

Exhibit A



February 23, 2017

Ms. Yasmin Guevara
New York State Department of Environmental Conservation - Region 8
Division of Solid and Hazardous Materials
6274 East Avon-Lima Road
Avon, New York 14414

RE: Hakes C&D, Campbell N.Y.
Hakes C&D Landfill Permit No. 8-4630-00010/00001-0
2017 4th Quarter Radionuclide Monitoring Results

Dear Ms. Guevara:

Enclosed please find a copy of the radionuclide sampling and analysis report for leachate sampling conducted during the fourth quarter 2017. This report is being submitted as required by the facility Environmental Monitoring Plan. Should you have any questions or require clarification of the enclosed data, please do not hesitate to contact me at 814-335-5183 or at lance.stevens@casella.com.

Sincerely,

CASELLA WASTE SERVICES

A handwritten signature in black ink, appearing to read "Lance Stevens", is written over a light gray rectangular background.

Lance Stevens
Environmental Manager

cc: Robert Kras, Casella (electronic)
Jonathan Brandes, On-Site Technical Services (electronic)
Richard Clarkson, NYSDEC (electronic)
Timothy Rice, NYSDEC (electronic)
Greg MacLean, NYSDEC (electronic)

Enclosures



ON-SITE TECHNICAL SERVICES, INC

72 Railroad Avenue
Wellsville, New York 14895

Phone: (585) 593-1824
Fax: (585) 593-7471

February 22, 2018

Mr. Lance Stevens
Casella Waste Systems, Inc.
4376 Manning Ridge Road
Campbell, New York 14870

Re: Hakes C & D Landfill Campbell, New York – 4th Quarter-2017-Radionuclide Test Results

Dear Lance:

The purpose of this letter is to present results of the leachate radiological sampling conducted at the Hakes C & D Landfill during the fourth quarter 2017. Leachate sampling and analysis for radionuclides is required as detailed in section 2.6.3 of the April 2015 Environmental Monitoring Plan (EMP). The initial radiological sampling and analysis of each landfill cell and combined leachate was completed in May 2012. Therefore, the sampling required in the fourth quarter 2017 includes only landfill cells which have received gas well waste. Currently, the cells containing gas well waste includes cells 5 through 8. Leachate from cell 7 drains through cell 4 and cell 8A leachate flows through cell 3. Therefore, fourth quarter 2017 leachate samples were collected from cells 3, 4, 5, 6 and 8B. Samples were collected by On-Site on November 17, 2017 and sent to ALS Environmental (ALS) in Fort Collins, Colorado for analysis. ALS Fort Collins is a New York State accredited laboratory. Attached Table 1 displays the current and historic leachate radionuclide results from leachate sampling conducted between fourth quarter 2015 and fourth quarter 2017. Also enclosed are the fourth quarter 2017 field sampling forms and laboratory analytical report.

If you have any questions regarding the information in this submittal, please call me at 585-593-1824.

Sincerely,

A handwritten signature in black ink, appearing to read "Jonathan E. Brandes". The signature is fluid and cursive, written over a light blue rectangular background.

Jonathan E. Brandes, P.G.
Senior Geologist

Enclosures

Table 1

Leachate Radionuclide Analytical Results
Fourth Quarter 2015 through Fourth Quarter 2017
Hakes C and D Landfill
Campbell, New York

Parameter	Cell 3 Leachate					Cell 4 Leachate				
	11/11/2015	5/4/2016	11/18/2016	6/6/2017	11/17/2017	11/11/2015	5/4/2016	11/18/2016	6/6/2017	11/17/2017
Field Parameters										
Field pH (std. units)	6.8	6.79	6.88	6.78	6.91	7.09	6.97	7.14	6.83	7.14
ORP (mV)	98.1	41.7	32.4	-323.8	-151.7	-143.1	29	35.8	2.8	-213.7
Specific Conductivity (us/cm)	3387	4086	6539	9085	7443	8252	7288	6235	6304	6889
Temperature (deg. C)	16.02	18	21.61	21.7	16.8	17.09	17.9	21.58	19.7	16.6
Turbidity (NTU)	89.4	606	100	69.2	140	52.1	35.9	26.1	14.7	42.1
Radionuclide Act + Unc (MDC) pCi/L										
Actinium-228, Dissolved (EPA 901.1)	9.101 ± 26.524 (34.5)	3.116 ± 16.467 (17.66)	0.255 ± 40.602 (42.85)	0 ± 10.788 (18.93)	33 ± 18 (27)	0 ± 17.365 (38.32)	0 ± 11.596 (22.52)	0 ± 15.614 (44.33)	0 ± 26.996 (53.58)	9 ± 16 (26)
Actinium-228, Total (EPA 901.1)	0 ± 4.384 (21.4)	0 ± 5.485 (19.92)	8.262 ± 25.890 (31.97)	37.525 ± 65.041 (71.44)	3 ± 21 (36)	12.968 ± 14.548 (16.16)	2.636 ± 26.970 (36.33)	35.329 ± 39.446 (43.02)	8.678 ± 11.881 (18.84)	26 ± 15 (24)
Bismuth-212, Dissolved (EPA 901.1)	0 ± 36.567 (113)	10.028 ± 64.348 (71.71)	83.393 ± 130.280 (137.1)	0 ± 31.352 (64.85)	69 ± 58 (92)	20.005 ± 127.980 (149.1)	0 ± 13.451 (88.26)	118.28 ± 173.930 (134.3)	0 ± 72.210 (189.8)	1 ± 52 (89)
Bismuth-212, Total (EPA 901.1)	5.033 ± 66.631 (74.22)	49.256 ± 47.540 (48.41)	13.73 ± 105.030 (122.1)	35.408 ± 196.270 (221)	85 ± 58 (90)	0 ± 10.427 (74.22)	0 ± 46.219 (152.9)	0 ± 56.604 (191.1)	31.323 ± 45.410 (47.8)	56 ± 48 (76)
Bismuth-214, Dissolved (EPA 901.1)	14.895 ± 13.603 (18.48)	11.604 ± 7.496 (11.14)	1320.9 ± 148.240 (23.77)	64.221 ± 13.485 (10.56)	3 ± 16 (27)	25.958 ± 18.004 (21.03)	4.12 ± 10.106 (11.53)	1013.4 ± 116.970 (27.6)	2475.4 ± 266.380 (30.1)	1 ± 11 (22)
Bismuth-214, Total (EPA 901.1)	28.356 ± 9.066 (8.704)	16.287 ± 8.662 (8.697)	63.664 ± 19.257 (17.07)	2162.4 ± 243.650 (42.68)	14.6 ± 8.4 (12.9)	37.991 ± 10.867 (10.07)	0 ± 12.030 (25.37)	1108.6 ± 132.190 (29.22)	22.837 ± 9.837 (9.001)	18.4 ± 8.7 (13.1)
Cesium-134, Dissolved (EPA 901.1)	5.375 ± 5.540 (6.026)	1.144 ± 2.503 (4.271)	0 ± 3.177 (14.32)	2.105 ± 3.133 (4.385)	3.3 ± 5.6 (9.1)	2.813 ± 7.274 (8.353)	0.885 ± 4.648 (5.224)	2.466 ± 4.890 (15)	0 ± 5.572 (13.48)	-3 ± 3.7 (6.6)
Cesium-134, Total (EPA 901.1)	3.052 ± 3.069 (5.64)	0.916 ± 1.468 (5.868)	1.439 ± 8.189 (9.31)	0 ± 5.685 (21.84)	-3 ± 4 (7)	3.398 ± 2.537 (5.771)	4.324 ± 6.376 (7.154)	0 ± 2.897 (15.61)	0.5 ± 4.213 (4.603)	-0.8 ± 3.9 (6.6)
Cesium-137, Dissolved (EPA 901.1)	0 ± 0.815 (8.748)	0 ± 0.609 (5.05)	-8.064 ± 12.680 (13.25)	-2.202 ± 4.723 (4.966)	-3.5 ± 4 (7)	2.643 ± 5.782 (6.649)	0.355 ± 4.492 (5.05)	-4.314 ± 11.841 (12.52)	0 ± 2.460 (12.96)	-0.1 ± 3.8 (6.5)
Cesium-137, Total (EPA 901.1)	-0.736 ± 4.737 (5.219)	0.558 ± 4.040 (4.51)	0 ± 0.815 (11.2)	1.637 ± 16.714 (18.72)	-4.5 ± 4.3 (7.8)	-1.168 ± 4.551 (4.995)	-3.805 ± 11.382 (12.87)	0 ± 3.051 (16.6)	-0.025 ± 3.741 (4.245)	-0.2 ± 3.7 (6.3)
Lead-212, Dissolved (EPA 901.1)	0 ± 8.755 (17.06)	12.262 ± 16.952 (9.224)	333.18 ± 72.729 (27.39)	4.075 ± 5.714 (7.888)	-0.7 ± 8.6 (14.4)	4.828 ± 12.260 (15.62)	12.925 ± 12.705 (9.224)	276.33 ± 79.596 (26.23)	295.32 ± 41.236 (28.58)	0.4 ± 8.2 (13.6)
Lead-212, Total (EPA 901.1)	1.962 ± 6.949 (8.667)	14.027 ± 16.916 (9.201)	0 ± 9.517 (20.59)	405.46 ± 77.374 (40.77)	2 ± 10 (17)	2.952 ± 5.243 (8.61)	1.214 ± 14.507 (18.13)	298.11 ± 55.113 (32.62)	1.701 ± 8.079 (9.9)	8.5 ± 6.4 (10.1)
Lead-214, Dissolved (EPA 901.1)	7.03 ± 18.878 (24.52)	24.509 ± 17.640 (10.63)	1403.9 ± 158.710 (32.38)	48.159 ± 13.024 (11.74)	9.6 ± 7.7 (12.3)	30.886 ± 16.585 (19.84)	18.684 ± 14.090 (11.07)	1124.9 ± 128.370 (26.33)	2549.1 ± 273.010 (30.86)	-9 ± 12 (20)
Lead-214, Total (EPA 901.1)	14.132 ± 8.782 (11.13)	24.291 ± 8.950 (9.612)	77.705 ± 19.834 (17)	1690.3 ± 193.770 (80.08)	-7 ± 13 (23)	48.796 ± 12.998 (9.549)	0 ± 11.346 (22.78)	1197.5 ± 141.580 (38.89)	8.983 ± 9.319 (11.85)	14.4 ± 7.4 (11.3)
Potassium-40, Dissolved (EPA 901.1)	0 ± 53.073 (153.1)	122.56 ± 42.315 (43.07)	104.53 ± 111.900 (115.2)	163.99 ± 66.366 (54.83)	140 ± 100 (160)	83.108 ± 132.290 (153.1)	260.5 ± 66.627 (50.55)	160.56 ± 97.218 (102.9)	210.6 ± 135.230 (134.5)	135 ± 92 (146)
Potassium-40, Total (EPA 901.1)	108.09 ± 38.360 (39.08)	59.436 ± 60.524 (64.51)	0 ± 74.192 (170.3)	129.63 ± 218.020 (226.4)	90 ± 110 (190)	151.28 ± 51.200 (48.24)	197.9 ± 94.924 (114)	143.06 ± 166.720 (181.5)	129.88 ± 46.728 (45.37)	145 ± 90 (142)
Radium-226, Dissolved (EPA 901.1)	0 ± 102.540 (200.3)	0 ± 62.447 (143.8)	0 ± 245.640 (379.7)	19.146 ± 84.796 (108.7)	39 ± 90 (150)	64.564 ± 155.530 (200.3)	36.587 ± 98.448 (122.2)	0 ± 163.030 (334.4)	0 ± 193.920 (356.4)	3 ± 95 (158)
Radium-226, Dissolved (EPA 903.1)	1.29 ± 0.935 (1.14)	0.442 ± 0.580 (0.966)	0.937 ± 0.952 (1.44)	1.75 ± 1.10 (0.473)	2.69 ± 0.78 (0.22)	4.59 ± 1.97 (1.64)	0.756 ± 0.493 (0.506)	0.483 ± 0.490 (0.742)	2.57 ± 1.30 (0.436)	1.59 ± 0.51 (0.24)
Radium-226, Total (EPA 901.1)	0 ± 68.875 (131.1)	31.779 ± 97.378 (122.7)	133.98 ± 155.690 (187.1)	132.62 ± 384.790 (469.5)	61 ± 67 (110)	91.528 ± 107.210 (128.3)	0 ± 54.840 (249.5)	196.74 ± 307.810 (370.4)	0 ± 69.468 (136.5)	40 ± 170 (280)
Radium-226, Total (EPA 903.1)	1.43 ± 1.03 (1.26)	1.66 ± 0.976 (0.966)	1.12 ± 0.616 (0.549)	2.85 ± 1.53 (0.552)	2.8 ± 0.78 (0.17)	5.11 ± 1.38 (0.213)	3.28 ± 1.20 (0.278)	2.43 ± 0.927 (0.577)	2.58 ± 1.51 (1.79)	2.53 ± 0.72 (0.21)
Radium-228, Dissolved (EPA 901.1)	9.101 ± 26.524 (34.5)	3.116 ± 16.467 (17.66)	0.255 ± 40.602 (42.85)	0 ± 10.788 (18.93)	33 ± 18 (27)	0 ± 17.365 (38.32)	0 ± 11.596 (22.52)	0 ± 15.614 (44.33)	0 ± 26.996 (53.58)	9 ± 16 (26)
Radium-228, Dissolved (EPA 904.0)	1.33 ± 0.526 (0.815)	0.985 ± 0.458 (0.78)	1.15 ± 0.499 (0.832)	3.25 ± 0.960 (1.15)	1.83 ± 0.57 (0.62)	5.92 ± 1.35 (0.996)	3.38 ± 0.867 (0.891)	2.68 ± 0.751 (0.819)	3.88 ± 0.957 (0.821)	2.48 ± 0.71 (0.63)
Radium-228, Total (EPA 901.1)	0 ± 4.384 (21.4)	0 ± 5.485 (19.92)	8.262 ± 25.890 (31.97)	37.525 ± 65.041 (71.44)	3 ± 21 (36)	12.968 ± 14.548 (16.16)	2.636 ± 26.970 (36.33)	35.329 ± 39.446 (43.02)	8.678 ± 11.881 (18.84)	26 ± 15 (24)
Radium-228, Total (EPA 904.0)	1.38 ± 0.591 (0.948)	1.4 ± 0.555 (0.862)	1.35 ± 0.519 (0.795)	3.9 ± 1.30 (1.88)	2.02 ± 0.63 (0.71)	5.13 ± 1.27 (1.07)	3.14 ± 0.847 (0.878)	2.2 ± 0.750 (1.07)	2.72 ± 0.892 (1.26)	2.22 ± 0.68 (0.74)
Thallium-208, Dissolved (EPA 901.1)	0 ± 4.078 (10.77)	3.126 ± 5.628 (5.521)	0 ± 12.981 (13.52)	2.794 ± 4.492 (4.558)	0.7 ± 5.9 (9.9)	0.577 ± 7.654 (10.11)	2.226 ± 3.095 (6.335)	5.178 ± 8.516 (12.66)	0 ± 6.890 (15.52)	5.9 ± 4 (6.2)
Thallium-208, Total (EPA 901.1)	0 ± 2.884 (5.473)	3.538 ± 4.124 (4.767)	0 ± 2.436 (11.34)	0 ± 10.451 (24.02)	-3.3 ± 6.3 (10.8)	0 ± 2.163 (4.908)	0 ± 3.268 (14.3)	0 ± 2.668 (21.1)	3.167 ± 4.550 (5.039)	1.8 ± 6.1 (10.1)
Thorium-227, Dissolved (EPA 901.1)					10 ± 30 (50)					6 ± 28 (47)
Thorium-227, Total (EPA 901.1)					3 ± 27 (45)					-28 ± 21 (37)
Thorium-232, Dissolved (EPA 901.1)	2903.2 ± 3952.500 (4780)	1475.1 ± 7430.700 (9194)	4032.8 ± 19159.000 (23230)	3383 ± 7122.000 (8586)	33 ± 18 (27)	3454.6 ± 4185.800 (5031)	1659.5 ± 7064.900 (8744)	2827.7 ± 18288.000 (22220)	-2380.5 ± 8049.000 (9653)	9 ± 16 (26)
Thorium-232, Total (EPA 901.1)	0 ± 3404.400 (9737)	1817.5 ± 7939.800 (9788)	4200.7 ± 4129.300 (4907)	3973.6 ± 10832.000 (13060)	3 ± 21 (36)	0 ± 3284.900 (9901)	2822.1 ± 4837.600 (5873)	-1184 ± 9164.700 (11140)	-1264.3 ± 7708.100 (9538)	26 ± 15 (24)
Thorium-234, Dissolved (EPA 901.1)	37.85 ± 230.230 (293.8)	93.454 ± 384.710 (488.8)	78.446 ± 1038.900 (1298)	62.96 ± 78.827 (488.5)	-34 ± 83 (140)	69.849 ± 245.530 (310)	0 ± 221.480 (509.1)	0 ± 276.650 (1242)	89.479 ± 439.130 (527.9)	26 ± 82 (137)
Thorium-234, Total (EPA 901.1)	0 ± 187.440 (536.1)	152.1 ± 424.640 (536)	20.553 ± 256.350 (325.1)	119.93 ± 619.240 (752.3)	12 ± 95 (159)	0 ± 127.450 (517)	0 ± 112.960 (366.1)	98.264 ± 499.240 (609.5)	161.6 ± 369.400 (464)	10 ± 160 (270)
Total Uranium (ASTM D5174-97)			0.000995 ± 0.048 (0.385)	0.00251 ± 0.127 (0.385)				0.000329 ± 0.016 (0.385)	0.000764 ± 0.029 (0.385)	
Total Uranium (EPA 908.0)	2.09 ± 0.708 (0.709)	1.41 ± 0.607 (0.886)				1.29 ± 0.587 (0.753)	0.402 ± 0.314 (0.518)			
Total Uranium, Dissolved (ASTM D5174-97)			0.00109 ± 0.047 (0.385)	0.00359 ± 0.156 (0.385)				0.000364 ± 0.014 (0.385)	0.000711 ± 0.033 (0.385)	
Total Uranium, Dissolved (EPA 908.0)	1.36 ± 0.658 (0.922)	1.76 ± 0.549 (0.543)				1.15 ± 0.544 (0.704)	0.806 ± 0.368 (0.484)			
Total Uranium, Dissolved (HASL-300)					0.29 ± 0.19 (0.22)					0.48 ± 0.18 (0.1)
Total Uranium, Total (HASL-300)					0.31 ± 0.15 (0.15)					0.56 ± 0.19 (0.1)
Uranium-232, Dissolved (HASL-300)					4.07 ± 0.71 (0.09)					5.75 ± 0.96 (0.11)
Uranium-232, Total (HASL-300)					4.92 ± 0.83 (0.11)					5.54 ± 0.93 (0.11)
Uranium-234, Dissolved (HASL-300)					0.19 ± 0.13 (0.15)					0.26 ± 0.12 (0.07)
Uranium-234, Total (HASL-300)					0.16 ± 0.11 (0.13)					0.29 ± 0.13 (0.07)
Uranium-235 (EPA 901.1)										
Uranium-235, Dissolved (EPA 901.1)										
Uranium-235, Dissolved (HASL-300)					-0.015 ± 0.078 (0.142)					0.01 ± 0.055 (0.082)
Uranium-235, Total (HASL-300)					0.045 ± 0.063 (0.094)					0.026 ± 0.058 (0.086)
Uranium-238 (EPA 901.1)										
Uranium-238, Dissolved (EPA 901.1)										
Uranium-238, Dissolved (HASL-300)					0.11 ± 0.11 (0.16)					0.21 ± 0.11 (0.07)
Uranium-238, Total (HASL-300)					0.105 ± 0.085 (0.096)					0.25 ± 0.12 (0.07)

Notes:

Act + Unc (MDC) = Activity ± Uncertainty (Minimum Detectable Concentration)

pCi/L = picocuries per liter

Dissolved - Indicates sample filtered with 0.45 micron filter prior to analysis.

Each of EPA 901.1, EPA 903.1, EPA 904.0, EPA 908.0, ASTM D5174-97, HASL-300 are laboratory analysis methods.

Table 1

Leachate Radionuclide Analytical Results
Fourth Quarter 2015 through Fourth Quarter 2017
Hakes C and D Landfill
Campbell, New York

Parameter	Cell 5 Leachate					Cell 6 Leachate				
	11/11/2015	5/4/2016	11/18/2016	6/6/2017	11/17/2017	11/11/2015	5/4/2016	11/18/2016	6/6/2017	11/17/2017
Field Parameters										
Field pH (std. units)	6.93	6.87	7.02	6.79	6.88	6.97	6.96	7.13	6.84	6.97
ORP (mV)	-126.4	54.2	-21.1	-205.9	-102.1	-107.2	-166.5	-222.1	-291.7	-239.1
Specific Conductivity (us/cm)	6704	6818	6101	6221	6278	10151	10908	9087	12178	10151
Temperature (deg. C)	16.03	17.5	20.89	21.9	16.2	17.73	21.1	24.05	24.6	19.2
Turbidity (NTU)	96.3	88.7	23.4	64.3	41.6	80.5	41.8	60.2	67.4	107
Radionuclide Act + Unc (MDC) pCi/L										
Actinium-228, Dissolved (EPA 901.1)	5.82 ± 26.105 (34.51)	11.706 ± 14.674 (15.24)	0.496 ± 36.150 (38.58)	11.148 ± 16.458 (16.64)	17 ± 14 (22)	9.101 ± 26.524 (34.51)	8.192 ± 14.364 (15.24)	0 ± 8.469 (48.02)	0 ± 15.628 (36.2)	4.8 ± 9.1 (19.5)
Actinium-228, Total (EPA 901.1)	2.06 ± 13.792 (16.16)	0 ± 14.673 (46.24)	0 ± 12.276 (58.75)	0 ± 7.662 (20.81)	37 ± 17 (25)	11.14 ± 9.835 (11.8)	17.4 ± 28.767 (36.33)	0.39 ± 14.166 (17.1)	3.444 ± 16.759 (18.84)	15 ± 19 (30)
Bismuth-212, Dissolved (EPA 901.1)	0 ± 46.255 (138.3)	17.473 ± 55.120 (61.64)	35.101 ± 108.130 (116.3)	23.217 ± 62.770 (60.75)	68 ± 48 (75)	22.897 ± 94.957 (113)	0 ± 33.494 (71.72)	-4.793 ± 137.760 (152)	0 ± 39.340 (126.7)	-7 ± 49 (82)
Bismuth-212, Total (EPA 901.1)	0 ± 13.461 (74.22)	0 ± 40.028 (142.4)	31.06 ± 106.960 (122.1)	0 ± 30.517 (67.34)	31 ± 59 (99)	38.732 ± 52.851 (57.12)	0 ± 32.683 (142.4)	20.552 ± 57.388 (62.96)	28.15 ± 56.478 (60.37)	38 ± 94 (157)
Bismuth-214, Dissolved (EPA 901.1)	22.554 ± 13.425 (16.82)	75.469 ± 14.748 (9.911)	595.81 ± 71.039 (25.89)	15.948 ± 9.449 (8.905)	-3 ± 12 (20)	36.899 ± 16.695 (18.42)	107.45 ± 17.701 (9.759)	17.385 ± 25.432 (27.25)	411.44 ± 51.257 (18.35)	-7.6 ± 9.5 (15.8)
Bismuth-214, Total (EPA 901.1)	49.436 ± 12.938 (10.31)	0 ± 10.770 (28.05)	347.44 ± 53.241 (23.93)	40.987 ± 11.091 (8.763)	14.1 ± 8.9 (13.9)	17.557 ± 11.768 (12.09)	74.751 ± 23.569 (22.52)	5.86 ± 10.909 (11.96)	8.261 ± 9.579 (12.72)	9.3 ± 9.7 (15.8)
Cesium-134, Dissolved (EPA 901.1)	0.194 ± 8.158 (9.562)	-0.043 ± 4.463 (5.079)	4.488 ± 7.851 (12.69)	2.276 ± 4.549 (4.221)	-2.9 ± 3.1 (5.5)	1.105 ± 7.107 (8.353)	0.325 ± 0.481 (5.767)	4.806 ± 4.715 (11.28)	0 ± 3.379 (9.98)	-1.7 ± 2 (3.5)
Cesium-134, Total (EPA 901.1)	1.664 ± 3.820 (4.274)	-0.284 ± 7.800 (9.166)	0 ± 5.376 (12.68)	1.467 ± 3.817 (4.083)	-1.8 ± 4.2 (7.3)	-2.506 ± 5.363 (5.899)	2.219 ± 8.990 (10.27)	0.827 ± 4.805 (5.276)	0 ± 0.965 (5.21)	-3.9 ± 4.9 (8.6)
Cesium-137, Dissolved (EPA 901.1)	2.304 ± 6.721 (7.782)	0 ± 0.862 (7.693)	0 ± 4.131 (11.41)	0.274 ± 4.280 (4.579)	0.6 ± 2.9 (4.9)	2.236 ± 5.722 (6.649)	0 ± 1.927 (5.685)	-5.004 ± 11.852 (12.68)	0 ± 1.039 (10.47)	-2 ± 1.8 (3.2)
Cesium-137, Total (EPA 901.1)	-1.27 ± 5.364 (5.835)	-3.126 ± 10.186 (11.63)	0.457 ± 10.815 (12.48)	-0.102 ± 4.476 (4.993)	0.3 ± 4.3 (7.3)	-1.041 ± 5.884 (6.387)	3.194 ± 8.180 (9.422)	1.168 ± 4.088 (4.511)	1.041 ± 3.824 (4.245)	1.6 ± 4.8 (8.1)
Lead-212, Dissolved (EPA 901.1)	0 ± 7.831 (19.9)	10.932 ± 18.133 (11.31)	195.89 ± 56.662 (23.86)	1.188 ± 5.691 (8.065)	-0.1 ± 6.9 (11.6)	0 ± 8.756 (15.99)	18.584 ± 16.533 (11.54)	4.077 ± 15.882 (19.13)	10.857 ± 9.656 (14.8)	-0.4 ± 5.5 (9.1)
Lead-212, Total (EPA 901.1)	0 ± 2.824 (10.1)	2.944 ± 15.715 (19.37)	73.833 ± 33.325 (27.92)	7.976 ± 14.760 (10.29)	0 ± 10 (17)	5.1 ± 6.860 (8.35)	0 ± 9.036 (22.42)	0 ± 4.170 (10.73)	3.325 ± 7.019 (8.608)	12.9 ± 6.2 (9.4)
Lead-214, Dissolved (EPA 901.1)	14.916 ± 17.730 (21.63)	75.215 ± 14.380 (9.459)	713.27 ± 85.748 (25.99)	8.424 ± 8.783 (9.561)	8.8 ± 6.1 (9.6)	32.969 ± 14.911 (19.87)	112.21 ± 18.663 (10.9)	34.098 ± 19.097 (21.01)	442.99 ± 53.175 (19.81)	-9.1 ± 8.4 (13.9)
Lead-214, Total (EPA 901.1)	37.508 ± 11.916 (9.768)	11.896 ± 17.951 (22.21)	345.25 ± 51.096 (24.26)	31.945 ± 11.578 (10.13)	-4 ± 12 (21)	22.521 ± 8.520 (8.884)	99.876 ± 26.198 (21.36)	11.224 ± 10.300 (10.35)	1.957 ± 8.850 (10.7)	12.9 ± 8.6 (13.5)
Potassium-40, Dissolved (EPA 901.1)	186.83 ± 109.530 (124)	150.28 ± 55.673 (53.17)	82.309 ± 106.210 (108)	110.43 ± 53.662 (50.04)	67 ± 75 (123)	134.97 ± 121.320 (139.4)	194.11 ± 50.952 (43.07)	204.34 ± 100.750 (109.1)	266.49 ± 95.889 (93.96)	55 ± 48 (78)
Potassium-40, Total (EPA 901.1)	56.529 ± 75.814 (75.48)	0 ± 69.751 (181.8)	46.882 ± 159.440 (181.5)	132.78 ± 49.874 (46.86)	80 ± 100 (170)	179.64 ± 47.476 (39.08)	209.21 ± 96.525 (114)	133.77 ± 52.140 (53.62)	216.58 ± 52.598 (40.14)	120 ± 140 (220)
Radium-226, Dissolved (EPA 901.1)	10.972 ± 141.870 (188.3)	97.244 ± 109.150 (128.9)	0 ± 192.880 (291.8)	12.579 ± 103.520 (119.4)	-1 ± 71 (118)	0 ± 96.482 (224.9)	112.13 ± 124.210 (142.8)	56.923 ± 204.080 (257)	0 ± 110.140 (207.1)	17 ± 67 (110)
Radium-226, Dissolved (EPA 903.1)	2.06 ± 1.15 (1.21)	2.96 ± 0.968 (0.507)	2.19 ± 1.30 (1.24)	0.898 ± 0.933 (1.39)	1.07 ± 0.36 (0.16)	2.7 ± 0.985 (0.228)	0.888 ± 0.642 (0.895)	0.762 ± 0.533 (0.643)	2.34 ± 1.21 (1.01)	2.77 ± 0.78 (0.19)
Radium-226, Total (EPA 901.1)	39.43 ± 91.210 (113.3)	0 ± 139.040 (263)	133.98 ± 195.550 (236.6)	18.509 ± 98.768 (124.1)	-10 ± 100 (170)	25.29 ± 101.430 (125.4)	0 ± 70.798 (237.6)	36.26 ± 99.458 (124.1)	8.462 ± 102.230 (128.4)	-30 ± 120 (210)
Radium-226, Total (EPA 903.1)	0.958 ± 0.712 (0.809)	1.27 ± 1.18 (1.55)	1.2 ± 0.724 (0.793)	1.35 ± 1.30 (1.87)	1.07 ± 0.36 (0.19)	0.984 ± 0.796 (0.985)	1.83 ± 1.02 (0.977)	0.675 ± 0.536 (0.696)	2.75 ± 1.80 (1.84)	1.81 ± 0.53 (0.12)
Radium-228, Dissolved (EPA 901.1)	5.82 ± 26.105 (34.51)	11.706 ± 14.674 (15.24)	0.496 ± 36.150 (38.58)	11.148 ± 16.458 (16.64)	17 ± 14 (22)	9.101 ± 26.524 (34.51)	8.192 ± 14.364 (15.24)	0 ± 8.469 (48.02)	0 ± 15.628 (36.2)	4.8 ± 9.1 (19.5)
Radium-228, Dissolved (EPA 904.0)	1.24 ± 0.541 (0.872)	0.00366 ± 0.308 (0.718)	2.33 ± 0.710 (0.898)	2.42 ± 0.699 (0.785)	1.85 ± 0.57 (0.61)	1.64 ± 0.596 (0.857)	0.957 ± 0.482 (0.86)	1.44 ± 0.569 (0.897)	2.07 ± 0.649 (0.807)	3.1 ± 0.84 (0.62)
Radium-228, Total (EPA 901.1)	2.06 ± 13.792 (16.16)	0 ± 14.673 (46.24)	0 ± 12.276 (58.75)	0 ± 7.662 (20.81)	37 ± 17 (25)	11.14 ± 9.835 (11.8)	17.4 ± 28.767 (36.33)	0.39 ± 14.166 (17.1)	3.444 ± 16.759 (18.84)	15 ± 19 (30)
Radium-228, Total (EPA 904.0)	1.66 ± 0.629 (0.956)	2.7 ± 0.770 (0.904)	1.94 ± 0.648 (0.893)	1.32 ± 0.846 (1.64)	1.07 ± 0.46 (0.75)	2.09 ± 0.652 (0.78)	3.27 ± 0.866 (0.879)	0.631 ± 0.409 (0.767)	2.4 ± 1.04 (1.77)	1.18 ± 0.46 (0.7)
Thallium-208, Dissolved (EPA 901.1)	0 ± 5.558 (12.52)	2.77 ± 3.703 (5.861)	3.648 ± 8.159 (9.008)	1.525 ± 4.526 (4.652)	-0.1 ± 4.8 (8.1)	0 ± 3.930 (10.11)	3.686 ± 6.273 (5.861)	0 ± 4.822 (12.9)	0 ± 6.558 (11.15)	-1 ± 3.3 (5.5)
Thallium-208, Total (EPA 901.1)	0 ± 1.102 (5.292)	0 ± 1.887 (12.82)	0 ± 6.257 (13)	0 ± 2.190 (6.381)	6.6 ± 4.2 (6.6)	2.568 ± 3.895 (4.489)	0 ± 2.882 (12.28)	4.871 ± 4.898 (4.409)	0.412 ± 4.491 (5.228)	-3.3 ± 7.4 (12.7)
Thorium-227, Dissolved (EPA 901.1)					-2 ± 20 (33)					1 ± 15 (25)
Thorium-227, Total (EPA 901.1)					10 ± 30 (49)					-29 ± 21 (36)
Thorium-232, Dissolved (EPA 901.1)	1184 ± 4262.300 (5269)	6190 ± 7584.700 (9106)	6861.1 ± 15847.000 (19150)	4675.1 ± 4366.500 (7076)	17 ± 14 (22)	859.6 ± 4436.100 (5497)	921.92 ± 7622.700 (9453)	12222 ± 15484.000 (18540)	2714 ± 4543.300 (5446)	4.8 ± 9.1 (19.5)
Thorium-232, Total (EPA 901.1)	0 ± 3686.200 (9737)	2741 ± 4616.100 (5607)	-162.19 ± 6157.400 (7585)	-2397 ± 8099.700 (9950)	37 ± 17 (25)	0 ± 4097.000 (9228)	2805.9 ± 4794.100 (5821)	2355.3 ± 6995.900 (8633)	3529.6 ± 6603.800 (8070)	15 ± 19 (30)
Thorium-234, Dissolved (EPA 901.1)	0 ± 142.200 (348.3)	47.94 ± 441.450 (560.8)	345.91 ± 860.080 (1070)	96.497 ± 139.230 (414.4)	38 ± 40 (76)	0 ± 112.960 (319.2)	0 ± 187.510 (551.7)	198.05 ± 909.930 (1156)	11.694 ± 258.590 (314.3)	49 ± 63 (105)
Thorium-234, Total (EPA 901.1)	0 ± 212.310 (559.1)	4.114 ± 269.030 (341.5)	15.067 ± 335.640 (418.4)	0 ± 212.310 (505.7)	69 ± 81 (138)	87.586 ± 160.400 (486.8)	0 ± 190.660 (363.4)	88.555 ± 378.210 (486)	0 ± 238.760 (515.5)	-10 ± 100 (170)
Total Uranium (ASTM D5174-97)			0.00052 ± 0.032 (0.385)	0.000733 ± 0.034 (0.385)				0.00062 ± 0.026 (0.385)	0.00112 ± 0.039 (0.385)	
Total Uranium (EPA 908.0)	2.23 ± 0.731 (0.675)	0.239 ± 0.307 (0.555)				2.59 ± 0.805 (0.736)	0.262 ± 0.325 (0.585)			
Total Uranium, Dissolved (ASTM D5174-97)			0.000518 ± 0.034 (0.385)	0.000797 ± 0.036 (0.385)				0.000732 ± 0.032 (0.385)	0.00105 ± 0.047 (0.385)	
Total Uranium, Dissolved (EPA 908.0)	2.74 ± 0.853 (0.818)	0.536 ± 0.340 (0.529)				0.536 ± 0.602 (1.07)	0.742 ± 0.450 (0.716)			
Total Uranium, Dissolved (HASL-300)					0.75 ± 0.2 (0.1)					0.32 ± 0.13 (0.09)
Total Uranium, Total (HASL-300)					0.82 ± 0.26 (0.15)					0.25 ± 0.19 (0.23)
Uranium-232, Dissolved (HASL-300)					6.7 ± 1.1 (0.1)					7 ± 1.1 (0.1)
Uranium-232, Total (HASL-300)					4.75 ± 0.81 (0.1)					3.67 ± 0.65 (0.11)
Uranium-234, Dissolved (HASL-300)					0.45 ± 0.16 (0.1)					0.192 ± 0.097 (0.07)
Uranium-234, Total (HASL-300)					0.47 ± 0.19 (0.13)					0.2 ± 0.14 (0.15)
Uranium-235 (EPA 901.1)										
Uranium-235, Dissolved (EPA 901.1)										
Uranium-235, Dissolved (HASL-300)					0.038 ± 0.048 (0.035)					0.012 ± 0.045 (0.033)
Uranium-235, Total (HASL-300)					0.023 ± 0.067 (0.121)					-0.017 ± 0.087 (0.157)
Uranium-238 (EPA 901.1)										
Uranium-238, Dissolved (EPA 901.1)										
Uranium-238, Dissolved (HASL-300)					0.26 ± 0.11 (0.03)					0.118 ± 0.076 (0.07)
Uranium-238, Total (HASL-300)					0.33 ± 0.15 (0.04)					0.064 ± 0.096 (0.179)

Notes:

Act + Unc (MDC) = Activity ± Uncertainty (Minimum Detectable Concentration)

pCi/L = picocuries per liter

Dissolved - Indicates sample filtered with 0.45 micron filter prior to analysis.

Each of EPA 901.1, EPA 903.1, EPA 904.0, EPA 908.0, ASTM D5174-97, HASL-300 are laboratory analysis methods.

Table 1

Leachate Radionuclide Analytical Results
Fourth Quarter 2015 through Fourth Quarter 2017
Hakes C and D Landfill
Campbell, New York

Parameter	Cell 8 Leachate			
	5/4/2016	11/18/2016	6/6/2017	11/17/2017
Field Parameters				
Field pH (std. units)	6.45	6.55	6.74	6.62
ORP (mV)	-153.5	73.6	-257.4	-13.5
Specific Conductivity (us/cm)	2785	1220	5306	2286
Temperature (deg. C)	17.6	6.08	22	14
Turbidity (NTU)	175	35.4	38.4	140
Radionuclide Act + Unc (MDC) pCi/L				
Actinium-228, Dissolved (EPA 901.1)	0.448 ± 34.301 (43.22)	47.093 ± 73.980 (76.54)	12.267 ± 9.673 (19.95)	4 ± 25 (43)
Actinium-228, Total (EPA 901.1)	0 ± 15.389 (54.22)	4.586 ± 15.790 (18.22)	6.953 ± 102.350 (110.6)	-3 ± 11 (19)
Bismuth-212, Dissolved (EPA 901.1)	23.229 ± 129.950 (152.9)	0 ± 142.110 (286)	0 ± 26.514 (75.19)	5 ± 49 (84)
Bismuth-212, Total (EPA 901.1)	0 ± 73.084 (171.8)	31.518 ± 54.776 (59.23)	0 ± 81.230 (391.1)	-16 ± 49 (82)
Bismuth-214, Dissolved (EPA 901.1)	0 ± 9.677 (28.89)	3779.3 ± 407.970 (48.82)	113.23 ± 18.794 (12.43)	-3 ± 14 (24)
Bismuth-214, Total (EPA 901.1)	0 ± 12.206 (26.3)	10.19 ± 11.736 (12.56)	6067.2 ± 653.720 (70.33)	-10.8 ± 9.6 (15.9)
Cesium-134, Dissolved (EPA 901.1)	0.569 ± 9.337 (10.78)	0 ± 7.265 (22.76)	1.167 ± 5.520 (5.334)	-0.5 ± 5.8 (9.8)
Cesium-134, Total (EPA 901.1)	-3.016 ± 10.794 (12.16)	0 ± 1.553 (5.413)	2.72 ± 24.998 (27.3)	-2.6 ± 2.1 (3.6)
Cesium-137, Dissolved (EPA 901.1)	-1.427 ± 10.640 (12.26)	0 ± 5.201 (23.21)	-3.479 ± 5.542 (5.783)	1.1 ± 3.6 (6)
Cesium-137, Total (EPA 901.1)	7.067 ± 6.059 (6.365)	0.863 ± 4.064 (4.511)	0 ± 15.721 (32.75)	-1.7 ± 1.8 (3.2)
Lead-212, Dissolved (EPA 901.1)	10.6 ± 14.194 (17.14)	1005.6 ± 123.520 (41.77)	37.763 ± 15.140 (9.644)	0 ± 10 (17)
Lead-212, Total (EPA 901.1)	2.013 ± 16.195 (19.96)	0 ± 4.168 (9.541)	1621.7 ± 196.040 (66.02)	3 ± 5.7 (9.4)
Lead-214, Dissolved (EPA 901.1)	0 ± 11.947 (22.78)	3990.1 ± 429.570 (59.09)	113.2 ± 16.304 (11.11)	3.6 ± 7.1 (11.7)
Lead-214, Total (EPA 901.1)	0 ± 9.755 (21)	11.641 ± 9.172 (10.6)	6183.9 ± 666.770 (83.91)	-1 ± 8.4 (13.9)
Potassium-40, Dissolved (EPA 901.1)	0 ± 73.330 (192.2)	0 ± 121.870 (261.7)	153.87 ± 56.967 (51.02)	-43 ± 98 (166)
Potassium-40, Total (EPA 901.1)	0 ± 90.521 (192.2)	17.429 ± 44.542 (53.76)	204.12 ± 307.190 (305.2)	-96 ± 46 (78)
Radium-226, Dissolved (EPA 901.1)	0 ± 110.980 (240.1)	254.23 ± 451.840 (540.6)	44.007 ± 103.980 (128.6)	10 ± 110 (180)
Radium-226, Dissolved (EPA 903.1)	1.13 ± 0.622 (0.554)	0.233 ± 0.355 (0.21)	1.51 ± 1.00 (0.455)	0.88 ± 0.31 (0.16)
Radium-226, Total (EPA 901.1)	0 ± 102.250 (256.4)	0 ± 38.887 (122.7)	32.493 ± 635.900 (770)	5 ± 66 (110)
Radium-226, Total (EPA 903.1)	0.211 ± 0.774 (1.27)	0.0769 ± 0.351 (0.208)	2.43 ± 2.24 (1.32)	1.38 ± 0.45 (0.18)
Radium-228, Dissolved (EPA 901.1)	0.448 ± 34.301 (43.22)	47.093 ± 73.980 (76.54)	12.267 ± 9.673 (19.95)	4 ± 25 (43)
Radium-228, Dissolved (EPA 904.0)	0.669 ± 0.465 (0.897)	0.585 ± 0.461 (0.918)	1.65 ± 0.611 (0.89)	1.38 ± 0.51 (0.72)
Radium-228, Total (EPA 901.1)	0 ± 15.389 (54.22)	4.586 ± 15.790 (18.22)	6.953 ± 102.350 (110.6)	-3 ± 11 (19)
Radium-228, Total (EPA 904.0)	0.732 ± 0.475 (0.905)	0.27 ± 0.378 (0.801)	1.77 ± 1.34 (2.7)	1.46 ± 0.54 (0.79)
Thallium-208, Dissolved (EPA 901.1)	0 ± 4.219 (10.49)	0 ± 4.529 (26.23)	4.204 ± 4.813 (5.453)	4.6 ± 3.9 (6.3)
Thallium-208, Total (EPA 901.1)	0 ± 5.660 (12.82)	0 ± 2.277 (5.75)	0 ± 11.613 (37.38)	-0.7 ± 3.3 (5.6)
Thorium-227, Dissolved (EPA 901.1)				4 ± 29 (48)
Thorium-227, Total (EPA 901.1)				-10 ± 15 (26)
Thorium-232, Dissolved (EPA 901.1)	1621.9 ± 4696.100 (5768)	-2891.6 ± 12811.000 (15380)	-4078.5 ± 8549.500 (10290)	4 ± 25 (43)
Thorium-232, Total (EPA 901.1)	-2043.6 ± 5291.000 (6465)	0 ± 4624.000 (10330)	194.63 ± 17777.000 (21420)	-3 ± 11 (19)
Thorium-234, Dissolved (EPA 901.1)	10.514 ± 271.710 (344.3)	0 ± 451.110 (882.2)	0 ± 153.520 (569.2)	148 ± 92 (146)
Thorium-234, Total (EPA 901.1)	0 ± 110.800 (360.7)	161.38 ± 394.500 (501.3)	0 ± 607.490 (1214)	62 ± 64 (104)
Total Uranium (ASTM D5174-97)		0.000612 ± 0.026 (0.385)	0.000866 ± 0.046 (0.385)	
Total Uranium (EPA 908.0)	0.856 ± 0.445 (0.662)			
Total Uranium, Dissolved (ASTM D5174-97)		0.000649 ± 0.024 (0.385)	0.000911 ± 0.047 (0.385)	
Total Uranium, Dissolved (EPA 908.0)	1.48 ± 0.518 (0.588)			
Total Uranium, Dissolved (HASL-300)				0.59 ± 0.21 (0.16)
Total Uranium, Total (HASL-300)				0.65 ± 0.18 (0.12)
Uranium-232, Dissolved (HASL-300)				4.91 ± 0.83 (0.1)
Uranium-232, Total (HASL-300)				7.7 ± 1.3 (0.1)
Uranium-234, Dissolved (HASL-300)				0.3 ± 0.15 (0.13)
Uranium-234, Total (HASL-300)				0.39 ± 0.14 (0.09)
Uranium-235 (EPA 901.1)				
Uranium-235, Dissolved (EPA 901.1)				
Uranium-235, Dissolved (HASL-300)				0.022 ± 0.064 (0.115)
Uranium-235, Total (HASL-300)				0.021 ± 0.041 (0.083)
Uranium-238 (EPA 901.1)				
Uranium-238, Dissolved (EPA 901.1)				
Uranium-238, Dissolved (HASL-300)				0.27 ± 0.14 (0.08)
Uranium-238, Total (HASL-300)				0.24 ± 0.11 (0.07)

Notes:

Act + Unc (MDC) = Activity ± Uncertainty (Minimum Detectable Concentration)

pCi/L = picocuries per liter

Dissolved - Indicates sample filtered with 0.45 micron filter prior to analysis.

Each of EPA 901.1, EPA 903.1, EPA 904.0, EPA 908.0, ASTM D5174-97, HASL-300 are laboratory analysis methods.

Groundwater Suppression and Leachate Sampling Field Form

On-Site Technical Services, Inc.

Project: Hakes C&D Landfill, Painted Post, New York

Date: 11-17-17

Sampling Location: Cell-3 Sample ID: Cell3-1117 Arrival Time: 1255

Weather Conditions:

Temp. 36.0° F Sunny () Partly Cloudy () Cloudy () Light Rain () Hvy. Rain () Snow

Wind Conditions: 0-10 mph

Location Type

() Groundwater Suppression Leachate () Secondary Leachate () Surface Water/Sediment () Res. Water
() Other _____

Flow and Depth Information (as appropriate)

Depth: NA Estimated Flow: NA

Comments: Hakes Employee Filled 5 gal Bucket

Field Parameters (as appropriate)

Meter: YSI (sn: 142100804), Hach 2100P (sn: 13309)

Field Parameters tested in: () Submerged Probe Cup
Note: Turbidity measured from a vial grab sample

Time	pH	Conductivity (us/cm)	Turbidity (ntu)	D.O. (mg/L)	Temp. (°C)	ORP (mV)
<u>1300</u>	<u>6.91</u>	<u>7443</u>	<u>140</u>	<u>NA</u>	<u>16.8</u>	<u>-151.7</u>

Sample Information

Sample Type: Grab () Composite Sample Location: Discharge Pipe () Pond () Ditch

Location Description/Condition: Riser west mt-F

Sample Collection Equipment/Method: 5 gal Bucket Sample Time: 1300

Sample Description (clarity/color): Slightly cloudy with light amber tint Sample Odor (Y) or (N) Explain: leachate odor

Other Observations/Comments: _____

Analysis Requested: RAD Number of Containers: 10

Sampling Completion: Time 1309 Date 11-17-17 Samplers K Dye - S. Watson

Groundwater Suppression and Leachate Sampling Field Form On-Site Technical Services, Inc.

Project: Hakes C&D Landfill, Painted Post, New York

Date: 11-17-17

Sampling Location: Cell-4 Sample ID: Cell4-1117 Arrival Time: 1313

Weather Conditions:

Temp. 40 ° F Sunny () Partly Cloudy () Cloudy () Light Rain () Hvy. Rain () Snow

Wind Conditions: 0-5 mph

Location Type

() Groundwater Suppression Leachate () Secondary Leachate () Surface Water/Sediment () Res. Water
() Other _____

Flow and Depth Information (as appropriate)

Depth: NA Estimated Flow: NA

Comments: Hakes Employees Fill Dec 5 gal Bucket

Field Parameters (as appropriate)

Meter: YSI (sn: 14210080-1), Hach 2100P (sn: 13309)

Field Parameters tested in: () Submerged Probe Cup
Note: Turbidity measured from a vial grab sample

Time	pH	Conductivity (us/cm)	Turbidity (ntu)	D.O. (mg/L)	Temp. (°C)	ORP (mV)
<u>1320</u>	<u>7.14</u>	<u>6889</u>	<u>42.1</u>	<u>NA</u>	<u>16.6</u>	<u>-213.7</u>

Sample Information

Sample Type: Grab () Composite Sample Location: Discharge Pipe () Pond () Ditch

Location Description/Condition: Riser West of MWGR

Sample Collection Equipment/Method: Dec 5 gal Bucket Sample Time: 1320

Sample Description (clarity/color): Slightly turbid Sample Odor (Y) or (N) Explain: leachate odor
with light amber tint

Other Observations/Comments: _____

Analysis Requested: RAD Number of Containers: 10

Sampling Completion: Time 1328 Date 11-17-17 Samplers R. Dye - S. Watson

Groundwater Suppression and Leachate Sampling Field Form On-Site Technical Services, Inc.

Project: Hakes C&D Landfill, Painted Post, New York

Date: 11-17-17

Sampling Location: Cell 5 Sample ID: Cell 5-1117 Arrival Time: 1332

Weather Conditions:

Temp. 40° F Sunny () Partly Cloudy () Cloudy () Light Rain () Hvy. Rain () Snow

Wind Conditions: 0-5 mph

Location Type

() Groundwater Suppression Leachate () Secondary Leachate () Surface Water/Sediment () Res. Water
() Other _____

Flow and Depth Information (as appropriate)

Depth: NA Estimated Flow: NA

Comments: Hakes Employees Filled 5 gal Ded Bucket

Field Parameters (as appropriate)

Meter: YSI (sn: 146100804), Hach 2100P (sn: 13309)

Field Parameters tested in: () Submerged Probe Cup

Note: Turbidity measured from a vial grab sample

Time	pH	Conductivity (us/cm)	Turbidity (ntu)	D.O. (mg/L)	Temp. (°C)	ORP (mV)
<u>1340</u>	<u>6.88</u>	<u>6278</u>	<u>41.6</u>	<u>NA</u>	<u>16.2</u>	<u>-102.1</u>

Sample Information

Sample Type: Grab () Composite Sample Location: Discharge Pipe () Pond () Ditch

Location Description/Condition: Rise West From MAT-N

Sample Collection Equipment/Method: Ded 5 gal Bucket Sample Time: 1340

Sample Description (clarity/color): Slightly Cloudy Sample Odor (Y) or (N) Explain: leachate odor with light amber tint

Other Observations/Comments: _____

Analysis Requested: RAD Number of Containers: 10

Sampling Completion: Time 1350 Date 11/17/17 Samplers K Dye - S. Watson

Groundwater Suppression and Leachate Sampling Field Form On-Site Technical Services, Inc.

Project: Hakes C&D Landfill, Painted Post, New York

Date: 11-17-17

Sampling Location: Cell 6 Sample ID: Cell 6-1117 Arrival Time: 1355

Weather Conditions:

Temp. 40 ° F Sunny () Partly Cloudy () Cloudy () Light Rain () Hvy. Rain () Snow

Wind Conditions: 0-5 mph

Location Type

() Groundwater Suppression Leachate () Secondary Leachate () Surface Water/Sediment () Res. Water
() Other _____

Flow and Depth Information (as appropriate)

Depth: N/A Estimated Flow: N/A

Comments: Hakes Employees Filled Ded 5 gal Bucket

Field Parameters (as appropriate)

Meter: YSI (sn. 142100804), Hach 2100P (sn. 13309)

Field Parameters tested in: () Submerged Probe Cup
Note: Turbidity measured from a vial grab sample

Time	pH	Conductivity (us/cm)	Turbidity (ntu)	D.O. (mg/L)	Temp. (°C)	ORP (mV)
<u>1400</u>	<u>6.97</u>	<u>101.51</u>	<u>107</u>	<u>NA</u>	<u>19.2</u>	<u>-239.1</u>

Sample Information

Sample Type: Grab () Composite Sample Location: Discharge Pipe () Pond () Ditch

Location Description/Condition: Riser Next to Control Panel for Cell 6

Sample Collection Equipment/Method: Ded 5 gal Bucket Sample Time: 1400

Sample Description (clarity/color): Black with fine black particulates Sample Odor: (Y) or (N) Explain: leachate odor

Other Observations/Comments: _____

Analysis Requested: RAD Number of Containers: 10

Sampling Completion: Time 1415 Date 11-17-17 Samplers R Dye - S. Watson

Groundwater Suppression and Leachate Sampling Field Form On-Site Technical Services, Inc.

Project: Hakes C&D Landfill, Painted Post, New York

Date: 11/7/17

Sampling Location: Cell-88 Sample ID: Cell/88-1117 Arrival Time: 12:24

Weather Conditions:

Temp. 34 ° F Sunny () Partly Cloudy () Cloudy () Light Rain () Hvy. Rain () Snow

Wind Conditions: 0-10 mph

Location Type

() Groundwater Suppression Leachate () Secondary Leachate () Surface Water/Sediment () Res. Water
() Other _____

Flow and Depth Information (as appropriate)

Depth: NA Estimated Flow: NA

Comments: Hakes Employee's Filled Buckets

Field Parameters (as appropriate)

Meter: YSI (sn: 144100204), Hach 2100P (sn: 13309)

Field Parameters tested in: () Submerged Probe Cup
Note: Turbidity measured from a vial grab sample

Time	pH	Conductivity (us/cm)	Turbidity (ntu)	D.O. (mg/L)	Temp. (°C)	ORP (mV)
<u>1235</u>	<u>6.60</u>	<u>2286</u>	<u>140</u>	<u>NA</u>	<u>14.0</u>	<u>-13.5</u>

Sample Information

Sample Type: Grab () Composite Sample Location: Discharge Pipe () Pond () Ditch

Location Description/Condition: _____

Sample Collection Equipment/Method: Red 5gal Bucket Sample Time: 1235

Sample Description (clarity/color): cloudy w light gray tint Sample Odor: (Y) or (N) Explain: leachate odor

Other Observations/Comments: _____

Analysis Requested: RAD Number of Containers: 10

Sampling Completion: Time 1247 Date 11/7/17 Samplers R. De S. Watson



February 28, 2018

Service Request No:R1712289

Mr. Lance Stevens
Casella Waste Systems
4376 Manning Ridge Road
Painted Post, NY 14870

Laboratory Results for: Hakes C&D Landfill - Leachate RAD

Dear Mr.Stevens,

Enclosed are the results of the sample(s) submitted to our laboratory November 18, 2017
For your reference, these analyses have been assigned our service request number **R1712289**.

All analyses were performed according to our laboratory's quality assurance program. The test results meet requirements of the NELAP standards except as noted in the case narrative report. All results are intended to be considered in their entirety, and ALS Environmental is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report. The measurement uncertainty of the results included in this report is within that expected when using the prescribed method(s) for analysis of these samples, and represented by Laboratory Control Sample control limits. Any events, such as QC failures, which may add to the uncertainty are explained in the report narrative.

Please contact me if you have any questions. My extension is 7472. You may also contact me via email at Janice.Jaeger@alsglobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Janice Jaeger
Project Manager

CC: Jon Brandes

ADDRESS 1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
PHONE +1 585 288 5380 | FAX +1 585 288 8475
ALS Group USA, Corp.
dba ALS Environmental



ALS Environmental
ALS Group USA, Corp
1565 Jefferson Road, Building 300, Suite 360
Rochester, NY 14623
T : +1 585 288 5380
F : +1 585 288 8475
www.alsglobal.com

Table of Contents

CoverLetter	1
Table of Contents	2
Narrative Documents	3
Case Narrative	4
Sample Receipt Information	5
Sample Cross-Reference	6
Internal Chain of Custody	7
Miscellaneous Forms	11
Qualifiers	12
Acronyms	13
Non-Certified Analytes	14
Prep Method Inorganic	15
Subcontracted Test Results	16
R1712289 - FC	17
R1712289-FCREV	45



Narrative Documents

ALS Environmental—Rochester Laboratory
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
Phone (585) 288-5380 Fax (585) 288-8475
www.alsglobal.com



Client: Casella Waste Systems (Hampden ME)
Project: Hakes C&D Landfill - Leachate RAD
Sample Matrix: Water

Service Request: R1712289
Date Received: 11/18/2017

CASE NARRATIVE

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples designated for Tier IV, validation deliverables including all summary forms and associated raw data. Analytical procedures performed by the lab are validated in accordance with NELAC standards. Any parameters that are not included in the lab's NELAC accreditation are identified on a "Non-Certified Analytes" report in the Miscellaneous Forms Section of this report. Individual analytical results requiring further explanation are flagged with qualifiers and/or discussed below. The flags are explained in the Report Qualifiers and Definitions page in the Miscellaneous Forms section of this report.

Sample Receipt:

Ten water samples were received for analysis at ALS Environmental on 11/18/2017. Any discrepancies noted upon initial sample inspection are noted on the cooler receipt and preservation form included in this data package. The samples were received in good condition and consistent with the accompanying chain of custody form. Samples are refrigerated at 6°C upon receipt at the lab except for aqueous samples designated for metals analyses, which are stored at room temperature.

Subcontracted Analytical Parameters:

One or more samples were subcontracted to another laboratory for testing. The certified analytical report from the subcontractor has been included in its entirety at the end of this report and includes the name and address of the subcontracted laboratory.

Approved by _____

Date _____

01/04/2018



Sample Receipt Information

ALS Environmental—Rochester Laboratory
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
Phone (585) 288-5380 Fax (585) 288-8475
www.alsglobal.com

Client: Casella Waste Systems (Hampden ME)
Project: Hakes C&D Landfill - Leachate RAD

Service Request:R1712289

SAMPLE CROSS-REFERENCE

<u>SAMPLE #</u>	<u>CLIENT SAMPLE ID</u>	<u>DATE</u>	<u>TIME</u>
R1712289-001	Cell 8B-1117	11/17/2017	1235
R1712289-002	Cel 8B-1117 Diss	11/17/2017	1235
R1712289-003	Cell3-1117	11/17/2017	1300
R1712289-004	Cell3-1117 Diss	11/17/2017	1300
R1712289-005	Cell4-1117	11/17/2017	1320
R1712289-006	Cell4-1117 Diss	11/17/2017	1320
R1712289-007	Cell5-1117	11/17/2017	1340
R1712289-008	Cell5-1117 Diss	11/17/2017	1340
R1712289-009	Cell6-1117	11/17/2017	1400
R1712289-010	Cell6-1117 Diss	11/17/2017	1400

ALS Group USA, Corp.
dba ALS Environmental

Internal Chain of Custody Report

Client: Casella Waste Systems
Project: Hakes C&D Landfill - Leachate RAD

Service Request: R1712289

Bottle ID	Methods	Date	Time	Sample Location / User	Disposed On
R1712289-001.01		12/29/2017	0759	SMO / JJAEGGER	
R1712289-001.02		12/29/2017	0759	SMO / JJAEGGER	
R1712289-001.03		12/29/2017	0759	SMO / JJAEGGER	
R1712289-001.04		12/29/2017	0759	SMO / JJAEGGER	
R1712289-001.05		12/29/2017	0759	SMO / JJAEGGER	
R1712289-002.01		12/29/2017	0759	SMO / JJAEGGER	
R1712289-002.02		12/29/2017	0759	SMO / JJAEGGER	
R1712289-002.03		12/29/2017	0759	SMO / JJAEGGER	
R1712289-002.04		12/29/2017	0759	SMO / JJAEGGER	
R1712289-002.05		12/29/2017	0759	SMO / JJAEGGER	
R1712289-003.01		12/29/2017	0759	SMO / JJAEGGER	
R1712289-003.02		12/29/2017	0759	SMO / JJAEGGER	
R1712289-003.03		12/29/2017	0759	SMO / JJAEGGER	
R1712289-003.04		12/29/2017	0759	SMO / JJAEGGER	

ALS Group USA, Corp.
dba ALS Environmental

Internal Chain of Custody Report

Client: Casella Waste Systems
Project: Hakes C&D Landfill - Leachate RAD

Service Request: R1712289

Bottle ID	Methods	Date	Time	Sample Location / User	Disposed On
R1712289-003.05		12/29/2017	0759	SMO / JJAEGGER	
R1712289-004.01		12/29/2017	0759	SMO / JJAEGGER	
R1712289-004.02		12/29/2017	0759	SMO / JJAEGGER	
R1712289-004.03		12/29/2017	0759	SMO / JJAEGGER	
R1712289-004.04		12/29/2017	0759	SMO / JJAEGGER	
R1712289-004.05		12/29/2017	0759	SMO / JJAEGGER	
R1712289-005.01		12/29/2017	0759	SMO / JJAEGGER	
R1712289-005.02		12/29/2017	0759	SMO / JJAEGGER	
R1712289-005.03		12/29/2017	0759	SMO / JJAEGGER	
R1712289-005.04		12/29/2017	0759	SMO / JJAEGGER	
R1712289-005.05		12/29/2017	0759	SMO / JJAEGGER	
R1712289-006.01		12/29/2017	0759	SMO / JJAEGGER	
R1712289-006.02		12/29/2017	0759	SMO / JJAEGGER	

ALS Group USA, Corp.
dba ALS Environmental

Internal Chain of Custody Report

Client: Casella Waste Systems
Project: Hakes C&D Landfill - Leachate RAD

Service Request: R1712289

Bottle ID	Methods	Date	Time	Sample Location / User	Disposed On
R1712289-006.03		12/29/2017	0759	SMO / JJAEGGER	
R1712289-006.04		12/29/2017	0759	SMO / JJAEGGER	
R1712289-006.05		12/29/2017	0759	SMO / JJAEGGER	
R1712289-007.01		12/29/2017	0759	SMO / JJAEGGER	
R1712289-007.02		12/29/2017	0759	SMO / JJAEGGER	
R1712289-007.03		12/29/2017	0759	SMO / JJAEGGER	
R1712289-007.04		12/29/2017	0759	SMO / JJAEGGER	
R1712289-007.05		12/29/2017	0759	SMO / JJAEGGER	
R1712289-008.01		12/29/2017	0759	SMO / JJAEGGER	
R1712289-008.02		12/29/2017	0759	SMO / JJAEGGER	
R1712289-008.03		12/29/2017	0759	SMO / JJAEGGER	
R1712289-008.04		12/29/2017	0759	SMO / JJAEGGER	
R1712289-008.05		12/29/2017	0759	SMO / JJAEGGER	

ALS Group USA, Corp.
dba ALS Environmental

Internal Chain of Custody Report

Client: Casella Waste Systems
Project: Hakes C&D Landfill - Leachate RAD

Service Request: R1712289

Bottle ID	Methods	Date	Time	Sample Location / User	Disposed On
R1712289-009.01		12/29/2017	0759	SMO / JJAEGGER	
R1712289-009.02		12/29/2017	0759	SMO / JJAEGGER	
R1712289-009.03		12/29/2017	0759	SMO / JJAEGGER	
R1712289-009.04		12/29/2017	0759	SMO / JJAEGGER	
R1712289-009.05		12/29/2017	0759	SMO / JJAEGGER	
R1712289-010.01		12/29/2017	0759	SMO / JJAEGGER	
R1712289-010.02		12/29/2017	0759	SMO / JJAEGGER	
R1712289-010.03		12/29/2017	0759	SMO / JJAEGGER	
R1712289-010.04		12/29/2017	0759	SMO / JJAEGGER	
R1712289-010.05		12/29/2017	0759	SMO / JJAEGGER	



Miscellaneous Forms

ALS Environmental—Rochester Laboratory
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
Phone (585) 288-5380 Fax (585) 288-8475
www.alsglobal.com

REPORT QUALIFIERS AND DEFINITIONS

<p>U Analyte was analyzed for but not detected. The sample quantitation limit has been corrected for dilution and for percent moisture, unless otherwise noted in the case narrative.</p> <p>J Estimated value due to either being a Tentatively Identified Compound (TIC) or that the concentration is between the MRL and the MDL. Concentrations are not verified within the linear range of the calibration. For DoD: concentration >40% difference between two GC columns (pesticides/Aroclors).</p> <p>B Analyte was also detected in the associated method blank at a concentration that may have contributed to the sample result.</p> <p>E Inorganics- Concentration is estimated due to the serial dilution was outside control limits.</p> <p>E Organics- Concentration has exceeded the calibration range for that specific analysis.</p> <p>D Concentration is a result of a dilution, typically a secondary analysis of the sample due to exceeding the calibration range or that a surrogate has been diluted out of the sample and cannot be assessed.</p> <p>* Indicates that a quality control parameter has exceeded laboratory limits. Under the "Notes" column of the Form I, this qualifier denotes analysis was performed out of Holding Time.</p> <p>H Analysis was performed out of hold time for tests that have an "immediate" hold time criteria.</p> <p># Spike was diluted out.</p>	<p>+ Correlation coefficient for MSA is <0.995.</p> <p>N Inorganics- Matrix spike recovery was outside laboratory limits.</p> <p>N Organics- Presumptive evidence of a compound (reported as a TIC) based on the MS library search.</p> <p>S Concentration has been determined using Method of Standard Additions (MSA).</p> <p>W Post-Digestion Spike recovery is outside control limits and the sample absorbance is <50% of the spike absorbance.</p> <p>P Concentration >40% difference between the two GC columns.</p> <p>C Confirmed by GC/MS</p> <p>Q DoD reports: indicates a pesticide/Aroclor is not confirmed ($\geq 100\%$ Difference between two GC columns).</p> <p>X See Case Narrative for discussion.</p> <p>MRL Method Reporting Limit. Also known as: LOQ Limit of Quantitation (LOQ) The lowest concentration at which the method analyte may be reliably quantified under the method conditions.</p> <p>MDL Method Detection Limit. A statistical value derived from a study designed to provide the lowest concentration that will be detected 99% of the time. Values between the MDL and MRL are estimated (see J qualifier).</p> <p>LOD Limit of Detection. A value at or above the MDL which has been verified to be detectable.</p> <p>ND Non-Detect. Analyte was not detected at the concentration listed. Same as U qualifier.</p>
--	---



Rochester Lab ID # for State Certifications¹

Connecticut ID # PH0556	Maine ID #NY0032	New Hampshire ID # 294100 A/B
Delaware Approved	New Jersey ID # NY004	Pennsylvania ID# 68-786
DoD ELAP #65817	New York ID # 10145	Rhode Island ID # 158
Florida ID # E87674	North Carolina #676	Virginia #460167

¹ Analyses were performed according to our laboratory's NELAP-approved quality assurance program and any applicable state or agency requirements. The test results meet requirements of the current NELAP/TNI standards or state or agency requirements, where applicable, except as noted in the case narrative. Since not all analyte/method/matrix combinations are offered for state/NELAC accreditation, this report may contain results which are not accredited. For a specific list of accredited analytes, contact the laboratory or go to <https://www.alsglobal.com/locations/americas/north-america/usa/new-york/rochester-environmental>

ALS Laboratory Group

Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

Water/Liquid Matrix

Analytical Method	Preparation Method
200.7	200.2
200.8	200.2
6010C	3005A/3010A
6020A	ILM05.3
9014 Cyanide Reactivity	SW846 Ch7, 7.3.4.2
9034 Sulfide Reactivity	SW846 Ch7, 7.3.4.2
9034 Sulfide Acid Soluble	9030B
9056A Bomb (Halogens)	5050A
9066 Manual Distillation	9065
SM 4500-CN-E Residual Cyanide	SM 4500-CN-G
SM 4500-CN-E WAD Cyanide	SM 4500-CN-I

Solid/Soil/Non-Aqueous Matrix

Analytical Method	Preparation Method
6010C	3050B
6020A	3050B
6010C TCLP (1311) extract	3005A/3010A
6010 SPLP (1312) extract	3005A/3010A
7196A	3060A
7199	3060A
9056A Halogens/Halides	5050
300.0 Anions/ 350.1/ 353.2/ SM 2320B/ SM 5210B/ 9056A Anions	DI extraction

For analytical methods not listed, the preparation method is the same as the analytical method reference.



Subcontracted Analytical Parameters

ALS Environmental—Rochester Laboratory
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
Phone (585) 288-5380 Fax (585) 288-8475
www.alsglobal.com



Thursday, December 28, 2017

Janice Jaeger
ALS Environmental
1565 Jefferson Rd., Bldg 300
Rochester, NY 14623

Re: ALS Workorder: 1711403
Project Name:
Project Number:

Dear Ms. Jaeger:

Ten water samples were received from ALS Environmental, on 11/18/2017. The samples were scheduled for the following analyses:

Gamma Spectroscopy

Radium-226

Radium-228

Total Uranium

The results for these analyses are contained in the enclosed reports.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Thank you for your confidence in ALS Environmental. Should you have any questions, please call.

Sincerely,

ALS Environmental

For Jeff R. Kujawa

Project Manager

ALS Environmental – Fort Collins is accredited by the following accreditation bodies for various testing scopes in accordance with requirements of each accreditation body. All testing is performed under the laboratory management system, which is maintained to meet these requirement and regulations. Please contact the laboratory or accreditation body for the current scope testing parameters.

ALS Environmental – Fort Collins	
Accreditation Body	License or Certification Number
AIHA	214884
Alaska (AK)	UST-086
Alaska (AK)	CO01099
Arizona (AZ)	AZ0742
California (CA)	06251CA
Colorado (CO)	CO01099
Connecticut (CT)	PH-0232
Florida (FL)	E87914
Idaho (ID)	CO01099
Kansas (KS)	E-10381
Kentucky (KY)	90137
L-A-B (DoD ELAP/ISO 170250)	L2257
Louisiana (LA)	05057
Maryland (MD)	285
Missouri (MO)	175
Nebraska(NE)	NE-OS-24-13
Nevada (NV)	CO000782008A
New York (NY)	12036
North Dakota (ND)	R-057
Oklahoma (OK)	1301
Pennsylvania (PA)	68-03116
Tennessee (TN)	2976
Texas (TX)	T104704241
Utah (UT)	CO01099
Washington (WA)	C1280



1711403

Gamma Spectroscopy:

The samples were analyzed for the presence of gamma emitting radionuclides according to EPA method 901.1. Samples 1711403-6 through -10 were filtered and preserved by 11/22/2017.

Radium-226 quantification based on the 186.21 keV photon suffers from interference with the 185.72 keV photon emitted by ^{235}U . Due to the high abundance of this photon in ^{235}U emissions, even small amounts of ^{235}U may bias the ^{226}Ra results high. Thus, any measured activity for ^{226}Ra has been flagged with an "SI" qualifier, denoting spectral interference.

In cases where there are no peaks found in the peak search routine, the software performs a net quantification. This indicates that nuclides are not detected or supported at any level above the reported MDC. Consequently, these nuclides are flagged with an "NQ" qualifier on the final reports. Please refer to the Technical Bulletin Addendum at the end of this report.

All remaining acceptance criteria were met.

Radium-228:

The samples were analyzed for the presence of ^{228}Ra by low background gas flow proportional counting of ^{228}Ac , which is the ingrown progeny of ^{228}Ra , according to EPA method 904.0. Samples 1711403-6 through -10 were filtered and preserved by 11/22/2017.

Due to high alpha counts, RA171212-1LCS and -1LCSD were re-planchetted as described on QASS 452560. Results are submitted without further qualification.

All remaining acceptance criteria were met.

Radium-226:

The samples were prepared and analyzed according to EPA method 903.1. Samples 1711403-6 through -10 were filtered and preserved by 11/22/2017.

All acceptance criteria were met.

Total Uranium:

The samples were analyzed for the presence of isotopic and total uranium according to HASL 300 method U-02. Samples 1711403-6 through -10 were filtered and preserved by 11/22/2017.

All acceptance criteria were met.

ALS -- Fort Collins

Sample Number(s) Cross-Reference Table

OrderNum: 1711403

Client Name: ALS Environmental

Client Project Name:

Client Project Number:

Client PO Number:

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
Cell8B-1117	1711403-1		WATER	17-Nov-17	12:35
Cell3-1117	1711403-2		WATER	17-Nov-17	13:00
Cell4-1117	1711403-3		WATER	17-Nov-17	13:20
Cell5-1117	1711403-4		WATER	17-Nov-17	13:40
Cell6-1117	1711403-5		WATER	17-Nov-17	14:00
Cell8B-1117	1711403-6		WATER	17-Nov-17	12:35
Cell3-1117	1711403-7		WATER	17-Nov-17	13:00
Cell4-1117	1711403-8		WATER	17-Nov-17	13:20
Cell5-1117	1711403-9		WATER	17-Nov-17	13:40
Cell6-1117	1711403-10		WATER	17-Nov-17	14:00

CHAIN of CUSTODY

Client: Casella/On-Site
4376 Manning Ridge Road
Painted Post, NY 14870

Project: Hakes C&D Landfill - Leachate RAD.

Telephone No.: 585-593-1824
Email: jonb@on-sitechs.com

Project Manager: Lance Stevens/Jon Brandes

Special Detection Limit/Reporting

PDF to Lance and On-Site, and EDD to On-Site.

R E M A R K S

Sample ID.	Lab Sample No.	No. of Containers	Matrix					Prsv.	Sampling Date	Sampling Time	Total Gamma Spec (901.1), Ra-226 (903.1), Ra-228 (904.0) (HNO3)	Total Uranium (908.0) (HNO3)	Dissolved: Gamma Spec (901.1), Ra-226 (903.1), Ra-228 (904.0)	Dissolved: Uranium (908.0)	Ice	No Ice	Temperature received:	Received by (Sign & Print Name)	
			Soil	Water	Air	Other	Yes											No	Date
Cell 18B-1117	1	10	X					X	11/17/17	1235	X	X	X					Army	11/18/17 0930
Cell 13-1117	2	10	X					X	11/17/17	1300	X	X	X						
Cell 14-1117	3	10	X					X	11/17/17	1320	X	X	X						
Cell 15-1117	4	10	X					X	11/17/17	1340	X	X	X						
Cell 16-1117	5	10	X					X	11/17/17	1400	X	X	X						

Note: Dissolved analysis requires lab filtering

Sample Received Intact: Yes No

Relinquished by: *Karen Dye* Date: 11-17-17 Time: 1500

Relinquished by: _____ Date: _____ Time: _____

Relinquished by: _____ Date: _____ Time: _____

Lab Work No.

Received by laboratory Date: _____ Time: _____



ALS Environmental - Fort Collins
CONDITION OF SAMPLE UPON RECEIPT FORM

Client: ONSITE

Workorder No: 1711403

Project Manager: JK

Initials: JA Date: 11/18/17

1. Does this project require any special handling in addition to standard ALS procedures?		YES	<input checked="" type="radio"/> NO
2. Are custody seals on shipping containers intact?	NONE	<input checked="" type="radio"/> YES	NO
3. Are Custody seals on sample containers intact?	<input checked="" type="radio"/> NONE	YES	NO
4. Is there a COC (Chain-of-Custody) present or other representative documents?		<input checked="" type="radio"/> YES	NO
5. Are the COC and bottle labels complete and legible?		<input checked="" type="radio"/> YES	NO
6. Is the COC in agreement with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		<input checked="" type="radio"/> YES	NO
7. Were airbills / shipping documents present and/or removable?	DROP OFF	<input checked="" type="radio"/> YES	NO
8. Are all aqueous samples requiring preservation preserved correctly? (excluding volatiles)	N/A	YES	<input checked="" type="radio"/> NO
9. Are all aqueous non-preserved samples pH 4-9?	N/A	<input checked="" type="radio"/> YES	NO
10. Is there sufficient sample for the requested analyses?		<input checked="" type="radio"/> YES	NO
11. Were all samples placed in the proper containers for the requested analyses?		<input checked="" type="radio"/> YES	NO
12. Are all samples within holding times for the requested analyses?		<input checked="" type="radio"/> YES	NO
13. Were all sample containers received intact? (not broken or leaking, etc.)		<input checked="" type="radio"/> YES	NO
14. Are all samples requiring no headspace (VOC, GRO, RSK/MEE, Rx CN/S, radon) headspace free? Size of bubble: ___ < green pea ___ > green pea	<input checked="" type="radio"/> N/A	YES	NO
15. Do any water samples contain sediment? Amount of sediment: ___ dusting ___ moderate ___ heavy	Amount N/A	YES	<input checked="" type="radio"/> NO
16. Were the samples shipped on ice?		YES	<input checked="" type="radio"/> NO
17. Were cooler temperatures measured at 0.1-6.0°C? IR gun used*: #2 #4	RAD ONLY	YES	<input checked="" type="radio"/> NO
Cooler #: <u>1</u> <u>2</u> <u>3</u> <u>4</u>			
Temperature (°C): <u>AMB</u> <u>—————</u> <u>—————</u> <u>—————</u>			
No. of custody seals on cooler: <u>1</u> <u>0</u> <u>1</u> <u>0</u>			
External µR/hr reading: <u>11</u> <u>12</u> <u>11</u> <u>11</u>			
Background µR/hr reading: <u>11</u>			
Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? YES / NO / NA (If no, see Form 008.)			

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16.

- PRESERVED POTTIES IN SAMPLES 2-5 HAVE A PH ABOVE 2
- SAMPLES ARE VERY MURKY.

If applicable, was the client contacted? YES / NO / NA Contact: _____ Date/Time: _____

Project Manager Signature / Date: [Signature] 11/21/17



ALS Environmental - Fort Collins
CONDITION OF SAMPLE UPON RECEIPT FORM

Client: ON SITE
Project Manager: JK

Workorder No: 1711403
Initials: JA Date: 11/18/17

NOTE:

No pH adjustments shall be made without prior consent of Project Manager. After pH adjustments, hold metals and radchem samples ≥ 16 hrs. before analysis.

Was the pH of any sample adjusted by the laboratory? YES (See Table below) / NO

pH Excursion:

ALS Sample ID	Client Sample ID	Initial pH	Final pH	Reagent Used	Volume Added (mL)	Lot No. of Reagent	Requested Analysis	Initials / Date / Time
1711403-2-6	CE113-1117	6	4.2	HNO ₃	3.0	152496	RAD	JA / 11-18 / 1159
↓ -2-7	↓	↓	↓	↓	↓	↓	↓	↓
↓ -2-8	↓	↓	↓	↓	↓	↓	↓	↓
↓ -2-9	↓	↓	↓	↓	↓	↓	↓	↓
↓ 2-10-6 NA 1118	↓	↓	↓	↓	↓	↓	↓	↓
↓ -3-7	CE114-1117	↓	4.2	↓	2.5	↓	↓	JA / 11-18 / 1205
↓ -3-8	↓	↓	↓	↓	↓	↓	↓	↓
↓ -3-9	↓	↓	↓	↓	↓	↓	↓	↓
↓ -3-10	↓	↓	↓	↓	↓	↓	↓	↓
↓ -3-6	↓	↓	↓	↓	↓	↓	↓	↓
↓ -4-6	CE115-1117	↓	4.2	↓	↓	↓	↓	JA / 11-18 / 1210
↓ -4-7	↓	↓	↓	↓	↓	↓	↓	↓
↓ -4-8	↓	↓	↓	↓	↓	↓	↓	↓
↓ -4-9	↓	↓	↓	↓	↓	↓	↓	↓
↓ -4-10	↓	↓	↓	↓	↓	↓	↓	↓
↓ -5-6	CE116-1117	7	4.2	↓	3.0	↓	↓	JA / 11-18 / 1220
↓ -5-7	↓	↓	↓	↓	↓	↓	↓	↓
↓ -5-8	↓	↓	↓	↓	↓	↓	↓	↓
↓ -5-9	↓	↓	↓	↓	↓	↓	↓	↓
↓ -5-10	↓	↓	↓	↓	↓	↓	↓	↓

If applicable, was the client contacted? YES / NO / NA Contact: _____ Date/Time: _____

Project Manager Signature / Date: JK 11/21/17

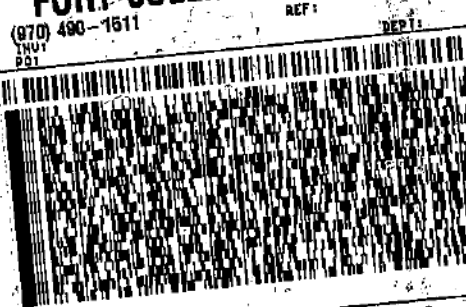
ORIGIN ID:ELMA (585) 583-1824
KEVIN DYE
ON-SITE
72 RAILROAD AVE
WELLSVILLE, NY 14895
UNITED STATES US

SHIP DATE: 17NOV17
ACTWGT: 33.20 LB
CAD: 006998274/SSE1822
DIMS: 13x12x24 IN
BILL THIRD PARTY

Part # 156297435 FNDB EXP 10/18
306/434/695

TO **RAD SAMPLES**
ALS ENVIREMENTAL
225 COMMERCE DRIVE
FORT COLLINS CO 80524

11-1



3 of 4
MPS# 7885 0640 9681
0269
Mstr# 7885 0640 9660

- SATURDAY 12:00P
PRIORITY OVERNIGHT

XO FTCA

80524
CO-US DEN



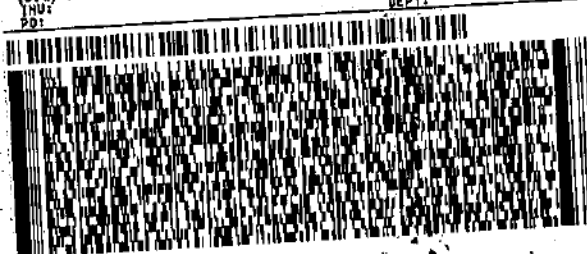
ORIGIN ID:ELMA (585) 593-1824
KEVIN DYE
ON-SITE
72 RAILROAD AVE
WELLSVILLE, NY 14895
UNITED STATES US

SHIP DATE: 17NOV17
ACTWGT: 44.90 LB
CAD: 006998274/99FE1822
DIMS: 19x12x24 IN
BILL THIRD PARTY

Part # 180297436 RR08 EXP 10/18
3001/2184/695

TO **RAD SAMPLES**
ALS ENVIREMENTAL
225 COMMERCE DRIVE
FORT COLLINS CO 80524
(970) 490-1611

12-0



FedEx
Express
E
#108180/112211

1 of 4
TRK# 7885 0640 9660
0201
MASTER

SATURDAY 12:00P
PRIORITY OVERNIGHT

XO FTCA

80524
CO-US DEN



D:ELMA (685) 593-1824
YE
LROAD AVE
LSVILLE, NY 14895
UNITED STATES US

SHIP DATE: 17NOV17
ACTWGT: 33.00 LB
CAD: 006998274/85FE1822
DIMS: 13x12x24 IN
BILL THIRD PARTY

Part # 186297-695 81008 EXP 10/18

**10 RAD SAMPLES
ALS ENVIREMENTAL
225 COMMERCE DRIVE
FORT COLLINS CO 80524**

11-1

(870) 490-1511
INOT
PDI

REF: DEPT:



4 of 4
MPS# 7885 0640 9692
0283
Metr# 7885 0640 9680

0201

**SATURDAY 12:00P
PRIORITY OVERNIGHT**

**80524
CO-US DEN**

XO FTCA



ORIGIN ID: ELMA (585) 593-1824
ON-SITE
72 RAILROAD AVE

WELLSVILLE, NY 14895
UNITED STATES US

SHIP DATE: 17NOV17
ACTWGT: 45.20 LB
CAD: 006988274/S9FE1822
DIMS: 13x12x24 IN.
BILL: THIRD PARTY

106207 308 / 22787652 X019

TO: **RAD SAMPLES**
ALS ENVIREMENTAL
225 COMMERCE DRIVE

FORT COLLINS CO 80524

(870) 490-1511
UNIT: 001



SATURDAY 12:00P
PRIORITY OVERNIGHT

80524
CO-US DEN

2 of 4
MP# 7885 0640 9670
Met# 7885 0640 9660

X0 FTCA



Client: ALS Environmental
 Project:
 Sample ID: Cell8B-1117
 Legal Location:
 Collection Date: 11/17/2017 12:35

Date: 28-Feb-18
 Work Order: 1711403
 Lab ID: 1711403-1
 Matrix: WATER
 Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Gamma Spectroscopy Results						
			SOP 713		Prep Date: 12/1/2017	PrepBy: NMP
Ac-228	-3 (+/- 11)	U	19	pCi/l	NA	12/5/2017 13:55
Bi-212	-16 (+/- 49)	U	82	pCi/l	NA	12/5/2017 13:55
Bi-214	-10.8 (+/- 9.6)	U	15.9	pCi/l	NA	12/5/2017 13:55
Cs-134	-2.6 (+/- 2.1)	U	3.6	pCi/l	NA	12/5/2017 13:55
Cs-137	-1.7 (+/- 1.8)	U	3.2	pCi/l	NA	12/5/2017 13:55
K-40	-96 (+/- 46)	U	78	pCi/l	NA	12/5/2017 13:55
Pb-212	3 (+/- 5.7)	U	9.4	pCi/l	NA	12/5/2017 13:55
Pb-214	-1 (+/- 8.4)	U	13.9	pCi/l	NA	12/5/2017 13:55
Ra-226	5 (+/- 66)	U,SI	110	pCi/l	NA	12/5/2017 13:55
Ra-228	-3 (+/- 11)	U	19	pCi/l	NA	12/5/2017 13:55
Th-227	-10 (+/- 15)	U	26	pCi/l	NA	12/5/2017 13:55
Th-232	-3 (+/- 11)	U	19	pCi/l	NA	12/5/2017 13:55
Th-234	62 (+/- 64)	U	104	pCi/l	NA	12/5/2017 13:55
Tl-208	-0.7 (+/- 3.3)	U	5.6	pCi/l	NA	12/5/2017 13:55
Radium-226 by Radon Emanation - Method 903.1						
			SOP 783		Prep Date: 12/11/2017	PrepBy: SKC
Ra-226	1.38 (+/- 0.45)		0.18	pCi/l	NA	12/22/2017 14:31
Carr: BARIUM	93.2		40-110	%REC	DL = NA	12/22/2017 14:31
Radium-228 Analysis by GFPC						
			SOP 724		Prep Date: 12/12/2017	PrepBy: SKC
Ra-228	1.46 (+/- 0.54)		0.79	pCi/l	NA	12/15/2017 08:48
Carr: BARIUM	87.8		40-110	%REC	DL = NA	12/15/2017 08:48
Total Uranium by Alpha Spectroscopy						
			SOP 714		Prep Date: 12/11/2017	PrepBy: SDW
Tracer: U-232	85.8		30-110	%REC	DL = NA	12/14/2017 13:51
U-234	0.39 (+/- 0.14)		0.09	pCi/l	NA	12/14/2017 13:51
U-235	0.021 (+/- 0.041)	U	0.083	pCi/l	NA	12/14/2017 13:51
U-238	0.24 (+/- 0.11)		0.07	pCi/l	NA	12/14/2017 13:51
URANIUM, TOTAL	0.65 (+/- 0.18)		0.12	pCi/l	NA	12/14/2017 13:51

Client: ALS Environmental
 Project:
 Sample ID: Cell3-1117
 Legal Location:
 Collection Date: 11/17/2017 13:00

Date: 28-Feb-18
 Work Order: 1711403
 Lab ID: 1711403-2
 Matrix: WATER
 Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Gamma Spectroscopy Results						
			SOP 713		Prep Date: 12/1/2017	PrepBy: NMP
Ac-228	3 (+/- 21)	U	36	pCi/l	NA	12/6/2017 14:39
Bi-212	85 (+/- 58)	U	90	pCi/l	NA	12/6/2017 14:39
Bi-214	14.6 (+/- 8.4)	NQ	12.9	pCi/l	NA	12/6/2017 14:39
Cs-134	-3 (+/- 4)	U	7	pCi/l	NA	12/6/2017 14:39
Cs-137	-4.5 (+/- 4.3)	U	7.8	pCi/l	NA	12/6/2017 14:39
K-40	90 (+/- 110)	U	190	pCi/l	NA	12/6/2017 14:39
Pb-212	2 (+/- 10)	U	17	pCi/l	NA	12/6/2017 14:39
Pb-214	-7 (+/- 13)	U	23	pCi/l	NA	12/6/2017 14:39
Ra-226	61 (+/- 67)	U,SI	110	pCi/l	NA	12/6/2017 14:39
Ra-228	3 (+/- 21)	U	36	pCi/l	NA	12/6/2017 14:39
Th-227	3 (+/- 27)	U	45	pCi/l	NA	12/6/2017 14:39
Th-232	3 (+/- 21)	U	36	pCi/l	NA	12/6/2017 14:39
Th-234	12 (+/- 95)	U	159	pCi/l	NA	12/6/2017 14:39
Tl-208	-3.3 (+/- 6.3)	U	10.8	pCi/l	NA	12/6/2017 14:39
Radium-226 by Radon Emanation - Method 903.1						
			SOP 783		Prep Date: 12/11/2017	PrepBy: SKC
Ra-226	2.8 (+/- 0.78)		0.17	pCi/l	NA	12/22/2017 14:31
Carr: BARIUM	92		40-110	%REC	DL = NA	12/22/2017 14:31
Radium-228 Analysis by GFPC						
			SOP 724		Prep Date: 12/12/2017	PrepBy: SKC
Ra-228	2.02 (+/- 0.63)		0.71	pCi/l	NA	12/15/2017 08:48
Carr: BARIUM	90.6		40-110	%REC	DL = NA	12/15/2017 08:48
Total Uranium by Alpha Spectroscopy						
			SOP 714		Prep Date: 12/11/2017	PrepBy: SDW
Tracer: U-232	54.5		30-110	%REC	DL = NA	12/14/2017 13:51
U-234	0.16 (+/- 0.11)	LT	0.13	pCi/l	NA	12/14/2017 13:51
U-235	0.045 (+/- 0.063)	U	0.094	pCi/l	NA	12/14/2017 13:51
U-238	0.105 (+/- 0.085)	LT	0.096	pCi/l	NA	12/14/2017 13:51
URANIUM, TOTAL	0.31 (+/- 0.15)		0.15	pCi/l	NA	12/14/2017 13:51

Client: ALS Environmental
 Project:
 Sample ID: Cell4-1117
 Legal Location:
 Collection Date: 11/17/2017 13:20

Date: 28-Feb-18
 Work Order: 1711403
 Lab ID: 1711403-3
 Matrix: WATER
 Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Gamma Spectroscopy Results						
			SOP 713		Prep Date: 12/1/2017	PrepBy: NMP
Ac-228	26 (+/- 15)	NQ	24	pCi/l	NA	12/6/2017 15:31
Bi-212	56 (+/- 48)	U	76	pCi/l	NA	12/6/2017 15:31
Bi-214	18.4 (+/- 8.7)	NQ	13.1	pCi/l	NA	12/6/2017 15:31
Cs-134	-0.8 (+/- 3.9)	U	6.6	pCi/l	NA	12/6/2017 15:31
Cs-137	-0.2 (+/- 3.7)	U	6.3	pCi/l	NA	12/6/2017 15:31
K-40	145 (+/- 90)		142	pCi/l	NA	12/6/2017 15:31
Pb-212	8.5 (+/- 6.4)	U	10.1	pCi/l	NA	12/6/2017 15:31
Pb-214	14.4 (+/- 7.4)	NQ	11.3	pCi/l	NA	12/6/2017 15:31
Ra-226	40 (+/- 170)	U,SI	280	pCi/l	NA	12/6/2017 15:31
Ra-228	26 (+/- 15)	NQ	24	pCi/l	NA	12/6/2017 15:31
Th-227	-28 (+/- 21)	U	37	pCi/l	NA	12/6/2017 15:31
Th-232	26 (+/- 15)	NQ	24	pCi/l	NA	12/6/2017 15:31
Th-234	10 (+/- 160)	U	270	pCi/l	NA	12/6/2017 15:31
Tl-208	1.8 (+/- 6.1)	U	10.1	pCi/l	NA	12/6/2017 15:31
Radium-226 by Radon Emanation - Method 903.1						
			SOP 783		Prep Date: 12/11/2017	PrepBy: SKC
Ra-226	2.53 (+/- 0.72)		0.21	pCi/l	NA	12/22/2017 14:31
Carr: BARIUM	93.8		40-110	%REC	DL = NA	12/22/2017 14:31
Radium-228 Analysis by GFPC						
			SOP 724		Prep Date: 12/12/2017	PrepBy: SKC
Ra-228	2.22 (+/- 0.68)		0.74	pCi/l	NA	12/15/2017 08:48
Carr: BARIUM	91.1		40-110	%REC	DL = NA	12/15/2017 08:48
Total Uranium by Alpha Spectroscopy						
			SOP 714		Prep Date: 12/11/2017	PrepBy: SDW
Tracer: U-232	61.3		30-110	%REC	DL = NA	12/14/2017 13:51
U-234	0.29 (+/- 0.13)		0.07	pCi/l	NA	12/14/2017 13:51
U-235	0.026 (+/- 0.058)	U	0.086	pCi/l	NA	12/14/2017 13:51
U-238	0.25 (+/- 0.12)		0.07	pCi/l	NA	12/14/2017 13:51
URANIUM, TOTAL	0.56 (+/- 0.19)		0.1	pCi/l	NA	12/14/2017 13:51

Client: ALS Environmental
 Project:
 Sample ID: Cell5-1117
 Legal Location:
 Collection Date: 11/17/2017 13:40

Date: 28-Feb-18
 Work Order: 1711403
 Lab ID: 1711403-4
 Matrix: WATER
 Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Gamma Spectroscopy Results						
			SOP 713		Prep Date: 12/1/2017	PrepBy: NMP
Ac-228	37 (+/- 17)	NQ	25	pCi/l	NA	12/6/2017 15:31
Bi-212	31 (+/- 59)	U	99	pCi/l	NA	12/6/2017 15:31
Bi-214	14.1 (+/- 8.9)	NQ	13.9	pCi/l	NA	12/6/2017 15:31
Cs-134	-1.8 (+/- 4.2)	U	7.3	pCi/l	NA	12/6/2017 15:31
Cs-137	0.3 (+/- 4.3)	U	7.3	pCi/l	NA	12/6/2017 15:31
K-40	80 (+/- 100)	U	170	pCi/l	NA	12/6/2017 15:31
Pb-212	0 (+/- 10)	U	17	pCi/l	NA	12/6/2017 15:31
Pb-214	-4 (+/- 12)	U	21	pCi/l	NA	12/6/2017 15:31
Ra-226	-10 (+/- 100)	U,SI	170	pCi/l	NA	12/6/2017 15:31
Ra-228	37 (+/- 17)	NQ	25	pCi/l	NA	12/6/2017 15:31
Th-227	10 (+/- 30)	U	49	pCi/l	NA	12/6/2017 15:31
Th-232	37 (+/- 17)	NQ	25	pCi/l	NA	12/6/2017 15:31
Th-234	69 (+/- 81)	U	138	pCi/l	NA	12/6/2017 15:31
Tl-208	6.6 (+/- 4.2)	NQ	6.6	pCi/l	NA	12/6/2017 15:31
Radium-226 by Radon Emanation - Method 903.1						
			SOP 783		Prep Date: 12/11/2017	PrepBy: SKC
Ra-226	1.07 (+/- 0.36)		0.19	pCi/l	NA	12/22/2017 14:31
Carr: BARIUM	96.6		40-110	%REC	DL = NA	12/22/2017 14:31
Radium-228 Analysis by GFPC						
			SOP 724		Prep Date: 12/12/2017	PrepBy: SKC
Ra-228	1.07 (+/- 0.46)		0.75	pCi/l	NA	12/15/2017 08:48
Carr: BARIUM	90.7		40-110	%REC	DL = NA	12/15/2017 08:48
Total Uranium by Alpha Spectroscopy						
			SOP 714		Prep Date: 12/11/2017	PrepBy: SDW
Tracer: U-232	52.6		30-110	%REC	DL = NA	12/14/2017 13:51
U-234	0.47 (+/- 0.19)		0.13	pCi/l	NA	12/14/2017 13:51
U-235	0.023 (+/- 0.067)	U	0.121	pCi/l	NA	12/14/2017 13:51
U-238	0.33 (+/- 0.15)		0.04	pCi/l	NA	12/14/2017 13:51
URANIUM, TOTAL	0.82 (+/- 0.26)		0.15	pCi/l	NA	12/14/2017 13:51

Client: ALS Environmental
Project:
Sample ID: Cell6-1117
Legal Location:
Collection Date: 11/17/2017 14:00

Date: 28-Feb-18
Work Order: 1711403
Lab ID: 1711403-5
Matrix: WATER
Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Gamma Spectroscopy Results						
			SOP 713		Prep Date: 12/1/2017	PrepBy: NMP
Ac-228	15 (+/- 19)	U	30	pCi/l	NA	12/6/2017 15:31
Bi-212	38 (+/- 94)	U	157	pCi/l	NA	12/6/2017 15:31
Bi-214	9.3 (+/- 9.7)	U	15.8	pCi/l	NA	12/6/2017 15:31
Cs-134	-3.9 (+/- 4.9)	U	8.6	pCi/l	NA	12/6/2017 15:31
Cs-137	1.6 (+/- 4.8)	U	8.1	pCi/l	NA	12/6/2017 15:31
K-40	120 (+/- 140)	U	220	pCi/l	NA	12/6/2017 15:31
Pb-212	12.9 (+/- 6.2)	NQ	9.4	pCi/l	NA	12/6/2017 15:31
Pb-214	12.9 (+/- 8.6)	U	13.5	pCi/l	NA	12/6/2017 15:31
Ra-226	-30 (+/- 120)	U,SI	210	pCi/l	NA	12/6/2017 15:31
Ra-228	15 (+/- 19)	U	30	pCi/l	NA	12/6/2017 15:31
Th-227	-29 (+/- 21)	U	36	pCi/l	NA	12/6/2017 15:31
Th-232	15 (+/- 19)	U	30	pCi/l	NA	12/6/2017 15:31
Th-234	-10 (+/- 100)	U	170	pCi/l	NA	12/6/2017 15:31
Tl-208	-3.3 (+/- 7.4)	U	12.7	pCi/l	NA	12/6/2017 15:31
Radium-226 by Radon Emanation - Method 903.1						
			SOP 783		Prep Date: 12/11/2017	PrepBy: SKC
Ra-226	1.81 (+/- 0.53)		0.12	pCi/l	NA	12/22/2017 14:31
Carr: BARIUM	95.1		40-110	%REC	DL = NA	12/22/2017 14:31
Radium-228 Analysis by GFPC						
			SOP 724		Prep Date: 12/12/2017	PrepBy: SKC
Ra-228	1.18 (+/- 0.46)		0.7	pCi/l	NA	12/15/2017 08:48
Carr: BARIUM	91.6		40-110	%REC	DL = NA	12/15/2017 08:48
Total Uranium by Alpha Spectroscopy						
			SOP 714		Prep Date: 12/11/2017	PrepBy: SDW
Tracer: U-232	40.7		30-110	%REC	DL = NA	12/14/2017 13:51
U-234	0.2 (+/- 0.14)	LT	0.15	pCi/l	NA	12/14/2017 13:51
U-235	-0.017 (+/- 0.087)	U	0.157	pCi/l	NA	12/14/2017 13:51
U-238	0.064 (+/- 0.096)	U	0.179	pCi/l	NA	12/14/2017 13:51
URANIUM, TOTAL	0.25 (+/- 0.19)	M3	0.23	pCi/l	NA	12/14/2017 13:51

Client: ALS Environmental
 Project:
 Sample ID: Cell8B-1117
 Legal Location:
 Collection Date: 11/17/2017 12:35

Date: 28-Feb-18
 Work Order: 1711403
 Lab ID: 1711403-6
 Matrix: WATER
 Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Dissolved Gamma Spectroscopy Results						
			SOP 713		Prep Date: 12/1/2017	PrepBy: NMP
Ac-228	4 (+/- 25)	U	43	pCi/l	NA	12/6/2017 15:31
Bi-212	5 (+/- 49)	U	84	pCi/l	NA	12/6/2017 15:31
Bi-214	-3 (+/- 14)	U	24	pCi/l	NA	12/6/2017 15:31
Cs-134	-0.5 (+/- 5.8)	U	9.8	pCi/l	NA	12/6/2017 15:31
Cs-137	1.1 (+/- 3.6)	U	6	pCi/l	NA	12/6/2017 15:31
K-40	-43 (+/- 98)	U	166	pCi/l	NA	12/6/2017 15:31
Pb-212	0 (+/- 10)	U	17	pCi/l	NA	12/6/2017 15:31
Pb-214	3.6 (+/- 7.1)	U	11.7	pCi/l	NA	12/6/2017 15:31
Ra-226	10 (+/- 110)	U,SI	180	pCi/l	NA	12/6/2017 15:31
Ra-228	4 (+/- 25)	U	43	pCi/l	NA	12/6/2017 15:31
Th-227	4 (+/- 29)	U	48	pCi/l	NA	12/6/2017 15:31
Th-232	4 (+/- 25)	U	43	pCi/l	NA	12/6/2017 15:31
Th-234	148 (+/- 92)	NQ	146	pCi/l	NA	12/6/2017 15:31
Tl-208	4.6 (+/- 3.9)	U	6.3	pCi/l	NA	12/6/2017 15:31
Dissolved Radium-226 by Radon Emanation - Method 903.						
			SOP 783		Prep Date: 12/11/2017	PrepBy: SKC
Ra-226	0.88 (+/- 0.31)	LT	0.16	pCi/l	NA	12/22/2017 14:31
Carr: BARIUM	97		40-110	%REC	DL = NA	12/22/2017 14:31
Dissolved Radium-228 Analysis by GFPC						
			SOP 724		Prep Date: 12/12/2017	PrepBy: SKC
Ra-228	1.38 (+/- 0.51)		0.72	pCi/l	NA	12/15/2017 08:48
Carr: BARIUM	93.5		40-110	%REC	DL = NA	12/15/2017 08:48
Dissolved Total Uranium by Alpha Spectroscopy						
			SOP 714		Prep Date: 12/11/2017	PrepBy: SDW
Tracer: U-232	54.3		30-110	%REC	DL = NA	12/14/2017 13:51
U-234	0.3 (+/- 0.15)		0.13	pCi/l	NA	12/14/2017 13:51
U-235	0.022 (+/- 0.064)	U	0.115	pCi/l	NA	12/14/2017 13:51
U-238	0.27 (+/- 0.14)		0.08	pCi/l	NA	12/14/2017 13:51
URANIUM, TOTAL	0.59 (+/- 0.21)		0.16	pCi/l	NA	12/14/2017 13:51

Client: ALS Environmental
 Project:
 Sample ID: Cell3-1117
 Legal Location:
 Collection Date: 11/17/2017 13:00

Date: 28-Feb-18
 Work Order: 1711403
 Lab ID: 1711403-7
 Matrix: WATER
 Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Dissolved Gamma Spectroscopy Results						
			SOP 713		Prep Date: 12/1/2017	PrepBy: NMP
Ac-228	33 (+/- 18)	NQ	27	pCi/l	NA	12/6/2017 15:31
Bi-212	69 (+/- 58)	U	92	pCi/l	NA	12/6/2017 15:31
Bi-214	3 (+/- 16)	U	27	pCi/l	NA	12/6/2017 15:31
Cs-134	3.3 (+/- 5.6)	U	9.1	pCi/l	NA	12/6/2017 15:31
Cs-137	-3.5 (+/- 4)	U	7	pCi/l	NA	12/6/2017 15:31
K-40	140 (+/- 100)	U	160	pCi/l	NA	12/6/2017 15:31
Pb-212	-0.7 (+/- 8.6)	U	14.4	pCi/l	NA	12/6/2017 15:31
Pb-214	9.6 (+/- 7.7)	U	12.3	pCi/l	NA	12/6/2017 15:31
Ra-226	39 (+/- 90)	U,SI	150	pCi/l	NA	12/6/2017 15:31
Ra-228	33 (+/- 18)	NQ	27	pCi/l	NA	12/6/2017 15:31
Th-227	10 (+/- 30)	U	50	pCi/l	NA	12/6/2017 15:31
Th-232	33 (+/- 18)	NQ	27	pCi/l	NA	12/6/2017 15:31
Th-234	-34 (+/- 83)	U	140	pCi/l	NA	12/6/2017 15:31
Tl-208	0.7 (+/- 5.9)	U	9.9	pCi/l	NA	12/6/2017 15:31
Dissolved Radium-226 by Radon Emanation - Method 903.						
			SOP 783		Prep Date: 12/11/2017	PrepBy: SKC
Ra-226	2.69 (+/- 0.78)		0.22	pCi/l	NA	12/22/2017 14:31
Carr: BARIUM	87.6		40-110	%REC	DL = NA	12/22/2017 14:31
Dissolved Radium-228 Analysis by GFPC						
			SOP 724		Prep Date: 12/12/2017	PrepBy: SKC
Ra-228	1.83 (+/- 0.57)		0.62	pCi/l	NA	12/15/2017 08:48
Carr: BARIUM	91.9		40-110	%REC	DL = NA	12/15/2017 08:48
Dissolved Total Uranium by Alpha Spectroscopy						
			SOP 714		Prep Date: 12/11/2017	PrepBy: SDW
Tracer: U-232	45.1		30-110	%REC	DL = NA	12/14/2017 13:51
U-234	0.19 (+/- 0.13)	LT	0.15	pCi/l	NA	12/14/2017 13:51
U-235	-0.015 (+/- 0.078)	U	0.142	pCi/l	NA	12/14/2017 13:51
U-238	0.11 (+/- 0.11)	U	0.16	pCi/l	NA	12/14/2017 13:51
URANIUM, TOTAL	0.29 (+/- 0.19)	M3	0.22	pCi/l	NA	12/14/2017 13:51

Client: ALS Environmental
 Project:
 Sample ID: Cell4-1117
 Legal Location:
 Collection Date: 11/17/2017 13:20

Date: 28-Feb-18
 Work Order: 1711403
 Lab ID: 1711403-8
 Matrix: WATER
 Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Dissolved Gamma Spectroscopy Results						
			SOP 713		Prep Date: 12/1/2017	PrepBy: NMP
Ac-228	9 (+/- 16)	U	26	pCi/l	NA	12/6/2017 15:31
Bi-212	1 (+/- 52)	U	89	pCi/l	NA	12/6/2017 15:31
Bi-214	1 (+/- 11)	U	22	pCi/l	NA	12/6/2017 15:31
Cs-134	-3 (+/- 3.7)	U	6.6	pCi/l	NA	12/6/2017 15:31
Cs-137	-0.1 (+/- 3.8)	U	6.5	pCi/l	NA	12/6/2017 15:31
K-40	135 (+/- 92)	U	146	pCi/l	NA	12/6/2017 15:31
Pb-212	0.4 (+/- 8.2)	U	13.6	pCi/l	NA	12/6/2017 15:31
Pb-214	-9 (+/- 12)	U	20	pCi/l	NA	12/6/2017 15:31
Ra-226	3 (+/- 95)	U,SI	158	pCi/l	NA	12/6/2017 15:31
Ra-228	9 (+/- 16)	U	26	pCi/l	NA	12/6/2017 15:31
Th-227	6 (+/- 28)	U	47	pCi/l	NA	12/6/2017 15:31
Th-232	9 (+/- 16)	U	26	pCi/l	NA	12/6/2017 15:31
Th-234	26 (+/- 82)	U	137	pCi/l	NA	12/6/2017 15:31
Tl-208	5.9 (+/- 4)	U	6.2	pCi/l	NA	12/6/2017 15:31
Dissolved Radium-226 by Radon Emanation - Method 903.						
			SOP 783		Prep Date: 12/11/2017	PrepBy: SKC
Ra-226	1.59 (+/- 0.51)		0.24	pCi/l	NA	12/22/2017 14:31
Carr: BARIUM	94.5		40-110	%REC	DL = NA	12/22/2017 14:31
Dissolved Radium-228 Analysis by GFPC						
			SOP 724		Prep Date: 12/12/2017	PrepBy: SKC
Ra-228	2.48 (+/- 0.71)		0.63	pCi/l	NA	12/15/2017 08:48
Carr: BARIUM	93.1		40-110	%REC	DL = NA	12/15/2017 08:48
Dissolved Total Uranium by Alpha Spectroscopy						
			SOP 714		Prep Date: 12/11/2017	PrepBy: SDW
Tracer: U-232	63.6		30-110	%REC	DL = NA	12/14/2017 13:51
U-234	0.26 (+/- 0.12)		0.07	pCi/l	NA	12/14/2017 13:51
U-235	0.01 (+/- 0.055)	U	0.082	pCi/l	NA	12/14/2017 13:51
U-238	0.21 (+/- 0.11)		0.07	pCi/l	NA	12/14/2017 13:51
URANIUM, TOTAL	0.48 (+/- 0.18)		0.1	pCi/l	NA	12/14/2017 13:51

Client: ALS Environmental
 Project:
 Sample ID: Cell5-1117
 Legal Location:
 Collection Date: 11/17/2017 13:40

Date: 28-Feb-18
 Work Order: 1711403
 Lab ID: 1711403-9
 Matrix: WATER
 Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Dissolved Gamma Spectroscopy Results						
			SOP 713		Prep Date: 12/1/2017	PrepBy: NMP
Ac-228	17 (+/- 14)	U	22	pCi/l	NA	12/6/2017 15:32
Bi-212	68 (+/- 48)	U	75	pCi/l	NA	12/6/2017 15:32
Bi-214	-3 (+/- 12)	U	20	pCi/l	NA	12/6/2017 15:32
Cs-134	-2.9 (+/- 3.1)	U	5.5	pCi/l	NA	12/6/2017 15:32
Cs-137	0.6 (+/- 2.9)	U	4.9	pCi/l	NA	12/6/2017 15:32
K-40	67 (+/- 75)	U	123	pCi/l	NA	12/6/2017 15:32
Pb-212	-0.1 (+/- 6.9)	U	11.6	pCi/l	NA	12/6/2017 15:32
Pb-214	8.8 (+/- 6.1)	U	9.6	pCi/l	NA	12/6/2017 15:32
Ra-226	-1 (+/- 71)	U,SI	118	pCi/l	NA	12/6/2017 15:32
Ra-228	17 (+/- 14)	U	22	pCi/l	NA	12/6/2017 15:32
Th-227	-2 (+/- 20)	U	33	pCi/l	NA	12/6/2017 15:32
Th-232	17 (+/- 14)	U	22	pCi/l	NA	12/6/2017 15:32
Th-234	38 (+/- 40)	U	76	pCi/l	NA	12/6/2017 15:32
Tl-208	-0.1 (+/- 4.8)	U	8.1	pCi/l	NA	12/6/2017 15:32
Dissolved Radium-226 by Radon Emanation - Method 903.						
			SOP 783		Prep Date: 12/11/2017	PrepBy: SKC
Ra-226	1.07 (+/- 0.36)		0.16	pCi/l	NA	12/22/2017 15:04
Carr: BARIUM	94.6		40-110	%REC	DL = NA	12/22/2017 15:04
Dissolved Radium-228 Analysis by GFPC						
			SOP 724		Prep Date: 12/12/2017	PrepBy: SKC
Ra-228	1.85 (+/- 0.57)		0.61	pCi/l	NA	12/15/2017 08:48
Carr: BARIUM	93.5		40-110	%REC	DL = NA	12/15/2017 08:48
Dissolved Total Uranium by Alpha Spectroscopy						
			SOP 714		Prep Date: 12/11/2017	PrepBy: SDW
Tracer: U-232	73.7		30-110	%REC	DL = NA	12/14/2017 13:51
U-234	0.45 (+/- 0.16)		0.1	pCi/l	NA	12/14/2017 13:51
U-235	0.038 (+/- 0.048)	LT	0.035	pCi/l	NA	12/14/2017 13:51
U-238	0.26 (+/- 0.11)		0.03	pCi/l	NA	12/14/2017 13:51
URANIUM, TOTAL	0.75 (+/- 0.2)		0.1	pCi/l	NA	12/14/2017 13:51

Client: ALS Environmental
Project:
Sample ID: Cell6-1117
Legal Location:
Collection Date: 11/17/2017 14:00

Date: 28-Feb-18
Work Order: 1711403
Lab ID: 1711403-10
Matrix: WATER
Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Dissolved Gamma Spectroscopy Results						
			SOP 713		Prep Date: 12/1/2017	PrepBy: NMP
Ac-228	4.8 (+/- 9.1)	U	19.5	pCi/l	NA	12/6/2017 15:32
Bi-212	-7 (+/- 49)	U	82	pCi/l	NA	12/6/2017 15:32
Bi-214	-7.6 (+/- 9.5)	U	15.8	pCi/l	NA	12/6/2017 15:32
Cs-134	-1.7 (+/- 2)	U	3.5	pCi/l	NA	12/6/2017 15:32
Cs-137	-2 (+/- 1.8)	U	3.2	pCi/l	NA	12/6/2017 15:32
K-40	55 (+/- 48)	U	78	pCi/l	NA	12/6/2017 15:32
Pb-212	-0.4 (+/- 5.5)	U	9.1	pCi/l	NA	12/6/2017 15:32
Pb-214	-9.1 (+/- 8.4)	U	13.9	pCi/l	NA	12/6/2017 15:32
Ra-226	17 (+/- 67)	U,SI	110	pCi/l	NA	12/6/2017 15:32
Ra-228	4.8 (+/- 9.1)	U	19.5	pCi/l	NA	12/6/2017 15:32
Th-227	1 (+/- 15)	U	25	pCi/l	NA	12/6/2017 15:32
Th-232	4.8 (+/- 9.1)	U	19.5	pCi/l	NA	12/6/2017 15:32
Th-234	49 (+/- 63)	U	105	pCi/l	NA	12/6/2017 15:32
Tl-208	-1 (+/- 3.3)	U	5.5	pCi/l	NA	12/6/2017 15:32
Dissolved Radium-226 by Radon Emanation - Method 903.						
			SOP 783		Prep Date: 12/11/2017	PrepBy: SKC
Ra-226	2.77 (+/- 0.78)		0.19	pCi/l	NA	12/22/2017 15:04
Carr: BARIUM	92.5		40-110	%REC	DL = NA	12/22/2017 15:04
Dissolved Radium-228 Analysis by GFPC						
			SOP 724		Prep Date: 12/12/2017	PrepBy: SKC
Ra-228	3.1 (+/- 0.84)		0.62	pCi/l	NA	12/15/2017 08:48
Carr: BARIUM	91.8		40-110	%REC	DL = NA	12/15/2017 08:48
Dissolved Total Uranium by Alpha Spectroscopy						
			SOP 714		Prep Date: 12/11/2017	PrepBy: SDW
Tracer: U-232	77.4		30-110	%REC	DL = NA	12/14/2017 13:51
U-234	0.192 (+/- 0.097)	LT	0.07	pCi/l	NA	12/14/2017 13:51
U-235	0.012 (+/- 0.045)	U	0.033	pCi/l	NA	12/14/2017 13:51
U-238	0.118 (+/- 0.076)	LT	0.07	pCi/l	NA	12/14/2017 13:51
URANIUM, TOTAL	0.32 (+/- 0.13)		0.09	pCi/l	NA	12/14/2017 13:51

Client: ALS Environmental
Project:
Sample ID: Cell6-1117
Legal Location:
Collection Date: 11/17/2017 14:00

Date: 28-Feb-18
Work Order: 1711403
Lab ID: 1711403-10
Matrix: WATER
Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
----------	--------	------	--------------	-------	-----------------	---------------

Explanation of Qualifiers

Radiochemistry:

- "Report Limit" is the MDC
- U or ND - Result is less than the sample specific MDC.
- Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
- Y2 - Chemical Yield outside default limits.
- W - DER is greater than Warning Limit of 1.42
- * - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.
- # - Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.
- G - Sample density differs by more than 15% of LCS density.
- D - DER is greater than Control Limit
- M - Requested MDC not met.
- LT - Result is less than requested MDC but greater than achieved MDC.
- M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
- L - LCS Recovery below lower control limit.
- H - LCS Recovery above upper control limit.
- P - LCS, Matrix Spike Recovery within control limits.
- N - Matrix Spike Recovery outside control limits
- NC - Not Calculated for duplicate results less than 5 times MDC
- B - Analyte concentration greater than MDC.
- B3 - Analyte concentration greater than MDC but less than Requested MDC.

Inorganics:

- B - Result is less than the requested reporting limit but greater than the instrument method detection limit (MDL).
- U or ND - Indicates that the compound was analyzed for but not detected.
- E - The reported value is estimated because of the presence of interference. An explanatory note may be included in the narrative.
- M - Duplicate injection precision was not met.
- N - Spiked sample recovery not within control limits. A post spike is analyzed for all ICP analyses when the matrix spike and or spike duplicate fail and the native sample concentration is less than four times the spike added concentration.
- Z - Spiked recovery not within control limits. An explanatory note may be included in the narrative.
- * - Duplicate analysis (relative percent difference) not within control limits.
- S - SAR value is estimated as one or more analytes used in the calculation were not detected above the detection limit.

Organics:

- U or ND - Indicates that the compound was analyzed for but not detected.
- B - Analyte is detected in the associated method blank as well as in the sample. It indicates probable blank contamination and warns the data user.
- E - Analyte concentration exceeds the upper level of the calibration range.
- J - Estimated value. The result is less than the reporting limit but greater than the instrument method detection limit (MDL).
- A - A tentatively identified compound is a suspected aldol-condensation product.
- X - The analyte was diluted below an accurate quantitation level.
- * - The spike recovery is equal to or outside the control criteria used.
- + - The relative percent difference (RPD) equals or exceeds the control criteria.
- G - A pattern resembling gasoline was detected in this sample.
- D - A pattern resembling diesel was detected in this sample.
- M - A pattern resembling motor oil was detected in this sample.
- C - A pattern resembling crude oil was detected in this sample.
- 4 - A pattern resembling JP-4 was detected in this sample.
- 5 - A pattern resembling JP-5 was detected in this sample.
- H - Indicates that the fuel pattern was in the heavier end of the retention time window for the analyte of interest.
- L - Indicates that the fuel pattern was in the lighter end of the retention time window for the analyte of interest.
- Z - This flag indicates that a significant fraction of the reported result did not resemble the patterns of any of the following petroleum hydrocarbon products:
 - gasoline
 - JP-8
 - diesel
 - mineral spirits
 - motor oil
 - Stoddard solvent
 - bunker C

ALS -- Fort Collins

Date: 2/28/2018 3:49:

Client: ALS Environmental

QC BATCH REPORT

Work Order: 1711403

Project:

Batch ID: RE171211-1.5

Instrument ID Alpha Scin

Method: Radium-226 by Radon Emanation

LCS		Sample ID RE171211-1			Units: pCi/l		Analysis Date: 12/22/2017 15:38				
Client ID:		Run ID: RE171211-1A			Prep Date: 12/11/2017		DF: NA				
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	47 (+/- 11)	0	46.34		100	67-120					P
Carr: BARIUM	15930		16720		95.3	40-110					

LCSD		Sample ID RE171211-1			Units: pCi/l		Analysis Date: 12/22/2017 15:38				
Client ID:		Run ID: RE171211-1A			Prep Date: 12/11/2017		DF: NA				
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	42 (+/- 10)	0	46.34		91.2	67-120		47	0.3	2.1	P
Carr: BARIUM	16620		16720		99.4	40-110		15930			

MB		Sample ID RE171211-1			Units: pCi/l		Analysis Date: 12/22/2017 15:38				
Client ID:		Run ID: RE171211-1A			Prep Date: 12/11/2017		DF: NA				
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	0.05 (+/- 0.088)	0.151									U
Carr: BARIUM	15080		16720		90.2	40-110					

The following samples were analyzed in this batch:

1711403-1	1711403-2	1711403-3
1711403-4	1711403-5	1711403-6
1711403-7	1711403-8	1711403-9
1711403-10		

Client: ALS Environmental

Work Order: 1711403

Project:

QC BATCH REPORT

Batch ID: AS171211-11-2

Instrument ID AlphaSpec2

Method: Total Uranium by Alpha Spectro

LCS		Sample ID AS171211-11			Units: pCi/l		Analysis Date: 12/14/2017 13:51				
Client ID:		Run ID: AS171211-11U			Prep Date: 12/11/2017		DF: NA				
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
U-234	4.27 (+/- 0.76)	0.03	4.22		101	82-122					P
U-235	0.191 (+/- 0.075)	0.017	0.2017		94.6						LT
U-238	4.36 (+/- 0.77)	0.05	4.382		99.6	78-126					P
URANIUM, TOTAL	8.8 (+/- 1.1)	0.1	8.804		100	82-122					P
Tracer: U-232	3.27	0.05	4.515		72.4	30-110					

MB		Sample ID AS171211-11			Units: pCi/l		Analysis Date: 12/14/2017 13:51				
Client ID:		Run ID: AS171211-11U			Prep Date: 12/11/2017		DF: NA				
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
U-234	0.017 (+/- 0.022)	0.039									U
U-235	0.002 (+/- 0.02)	0.037									U
U-238	0.022 (+/- 0.021)	0.026									U
URANIUM, TOTAL	0.04 (+/- 0.037)	0.047									U
Tracer: U-232	3.85	0.06	4.515		85.2	30-110					

The following samples were analyzed in this batch:

1711403-1	1711403-2	1711403-3
1711403-4	1711403-5	1711403-6
1711403-7	1711403-8	1711403-9
1711403-10		

Client: ALS Environmental

Work Order: 1711403

Project:

QC BATCH REPORT

Batch ID: RA171212-1-2

Instrument ID LB4100-C

Method: Radium-228 Analysis by GFPC

LCS		Sample ID RA171212-1					Units: pCi/l	Analysis Date: 12/19/2017 10:45				
Client ID:		Run ID: RA171212-1A			Prep Date: 12/12/2017			DF: NA				
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual	
Ra-228	6.3 (+/- 1.7)	1	6.438		97.5	70-130					P,M3	
Carr: BARIUM	31150		32800		95	40-110						

LCSD		Sample ID RA171212-1					Units: pCi/l	Analysis Date: 12/19/2017 10:45				
Client ID:		Run ID: RA171212-1A			Prep Date: 12/12/2017			DF: NA				
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual	
Ra-228	6.1 (+/- 1.7)	1	6.438		94.8	70-130		6.3	0.07	2.1	P,M3	
Carr: BARIUM	31810		32800		97	40-110		31150				

MB		Sample ID RA171212-1					Units: pCi/l	Analysis Date: 12/15/2017 08:48				
Client ID:		Run ID: RA171212-1A			Prep Date: 12/12/2017			DF: NA				
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual	
Ra-228	0.16 (+/- 0.3)	0.66									U	
Carr: BARIUM	29900		32800		91.2	40-110						

The following samples were analyzed in this batch:

1711403-1	1711403-2	1711403-3
1711403-4	1711403-5	

Client: ALS Environmental
 Work Order: 1711403
 Project:

QC BATCH REPORT

Batch ID: **GS171201-1-4** Instrument ID **GAMMA** Method: **Gamma Spectroscopy Results**

LCS		Sample ID	GS171201-1		Units: pCi/l		Analysis Date: 12/6/2017 14:06				
Client ID:		Run ID: GS171201-1A			Prep Date: 12/1/2017		DF: NA				
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Am-241	103000 (+/- 12000)	1000	99500		103	85-115					P
Co-60	38900 (+/- 4600)	100	38760		100	85-115					P
Cs-137	39700 (+/- 4600)	100	37330		106	85-115					P,M3

MB		Sample ID	GS171201-1C		Units: pCi/l		Analysis Date: 12/6/2017 15:32				
Client ID:		Run ID: GS171201-1A			Prep Date: 12/1/2017		DF: NA				
Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ac-228	23 (+/- 15)	24									U
Am-241	2.9 (+/- 4.3)	7									U
Bi-212	21 (+/- 80)	134									U
Bi-214	-7 (+/- 13)	22									U
Co-60	-2.7 (+/- 3.8)	7.1									U
Cs-134	1.1 (+/- 3.4)	5.7									U
Cs-137	-0.9 (+/- 3.4)	6									U
K-40	-29 (+/- 80)	138									U
Pb-212	1.4 (+/- 7.9)	13.1									U
Pb-214	9.2 (+/- 6.7)	10.6									U
Ra-226	61 (+/- 91)	150									U,SI
Ra-228	23 (+/- 15)	24									U
Th-227	5 (+/- 22)	36									U
Th-232	23 (+/- 15)	24									U
Th-234	20 (+/- 54)	89									U
Tl-208	-1.9 (+/- 5.5)	9.4									U

The following samples were analyzed in this batch:

1711403-1	1711403-2	1711403-3
1711403-4	1711403-5	1711403-6
1711403-7	1711403-8	1711403-9
1711403-10		

TECHNICAL BULLETIN ADDENDUM

The library used for analysis defines the gamma emission(s) to be used for analysis of each nuclide. If multiple gamma emissions are used for quantification, then a 'NET' quantification emission (or peak) must be defined in the library. This designation provides for the calculation of nuclide activity concentrations and detection limits in the case of non-presence of the nuclide. When the nuclide is not present, or the software is unable to resolve a peak at the library defined 'NET' energy, the software evaluates the 'NET' region of interest ('NET' peak energy +/- 2 keV) by performing a summation of the net counts above the background level. This 'NET' quantification can result in net negative, zero, or positive activity results, and is highly dependent on the spectral distribution in the region of interest of the 'NET' peak. In cases where only the 'NET' peak is found, and the software performs a net quantification, the nuclide result will be flagged with an 'NQ' qualifier on the final reports. This indicates that the nuclide is not detected or supported at any level above the reported MDC. Results are submitted without further qualification.

All nuclides specified in the library of analysis for gamma spectroscopy are evaluated for positive OR tentative identification on the following criteria:

- The individual abundances for the gamma emissions specified for each nuclide are summed to obtain a total nuclide abundance.
- From the total nuclide abundance, a positive identification criterion is set as 75% of this total nuclide abundance.
- For all nuclide peaks that are not net quantified, those peak abundances are summed. The total non-net quantified peak sum is compared to the calculated 75% abundance criterion. If this sum is greater than the 75% criterion, the nuclide is considered to be positively identified at the reported concentration. If the sum is less than the 75% criterion, the nuclide is tentatively identified at the reported concentration. These results will be flagged with a 'TI' qualifier on the final reports to indicate that the 75% abundance criterion was not met.

QUALITY ASSURANCE SUMMARY SHEET

ALS W.O. # / BATCH Generic - for non-sequential Ra-em samples *Ra228 replanchetting*

TEST Ra 228

METHOD Prep

SOP/REV (PREP) 749

SOP/REV (ANAL) _____

Briefly document any QA or other problems or deviations associated with the analysis of samples. Problems could result from: log-in, color, odor, dilution, consistency, scheduling, equipment, or instrumentation; or may include documentation of minor deviations necessary due to unique DQO's or sample characteristics.

ARS 8/24/16

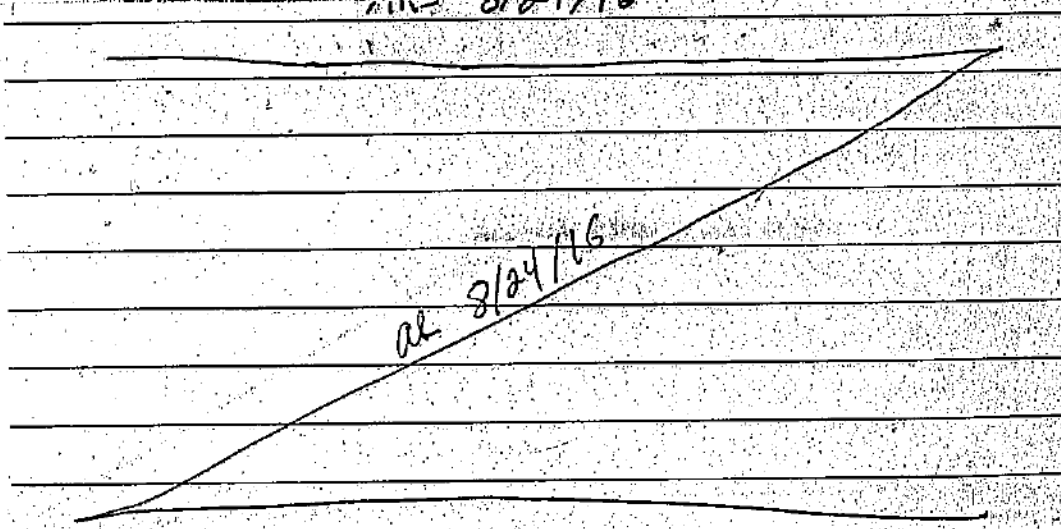
For non-sequential Ra-em samples that are replanchetted:

ARS 8/24/16

1. Use the supernatant fraction from SOP 749 step 8.1.25.
2. If the supernatant is in a cup, transfer to a 50mL centrifuge tube and add 1mL Yttrium carrier.
3. Shake for ~36 hours and replanchett for Ra228 analysis per step 8.1.25.
4. On the benchsheet, the previous decay date/time will become the new ingrowth date/time. The new decay date/time will be the new replanchet time as listed in step 8.1.25.

ARS 8/24/16

ARS 8/24/16



TECHNICIAN/ANALYST *Andrew N. Styer*

DATE *8/24/16*

DEPARTMENT MANAGER *[Signature]*

DATE *8/24/16*