



# Tonawanda Landfill Vicinity Property

## Environmental Monitoring Data Release

### 2013 Sampling Results

Tonawanda, NY

**U.S. Army Corps of Engineers**  
**Buffalo District**  
April 2014

**Building Strong**®

#### Formerly Utilized Sites Remedial Action Program (FUSRAP)

FUSRAP was initiated in 1974 to identify, investigate, and clean up or control sites throughout the United States that were contaminated as the result of activities related to the Nation's early atomic energy and weapons program in the 1940s, 1950s and 1960s. When implementing FUSRAP, the U.S. Army Corps of Engineers follows the provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The Tonawanda Landfill Vicinity Property was designated into FUSRAP in 1992, and is currently in the Feasibility Study phase of the CERCLA investigation process.

#### Site Description

The Tonawanda Landfill Vicinity Property consists of two parcels owned by the Town of Tonawanda: the Town of Tonawanda Landfill (Landfill Operable Unit [OU]) and the North Youngmann Commerce Center (formerly known as the Mudflats). The Tonawanda Landfill Vicinity Property covers approximately 170 acres in the Town of Tonawanda, Erie County, New York. The vicinity property is bordered by a residential area within the City of Tonawanda, a railroad line, Interstate 290 and East Park Drive. A National Grid utility corridor separates the Landfill OU and the North Youngmann Commerce Center.

#### Purpose

The purpose of this environmental data release is to provide groundwater, surface water, and sediment monitoring data that is collected annually at the site. The Corps of Engineers is posting this data at <http://www.lrb.usace.army.mil/Missions/HTRW/FUSRAP/TonawandaLandfill.aspx> on the Tonawanda Landfill Vicinity Property Web page. Included on the Web page are annual environmental monitoring data and the Corps' interpretation of these data, and a fact sheet describing the annual environmental monitoring program.

#### Results and Interpretation

Groundwater, surface water and sediment samples were collected from the Landfill OU in the spring of 2013, and an additional round of surface water samples was collected in the fall of 2013. Figure 1 shows the location of the groundwater, and surface water and collocated sediment locations, sampled at the Landfill OU in the spring and fall of 2013. Groundwater surface elevations were measured during the spring 2013 monitoring event and are presented in Table 1. These elevations were plotted as groundwater contours, shown in Figure 2. The data indicate that groundwater flow in the Landfill OU is generally towards the south or southwest.

Groundwater analytical results for the spring 2013 annual monitoring event, for non-filtered and filtered samples, are presented in Tables 2 and 3, respectively. Concentrations of radium-226 (Ra-226) and thorium-230 (Th-230) have consistently been at or near background levels in groundwater samples from all permanent monitoring well and temporary well point (TWP) sample locations. Elevated levels of uranium were detected in groundwater samples from several of the permanent monitoring well and TWP locations. The U.S. Environmental Protection Agency Maximum Contaminant Levels (MCLs) are the accepted contaminant guidelines for drinking water; and while groundwater at the Landfill OU is not a drinking water source, the MCL for total uranium (U) of 30 micrograms per liter ( $\mu\text{g/L}$ ) was used for screening purposes to identify elevated levels of uranium in the sample results. Concentrations of uranium near or above the MCL were detected in groundwater samples from wells BM-4, BM-16, BM-19, L-2, TWP-6, TWP-7, TWP-8, and TWP-13, which is consistent with previous rounds of sampling conducted by the Corps. Wells BM-15, BM-17 and BM-18 had total uranium results that were below the MCL, but appeared elevated above background levels. Figure 3 shows the total uranium concentrations in filtered groundwater samples for the 2013 and previous Corps of Engineers sampling events. Exceedances of the total uranium MCL do not indicate an impact to human health, because the groundwater is not utilized for drinking water.

Surface water analytical results are presented in Table 4. Surface water samples were collected in the spring of 2013 from the drainage ditch leading from the Landfill OU to Two Mile Creek; and in the fall of 2013 from both the drainage ditch and Two Mile Creek. Surface water samples were also collected from a ditch that drains the adjacent National Grid utility corridor and intersects the Landfill OU drainage ditch (locations SW/SD-12 and SW-17). Concentrations of Ra-226 and Th-230 have consistently been at or near background levels in all surface water samples collected. Concentrations of uranium in surface water samples collected from the primary drainage ditch were elevated above background levels, exceeding either the drinking water MCL for total uranium or the Canadian surface water quality guideline (CWQG) for protection of aquatic life of 15  $\mu\text{g/L}$  for total uranium. (The CWQG for protection of aquatic life, which includes aquatic plants, fish, and insects and other invertebrates which live in the water, was developed by the Canadian Council of Ministers of the Environment in 2011, and is used here for screening purposes to identify potential risks to aquatic life. No corresponding surface water quality criteria for uranium have been developed by the U.S. Environmental Protection Agency or individual States.) However, surface water flow in the drainage ditch is temporary in nature, and the ditch is not a drinking water source or viable habitat for aquatic life. Surface water samples collected in the fall of 2013 from Two Mile Creek, the most likely aquatic habitat into which the ditch discharges, exhibited total uranium concentrations that were below both the MCL and the CWQG.

Sediment sample analytical results are presented in Table 5. Although cleanup criteria have not been established for the Landfill OU, for comparison purposes the sediment results were screened against the standard in Title 40 of the Code of Federal Regulations, Part 192 (40CFR192), Subpart B, for cleanup of Ra-226 in surface soils of 5 picocuries per gram (pCi/g) above background. Sediment results were also compared to an ecological screening level for total uranium of 100 milligrams per kilogram (mg/kg). None of the sediment samples exceeded either the Ra-226 or the total uranium screening levels, which is consistent with the previous rounds of sediment sampling conducted by the Corps of Engineers. Therefore, future FUSRAP annual environmental monitoring sampling events at the Landfill OU will not include sediment sampling.

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**Legend**

- Monitoring Well
- Temporary Well Point
- Surface Water/Sediment Sample
- Northern Drainage Ditch
- Landfill Operable Unit Boundary
- Mudflats Operable Unit Boundary



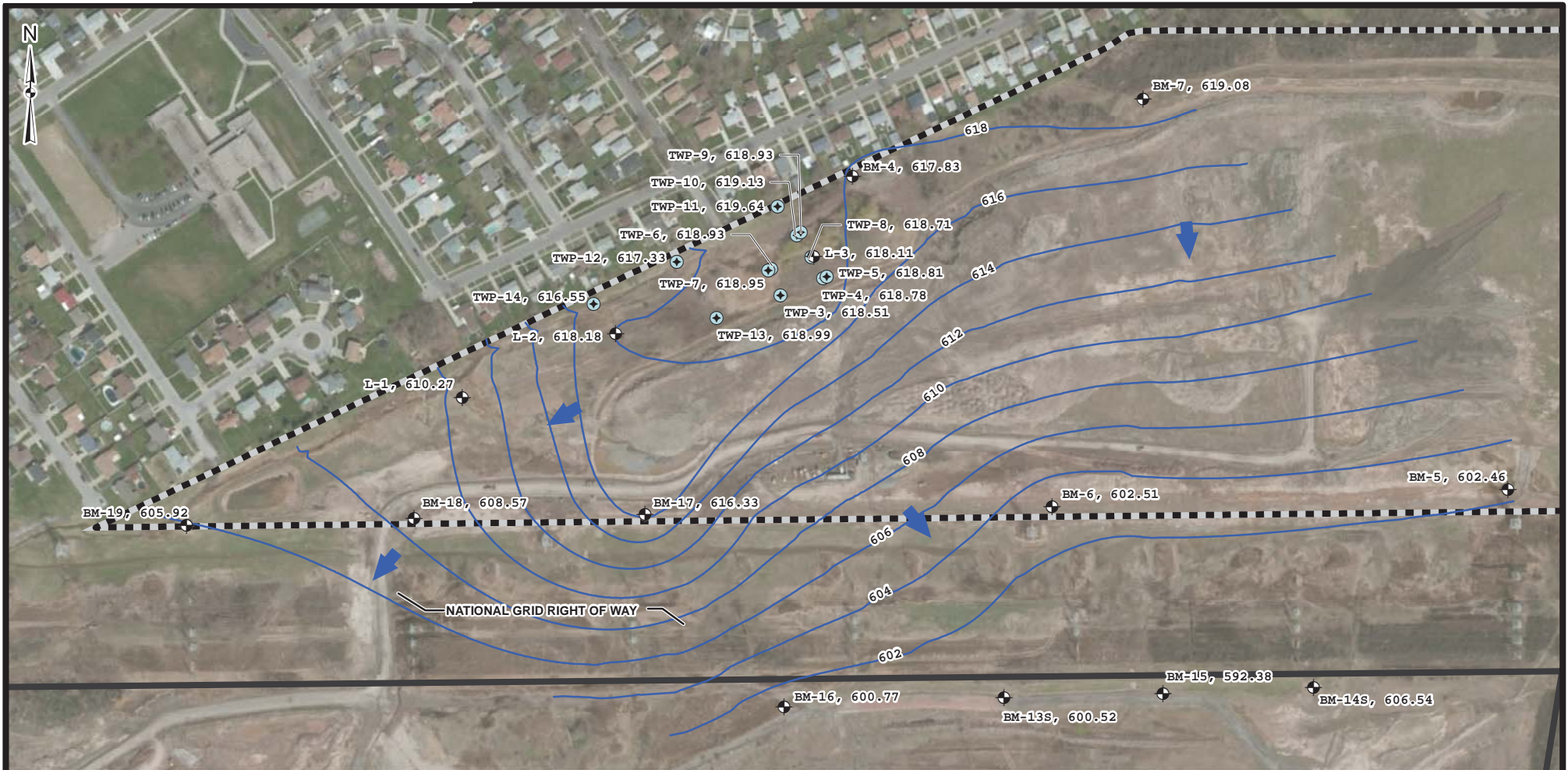
U.S. ARMY ENGINEER DISTRICT  
 CORPS OF ENGINEERS  
 BUFFALO, NY

**2013 GROUNDWATER AND SURFACE WATER/SEDIMENT  
 SAMPLE LOCATIONS**

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**TONAWANDA LANDFILL  
 FUSRAP VICINITY PROPERTY  
 TONAWANDA, NEW YORK**

FIGURE 1



**Legend**

- Monitoring Well
- Temporary Well Point
- Groundwater Elevation Contour (ft amsl)
- Groundwater Flow Direction
- Landfill Operable Unit Boundary
- Mudflats Operable Unit Boundary

NOTES:  
1) Groundwater elevations measured in ft amsl.



U.S. ARMY ENGINEER DISTRICT  
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GROUNDWATER ELEVATION CONTOUR MAP  
APRIL 8, 2013

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TONAWANDA LANDFILL  
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FIGURE 2

**Table 1: Groundwater Elevations for 2013 Monitoring Event**

<b>Well ID</b>	<b>Top of Casing Elevation (ft AMSL)</b>	<b>Depth to Water (ft from TOC)</b>	<b>Groundwater Elevation (ft AMSL)</b>
BM-4	621.60	3.77	617.83
BM-5 <sup>1</sup>	618.91	16.45	602.46
BM-6 <sup>1</sup>	619.66	17.15	602.51
BM-7 <sup>1</sup>	625.24	6.16	619.08
BM-13S <sup>1</sup>	605.78	5.26	600.52
BM-13D <sup>1</sup>	605.69	19.49	586.20
BM-14S <sup>1</sup>	610.90	4.36	606.54
BM-14D <sup>1</sup>	609.92	10.64	599.28
BM-15	606.20	13.82	592.38
BM-16	613.86	13.09	600.77
BM-17	621.73	5.40	616.33
BM-18	619.51	10.94	608.57
BM-19	610.20	4.28	605.92
L-1	616.12	5.85	610.27
L-2	622.03	3.85	618.18
L-3	621.34	3.23	618.11
TWP-3 <sup>1</sup>	621.03	2.52	618.51
TWP-4	622.47	3.69	618.78
TWP-5	622.93	4.12	618.81
TWP-6	619.92	0.99	618.93
TWP-7	619.62	0.67	618.95
TWP-8	620.36	1.65	618.71
TWP-9	620.56	1.63	618.93
TWP-10	620.15	1.02	619.13
TWP-11	622.43	2.79	619.64
TWP-12 <sup>1</sup>	620.87	3.54	617.33
TWP-13	622.27	3.28	618.99
TWP-14 <sup>1</sup>	618.81	2.26	616.55

AMSL = Above Mean Sea Level

TOC = Top of Casing

1. These wells are not sampled as part of the environmental monitoring program, but groundwater elevations were recorded.

**Table 2: Groundwater Analytical Results for Non-Filtered Samples**

Well	Month & Year	Ra-226 (pCi/L)	Th-230 (pCi/L)	U-234 (pCi/L)	U-235 (pCi/L)	U-238 (pCi/L)	Total U (µg/L) <sup>1</sup>
BM-4	Sep-01	1.50	0.300	14.4	0.400	12.3	30.1
	Jul-09	0.312	0.248	13.1	1.31	14.2	28.0
	Apr-12	0.000	0.00100	11.2	0.733	9.74	32.1
	Apr-13	ND	ND	14.2	0.766	11.9	31.8
BM-15	Sep-01	0.600	0.100	7.40	0.400	6.00	14.8
	Jul-09	NC	NC	NC	NC	NC	NC
	Apr-12	0.356	0.157	7.84	0.201	5.95	16.1
	Apr-13	0.672	ND	7.23	0.243	4.25	16.5
BM-16	Sep-01	0.400	0.000	13.2	0.600	9.90	27.0
	Jul-09	0.712	0.170	14.3	0.940	11.3	26.5
	Apr-12	0.315	0.0660	13.6	0.499	12.0	36.3
	Apr-13	ND	ND	11.3	0.496	9.47	27.1
BM-17	Sep-01	1.50	0.300	9.20	0.700	8.00	22.5
	Jul-09	1.62	0.351	9.58	0.340	8.08	20.2
	Apr-12	0.470	0.0370	5.96	0.400	5.97	17.2
	Apr-13	0.331	ND	5.97	0.195	4.80	13.6
BM-18	Sep-01	2.20	0.400	12.2	0.600	10.0	30.7
	Jul-09	0.994	0.138	10.0	0.792	7.57	47.1
	Apr-12	0.0550	0.276	10.5	0.548	8.74	25.2
	Apr-13	0.353	ND	7.85	0.259	7.28	19.3
BM-19	Sep-01	0.700	0.100	12.1	0.700	10.6	34.8
	Jul-09	0.338	0.0779	12.0	0.610	10.6	27.1
	Apr-12	0.118	0.506	9.98	0.360	9.28	27.6
	Apr-13	ND	ND	10.4	0.649	9.38	28.3
L-1	Sep-01	0.300	0.300	1.80	0.100	1.40	3.60
	Jul-09	0.873	0.172	0.571	0.130	0.568	1.01
	Apr-12	0.0560	0.0770	0.744	0.036	0.921	1.43
	Apr-13	ND	ND	0.935	ND	1.02	3.41
L-2	Sep-01	0.700	1.10	1.10	0.100	1.60	4.50
	Jul-09	0.453	0.124	2.75	0.361	1.78	6.40
	Apr-12	0.349	0.201	11.1	0.723	9.48	29.8
	Apr-13	ND	ND	9.04	0.547	10.0	31.4
L-3	Sep-01	0.900	3.00	58.2	2.50	58.3	175
	Jul-09	1.35	0.261	3.54	0.272	2.99	7.37
	Apr-12	0.148	0.112	1.62	0.0800	1.61	5.13
	Apr-13	ND	ND	2.25	ND	2.65	6.78

pCi/L = picocuries per liter

µg/L = micrograms per liter

NC = Not collected

ND = Not detected

1. Unless stated otherwise, total uranium was analyzed for separately via kinetic phosphorescence analysis (KPA).

**Table 2: Groundwater Analytical Results for Non-Filtered Samples (continued)**

Well	Month & Year	Ra-226 (pCi/L)	Th-230 (pCi/L)	U-234 (pCi/L)	U-235 (pCi/L)	U-238 (pCi/L)	Total U (µg/L) <sup>1</sup>
TWP-1	Apr-10	NC	NC	NC	NC	NC	NC
	Apr-12	0.273	-0.0100	2.97	0.160	2.78	8.72
	Apr-13	ND	ND	1.31	0.0950	1.75	5.30
TWP-4	Apr-10	NC	NC	NC	NC	NC	NC
	Apr-12	0.304	0.218	0.159	0.00900	0.110	0.386
	Apr-13	ND	ND	0.345	ND	0.289	0.800
TWP-5	Apr-10	NC	NC	NC	NC	NC	NC
	Apr-12	0.174	0.181	0.113	-0.0100	0.0640	0.434
	Apr-13	ND	ND	ND	ND	0.382	0.816
TWP-6	Apr-10	NC	NC	NC	NC	NC	NC
	Apr-12	0.208	0.0390	44.3	2.80	45.2	128
	Apr-13	0.688	ND	39.5	1.90	39.1	118
TWP-7	Apr-10	NC	NC	NC	NC	NC	NC
	Apr-12	0.422	0.175	30.2	1.53	32.0	91.7
	Apr-13	ND	ND	70.0	3.39	69.7	216
TWP-8	Apr-10	NC	NC	NC	NC	NC	NC
	Apr-12	0.145	0.219	5.03	0.238	4.77	13.5
	Apr-13	ND	ND	9.61	0.576	10.3	30.4
TWP-9	Apr-10	NC	NC	NC	NC	NC	NC
	Apr-12	-0.0500	0.0530	3.35	0.170	2.92	9.17
	Apr-13	ND	ND	2.93	ND	2.91	6.93
TWP-10	Apr-10	NC	NC	NC	NC	NC	NC
	Apr-12	NC	NC	NC	NC	NC	NC
	Apr-13	ND	ND	5.21	0.345	4.42	14.80
TWP-11	Apr-10	NC	NC	NC	NC	NC	NC
	Apr-12	-0.120	0.234	2.68	0.109	2.42	3.23
	Apr-13	ND	ND	3.28	ND	2.75	7.82
TWP-13	Apr-10	NC	NC	NC	NC	NC	NC
	Apr-12	0.149	0.0240	15.5	0.488	15.9	57.5
	Apr-13	ND	ND	16.3	1.13	16.1	45.5

pCi/L = picocuries per liter

µg/L = micrograms per liter

NC = Not collected

ND = Not detected

1. Unless stated otherwise, total uranium was analyzed for separately via kinetic phosphorescence analysis (KPA).

**Table 3: Groundwater Analytical Results for Filtered Samples**

Well	Month & Year	Ra-226 (pCi/L)	Th-230 (pCi/L)	U-234 (pCi/L)	U-235 (pCi/L)	U-238 (pCi/L)	Total U (µg/L) <sup>1</sup>
BM-4	Sep-01	0.700	0.100	12.2	0.800	11.6	32.1
	Jul-09	0.800	0.247	13.0	0.504	11.8	26.7
	Apr-12	0.423	0.161	12.3	0.196	10.6	30.9
	Apr-13	ND	ND	14.0	0.654	11.8	32.6
BM-15	Sep-01	0.600	0.100	6.30	0.400	5.10	15.4
	Jul-09	NC	NC	NC	NC	NC	NC
	Apr-12	0.108	0.111	7.98	0.209	5.14	16.5
	Apr-13	ND	ND	7.07	ND	4.21	16.4
BM-16	Sep-01	0.400	0.100	13.3	0.900	9.60	27.0
	Jul-09	0.548	0.107	12.3	1.31	11.9	29.3
	Apr-12	0.201	-0.0100	15.2	0.455	12.2	34.1
	Apr-13	ND	ND	11.1	0.551	8.79	29.7
BM-17	Sep-01	1.00	0.100	9.30	0.600	7.90	24.0
	Jul-09	0.360	0.184	6.71	0.645	6.95	18.4
	Apr-12	0.695	0.0740	6.15	0.402	6.38	19.9
	Apr-13	ND	ND	6.08	ND	5.43	14.2
BM-18	Sep-01	0.900	0.000	10.4	0.700	8.90	31.0
	Jul-09	0.898	0.229	10.5	0.609	9.46	35.4
	Apr-12	0.159	0.180	9.30	0.492	8.33	23.9
	Apr-13	ND	ND	9.50	0.400	9.25	23.4
BM-19	Sep-01	0.400	0.100	13.0	0.600	10.4	31.6
	Jul-09	0.440	0.265	14.5	0.554	10.8	25.4
	Apr-12	0.162	0.0840	10.9	0.569	9.57	14.9
	Apr-13	ND	ND	11.5	0.587	10.3	27.6
L-1	Sep-01	0.500	0.100	1.80	0.100	2.00	2.90
	Jul-09	0.990	0.291	1.94	0.086	0.481	0.915
	Apr-12	-0.170	0.137	0.298	0.041	0.750	1.58
	Apr-13	ND	ND	1.24	ND	0.888	3.31
L-2	Sep-01	0.500	0.100	0.500	0.000	0.600	1.60
	Jul-09	1.33	0.231	3.88	0.260	4.46	49.5
	Apr-12	0.000	0.150	10.8	0.632	9.89	29.7
	Apr-13	ND	ND	9.71	0.406	9.46	30.3
L-3	Sep-01	0.500	0.500	46.8	3.40	46.9	133
	Jul-09	1.18	0.217	2.19	0.279	2.85	6.61
	Apr-12	0.0500	-0.0100	1.85	0.075	2.09	5.73
	Apr-13	ND	ND	2.38	ND	2.03	6.97

pCi/L = picocuries per liter

µg/L = micrograms per liter

NC = Not collected

ND = Not detected

1. Unless stated otherwise, total uranium was analyzed for separately via kinetic phosphorescence analysis (KPA).



**Table 3: Groundwater Analytical Results for Filtered Samples (continued)**

Well	Month & Year	Ra-226 (pCi/L)	Th-230 (pCi/L)	U-234 (pCi/L)	U-235 (pCi/L)	U-238 (pCi/L)	Total U (µg/L) <sup>1</sup>
TWP-1 <sup>2</sup>	Apr-10	0.230	0.0800	2.87	0.110	2.43	7.20
	Apr-12	0.112	0.158	3.48	0.111	3.02	8.87
	Apr-13	ND	ND	4.09	ND	3.35	9.07
TWP-4 <sup>2</sup>	Apr-10	0.270	0.110	3.20	0.170	3.84	11.4
	Apr-12	0.515	0.000	0.151	0.000	0.097	0.461
	Apr-13	ND	ND	0.288	ND	0.182	0.723
TWP-5 <sup>2</sup>	Apr-10	ND	ND	0.370	ND	0.380	1.12
	Apr-12	0.617	0.0420	0.0550	-0.0100	0.104	0.462
	Apr-13	ND	ND	0.347	ND	ND	0.897
TWP-6 <sup>2</sup>	Apr-10	0.280	0.150	28.1	0.850	28.2	83.4
	Apr-12	0.487	0.174	49.3	2.52	46.7	127
	Apr-13	ND	ND	39.2	1.87	37.5	129
TWP-7 <sup>2</sup>	Apr-10	ND	ND	50.7	1.99	51.8	153
	Apr-12	0.100	0.174	29.1	2.17	30.4	93.2
	Apr-13	ND	ND	71.4	5.40	73.4	231
TWP-8 <sup>2</sup>	Apr-10	0.170	0.0700	4.21	0.240	4.10	12.2
	Apr-12	-0.160	0.175	3.88	0.0400	6.74	11.0
	Apr-13	ND	ND	5.61	0.227	5.89	16.0
TWP-9 <sup>2</sup>	Apr-10	ND	0.440	2.14	0.220	1.95	5.84
	Apr-12	0.231	0.0770	3.43	0.234	2.83	10.1
	Apr-13	ND	ND	2.83	ND	2.40	7.25
TWP-10	Apr-10	NC	NC	NC	NC	NC	NC
	Apr-12	NC	NC	NC	NC	NC	NC
	Apr-13	NC	NC	NC	NC	NC	NC
TWP-11 <sup>2</sup>	Apr-10	0.260	0.0800	70.2	0.950	20.3	60.0
	Apr-12	0.169	0.134	2.29	0.0570	2.42	6.47
	Apr-13	ND	ND	3.17	ND	2.87	7.91
TWP-13 <sup>2</sup>	Apr-10	0.230	0.0900	4.52	0.170	4.19	12.4
	Apr-12	0.146	0.123	13.7	0.865	13.1	46.5
	Apr-13	ND	ND	14.4	0.591	15.5	47.4

pCi/L = picocuries per liter

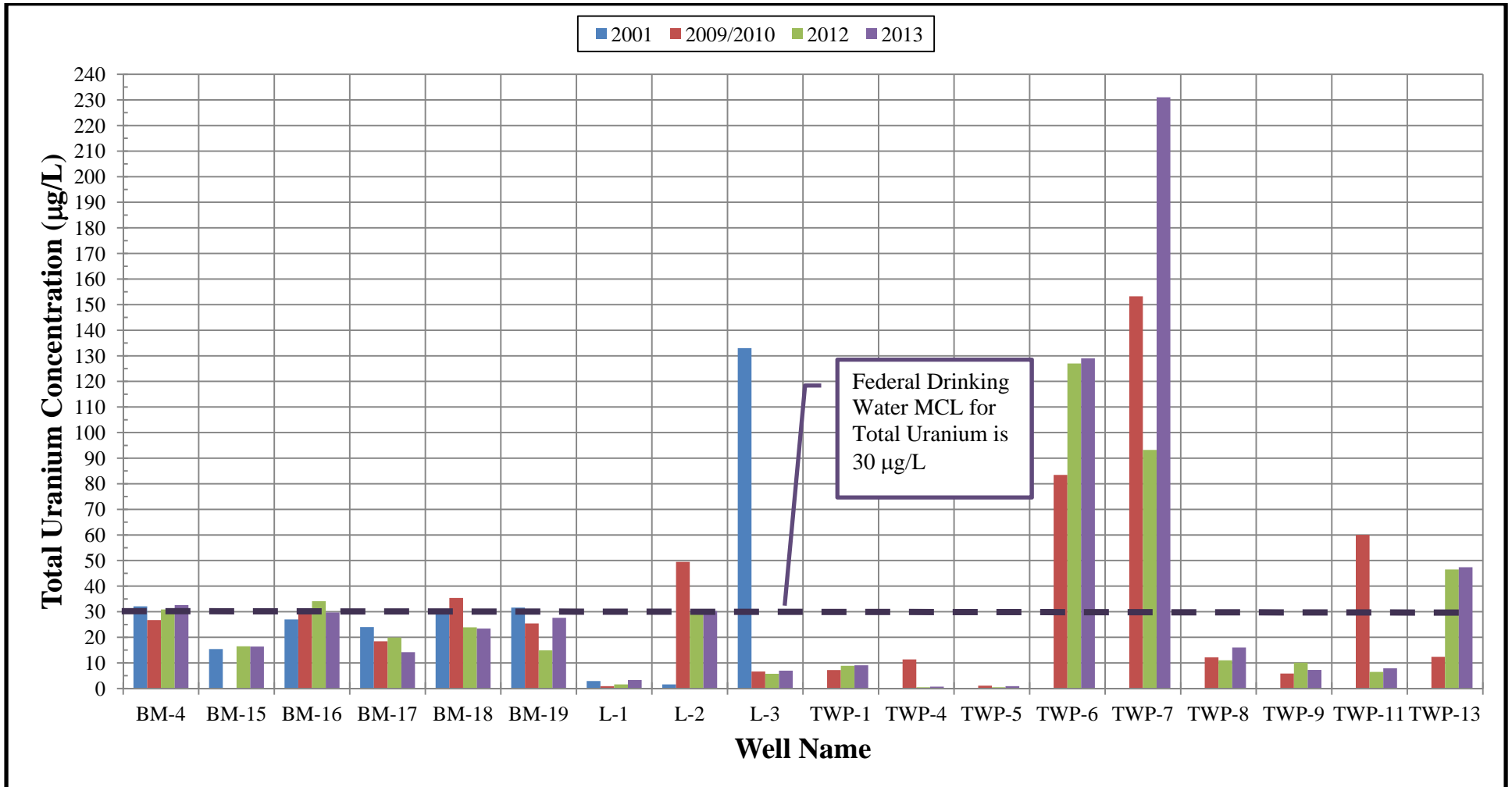
µg/L = micrograms per liter

NC = Not collected

ND = Not detected

1. Unless stated otherwise, total uranium was analyzed for separately via kinetic phosphorescence analysis (KPA).
2. April 2010 Total U result for these locations calculated using the specific activities for each uranium isotope from 40CFR71, Appendix A.

Figure 3: Total Uranium Concentrations in Filtered Groundwater Samples Over Time



**Table 4: Surface Water Analytical Results**

Location	Month & Year	Ra-226 (pCi/L)	Th-230 (pCi/L)	U-234 (pCi/L)	U-235 (pCi/L)	U-238 (pCi/L)	Total U (µg/L) <sup>1</sup>
SW/SD-01	Jul-09	0.608	0.0889	57.8	4.74	56.9	144
	Apr-12	0.249	0.107	70.8	3.71	68.3	252
	Apr-13	ND	ND	46.9	2.65	43.9	127.00
	Nov-13	NA	NA	20.8	1.15	23.1	76.6
SW/SD-02	Jul-09	0.342	0.311	19.9	1.49	19.6	44.3
	Apr-12	0.112	0.168	2.91	0.133	2.81	9.08
	Apr-13	ND	ND	3.21	ND	2.87	8.48
	Nov-13	NA	NA	2.53	0.0740	2.31	8.55
SW/SD-05	Jul-09	1.51	0.164	61.4	6.44	61.9	162
	Apr-12	0.597	0.173	49.8	2.46	48.2	145
	Apr-13	ND	ND	38.9	2.12	37.9	117
	Nov-13	NA	NA	10.6	0.622	10.8	36.9
SW/SD-06	Jul-09	0.436	0.104	27.6	1.86	28.5	76.1
	Apr-12	0.0830	0.206	8.40	0.514	8.98	24.2
	Apr-13	0.171	ND	6.76	0.609	7.10	16.7
	Nov-13	NA	NA	52.9	3.44	51.9	179
SW/SD-07	Jul-09	1.21	0.0579	6.49	0.989	5.56	23.4
	Apr-12	0.217	0.224	7.87	0.423	7.47	24.5
	Apr-13	ND	ND	6.03	0.460	5.02	16.6
	Nov-13	NA	NA	49.3	2.65	46.5	154
SW/SD-08	Jul-09	0.603	0.170	5.93	0.565	5.53	19.3
	Apr-12	-0.130	0.331	7.64	0.415	8.65	25.6
	Apr-13	ND	ND	12.8	0.697	12.3	39.6
	Nov-13	NA	NA	20.9	1.54	21.5	72.2
SW/SD-09	Jul-09	0.363	0.0722	7.30	0.289	6.23	108
	Apr-12	0.0460	0.271	9.19	0.499	8.55	30.3
	Apr-13	ND	ND	18.7	0.719	19.1	54.9
	Nov-13	NA	NA	22.1	1.25	20.4	72.3
SW/SD-10	Jul-09	1.90	0.157	7.98	0.269	8.02	49.2
	Apr-12	0.346	0.170	4.34	0.344	4.99	15.7
	Apr-13	0.338	ND	17.2	0.472	16.3	42.7
	Nov-13	NA	NA	6.95	0.596	6.75	20.7
SW/SD-11	Jul-09	0.741	0.325	5.44	0.485	4.70	19.2
	Apr-12	0.333	0.124	9.83	0.548	8.74	31.3
	Apr-13	ND	ND	17.1	1.22	18.7	50.8
	Nov-13	NA	NA	22.2	1.30	20.3	70.6

pCi/L = picocuries per liter

µg/L = micrograms per liter

ND = Not detected

NA = Not analyzed

1. Unless stated otherwise, total uranium was analyzed for separately via kinetic phosphorescence analysis (KPA).

**Table 4: Surface Water Analytical Results (continued)**

Location	Month & Year	Ra-226 (pCi/L)	Th-230 (pCi/L)	U-234 (pCi/L)	U-235 (pCi/L)	U-238 (pCi/L)	Total U (µg/L) <sup>1</sup>
SW/SD-12	Nov-11	0.177	0.118	0.195	0.0330	0.0680	0.289
	Apr-12	-0.0900	0.234	-0.0700	0.0120	0.143	0.356
	Apr-13	ND	ND	10.5	0.702	9.75	27.4
	Nov-13	NA	NA	1.32	0.159	1.86	4.92
SW/SD-13	Nov-11	-0.0890	0.107	6.29	0.112	6.05	18.7
	Apr-12	-0.0900	0.238	4.82	0.369	4.77	14.6
	Apr-13	0.344	ND	14.8	0.490	13.3	42.7
	Nov-13	NA	NA	6.46	0.421	5.79	21.9
SW/SD-14	Nov-11	0.147	0.0740	0.0890	0.000	0.096	0.292
	Apr-12	0.0920	0.127	0.0540	0.0330	0.311	0.395
	Apr-13	ND	ND	6.34	ND	6.10	19.1
	Nov-13	NA	NA	6.68	0.366	7.92	22.0
SW/SD-15	Nov-11	-0.0440	0.0690	0.261	0.0670	0.231	0.905
	Apr-12	-0.130	0.251	4.99	0.317	4.43	1.02
	Apr-13	ND	ND	6.09	0.194	5.69	16.6
	Nov-13	NA	NA	5.38	0.218	4.67	15.4
SW/SD-16	Nov-11	0.198	0.0270	0.247	0.0590	0.239	0.634
	Apr-12	-0.160	0.0360	0.193	0.0110	0.298	0.902
	Apr-13	ND	ND	5.75	0.413	5.34	16.6
	Nov-13	NA	NA	4.52	0.298	5.20	15.2
SW-17	Nov-13	NA	NA	2.19	0.131	1.63	4.16
SW-18	Nov-13	NA	NA	1.46	0.0920	1.21	3.77
SW-19	Nov-13	NA	NA	1.58	0.0730	1.49	4.11
SW-20	Nov-13	NA	NA	1.15	0.0530	1.16	3.44

pCi/L = picocuries per liter

µg/L = micrograms per liter

ND = Not detected

NA = Not analyzed

1. Unless stated otherwise, total uranium was analyzed for separately via kinetic phosphorescence analysis (KPA).

**Table 5: Sediment Analytical Results**

Location	Month & Year	Ra-226 (pCi/g)	Th-230 (pCi/g)	U-234 (pCi/g)	U-235 (pCi/g)	U-238 (pCi/g)	Total U (mg/kg) <sup>1</sup>
SW/SD-01 <sup>2</sup>	Jul-09	1.33	2.24	7.31	0.615	7.92	15.6
	Apr-12	2.70	1.46	22.6	1.37	22.5	66.8
	Apr-13	1.27	0.675	11.2	0.539	11.0	32.6
SW/SD-02 <sup>2</sup>	Jul-09	1.49	0.485	10.4	1.11	11.3	13.3
	Apr-12	0.975	0.932	1.71	0.0570	1.82	5.38
	Apr-13	1.14	0.633	2.17	0.123	2.16	6.41
SW/SD-05 <sup>2</sup>	Jul-09	1.27	1.08	15.3	1.39	14.1	44.4
	Apr-12	1.03	0.729	7.78	0.456	7.94	23.6
	Apr-13	1.27	0.750	7.18	0.317	7.14	21.1
SW/SD-06 <sup>2</sup>	Jul-09	1.11	0.514	1.54	0.142	1.53	3.87
	Apr-12	1.47	0.923	1.40	0.146	1.27	3.80
	Apr-13	1.26	1.11	1.18	ND	1.23	3.62
SW/SD-07 <sup>2</sup>	Jul-09	0.670	1.14	2.31	0.254	2.33	4.18
	Apr-12	1.39	1.18	2.77	0.0620	2.45	7.23
	Apr-13	1.37	1.09	1.33	0.147	0.867	2.62
SW/SD-08 <sup>2</sup>	Jul-09	1.19	1.02	4.75	0.329	4.43	9.70
	Apr-12	1.20	0.843	3.75	0.148	3.79	11.2
	Apr-13	1.19	1.16	2.14	0.149	2.05	6.10
SW/SD-09 <sup>2</sup>	Jul-09	1.19	0.94	1.20	0.0491	0.995	2.31
	Apr-12	0.872	0.747	0.558	0.0130	0.675	1.99
	Apr-13	1.03	1.14	1.09	0.0910	1.31	3.89
SW/SD-10 <sup>2</sup>	Jul-09	1.44	0.712	0.955	0.0593	1.07	2.06
	Apr-12	1.05	0.711	0.828	0.0460	1.27	3.76
	Apr-13	1.05	0.889	0.841	ND	0.695	2.04
SW/SD-11 <sup>2</sup>	Jul-09	1.11	0.898	0.834	0.120	0.955	3.78
	Apr-12	1.03	0.814	0.816	0.0410	0.787	2.33
	Apr-13	0.988	0.676	1.06	ND	1.18	3.47
SW/SD-12 <sup>3</sup>	Nov-11	1.32	1.28	0.776	0.0280	0.741	2.19
	Apr-12	1.17	1.24	0.722	0.0070	0.799	2.35
	Apr-13	1.09	1.22	0.589	0.0700	0.632	1.89
SW/SD-13 <sup>3</sup>	Nov-11	1.20	1.14	0.659	0.0510	0.747	2.22
	Apr-12	1.02	0.901	0.904	0.0440	0.822	2.44
	Apr-13	1.00	1.46	0.791	ND	0.967	2.84
SW/SD-14 <sup>3</sup>	Nov-11	1.20	1.11	0.896	0.0680	0.884	2.63
	Apr-12	1.12	0.972	0.892	0.0670	1.17	3.47
	Apr-13	1.02	0.312	0.821	ND	0.765	2.25
SW/SD-15 <sup>3</sup>	Nov-11	1.15	0.907	0.665	0.0590	0.829	2.47
	Apr-12	1.09	1.45	0.867	0.098	0.811	2.43
	Apr-13	1.05	1.13	0.840	ND	0.613	1.80
SW/SD-16 <sup>3</sup>	Nov-11	1.17	1.07	0.974	0.0460	1.01	2.99
	Apr-12	1.52	0.848	0.944	0.0380	0.932	2.76
	Apr-13	0.916	0.831	0.646	ND	0.782	2.30

pCi/g = picocuries per gram  
mg/kg = milligrams per kilogram  
ND = Not detected

1. Unless stated otherwise, total uranium was analyzed for separately via KPA.
2. Apr 2012 and Apr 2013 Total U results for these locations calculated using the specific activities for each uranium isotope from 40CFR71, Appendix A.
3. Nov 2011, Apr 2012, and Apr 2013 Total U results for these locations calculated using the specific activities for each uranium isotope from 40CFR71, Appendix A.