- 1.08	-0.30	UV	pCi/g	4.76	+/- 2.02	2.74	V	pCi/g
Lead-210	-0.270	+/- 1.54	1.27	UV	pCi/g	1.53	+/- 1.43	2.96	UV	pCi/g	**4.505**	0.877	+/- 1.35	-0.473	UV	pCi/g	4.05	+/- 2.67	1.38	V	pCi/g
Lead-214	0.45	+/- 0.125	0.575	V	pCi/g	0.353	+/- 0.113	0.466	V	pCi/g	**0.6747**	0.451	+/- 0.150	0.301	V	pCi/g	0.690	+/- 0.200	0.49	V	pCi/g
Reference 42	p. 13-14					p. 17-18						p. 12, 13					p. 16				

Yellow Highlight signifies that Adjusted Result is above the Upper Limit Value (>1.5 pCi/g).
RED font signfies that adjusted concentration exceeds 2x the Standard Deviation of the Adjusted Site Specific Mean.
V = Verified by Certified Health Physicist
UV = Indicated the analyte was analyzed for but not detected and verified by a Certified Health Physicist
pCi/g = picocurie per gram

DCN: 2222-2A-BJMQ

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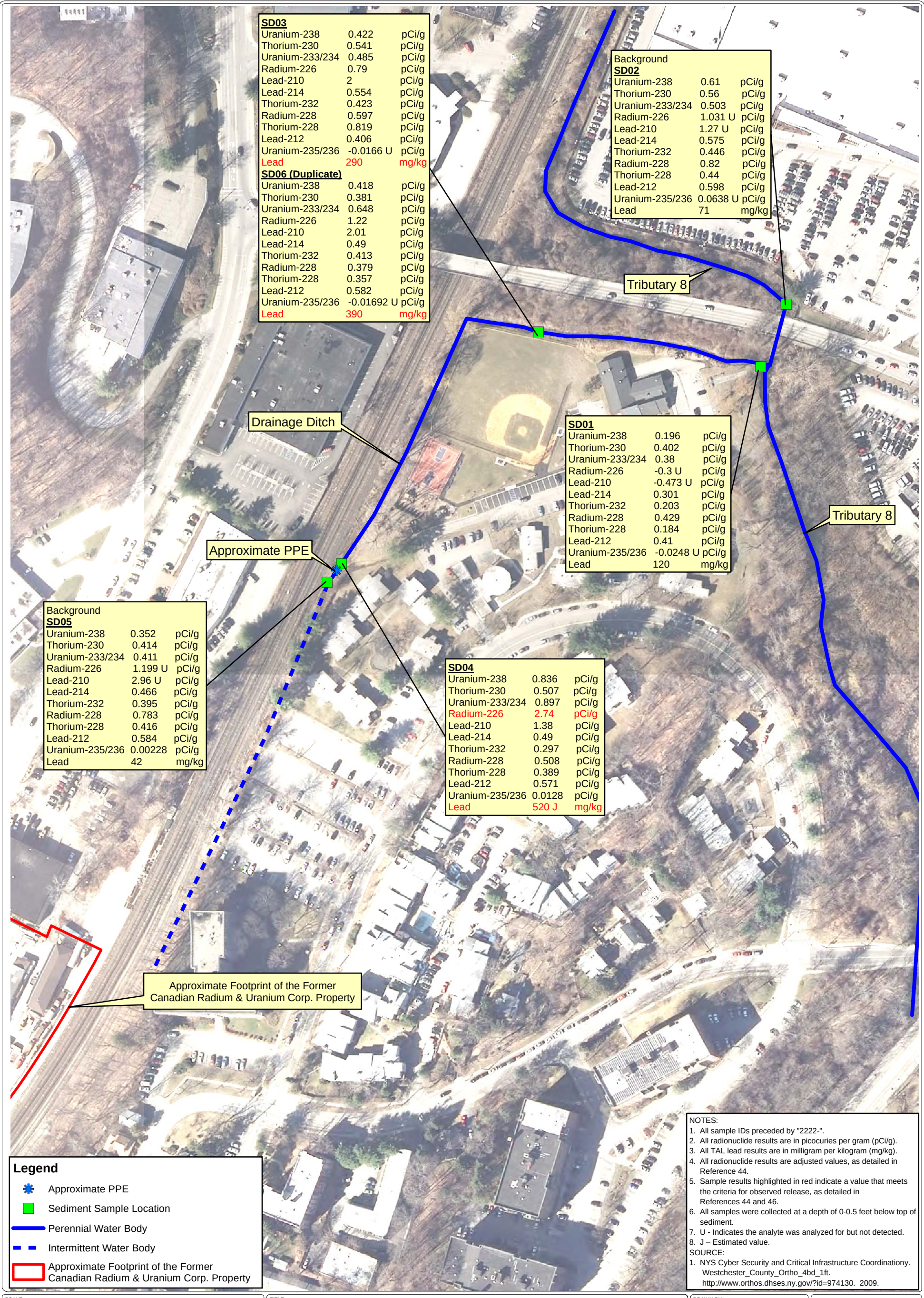

SCALE:
150 75 0 150
Graphic Scale In Feet

PROJECT:
Canadian Radium & Uranium Corp.

CLIENT NAME:
EPA

TITLE:
Sample Location and Data Results Map
Canadian Radium & Uranium Corp.
103/105 Kisco Avenue
Mount Kisco, NY 10549

DRAWING NUMBER: 15154

FIGURE #: 5

DRAWN BY: J. Lynes

REVIEWED BY: D. Breen

PROJECT MANAGER: D. Breen

SCALE: 1" = 150'

DATE: June 2014

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