EXHIBIT K

November 9, 2016

Mr. Mark Domagala
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, Painted Post N.Y.
Hakes C&D Landfill Permit No. 8-4630-00010/00001-0
2016 2nd & 3rd Radionuclide Monitoring Results

Dear Mr. Domagala:

Enclosed please find a copy of the radionuclide sampling and analysis report for leachate and leachate tank sediment sampling conducted during the second and third quarters 2016 at Hakes C&D Landfill. 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.

Sincerely,

CASELLA WASTE SERVICES

Lance Stevens
Environmental Manager

cc: Robert Kras, Casella
Jonathan Brandes, On-Site Technical Services
Yasmin Guevara, NYSDEC
Richard Clarkson, NYSDEC
Timothy Rice, NYSDEC

Enclosures

ON-SITE TECHNICAL SERVICES, INC
72 Railroad Avenue
Wellsville, New York 14895
Phone: (585) 593-1824
Fax: (585) 593-7471

November 8, 2016

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

Re: Hakes C & D Landfill Painted Post, New York – 2nd and 3th Quarters 2016 Radionuclide Test Results

Dear Lance:

The purpose of this letter is to present results of the radiological sampling conducted at the Hakes C & D Landfill during the second and third quarter 2016. Leachate sampling and analysis for radiological testing is required as detailed in section 2.6.3 of the March 2012 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 second quarter 2016 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, second quarter 2016 leachate samples were collected from cells 3, 4, 5, 6 and 8B. Samples were collected on May 4, 2016 and sent to ALS Environmental in Rochester, New York for analysis. Additionally, one sediment sample was collected from the north leachate tank on August 24, 2016 as part of annual leachate tank cleaning activities. Attached Table 1 displays the current and historic leachate radionuclide results from sampling conducted from 2012 through 2016. Table 2 exhibits the current and historic radionuclide results for leachate tank sediment samples collected from 2013 through 2016. Also enclosed are the field sampling forms and laboratory analytical reports.

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

Sincerely,

Jonathan E. Brandes, P.G.
Senior Geologist

Enclosures

Table 1

Leachate Radionuclide Analytical Results
2012 Through 2016
Hakes C and D Landfill
Painted Post, New York

Parameter	LCS 5/23/2012	Cell 1 Leachate 5/23/2012	Cell 1A Leachate 5/24/2012	Cell 2 Leachate 5/23/2012	Cell 3 Leachate				Cell 4 Leachate			
					5/23/2012	5/7/2015	11/11/2015	5/4/2016	5/23/2012	5/7/2015	11/11/2015	5/4/2016
Radionuclide Act + Unc (MDC) pCi/L												
Actinium-228 (EPA 901.1)	-1.140 ± 12.4 (18.0)	-6.120 ± 276 (18.4)	-2.640 ± 16.8 (20.0)	-7.120 ± 526 (12.9)	-1.580 ± 15.5 (19.2)	0 ± 7.767 (24.95)	0 ± 4.384 (21.4)	0 ± 5.485 (19.92)	4.03 ± 4.90 (17.3)	5.215 ± 30.714 (39.31)	12.968 ± 14.548 (16.16)	2.636 ± 26.970 (36.33)
Actinium-228, Dissolved (EPA 901.1)	1.61 ± 8.98 (17.5)	5.15 ± 7.66 (15.0)	-0.056 ± 10.7 (20.8)	-6.610 ± 18.2 (31.1)	12.5 ± 6.37 (12.0)	3.133 ± 16.452 (17.65)	9.101 ± 26.524 (34.5)	3.116 ± 16.467 (17.66)	-0.042 ± 0.0720 (16.1)	0 ± 4.640 (39.33)	0 ± 17.365 (38.32)	0 ± 11.596 (22.52)
Bismuth-212 (EPA 901.1)	16.4 ± 39.0 (68.3)	20.5 ± 41.5 (71.6)	-4.580 ± 183 (43.5)	24.8 ± 28.8 (47.9)	-5.250 ± 1,320 (71.8)	59.801 ± 61.695 (65.04)	5.033 ± 66.631 (74.22)	49.256 ± 47.540 (48.41)	0.646 ± 31.7 (57.4)	9.62 ± 100.500 (121)	0 ± 10.427 (74.22)	0 ± 46.219 (152.9)
Bismuth-212, Dissolved (EPA 901.1)	-3.330 ± 231 (76.2)	-5.440 ± 2,510 (51.5)	17.0 ± 36.4 (63.4)	-8.130 ± 60.6 (105)	-19.700 ± 175 (65.1)	30.575 ± 41.997 (71.63)	0 ± 36.567 (113)	10.028 ± 64.348 (71.71)	1.83 ± 35.4 (64.3)	30.809 ± 75.290 (90.19)	20.005 ± 127.980 (149.1)	0 ± 13.451 (88.26)
Bismuth-214 (EPA 901.1)	-2.330 ± 3.87 (51.8)	6.21 ± 4.50 (38.8)	7.15 ± 19.6 (34.7)	0.471 ± 0.761 (29.4)	1.88 ± 2.10 (51.4)	391.34 ± 48.673 (15.31)	28.356 ± 9.066 (8.704)	16.287 ± 8.662 (8.697)	43.1 ± 9.54 (36.2)	0 ± 7.147 (26.3)	37.991 ± 10.867 (10.07)	0 ± 12.030 (25.37)
Bismuth-214, Dissolved (EPA 901.1)	5.58 ± 4.94 (37.8)	6.57 ± 3.71 (38.3)	0.992 ± 18.5 (34.2)	428 ± 33.1 (54.3)	3.30 ± 3.70 (33.2)	0 ± 6.254 (13.48)	14.895 ± 13.603 (18.48)	11.604 ± 7.496 (11.14)	8.50 ± 5.78 (31.3)	3.129 ± 18.181 (23.4)	25.958 ± 18.004 (21.03)	4.12 ± 10.106 (11.53)
Cesium-134 (EPA 901.1)	-0.751 ± 3.37 (5.54)	2.14 ± 2.23 (5.83)	-0.641 ± 3.38 (5.85)	1.41 ± 2.44 (3.54)	0.428 ± 0.700 (5.39)	4.086 ± 5.209 (8.05)	3.052 ± 3.069 (5.64)	0.916 ± 1.468 (5.868)	-2.850 ± 3.70 (6.00)	0 ± 1.671 (11.7)	3.398 ± 2.537 (5.771)	4.324 ± 6.376 (7.154)
Cesium-134, dissolved (EPA 901.1)	-1.270 ± 3.32 (5.50)	0.148 ± 4.00 (6.80)	-0.775 ± 2.88 (4.99)	1.57 ± 4.78 (7.36)	-1.970 ± 3.23 (4.98)	0 ± 1.159 (5.007)	5.375 ± 5.540 (6.026)	1.144 ± 2.503 (4.271)	-0.555 ± 3.52 (4.61)	-0.853 ± 8.882 (10.27)	2.813 ± 7.274 (8.353)	0.885 ± 4.648 (5.224)
Cesium-137 (EPA 901.1)	1.07 ± 2.45 (4.25)	-0.955 ± 2.89 (5.02)	0.289 ± 2.65 (4.75)	1.62 ± 2.06 (3.38)	-0.198 ± 2.70 (4.85)	0 ± 1.553 (7.209)	-0.736 ± 4.737 (5.219)	0.558 ± 4.040 (4.51)	1.91 ± 1.72 (2.65)	0 ± 1.997 (11.62)	-1.168 ± 4.551 (4.995)	-3.805 ± 11.382 (12.87)
Cesium-137, dissolved (EPA 901.1)	-0.002 ± 2.76 (4.99)	2.49 ± 2.21 (3.50)	0.0580 ± 2.74 (4.95)	1.45 ± 5.36 (8.20)	0.0350 ± 2.24 (4.02)	1.498 ± 3.863 (4.246)	0 ± 0.815 (8.748)	0 ± 0.609 (5.05)	0.224 ± 2.50 (4.43)	0 ± 2.578 (12.87)	2.643 ± 5.782 (6.649)	0.355 ± 4.492 (5.05)
Lead-212 (EPA 901.1)	-1.360 ± 8.94 (9.32)	9.01 ± 13.1 (10.5)	8.76 ± 11.2 (9.99)	24.8 ± 14.9 (7.26)	-4.200 ± 181 (12.9)	75.819 ± 27.500 (14.72)	1.962 ± 6.949 (8.667)	14.027 ± 16.916 (9.201)	11.0 ± 13.2 (10.5)	0 ± 7.818 (17.3)	2.952 ± 5.243 (8.61)	1.214 ± 14.507 (18.13)
Lead-212, Dissolved (EPA 901.1)	5.46 ± 7.83 (9.53)	4.04 ± 6.37 (7.92)	0.520 ± 5.33 (9.70)	-1.310 ± 7.89 (13.1)	36.1 ± 21.4 (7.33)	0 ± 4.276 (8.743)	0 ± 8.755 (17.06)	12.262 ± 16.952 (9.224)	0.147 ± 5.23 (9.35)	4.472 ± 13.018 (16.63)	4.828 ± 12.260 (15.62)	12.925 ± 12.705 (9.224)
Lead-214 (EPA 901.1)	-2.020 ± 11.0 (12.8)	17.4 ± 7.14 (9.61)	7.30 ± 9.32 (12.4)	25.5 ± 20.5 (8.57)	11.1 ± 7.56 (11.1)	± 49.31 (16.39)	14.132 ± 8.782 (11.13)	24.291 ± 8.950 (9.612)	38.0 ± 10.6 (9.95)	2.145 ± 14.761 (19.96)	48.796 ± 12.998 (9.549)	0 ± 11.346 (22.78)
Lead-214, dissolved (EPA 901.1)	1.35 ± 2.66 (12.5)	12.7 ± 7.35 (8.96)	-2.500 ± 11.3 (12.1)	410 ± 39.2 (15.3)	42.4 ± 24.0 (10.3)	0 ± 5.108 (12.51)	7.03 ± 18.878 (24.52)	24.509 ± 17.640 (10.63)	10.4 ± 6.01 (7.86)	0 ± 11.097 (22.99)	30.886 ± 16.585 (19.84)	18.684 ± 14.090 (11.07)
Potassium-40 (EPA 901.1)	-15.600 ± 76.2 (80.1)	138 ± 42.1 (52.0)	17.9 ± 36.2 (69.3)	75.2 ± 35.2 (57.1)	101 ± 45.5 (69.5)	48.42 ± 67.315 (69.57)	108.09 ± 38.360 (39.08)	59.436 ± 60.524 (64.51)	-22.200 ± 77.2 (63.8)	93.499 ± 118.740 (143.1)	151.28 ± 51.200 (48.24)	197.9 ± 94.924 (114)
Potassium-40, dissolved (EPA 901.1)	9.24 ± 35.6 (70.9)	125 ± 41.0 (46.0)	129 ± 44.3 (51.3)	35.6 ± 62.3 (116)	179 ± 52.8 (47.0)	65.824 ± 33.329 (41.24)	0 ± 53.073 (153.1)	122.56 ± 42.315 (43.07)	1.45 ± 29.8 (57.8)	140.64 ± 84.435 (110.9)	83.108 ± 132.290 (153.1)	260.5 ± 66.627 (50.55)
Radium-226 (EPA 901.1)	16.7 ± 55.7 (97.4)	24.0 ± 69.5 (119)	52.2 ± 56.1 (79.0)	7.10 ± 58.1 (99.6)	6.37 ± 70.3 (123)	0 ± 89.757 (195.1)	0 ± 68.875 (131.1)	31.779 ± 97.378 (122.7)	-1.850 ± 98.6 (118)	0 ± 89.553 (193.9)	91.528 ± 107.210 (128.3)	0 ± 54.840 (249.5)
Radium-226 (EPA 903.1)	0.509 ± 0.406 (0.468)	1.05 ± 0.595 (0.630)	1.61 ± 0.665 (0.395)	1.12 ± 0.551 (0.474)	1.23 ± 0.551 (0.145)	3.42 ± 2.15 (0.926)	1.43 ± 1.03 (1.26)	1.66 ± 0.976 (0.966)	0.574 ± 0.404 (0.422)	5.19 ± 2.54 (0.827)	5.11 ± 1.38 (0.213)	3.28 ± 1.20 (0.278)
Radium-226, Dissolved (EPA 901.1)	39.5 ± 71.9 (121)	-13.000 ± 656 (104)	19.4 ± 63.0 (109)	-65.400 ± 113 (191)	44.5 ± 62.1 (104)	0 ± 60.574 (139.9)	0 ± 102.540 (200.3)	0 ± 62.447 (143.8)	-11.700 ± 642 (93.9)	0 ± 102.250 (205.6)	64.564 ± 155.530 (200.3)	36.587 ± 98.448 (122.2)
Radium-226, Dissolved (EPA 903.1)	0.716 ± 0.486 (0.554)	1.05 ± 0.586 (0.571)	0.608 ± 0.406 (0.407)	1.63 ± 0.738 (0.712)	0.731 ± 0.545 (0.737)	0.678 ± 0.778 (0.46)	1.29 ± 0.935 (1.14)	0.442 ± 0.580 (0.966)	0.348 ± 0.365 (0.539)	1.57 ± 1.04 (0.472)	4.59 ± 1.97 (1.64)	0.756 ± 0.493 (0.506)
Radium-228 (EPA 901.1)	-1.140 ± 12.4 (18.0)	-6.120 ± 276 (18.4)	-2.640 ± 16.8 (20.0)	-7.120 ± 526 (12.9)	-1.580 ± 15.5 (19.2)	0 ± 7.767 (24.95)	0 ± 4.384 (21.4)	0 ± 5.485 (19.92)	4.03 ± 4.90 (17.3)	5.215 ± 30.714 (39.31)	12.968 ± 14.548 (16.16)	2.636 ± 26.970 (36.33)
Radium-228 (EPA 904.0)	1.19 ± 0.538 (0.889)	1.32 ± 0.565 (0.901)	1.16 ± 0.565 (0.964)	2.46 ± 0.759 (0.925)	1.20 ± 0.547 (0.906)	2.1 ± 1.01 (1.78)	1.38 ± 0.591 (0.948)	1.4 ± 0.555 (0.862)	1.10 ± 0.563 (0.976)	3.77 ± 1.17 (1.6)	5.13 ± 1.27 (1.07)	3.14 ± 0.847 (0.878)
Radium-228, Dissolved (EPA 901.1)	1.61 ± 8.98 (17.5)	5.15 ± 7.66 (15.0)	-0.056 ± 10.7 (20.8)	-6.610 ± 18.2 (31.1)	12.5 ± 6.37 (12.0)	3.133 ± 16.452 (17.65)	9.101 ± 26.524 (34.5)	3.116 ± 16.467 (17.66)	-0.042 ± 0.0720 (16.1)	0 ± 4.640 (39.33)	0 ± 17.365 (38.32)	0 ± 11.596 (22.52)
Radium-228, Dissolved (EPA 904.0)	1.11 ± 0.516 (0.826)	1.12 ± 0.502 (0.816)	0.947 ± 0.542 (0.973)	1.94 ± 0.636 (0.858)	1.27 ± 0.536 (0.820)	0.669 ± 0.466 (0.895)	1.33 ± 0.526 (0.815)	0.985 ± 0.458 (0.78)	0.694 ± 0.475 (0.896)	1.64 ± 0.630 (0.97)	5.92 ± 1.35 (0.996)	3.38 ± 0.867 (0.891)
Thallium-208 (EPA 901.1)	-0.961 ± 5.35 (5.53)	-0.886 ± 5.39 (5.67)	-0.167 ± 3.43 (5.93)	1.08 ± 1.06 (4.40)	-1.450 ± 8.41 (5.68)	4.588 ± 4.703 (7.916)	0 ± 2.884 (5.473)	3.538 ± 4.124 (4.767)	-0.364 ± 3.23 (4.94)	2.827 ± 7.710 (9.576)	0 ± 2.163 (4.908)	0 ± 3.268 (14.3)
Thallium-208, dissolved (EPA 901.1)	-2.450 ± 45.2 (5.70)	1.89 ± 2.04 (4.85)	0.332 ± 0.526 (5.40)	-1.810 ± 5.10 (8.44)	2.89 ± 3.31 (4.31)	1.148 ± 3.810 (4.521)	0 ± 4.078 (10.77)	3.126 ± 5.628 (5.521)	1.39 ± 2.46 (4.28)	2.444 ± 7.676 (9.584)	0.577 ± 7.654 (10.11)	2.226 ± 3.095 (6.335)
Thorium-232 (EPA 901.1)	-1.140 ± 12.4 (18.0)	-6.120 ± 276 (18.4)	-2.640 ± 16.8 (20.0)	-7.120 ± 526 (12.9)	-1.580 ± 15.5 (19.2)	3092.4 ± 9641.800 (11800)	0 ± 3404.400 (9737)	1817.5 ± 7939.800 (9788)	4.03 ± 4.90 (17.3)	1865.2 ± 3676.700 (4514)	0 ± 3284.900 (9901)	2822.1 ± 4837.600 (5873)
Thorium-232, Dissolved (EPA 901.1)	1.61 ± 8.98 (17.5)	5.15 ± 7.66 (15.0)	-0.056 ± 10.7 (20.8)	-6.610 ± 18.2 (31.1)	12.5 ± 6.37 (12.0)	0 ± 4602.400 (9295)	2903.2 ± 3952.500 (4780)	1475.1 ± 7430.700 (9194)	-0.042 ± 0.0720 (16.1)	4249.3 ± 3656.800 (4303)	3454.6 ± 4185.800 (5031)	1659.5 ± 7064.900 (8744)
Thorium-234 (EPA 901.1)	-5.310 ± 562 (973)	-12.600 ± 541 (936)	-345.000 ± 699 (1,170)	-162.000 ± 518 (869)	-219.000 ± 620 (1,050)	0 ± 174.990 (667.4)	0 ± 187.440 (536.1)	152.1 ± 424.640 (536)	260 ± 583 (973)	0 ± 120.180 (301.3)	0 ± 127.450 (517)	0 ± 112.960 (366.1)
Thorium-234, Dissolved (EPA 901.1)	23.6 ± 596 (1,030)	-9.590 ± 404 (691)	-303.000 ± 607 (1,020)	102 ± 122 (211)	-131.000 ± 636 (1,070)	97.813 ± 371.640 (474.1)	37.85 ± 230.230 (293.8)	93.454 ± 384.710 (488.8)	-175.000 ± 551 (928)	0 ± 134.510 (329.1)	69.849 ± 245.530 (310)	0 ± 221.480 (509.1)
Total Uranium (EPA 908.0)	-0.960 ± 1.04 (3.10)	-1.15 ± 0.952 (3.01)	0.424 ± 1.27 (2.89)	-1.24 ± 0.917 (3.00)	-1.91 ± 1.35 (3.96)	0.492 ± 0.354 (0.559)	2.09 ± 0.708 (0.709)	1.41 ± 0.607 (0.886)	0.772 ± 0.745 (1.40)	0.272 ± 0.337 (0.573)	1.29 ± 0.587 (0.753)	0.402 ± 0.314 (0.518)
Total Uranium, Dissolved (EPA 908.0)	-0.376 ± 0.713 (1.87)	0.848 ± 1.37 (2.89)	0.281 ± 0.667 (1.48)	-0.299 ± 0.530 (1.48)	0.982 ± 0.792 (1.40)	0.453 ± 0.390 (0.638)	1.36 ± 0.658 (0.922)	1.76 ± 0.549 (0.543)	0.350 ± 0.641 (1.38)	0.551 ± 0.360 (0.559)	1.15 ± 0.544 (0.704)	0.806 ± 0.368 (0.484)
Uranium-235 (EPA 901.1)	-9.300 ± 24.7 (41.8)	0.592 ± 0.780 (42.5)	9.42 ± 17.5 (40.6)	-2.120 ± 19.6 (33.4)	-2.530 ± 24.1 (41.8)	0 ± 26.904 (65.25)			-1.220 ± 22.6 (38.7)	0 ± 20.011 (60.11)		
Uranium-235, Dissolved (EPA 901.1)	11.4 ± 18.1 (26.1)	30.8 ± 21.7 (27.7)	0.101 ± 19.0 (33.5)	5.34 ± 32.1 (48.9)	0.112 ± 21.4 (36.8)	0 ± 18.781 (40.22)			-12.900 ± 21.9 (36.5)	8.353 ± 44.770 (55.55)		
Uranium-238 (EPA 901.1)	-24.700 ± 105 (127)	66.4 ± 60.9 (83.3)	-11.600 ± 465 (147)	-4.880 ± 195 (116)	58.9 ± 78.0 (129)	0 ± 90.328 (192.5)			-3.260 ± 409 (128)	81.058 ± 113.800 (146.5)		
Uranium-238, Dissolved (EPA 901.1)	34.1 ± 67.1 (114)	29.6 ± 66.2 (112)	22.6 ± 74.5 (130)	34.7 ± 825 (1,430)	-1.830 ± 105 (119)	0 ± 52.151 (131.1)			15.3 ± 64.6 (112)	0 ± 75.222 (172.7)		

Notes:
Act + Unc (MDC) = Activity ± Uncertainty (Minimum Detectable Concentration)
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 are laboratory analysis methods.

Table 1

Leachate Radionuclide Analytical Results
2012 Through 2016
Hakes C and D Landfill
Painted Post, New York

Parameter	Cell 5 Leachate									
	5/23/2012	11/14/2012	12/4/2012	5/15/2013	11/6/2013	5/15/2014	11/11/2014	5/7/2015	11/11/2015	5/4/2016
Radionuclide Act + Unc (MDC) pCi/L										
Actinium-228 (EPA 901.1)	-2.900 ± 21.8 (17.4)		-5.74 ± 648	-10.7996 ± 245.7	-1.515 ± 31.550 (44.23)	-1.608 ± 22.395 (16.88)	-6.837 ± 120.320 (30.58)	1.083 ± 12.233 (13.83)	2.06 ± 13.792 (16.16)	0 ± 14.673 (46.24)
Actinium-228, Dissolved (EPA 901.1)	-7.120 ± 904 (15.8)		1.48 ± 10.5	-1.558 ± 52.055	-5.263 ± 52.415 (43.25)	-8.630 ± 41.176 (32.31)	-26.581 ± 91.130 (102.7)	0 ± 11.397 (27.86)	5.82 ± 26.105 (34.51)	11.706 ± 14.674 (15.24)
Bismuth-212 (EPA 901.1)	2.36 ± 24.7 (45.6)		19.5 ± 44.3	-1.199 ± 61.325	-13.743 ± 549.740 (182.3)	0.934 ± 32.245 (59.15)	-20.414 ± 78.455 (107.5)	31.826 ± 39.954 (44.13)	0 ± 13.461 (74.22)	0 ± 40.028 (142.4)
Bismuth-212, Dissolved (EPA 901.1)	-13.700 ± 1,880 (63.5)		-6.22 ± 249	53.992 ± 147.880	31.422 ± 63.942 (113.6)	-32.081 ± 104.020 (100.6)	-25.026 ± 237.650 (325)	14.857 ± 82.718 (90.45)	0 ± 46.255 (138.3)	17.473 ± 55.120 (61.64)
Bismuth-214 (EPA 901.1)	6.83 ± 4.49 (34.4)		87.6 ± 18.4	17.264 ± 32.231	186.460 ± 33.504 (19.71)	7.327 ± 6.499 (10.62)	-0.226 ± 9.291 (15.45)	7.984 ± 12.612 (14.53)	49.436 ± 12.938 (10.31)	0 ± 10.770 (28.05)
Bismuth-214, Dissolved (EPA 901.1)	7.46 ± 7.57 (31.0)		24.2 ± 8.80	2878.9 ± 316.840	50.799 ± 14.979 (15.3)	19.076 ± 13.484 (15.51)	6221.7 ± 670.090 (57.08)	512.4 ± 60.088 (16.65)	22.554 ± 13.425 (16.82)	75.469 ± 14.748 (9.911)
Cesium-134 (EPA 901.1)	0.444 ± 0.507 (4.60)		-2.09 ± 5.50	-1.574 ± 5.240	1.346 ± 23.514 (39.6)	-1.066 ± 3.278 (5.605)	0.018 ± 3.795 (6.95)	1.316 ± 4.284 (4.693)	1.664 ± 3.820 (4.274)	-0.284 ± 7.800 (9.166)
Cesium-134, dissolved (EPA 901.1)	-0.057 ± 16.7 (4.26)		-0.672 ± 3.45	2.646 ± 90.325	0.000 ± 13.128 (22.55)	-1.511 ± 3.872 (6.565)	18.583 ± 122.550 (202.5)	0 ± 2.735 (8.447)	0.194 ± 8.158 (9.562)	-0.043 ± 4.463 (5.079)
Cesium-137 (EPA 901.1)	-0.560 ± 2.48 (4.30)		-0.205 ± 8.22	0.875 ± 5.066	-0.243 ± 5.802 (9.642)	-0.879 ± 3.976 (4.96)	0 ± 4.798 (8.73)	0.228 ± 4.257 (4.759)	-1.27 ± 5.364 (5.835)	-3.126 ± 10.186 (11.63)
Cesium-137, dissolved (EPA 901.1)	-0.232 ± 32.5 (4.00)		-0.209 ± 8.368	-11.315 ± 15.998	-0.105 ± 7.143 (9.56)	0.508 ± 3.702 (6.566)	-23.293 ± 21.840 (35.49)	1.25 ± 6.216 (6.728)	2.304 ± 6.721 (7.782)	0 ± 0.862 (7.693)
Lead-212 (EPA 901.1)	7.11 ± 10.2 (9.47)		-7.24 ± 43.3	-6.346 ± 211.120	13.493 ± 10.788 (17.79)	4.344 ± 8.188 (9.332)	-1.043 ± 16.386 (12.77)	0 ± 3.950 (9.473)	0 ± 2.824 (10.1)	2.944 ± 15.715 (19.37)
Lead-212, Dissolved (EPA 901.1)	8.85 ± 15.6 (7.97)		2.31 ± 6.50	-88.256 ± 44.016	2.371 ± 8.658 (15.87)	-6.375 ± 21.764 (14.84)	1205.7 ± 187.920 (162.1)	97.904 ± 29.589 (16.92)	0 ± 7.831 (19.9)	10.932 ± 18.133 (11.31)
Lead-214 (EPA 901.1)	16.1 ± 11.7 (9.92)		76.8 ± 15.4	-3.963 ± 24.352	188.830 ± 34.085 (21.45)	21.217 ± 8.711 (10.12)	11.765 ± 7.949 (10.42)	3.255 ± 9.484 (11.43)	37.508 ± 11.916 (9.768)	11.896 ± 17.951 (22.21)
Lead-214, dissolved (EPA 901.1)	13.1 ± 19.0 (10.2)		33.5 ± 15.9	2853.2 ± 314.060	49.889 ± 15.466 (20.4)	9.036 ± 9.583 (16.47)	6818.9 ± 738.230 (73.28)	581.9 ± 69.012 (18.43)	14.916 ± 17.730 (21.63)	75.215 ± 14.380 (9.459)
Potassium-40 (EPA 901.1)	19.3 ± 30.5 (58.8)		94.6 ± 50.6	97.208 ± 76.387	16.102 ± 67.685 (140.9)	119.430 ± 36.610 (42.66)	22.019 ± 50.369 (96.66)	76.459 ± 54.759 (57.36)	56.529 ± 75.814 (75.48)	0 ± 69.751 (181.8)
Potassium-40, dissolved (EPA 901.1)	42.0 ± 32.5 (55.2)		111 ± 48.3	38.195 ± 120.260	45.325 ± 76.125 (146)	-32.749 ± 73.738 (114.1)	49.679 ± 149.290 (255.1)	39.745 ± 91.876 (91.06)	186.83 ± 109.530 (124)	150.28 ± 55.673 (53.17)
Radium-226 (EPA 901.1)	5.94 ± 58.1 (101)		4.34 ± 88.5	-9.006 ± 117.540	180.910 ± 135.860 (193.4)	-4.145 ± 81.047 (135)	22.673 ± 97.209 (180.2)	41.083 ± 70.324 (100.6)	39.43 ± 91.210 (113.3)	0 ± 139.040 (263)
Radium-226 (EPA 903.1)	0.888 ± 0.494 (0.172)	0.733 ± 1.76		2.12 ± 1.35	2.57 ± 1.71 (0.774)	1.40 ± 1.41 (1.87)	2.68 ± 1.88 (0.908)	3.14 ± 2.08 (0.945)	0.958 ± 0.712 (0.809)	1.27 ± 1.18 (1.55)
Radium-226, Dissolved (EPA 901.1)	34.6 ± 57.6 (97.3)		-7.11 ± 231	-1.335 ± 343.750	40.459 ± 108.470 (201.6)	126.970 ± 127.850 (163.2)	37.208 ± 567.340 (947.8)	0 ± 110.680 (218.8)	10.972 ± 141.870 (188.3)	97.244 ± 109.150 (128.9)
Radium-226, Dissolved (EPA 903.1)	0.427 ± 0.326 (0.165)	0.877 ± 0.746		1.03 ± 0.797	0.771 ± 0.945 (1.32)	2.44 ± 1.06 (0.964)	3.11 ± 1.57 (0.527)	2.67 ± 1.20 (0.954)	2.06 ± 1.15 (1.21)	2.96 ± 0.968 (0.507)
Radium-228 (EPA 901.1)	-2.900 ± 21.8 (17.4)		-5.74 ± 648	-10.799 ± 245.760	-1.515 ± 31.550 (44.23)	-1.608 ± 22.395 (16.88)	-6.837 ± 120.320 (30.58)	1.083 ± 12.233 (13.83)	2.06 ± 13.792 (16.16)	0 ± 14.673 (46.24)
Radium-228 (EPA 904.0)	0.549 ± 0.451 (0.894)	1.09 ± 0.638		2.37 ± 1.35	2.29 ± 2.48 (4.47)	0.746 ± 0.525 (0.998)	3.14 ± 0.942 (1.19)	1.43 ± 0.925 (1.75)	1.66 ± 0.629 (0.956)	2.7 ± 0.770 (0.904)
Radium-228, Dissolved (EPA 901.1)	-7.120 ± 904 (15.8)		1.48 ± 10.5	-1.558 ± 52.055	-5.263 ± 52.415 (43.25)	-8.630 ± 41.176 (32.31)	-26.581 ± 91.130 (102.7)	0 ± 11.397 (27.86)	5.82 ± 26.105 (34.51)	11.706 ± 14.674 (15.24)
Radium-228, Dissolved (EPA 904.0)	1.26 ± 0.580 (0.965)	0.939 ± 0.545		1.56 ± 0.608	1.92 ± 0.795 (1.21)	1.15 ± 0.500 (0.815)	1.01 ± 0.513 (0.9)	0.681 ± 0.479 (0.933)	1.24 ± 0.541 (0.872)	0.00366 ± 0.308 (0.718)
Thallium-208 (EPA 901.1)	-0.301 ± 3.36 (5.23)		-2.03 ± 22.9	-1.618 ± 15.179	-0.294 ± 7.841 (10.27)	2.063 ± 2.103 (5.368)	-1.255 ± 38.779 (7.649)	0 ± 2.277 (4.518)	0 ± 1.102 (5.292)	0 ± 1.887 (12.82)
Thallium-208, dissolved (EPA 901.1)	2.12 ± 2.48 (4.58)		-0.065 ± 3.70	-3.223 ± 128.930	-2.025 ± 20.895 (10.7)	-0.886 ± 6.943 (8.965)	-12.905 ± 21.692 (30.68)	0.499 ± 6.336 (7.213)	0 ± 5.558 (12.52)	2.77 ± 3.703 (5.861)
Thorium-232 (EPA 901.1)	-2.900 ± 21.8 (17.4)		-5.74 ± 648	461.14 ± 2681.000	423.750 ± 3507.300 (6138)	1760.700 ± 4250.200 (7296)	-981.84 ± 39274.000 (14230)	2723.6 ± 6705.300 (8284)	0 ± 3686.200 (9737)	2741 ± 4616.100 (5607)
Thorium-232, Dissolved (EPA 901.1)	-7.120 ± 904 (15.8)		1.48 ± 10.5	-2154 ± 51946.000	267.070 ± 2983.200 (5328)	591.360 ± 2528.500 (4372)	-10170 ± 41412.000 (56830)	0 ± 6564.500 (14200)	1184 ± 4262.300 (5269)	6190 ± 7584.700 (9106)
Thorium-234 (EPA 901.1)	253 ± 503 (840)		18.7 ± 1037	-7.505 ± 175.730	1.122 ± 196.560 (348.2)	33.367 ± 270.470 (475)	124.82 ± 138.410 (638.6)	167.6 ± 357.650 (452.2)	0 ± 212.310 (559.1)	4.114 ± 269.030 (341.5)
Thorium-234, Dissolved (EPA 901.1)	-7.250 ± 453 (777)		334 ± 631	-273.2 ± 1299.400	-14.922 ± 218.470 (308.7)	-19.457 ± 184.230 (252.7)	1225.5 ± 1564.500 (2572)	94.097 ± 602.680 (757.1)	0 ± 142.200 (348.3)	47.94 ± 441.450 (560.8)
Total Uranium (EPA 908.0)	-0.524 ± 0.415 (1.38)		0.133 ± 0.164	1.04 ± 1.40	0.689 ± 0.672 (1.09)	-0.427 ± 0.334 (0.638)	0.334 ± 0.287 (0.45)	0.865 ± 0.360 (0.472)	2.23 ± 0.731 (0.675)	0.239 ± 0.307 (0.555)
Total Uranium, Dissolved (EPA 908.0)	1.09 ± 0.975 (1.86)		0.0564 ± 0.190	1.06 ± 1.50	1.17 ± 0.597 (0.8)	-0.0261 ± 0.301 (0.544)	0.778 ± 0.592 (0.918)	0.636 ± 0.348 (0.512)	2.74 ± 0.853 (0.818)	0.536 ± 0.340 (0.529)
Uranium-235 (EPA 901.1)	-4.340 ± 22.5 (38.2)		-7.47 ± 91.0	-8.563 ± 137.160	12.897 ± 40.224 (68.86)	-9.698 ± 167.950 (43.18)	-12.206 ± 87.172 (46.67)	12.604 ± 27.105 (33.66)		
Uranium-235, Dissolved (EPA 901.1)	0.360 ± 20.5 (35.4)		1.27 ± 29.4	61.408 ± 111.980	21.278 ± 35.176 (59.57)	-1.196 ± 34.832 (51.23)	-97.448 ± 219.760 (316.6)	24.699 ± 55.125 (66.92)		
Uranium-238 (EPA 901.1)	26.7 ± 31.5 (115)		26 ± 90.4	43.862 ± 80.842	63.211 ± 109.740 (188.1)	57.183 ± 78.272 (130.5)	64.726 ± 90.801 (159.4)	0 ± 57.889 (128.1)		
Uranium-238, Dissolved (EPA 901.1)	3.17 ± 71.6 (125)		-5.15 ± 375	-80.062 ± 1270.300	98.808 ± 96.080 (160.1)	31.516 ± 81.183 (145.2)	-402.38 ± 650.120 (849.1)	0 ± 99.555 (218)		

Notes:
Act + Unc (MDC) = Activity ± Uncertainty (Minimum Detectable Concentration)
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 are laboratory analysis methods.

Table 1

Leachate Radionuclide Analytical Results
2012 Through 2016
Hakes C and D Landfill
Painted Post, New York

Parameter	Cell 6 Leachate									Cell-8B 5/4/2016
	5/23/2012	12/4/2012	5/15/2013	11/6/2013	5/15/2014	11/11/2014	5/7/2015	11/11/2015	5/4/2016	
Radionuclide Act + Unc (MDC) pCi/L										
Actinium-228 (EPA 901.1)	5.36 ± 42.7 (48.8)	9.2 ± 16.6	-6.921 ± 73.925	3.731 ± 23.437 (44.29)	4.435 ± 10.110 (18.06)	10.409 ± 24.611 (48.16)	0 ± 17.356 (39.31)	11.14 ± 9.835 (11.8)	17.4 ± 28.767 (36.33)	0 ± 15.389 (54.22)
Actinium-228, Dissolved (EPA 901.1)	-30.200 ± 39.3 (53.6)	6.35 ± 14.4	-4.078 ± 32.606	-6.774 ± 88.042 (50.24)	-0.333 ± 18.778 (33.97)	9.886 ± 30.538 (59.54)	2.209 ± 26.309 (35.64)	9.101 ± 26.524 (34.51)	8.192 ± 14.364 (15.24)	0.448 ± 34.301 (43.22)
Bismuth-212 (EPA 901.1)	1.46 ± 101 (176)	22 ± 58.4	-0.63 ± 85.341	-38.698 ± 188.190 (163.9)	-2.533 ± 101.300 (72.9)	-10.516 ± 420.640 (185.4)	20.202 ± 88.761 (106.9)	38.732 ± 52.851 (57.12)	0 ± 32.683 (142.4)	0 ± 73.084 (171.8)
Bismuth-212, Dissolved (EPA 901.1)	105 ± 115 (200)	15.9 ± 48.9	1.482 ± 62.670	-7.919 ± 316.740 (163.8)	3.567 ± 57.097 (104.2)	-11.62 ± 464.800 (94.07)	21.182 ± 101.920 (121.1)	22.897 ± 94.957 (113)	0 ± 33.494 (71.72)	23.229 ± 129.950 (152.9)
Bismuth-214 (EPA 901.1)	43.2 ± 38.4 (95.4)	-23.9 ± 144	166.5 ± 29.290	450.210 ± 63.878 (27.69)	46.389 ± 12.358 (10.1)	-4.361 ± 29.908 (27.92)	17.718 ± 16.357 (20.19)	17.557 ± 11.768 (12.09)	74.751 ± 23.569 (22.52)	0 ± 12.206 (26.3)
Bismuth-214, Dissolved (EPA 901.1)	1,870 ± 108 (103)	-8.78 ± 118	-6.882 ± 42.477	537.350 ± 70.694 (19.97)	2.008 ± 10.221 (18.36)	-10.736 ± 429.430 (35.06)	0 ± 9.455 (24.41)	36.899 ± 16.695 (18.42)	107.45 ± 17.701 (9.759)	0 ± 9.677 (28.89)
Cesium-134 (EPA 901.1)	-3.310 ± 7.74 (12.6)	-1.28 ± 4.12	2.351 ± 3.694	-2.014 ± 35.919 (60.04)	-2.557 ± 4.148 (6.901)	-1.461 ± 6.674 (12.34)	3.922 ± 5.602 (6.314)	-2.506 ± 5.363 (5.899)	2.219 ± 8.990 (10.27)	-3.016 ± 10.794 (12.16)
Cesium-134, dissolved (EPA 901.1)	6.82 ± 8.92 (13.3)	-1.22 ± 4.93	-1.779 ± 5.252	1.349 ± 41.714 (69.61)	0.057 ± 4.522 (7.902)	-1.931 ± 9.353 (16.93)	0 ± 2.159 (9.734)	1.105 ± 7.107 (8.353)	0.325 ± 0.481 (5.767)	0.569 ± 9.337 (10.78)
Cesium-137 (EPA 901.1)	-6.710 ± 7.62 (12.8)	-0.943 ± 6.21	-2.479 ± 8.102	0.271 ± 6.598 (11.92)	-0.088 ± 10.733 (5.12)	-0.2 ± 7.990 (6.009)	0 ± 4.314 (10.22)	-1.041 ± 5.884 (6.387)	3.194 ± 8.180 (9.422)	7.067 ± 6.059 (6.365)
Cesium-137, dissolved (EPA 901.1)	-2.220 ± 9.76 (13.9)	1.8 ± 3.67	-0.209 ± 20.920	-2.554 ± 13.479 (14.74)	-0.026 ± 4.187 (7.425)	-0.221 ± 8.829 (13.7)	12.23 ± 4.646 (3.005)	2.236 ± 5.722 (6.649)	0 ± 1.927 (5.685)	-1.427 ± 10.640 (12.26)
Lead-212 (EPA 901.1)	6.36 ± 18.3 (22.5)	-1.83 ± 19.3	26.725 ± 15.570	57.948 ± 18.576 (27.5)	0.329 ± 5.473 (9.839)	2.106 ± 11.720 (22.55)	0 ± 8.957 (19.51)	5.1 ± 6.860 (8.35)	0 ± 9.036 (22.42)	2.013 ± 16.195 (19.96)
Lead-212, Dissolved (EPA 901.1)	-1.910 ± 16.9 (24.7)	-4.41 ± 233	-6.801 ± 93.396	75.475 ± 22.154 (23.09)	4.018 ± 10.403 (14.08)	-6.937 ± 214.460 (26.04)	0 ± 7.231 (19.23)	0 ± 8.756 (15.99)	18.584 ± 16.533 (11.54)	10.6 ± 14.194 (17.14)
Lead-214 (EPA 901.1)	24.9 ± 15.2 (27.4)	3.52 ± 10.2	189.33 ± 28.610	432.490 ± 59.577 (25.03)	27.287 ± 14.016 (12.68)	-0.068 ± 11.656 (24.3)	0.371 ± 18.012 (23.54)	22.521 ± 8.520 (8.884)	99.876 ± 26.198 (21.36)	0 ± 9.755 (21)
Lead-214, dissolved (EPA 901.1)	1,910 ± 144 (28.9)	8.53 ± 9.80	8.682 ± 8.606	563.230 ± 72.309 (24.69)	1.701 ± 9.521 (17.36)	8.47 ± 15.521 (28.85)	3.229 ± 15.459 (20.61)	32.969 ± 14.911 (19.87)	112.21 ± 18.663 (10.9)	0 ± 11.947 (22.78)
Potassium-40 (EPA 901.1)	-35.900 ± 139 (213)	254 ± 92.1	92.937 ± 83.848	59.864 ± 86.218 (159.3)	102.020 ± 45.390 (52.27)	109.74 ± 112.200 (206.1)	87.842 ± 118.150 (143.1)	179.64 ± 47.476 (39.08)	209.21 ± 96.525 (114)	0 ± 90.521 (192.2)
Potassium-40, dissolved (EPA 901.1)	61.0 ± 135 (195)	67.4 ± 69.7	185.06 ± 102.490	299.730 ± 96.482 (106.7)	41.610 ± 62.411 (124.8)	79.214 ± 127.930 (249)	133.1 ± 122.860 (143.1)	134.97 ± 121.320 (139.4)	194.11 ± 50.952 (43.07)	0 ± 73.330 (192.2)
Radium-226 (EPA 901.1)	-55.100 ± 214 (281)	-2.36 ± 94.2	40.06 ± 122.330	61.980 ± 161.570 (284.9)	81.405 ± 89.399 (118.9)	116.87 ± 148.630 (264.7)	192.61 ± 117.300 (148.7)	25.29 ± 101.430 (125.4)	0 ± 70.798 (237.6)	0 ± 102.250 (256.4)
Radium-226 (EPA 903.1)	1.97 ± 0.767 (0.162)	5.6 ± 2.66	3.31 ± 1.70	1.28 ± 1.47 (0.87)	1.30 ± 1.20 (1.51)	1.4 ± 1.68 (0.946)	3.5 ± 2.21 (0.948)	0.984 ± 0.796 (0.985)	1.83 ± 1.02 (0.977)	0.211 ± 0.774 (1.27)
Radium-226, Dissolved (EPA 901.1)	-93.300 ± 247 (350)	37.7 ± 79.4	29.396 ± 109.850	1.854 ± 186.260 (328)	-10.793 ± 107.810 (162.5)	146.1 ± 127.750 (212.1)	31.131 ± 147.760 (193.9)	0 ± 96.482 (224.9)	112.13 ± 124.210 (142.8)	0 ± 110.980 (240.1)
Radium-226, Dissolved (EPA 903.1)	1.19 ± 0.582 (0.501)	5.74 ± 1.66	4.18 ± 1.81	1.24 ± 0.999 (1.24)	2.47 ± 1.18 (1.2)	1.71 ± 0.985 (0.966)	2.22 ± 1.12 (0.978)	2.7 ± 0.985 (0.228)	0.888 ± 0.642 (0.895)	1.13 ± 0.622 (0.554)
Radium-228 (EPA 901.1)	5.36 ± 42.7 (48.8)	9.2 ± 16.6	-6.921 ± 73.925	3.731 ± 23.437 (44.29)	4.435 ± 10.110 (18.06)	10.409 ± 24.611 (48.16)	0 ± 17.356 (39.31)	11.14 ± 9.835 (11.8)	17.4 ± 28.767 (36.33)	0 ± 15.389 (54.22)
Radium-228 (EPA 904.0)	1.56 ± 0.604 (0.925)	5.84 ± 2.51	2.73 ± 1.45	1.72 ± 1.30 (2.26)	0.960 ± 0.534 (0.959)	3.57 ± 1.29 (1.84)	1.49 ± 0.817 (1.49)	2.09 ± 0.652 (0.78)	3.27 ± 0.866 (0.879)	0.732 ± 0.475 (0.905)
Radium-228, Dissolved (EPA 901.1)	-30.200 ± 39.3 (53.6)	6.35 ± 14.4	-4.078 ± 32.606	-6.774 ± 88.042 (50.24)	-0.333 ± 18.778 (33.97)	9.886 ± 30.538 (59.54)	2.209 ± 26.309 (35.64)	9.101 ± 26.524 (34.51)	8.192 ± 14.364 (15.24)	0.448 ± 34.301 (43.22)
Radium-228, Dissolved (EPA 904.0)	0.810 ± 0.515 (0.958)	3.87 ± 0.991	1.87 ± 0.662	2.71 ± 1.02 (1.5)	1.64 ± 0.590 (0.858)	2.01 ± 0.674 (0.912)	1.49 ± 0.524 (0.738)	1.64 ± 0.596 (0.857)	0.957 ± 0.482 (0.86)	0.669 ± 0.465 (0.897)
Thallium-208 (EPA 901.1)	-0.295 ± 12.2 (14.5)	-2.61 ± 129	-2.693 ± 46.305	1.912 ± 6.620 (11.87)	1.768 ± 1.640 (5.327)	-0.017 ± 7.625 (15.8)	0 ± 4.487 (11.52)	2.568 ± 3.895 (4.489)	0 ± 2.882 (12.28)	0 ± 5.660 (12.82)
Thallium-208, dissolved (EPA 901.1)	-6.460 ± 11.5 (15.1)	0.98 ± 4.22	-0.741 ± 6.759	-1.581 ± 16.329 (11.65)	-2.271 ± 9.513 (8.781)	-5.66 ± 63.906 (18.47)	0 ± 4.991 (12.65)	0 ± 3.930 (10.11)	3.686 ± 6.273 (5.861)	0 ± 4.219 (10.49)
Thorium-232 (EPA 901.1)	5.36 ± 42.7 (48.8)	9.2 ± 16.6	349.91 ± 3328.000	-1637.200 ± 92402.000 (7921.000)	157.210 ± 5971.500 (10320)	927.75 ± 4090.100 (7345)	1297.5 ± 4019.600 (4969)	0 ± 4097.000 (9228)	2805.9 ± 4794.100 (5821)	-2043.6 ± 5291.000 (6465)
Thorium-232, Dissolved (EPA 901.1)	-30.200 ± 39.3 (53.6)	6.35 ± 14.4	595.51 ± 2727.700	511.900 ± 4679.000 (8051)	998.600 ± 2692.300 (4706)	-811.94 ± 11917.000 (7399)	535.22 ± 4031.900 (5031)	859.6 ± 4436.100 (5497)	921.92 ± 7622.700 (9453)	1621.9 ± 4696.100 (5768)
Thorium-234 (EPA 901.1)	399 ± 471 (759)	277 ± 759	1.299 ± 198.230	-68.843 ± 1176.300 (439)	33.911 ± 333.570 (578)	31.213 ± 234.030 (425.2)	72.665 ± 219.270 (277.7)	87.586 ± 160.400 (486.8)	0 ± 190.660 (363.4)	0 ± 110.800 (360.7)
Thorium-234, Dissolved (EPA 901.1)	196 ± 234 (380)	247 ± 667	-54.779 ± 449.200	-16.941 ± 355.100 (463.6)	145.120 ± 128.140 (196.7)	-59.642 ± 772.250 (421.9)	0 ± 125.090 (298.1)	0 ± 112.960 (319.2)	0 ± 187.510 (551.7)	10.514 ± 271.710 (344.3)
Total Uranium (EPA 908.0)	0.0510 ± 0.793 (1.86)	0.0671 ± 0.140	1.27 ± 1.33	0.866 ± 0.531 (0.773)	-0.0546 ± 0.262 (0.486)	0.0554 ± 0.380 (0.669)	0.918 ± 0.383 (0.512)	2.59 ± 0.805 (0.736)	0.262 ± 0.325 (0.585)	0.856 ± 0.445 (0.662)
Total Uranium, Dissolved (EPA 908.0)	-0.233 ± 0.739 (1.87)	0.178 ± 0.154	1.34 ± 1.42	0.693 ± 0.216 (0.205)	0.196 ± 0.306 (0.518)	-0.084 ± 0.267 (0.498)	1.59 ± 0.515 (0.595)	0.536 ± 0.602 (1.07)	0.742 ± 0.450 (0.716)	1.48 ± 0.518 (0.588)
Uranium-235 (EPA 901.1)	27.2 ± 47.2 (73.7)	0.502 ± 31.1	-29.946 ± 59.449	-22.747 ± 79.996 (86.53)	-11.969 ± 95.260 (41.58)	0.845 ± 29.212 (57.04)	0 ± 14.819 (58.33)			
Uranium-235, Dissolved (EPA 901.1)	1.77 ± 53.9 (87.0)	-2.73 ± 307	8.328 ± 31.446	-24.889 ± 93.288 (88.56)	-4.231 ± 46.216 (56.43)	-19.512 ± 147.980 (99.7)	16.188 ± 41.178 (50.54)			
Uranium-238 (EPA 901.1)	289 ± 1,210 (2,070)	0.382 ± 85.1	85.842 ± 95.919	38.315 ± 135.950 (233.3)	55.661 ± 75.356 (125.7)	50.771 ± 132.180 (234.5)	84.974 ± 126.500 (161)			
Uranium-238, Dissolved (EPA 901.1)	-1,060.000 ± 1,730 (2,390)	-30 ± 129	54.16 ± 82.463	-41.734 ± 2030.000 (259.700)	36.295 ± 89.703 (159.5)	75.716 ± 137.740 (242.3)	0 ± 84.714 (164.4)			

Notes:
Act + Unc (MDC) = Activity ± Uncertainty (Minimum Detectable Concentration)
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 are laboratory analysis methods.

Table 2

Leachate Tank Sediment Radionuclide Analyitcal Results 2013 Through 2016
Hakes C and D Landfill
Painted Post, NY

Parameter	LCS-SED 10/21/2013	LCS-SED 10/22/2014	LCS 9/24/2015	LCS 8/24/2016
Radionuclide Act + Unc (MDC) pCi/g				
Actinium-228 (EPA 901.1)			2.208 ± 0.473 (0.35)	2.454 ± 0.539 (0.342)
Bismuth-212 (EPA 901.1)			2.347 ± 1.684 (1.592)	3.506 ± 1.366 (1.193)
Bismuth-214 (EPA 901.1)			1.565 ± 0.388 (0.278)	1.677 ± 0.357 (0.227)
Cesium-134 (EPA 901.1)			0 ± 0.037 (0.196)	0.04 ± 0.055 (0.136)
Cesium-137 (EPA 901.1)			0.049 ± 0.100 (0.107)	0.026 ± 0.098 (0.103)
Lead-212 (EPA 901.1)			1.521 ± 0.305 (0.233)	2.292 ± 0.369 (0.195)
Lead-214 (EPA 901.1)			1.918 ± 0.409 (0.25)	1.91 ± 0.399 (0.253)
Potassium-40 (EPA 901.1)			17.396 ± 3.797 (2.151)	32.709 ± 4.921 (1.198)
Radium-226 (EPA 901.1)		2.118 ± 0.468 (0.323)	1.817 ± 0.337 (0.269)	1.773 ± 0.370 (0.227)
Radium-226, Total (EPA 901.1)	2.693 ± 0.415 (0.234)			
Radium-228 (EPA 901.1)		1.839 ± 0.584 (0.997)	2.208 ± 0.473 (0.35)	2.454 ± 0.539 (0.342)
Radium-228, Total (EPA 901.1)	3.432 ± 0.669 (0.294)			
Thallium-208 (EPA 901.1)			0.53 ± 0.148 (0.108)	0.694 ± 0.162 (0.112)
Thorium-232 (EPA 901.1)			10.47 ± 65.464 (81.56)	64.939 ± 60.776 (71.21)
Thorium-234 (EPA 901.1)			1.364 ± 1.298 (4.8)	1.787 ± 2.696 (4.539)
Uranium-234	0.257 ± 0.149 (0.145)			
Uranium-234 (HSL-300)		0.076 ± 0.193 (0.443)	0.656 ± 0.202 (0.107)	1 ± 0.234 (0.084)
Uranium-235 (HSL-300)		-0.011 ± 0.161 (0.224)	0.035 ± 0.056 (0.103)	0.047 ± 0.050 (0.073)
Uranium-235, Total (EPA 901.1)	-0.029 ± 0.088 (0.19)			
Uranium-238 (HSL-300)		0.243 ± 0.211 (0.314)	0.578 ± 0.187 (0.099)	0.962 ± 0.226 (0.056)
Uranium-238, Total (EPA 901.1)	0.35 ± 0.174 (0.145)			

Notes:
Act + Unc (MDC) = Activity $\pm$ Uncertainty (Minimum Detectable Concentration)
Each of EPA 901.1, EPA 903.1, EPA 904.0 & EPA 908.0 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:** 5-4-16

Sampling Location: Cell 3 **Sample ID:** Cell3-0516 **Arrival Time:** 1056

Weather Conditions:

Temp. 49 ° F ( ) Sunny ( ) Partly Cloudy (X) Cloudy ( ) Light Rain ( ) Hvy. Rain ( ) Snow

Wind Conditions: 05mph

Location Type

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

( ) Other _____

Flow and Depth Information (as appropriate)

Depth: NA Estimated Flow: NA

Comments: _____

Field Parameters (as appropriate)

Meter: YSI 556 (sn: 14L100804), Hach 2100P (sn: 13309)

Field Parameters tested in: ( ) Submerged Probe (X) Cup

Note: Turbidity measured from a vial grab sample

Time	pH	Conductivity (us/cm)	Turbidity (ntu)	D.O. (mg/L)	Temp. (°C)	ORP (mV)
1105	6.79	4086	6606.0	NA	18.0	41.7

Sample Information

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

Location Description/Condition: West across road From MH-F

Sample Collection Equipment/Method: Ded 5gal Pail Sample Time: 1105

Sample Description (clarity\color): Black Sample Odor (Y) or (N) Explain: leachate odor

Other Observations/Comments: _____

Analysis Requested: RAD Number of Containers: 10

Sampling Completion: Time 1114 Date 5-4-16 Samplers KDE - T. Reed

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

Project: Hakes C&D Landfill, Painted Post, New York **Date:** 5-4-16

Sampling Location: Cell 4-1 **Sample ID:** Cell 4-0516 **Arrival Time:** 1115

Weather Conditions:

Temp: 52 ° F ( ) Sunny ( ) Partly Cloudy (X) Cloudy ( ) Light Rain ( ) Hvy. Rain ( ) Snow

Wind Conditions: 0-5mph

Location Type

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

( ) Other _____

Flow and Depth Information (as appropriate)

Depth: NA Estimated Flow: NA

Comments: _____

Field Parameters (as appropriate)

Meter: YSI 556 (sn: 14L100804), Hach 2100P (sn: 13309)

Field Parameters tested in: ( ) Submerged Probe (X) Cup

Note: Turbidity measured from a vial grab sample

Time	pH	Conductivity (us/cm)	Turbidity (ntu)	D.O. (mg/L)	Temp. (°C)	ORP (mV)
1125	6.97	7288	35.9	NA	17.9	29.0

Sample Information

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

Location Description/Condition: West Brass Road From MW-GR

Sample Collection Equipment/Method: Ded 5 gal Pail Sample Time: 1125

Sample Description (clarity\color): Clear w/ med Amber tint Sample Odor (Y) or (N) Explain: leachate odor

Other Observations/Comments: _____

Analysis Requested: RAD Number of Containers: 10

Sampling Completion: Time 1133 Date 5-4-16 Samplers KDye - T. Reed

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

Project: Hakes C&D Landfill, Painted Post, New York **Date:** 5-4-16

Sampling Location: Cell-5 **Sample ID:** Cell5-0516 **Arrival Time:** 1134

Weather Conditions:

Temp. 52 ° F ( ) Sunny ( ) Partly Cloudy (X) Cloudy ( ) Light Rain ( ) Hvy. Rain ( ) Snow

Wind Conditions: 0-5 mph

Location Type

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

( ) Other _____

Flow and Depth Information (as appropriate)

Depth: NA Estimated Flow: NA

Comments: _____

Field Parameters (as appropriate)

Meter: YSI 556 (sn: 14A104804), Hach 2100P (sn: 13309)

Field Parameters tested in: ( ) Submerged Probe (X) Cup

Note: Turbidity measured from a vial grab sample

Time	pH	Conductivity (us/cm)	Turbidity (ntu)	D.O. (mg/L)	Temp. (°C)	ORP (mV)
1145	6.87	6818	88.7	NA	17.5	54.2

Sample Information

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

Location Description/Condition: West access Road From manhole

Sample Collection Equipment/Method: Ded 5 gal Pail Sample Time: 1145

Sample Description (clarity\color): Clear w/Amber tint Sample Odor (Y) or (N) Explain: _____

Other Observations/Comments: _____

Analysis Requested: RAD Number of Containers: 10

Sampling Completion: Time 1150 Date 5-4-16 Samplers KDyE - TReed

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

Project: Hakes C&D Landfill, Painted Post, New York **Date:** 5-4-16

Sampling Location: Cell-6 **Sample ID:** Cell6-0516 **Arrival Time:** 1200

Weather Conditions:

Temp. 52 ° F ( ) Sunny ( ) Partly Cloudy (X) Cloudy ( ) Light Rain ( ) Hvy. Rain ( ) Snow

Wind Conditions: 0-5mph

Location Type

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

( ) Other _____

Flow and Depth Information (as appropriate)

Depth: NA Estimated Flow: NA

Comments: _____

Field Parameters (as appropriate)

Meter: YSI 556 (sn: 14L100804), Hach 2100P (sn: 13309)

Field Parameters tested in: ( ) Submerged Probe (X) Cup

Note: Turbidity measured from a vial grab sample

Time	pH	Conductivity (us/cm)	Turbidity (ntu)	D.O. (mg/L)	Temp. (°C)	ORP (mV)
1215	6.96	10908	41.8	NA	21.1	-166.5

Sample Information

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

Location Description/Condition: Across Road West of GSS-6

Sample Collection Equipment/Method: Ded 5 gal Pail Sample Time: 1215

Sample Description (clarity\color): Clear w/ light yellow tint Sample Odor (Y) or (N) Explain: leachate odor

Other Observations/Comments: _____

Analysis Requested: RAD Number of Containers: 10

Sampling Completion: Time 1226 Date 5-4-16 Samplers KDyE - T. Reed

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

Project: Hakes C&D Landfill, Painted Post, New York **Date:** 5-4-16

Sampling Location: Cell-8B **Sample ID:** Cell8B-0516 **Arrival Time:** 1228

Weather Conditions:

Temp. 52° F ( ) Sunny ( ) Partly Cloudy (X) Cloudy ( ) Light Rain ( ) Hvy. Rain ( ) Snow

Wind Conditions: 0-5 mph

Location Type

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

( ) Other _____

Flow and Depth Information (as appropriate)

Depth: NA Estimated Flow: NA

Comments: _____

Field Parameters (as appropriate)

Meter: YSI 556 (sn: 14L100804), Hach 2100P (sn: 13309)

Field Parameters tested in: ( ) Submerged Probe (X) Cup

Note: Turbidity measured from a vial grab sample

Time	pH	Conductivity (us/cm)	Turbidity (ntu)	D.O. (mg/L)	Temp. (°C)	ORP (mV)
1245	6.45	2785	175.0	NA	17.6	-153.5

Sample Information

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

Location Description/Condition: Across Road North of MW-1

Sample Collection Equipment/Method: Ded 5gal Pail Sample Time: 1245

Sample Description (clarity\color): Med Gray Tint Sample Odor (Y) or (N) Explain: leachate odor

Other Observations/Comments: _____

Analysis Requested: RAD Number of Containers: 10

Sampling Completion: Time 1256 Date 5-4-16 Samplers K Oye - T. Reed

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

Project: Hakes C&D Landfill, Painted Post, New York **Date:** 8-24-16

Sampling Location: PLCS **Sample ID:** PLCSSED-0816 **Arrival Time:** 1016

Weather Conditions:

Temp. 78 ° F (X) Sunny ( ) Partly Cloudy ( ) Cloudy ( ) Light Rain ( ) Hvy. Rain ( ) Snow

Wind Conditions: 0-5mph

Location Type

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

( ) Other _____

SED

Flow and Depth Information (as appropriate)

Depth: 2"-3" Estimated Flow: None

Comments: North Tank

Field Parameters (as appropriate)

Meter: YSI 556 (sn: _____), Hach 2100P (sn: _____)

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)

Sample Information

Sample Type: (X) Grab ( ) Composite Sample Location: ( ) Discharge Pipe ( ) Pond ( ) ~~Ditch~~ North Tank

Location Description/Condition: Access Hole in East side of North tank

Sample Collection Equipment/Method: dipper Sample Time: 1030

Sample Description (clarity\color): Black, wet SED similar to pudding consistancy. Sample Odor (Y) or (N) Explain: leachate landfill odor

Other Observations/Comments: _____

Analysis Requested: RAD Number of Containers: 3

Sampling Completion: Time 1039 Date 8-24-16 Samplers K Dye - C. Brown

July 11, 2016

Mr. Jerry Leone
Casella Waste Systems
Ontario County Landfill
1979 Rte. 5 & 20
Stanley, NY 14561

Re: Hakes C&D Landfill – Leachate
Service Request # R1604586

Dear Mr. Leone:

Enclosed is the analytical data report for the above referenced facility. A total of four samples were subcontracted to Pace Analytical for Radiological Testing.

This report consists of one (1) package: the sample data summary package. The summary package has been e-mailed to your attention and to On-Site. All data presented in this package has been reviewed prior to report submission. If you should have any questions or concerns, please contact me at (585) 288-5380.

Thank you for your continued use of our services.

Sincerely,

ALS Environmental

Janice M Jaeger

Janice M. Jaeger
Project Chemist

enc.

cc: Mr. Jon Brandes
On-Site
72 Railroad Avenue
Wellsville, NY 14895

ALS-Environmental
1565 Jefferson Rd, Bldg 300, Suite 360
Rochester, NY 14623
585.288.5380

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

Project Manager: **Jerry Leone/Jon Brandes**

CHAIN of CUSTODY

Page 1 of 1

Project: **Hakes C&D Landfill - Leachate RAD.**

Telephone No. 585-593-1824

Email: jonb@on-sitehs.com

Method of Shipment: FED EX

Special Detection Limit/Reporting

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

Sample I.D.	Lab Sample No.	No. of Containers	Matrix: Soil	Matrix: Water	Matrix: Air	Matrix: Other	Prsv.: Yes	Prsv.: No	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)
Cell3-0516		10		X			X	X	5-4-16	1105	X	X	X	X	X	X
Cell4-0516		10		X			X	X	5-4-16	1125	X	X	X	X	X	X
Cell5-0516		10		X			X	X	5-4-16	1145	X	X	X	X	X	X
Cell6-0516		10		X			X	X	5-4-16	1215	X	X	X	X	X	X
Cell8B-0516		10		X			X	X	5-4-16	1245	X	X	X	X	X	X

Note: Dissolved analysis requires lab filtering

REMARKS

Sample Received Intact: Yes No

Temperature received: Ice No ice

Relinq. by sampler (Sign & Print Name)	Date	Time	Received by (Sign & Print Name)
Kevin Dye / Kevin Dye	5-4-16	1400	
Relinquished by	Date	Time	Received by
Relinquished by	Date	Time	Received by
Relinquished by	Date	Time	Received by laboratory: Date 5/6/16 Time 1140

Lab Work No.

R1604586 5
Casella Waste Systems
Hakes C&D Landfill

Cooler Receipt and Preservation Check For

R1604586 5
Casella Waste Systems
Hakes C&D Landfill

Project/Client Casella Hakes Folder Number R16-4586

Cooler received on 5/5/16 by: @

COURIER: ALS UPS (FEDEX) VELOCITY CLIENT

1	Were **Custody seals** on outside of cooler?	(Y) N
2	**Custody papers** properly completed (ink, signed)?	(Y) N
3	Did all bottles arrive in good **condition** (unbroken)?	(Y) N
4	Circle: (Wet Ice) **Dry Ice Gel packs** present?	(Y) N

5a	**Perchlorate** samples have required headspace?	Y N (NA)
5b	Did VOA vials, Alk,or Sulfide have sig* **bubbles**?	(Y) N NA
6	Where did the bottles originate?	(ALS/ROC) CLIENT
7	Soil VOA received as: Bulk Encore 5035set	(NA)

8. Temperature Readings Date: 5/5/16 Time: 1140 ID: IR#3 (IR#5) From: (Temp Blank) Sample Bottle

Observed Temp (°C)	3.5	*10.1	*8.9	3.7	*8.2	1.4	
Correction Factor (°C)	±0.0	±0.0	±0.0	±0.0	±0.0	±0.0	
Corrected Temp (°C)	3.5°	*10.1°	8.9°	3.7°	8.2°	1.4°	
Within 0-6°C?	(Y) N	Y (N)	Y (N)	(Y) N	Y (N)	(Y) N	Y N
If <0°C, were samples frozen?	Y N	Y N	Y N	Y N	Y N	Y N	Y N

If out of Temperature, note packing/ice condition: _____ Ice melted (Poorly Packed) Same Day Rule

&Client Approval to Run Samples: _____ Standing Approval Client aware at drop-off Client notified by: _____

All samples held in storage location: R-002 by @ on 5/5/16 at ~~1157~~ 1157
5035 samples placed in storage location: _____ by _____ on _____ at _____

PC Secondary Review: MMS 5/6/16

Cooler Breakdown: Date: 5/6/16 Time: 1902 by: DW

1. Were all bottle labels complete (*i.e.* analysis, preservation, etc.)? (YES) NO
2. Did all bottle labels and tags agree with custody papers? (YES) NO
3. Were correct containers used for the tests indicated? (YES) NO
4. Air Samples: Cassettes / Tubes Intact Canisters Pressurized Tedlar® Bags Inflated (N/A)

Explain any discrepancies:

pH	Reagent	Yes	No	Lot Received	Exp	Sample ID	Vol. Added	Lot Added	Final pH
≥12	NaOH								
≤2	HNO_3	✓		1308260534	4/17				
≤2	H_2SO_4								
<4	$NaHSO_4$								
Residual Chlorine (-)	For CN Phenol and 522			If +, contact PM to add $Na_2S_2O_3$ (CN), ascorbic (phenol).					
	$Na_2S_2O_3$	-	-						
	ZnAcetate	-	-						
	HCl	**	**						

**Not to be tested before analysis – pH tested and recorded by VOAs on a separate worksheet

Yes=All samples OK

No=Samples were preserved at The lab as listed

PM OK to Adjust: _____

Bottle lot numbers: 032116-2ABL

Other Comments:

* Rad samples only

BOD 6
NO3 5
TKN 1
Alkalinity 1
TDS 5
Color 1
ASPHT 5/5/16 1140

PC Secondary Review: MMS 5/6/16

*significant air bubbles: VOA > 5-6 mm : WC >1 in. diameter

Pace Analytical Services, Inc.
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

June 01, 2016

Ms. Janice Jaeger
ALS Environmental Columbia
1565 Jefferson Road
Building 300
Rochester, NY 14623

RE: Project: R1604586
Pace Project No.: 30182709

Dear Ms. Jaeger:
Enclosed are the analytical results for sample(s) received by the laboratory on May 10, 2016. The results relate only to the samples included in this report. Results reported herein conform to the most current TNI standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Carin A. Ferris

Carin Ferris
carin.ferris@pacelabs.com
Project Manager

Enclosures

Pace Analytical Services, Inc.
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

CERTIFICATIONS

Project: R1604586
Pace Project No.: 30182709

Pennsylvania Certification IDs

1638 Roseytown Rd Suites 2,3&4, Greensburg, PA 15601
L-A-B DOD-ELAP Accreditation #: L2417
Alabama Certification #: 41590
Arizona Certification #: AZ0734
Arkansas Certification
California Certification #: 04222CA
Colorado Certification
Connecticut Certification #: PH-0694
Delaware Certification
Florida/TNI Certification #: E87683
Georgia Certification #: C040
Guam Certification
Hawaii Certification
Idaho Certification
Illinois Certification
Indiana Certification
Iowa Certification #: 391
Kansas/TNI Certification #: E-10358
Kentucky Certification #: 90133
Louisiana DHH/TNI Certification #: LA140008
Louisiana DEQ/TNI Certification #: 4086
Maine Certification #: PA00091
Maryland Certification #: 308
Massachusetts Certification #: M-PA1457
Michigan/PADEP Certification
Missouri Certification #: 235
Montana Certification #: Cert 0082
Nebraska Certification #: NE-05-29-14
Nevada Certification #: PA014572015-1
New Hampshire/TNI Certification #: 2976
New Jersey/TNI Certification #: PA 051
New Mexico Certification #: PA01457
New York/TNI Certification #: 10888
North Carolina Certification #: 42706
North Dakota Certification #: R-190
Oregon/TNI Certification #: PA200002
Pennsylvania/TNI Certification #: 65-00282
Puerto Rico Certification #: PA01457
Rhode Island Certification #: 65-00282
South Dakota Certification
Tennessee Certification #: TN2867
Texas/TNI Certification #: T104704188-14-8
Utah/TNI Certification #: PA014572015-5
USDA Soil Permit #: P330-14-00213
Vermont Dept. of Health: ID# VT-0282
Virgin Island/PADEP Certification
Virginia/VELAP Certification #: 460198
Washington Certification #: C868
West Virginia DEP Certification #: 143
West Virginia DHHR Certification #: 9964C
Wisconsin Certification
Wyoming Certification #: 8TMS-L

Pace Analytical Services, Inc.
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

SAMPLE SUMMARY

Project: R1604586
Pace Project No.: 30182709

Lab ID	Sample ID	Matrix	Date Collected	Date Received
30182709001	**Cell3-0516**	Water	05/04/16 11:05	05/10/16 09:55
30182709002	**Cell3-0516 Dissolved**	Water	05/04/16 11:05	05/10/16 09:55
30182709003	**Cell4-0516**	Water	05/04/16 11:25	05/10/16 09:55
30182709004	**Cell4-0516 Dissolved**	Water	05/04/16 11:25	05/10/16 09:55
30182709005	**Cell5-0516**	Water	05/04/16 11:45	05/10/16 09:55
30182709006	**Cell5-0516 Dissolved**	Water	05/04/16 11:45	05/10/16 09:55
30182709007	**Cell6-0516**	Water	05/04/16 12:15	05/10/16 09:55
30182709008	**Cell6-0516 Dissolved**	Water	05/04/16 12:15	05/10/16 09:55
30182709009	**Cell8B-0516**	Water	05/04/16 12:45	05/10/16 09:55
30182709010	**Cell8B-0516 Dissolved**	Water	05/04/16 12:45	05/10/16 09:55

Pace Analytical Services, Inc.
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

SAMPLE ANALYTE COUNT

Project: R1604586
Pace Project No.: 30182709

Lab ID	Sample ID	Method	Analysts	Analytes Reported
30182709001	**Cell3-0516**	EPA 901.1	MAH	13
		EPA 903.1	WRR	1
		EPA 904.0	JLW	1
		EPA 908.0	LAL	1
30182709002	**Cell3-0516 Dissolved**	EPA 901.1	MAH	13
		EPA 903.1	WRR	1
		EPA 904.0	JLW	1
		EPA 908.0	LAL	1
30182709003	**Cell4-0516**	EPA 901.1	MAH	13
		EPA 903.1	WRR	1
		EPA 904.0	JLW	1
		EPA 908.0	LAL	1
30182709004	**Cell4-0516 Dissolved**	EPA 901.1	MAH	13
		EPA 903.1	WRR	1
		EPA 904.0	JLW	1
		EPA 908.0	LAL	1
30182709005	**Cell5-0516**	EPA 901.1	MAH	13
		EPA 903.1	WRR	1
		EPA 904.0	JLW	1
		EPA 908.0	LAL	1
30182709006	**Cell5-0516 Dissolved**	EPA 901.1	MAH	13
		EPA 903.1	WRR	1
		EPA 904.0	JLW	1
		EPA 908.0	LAL	1
30182709007	**Cell6-0516**	EPA 901.1	MAH	13
		EPA 903.1	WRR	1
		EPA 904.0	JLW	1
		EPA 908.0	LAL	1
30182709008	**Cell6-0516 Dissolved**	EPA 901.1	MAH	13
		EPA 903.1	WRR	1
		EPA 904.0	JLW	1
		EPA 908.0	LAL	1
30182709009	**Cell8B-0516**	EPA 901.1	MAH	13
		EPA 903.1	WRR	1
		EPA 904.0	JLW	1
		EPA 908.0	LAL	1
30182709010	**Cell8B-0516 Dissolved**	EPA 901.1	MAH	13

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SAMPLE ANALYTE COUNT

Project: R1604586
Pace Project No.: 30182709

Lab ID	Sample ID	Method	Analysts	Analytes Reported
		EPA 903.1	WRR	1
		EPA 904.0	JLW	1
		EPA 908.0	LAL	1

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PROJECT NARRATIVE

Project: R1604586
Pace Project No.: 30182709

Method: **EPA 901.1**
Description: 901.1 Gamma Spec
Client: ALS Environmental Columbia
Date: June 01, 2016

General Information:
10 samples were analyzed for EPA 901.1. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

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PROJECT NARRATIVE

Project: R1604586
Pace Project No.: 30182709

Method: **EPA 903.1**
Description: 903.1 Radium 226
Client: ALS Environmental Columbia
Date: June 01, 2016

General Information:
5 samples were analyzed for EPA 903.1. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

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PROJECT NARRATIVE

Project: R1604586
Pace Project No.: 30182709

Method: **EPA 903.1**
Description: 903.1 Radium 226, Dissolved
Client: ALS Environmental Columbia
Date: June 01, 2016

General Information:
5 samples were analyzed for EPA 903.1. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

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PROJECT NARRATIVE

Project: R1604586
Pace Project No.: 30182709

Method: **EPA 904.0**
Description: 904.0 Radium 228
Client: ALS Environmental Columbia
Date: June 01, 2016

General Information:
5 samples were analyzed for EPA 904.0. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

Analyte Comments:

QC Batch: RADC/29468

1c: The MB failed high on the 1st and 2nd counts. All samples above 1.0 were re-ingrowthed, re-counted, and verifiied.

- BLANK (Lab ID: 1076506)
  - Radium-228
- Cell3-0516 (Lab ID: 30182709001)
  - Radium-228
- Cell4-0516 (Lab ID: 30182709003)
  - Radium-228
- Cell5-0516 (Lab ID: 30182709005)
  - Radium-228
- Cell8B-0516 (Lab ID: 30182709009)
  - Radium-228

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PROJECT NARRATIVE

Project: R1604586
Pace Project No.: 30182709

Method: **EPA 904.0**
Description: 904.0 Radium 228, Dissolved
Client: ALS Environmental Columbia
Date: June 01, 2016

General Information:
5 samples were analyzed for EPA 904.0. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

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PROJECT NARRATIVE

Project: R1604586
Pace Project No.: 30182709

Method: **EPA 908.0**
Description: 908.0 Total Uranium
Client: ALS Environmental Columbia
Date: June 01, 2016

General Information:
10 samples were analyzed for EPA 908.0. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

This data package has been reviewed for quality and completeness and is approved for release.

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ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: R1604586
Pace Project No.: 30182709

Sample: Cell3-0516 **Lab ID: 30182709001** Collected: 05/04/16 11:05 Received: 05/10/16 09:55 Matrix: Water
PWS: Site ID: Sample Type:

Comments: •
• The sampler's name and signature were not listed on the COC.

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Actinium-228	EPA 901.1	**0.000 ± 5.485 (19.920) C:NA T:NA**	pCi/L	05/26/16 16:58	14331-83-0	
Bismuth-212	EPA 901.1	**49.256 ± 47.540 (48.410) C:NA T:NA**	pCi/L	05/26/16 16:58	14913-49-6	
Bismuth-214	EPA 901.1	**16.287 ± 8.662 (8.697) C:NA T:NA**	pCi/L	05/26/16 16:58	14733-03-0	
Cesium-134	EPA 901.1	**0.916 ± 1.468 (5.868) C:NA T:NA**	pCi/L	05/26/16 16:58	13967-70-9	
Cesium-137	EPA 901.1	**0.558 ± 4.040 (4.510) C:NA T:NA**	pCi/L	05/26/16 16:58	10045-97-3	
Lead-212	EPA 901.1	**14.027 ± 16.916 (9.201) C:NA T:NA**	pCi/L	05/26/16 16:58	15092-94-1	
Lead-214	EPA 901.1	**24.291 ± 8.950 (9.612) C:NA T:NA**	pCi/L	05/26/16 16:58	15067-28-4	
Potassium-40	EPA 901.1	**59.436 ± 60.524 (64.510) C:NA T:NA**	pCi/L	05/26/16 16:58	13966-00-2	
Radium-226	EPA 901.1	**31.779 ± 97.378 (122.700) C:NA T:NA**	pCi/L	05/26/16 16:58	13982-63-3	
Radium-228	EPA 901.1	**0.000 ± 5.485 (19.920) C:NA T:NA**	pCi/L	05/26/16 16:58	15262-20-1	
Thallium-208	EPA 901.1	**3.538 ± 4.124 (4.767) C:NA T:NA**	pCi/L	05/26/16 16:58	14913-50-9	
Thorium-232	EPA 901.1	**1817.500 ± 7939.800 (9788.000) C:NA T:NA**	pCi/L	05/26/16 16:58	7440-29-1	
Thorium-234	EPA 901.1	**152.100 ± 424.640 (536.000) C:NA T:NA**	pCi/L	05/26/16 16:58	15065-10-8	
Radium-226	EPA 903.1	**1.66 ± 0.976 (0.966) C:NA T:87%**	pCi/L	06/01/16 12:52	13982-63-3	
Radium-228	EPA 904.0	**1.40 ± 0.555 (0.862) C:77% T:73%**	pCi/L	05/31/16 12:29	15262-20-1	1c
Total Uranium	EPA 908.0	**1.41 ± 0.607 (0.886) C:NA T:87%**	pCi/L	05/20/16 19:53	7440-61-1	

Sample: Cell3-0516 Dissolved **Lab ID: 30182709002** Collected: 05/04/16 11:05 Received: 05/10/16 09:55 Matrix: Water
PWS: Site ID: Sample Type:

Comments: • The sampler's name and signature were not listed on the COC.

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Actinium-228	EPA 901.1	**3.116 ± 16.467 (17.660) C:NA T:NA**	pCi/L	05/31/16 14:01	14331-83-0	
Bismuth-212	EPA 901.1	**10.028 ± 64.348 (71.710) C:NA T:NA**	pCi/L	05/31/16 14:01	14913-49-6	
Bismuth-214	EPA 901.1	**11.604 ± 7.496 (11.140) C:NA T:NA**	pCi/L	05/31/16 14:01	14733-03-0	
Cesium-134	EPA 901.1	**1.144 ± 2.503 (4.271) C:NA T:NA**	pCi/L	05/31/16 14:01	13967-70-9	
Cesium-137	EPA 901.1	**0.000 ± 0.609 (5.050) C:NA T:NA**	pCi/L	05/31/16 14:01	10045-97-3	
Lead-212	EPA 901.1	**12.262 ± 16.952 (9.224) C:NA T:NA**	pCi/L	05/31/16 14:01	15092-94-1	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
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ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: R1604586
Pace Project No.: 30182709

Sample: Cell3-0516 Dissolved **Lab ID: 30182709002** Collected: 05/04/16 11:05 Received: 05/10/16 09:55 Matrix: Water
PWS: Site ID: Sample Type:

Comments: • The sampler's name and signature were not listed on the COC.

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Lead-214	EPA 901.1	**24.509 ± 17.640 (10.630) C:NA T:NA**	pCi/L	05/31/16 14:01	15067-28-4	
Potassium-40	EPA 901.1	**122.560 ± 42.315 (43.070) C:NA T:NA**	pCi/L	05/31/16 14:01	13966-00-2	
Radium-226	EPA 901.1	**0.000 ± 62.447 (143.800) C:NA T:NA**	pCi/L	05/31/16 14:01	13982-63-3	
Radium-228	EPA 901.1	**3.116 ± 16.467 (17.660) C:NA T:NA**	pCi/L	05/31/16 14:01	15262-20-1	
Thallium-208	EPA 901.1	**3.126 ± 5.628 (5.521) C:NA T:NA**	pCi/L	05/31/16 14:01	14913-50-9	
Thorium-232	EPA 901.1	**1475.100 ± 7430.700 (9194.000) C:NA T:NA**	pCi/L	05/31/16 14:01	7440-29-1	
Thorium-234	EPA 901.1	**93.454 ± 384.710 (488.800) C:NA T:NA**	pCi/L	05/31/16 14:01	15065-10-8	
Radium-226, Dissolved	EPA 903.1	**0.442 ± 0.580 (0.966) C:NA T:83%**	pCi/L	05/31/16 12:20	13982-63-3	
Radium-228, Dissolved	EPA 904.0	**0.985 ± 0.458 (0.780) C:81% T:74%**	pCi/L	05/26/16 11:32	15262-20-1	
Total Uranium	EPA 908.0	**1.76 ± 0.549 (0.543) C:NA T:87%**	pCi/L	05/20/16 19:48	7440-61-1	

Sample: Cell4-0516 **Lab ID: 30182709003** Collected: 05/04/16 11:25 Received: 05/10/16 09:55 Matrix: Water
PWS: Site ID: Sample Type:

Comments: • The sampler's name and signature were not listed on the COC.
• Upon receipt at the laboratory, 3 mls of nitric acid were added to the sample to meet the sample preservation requirement of pH <2 for radiochemistry analysis.

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Actinium-228	EPA 901.1	**2.636 ± 26.970 (36.330) C:NA T:NA**	pCi/L	05/31/16 14:02	14331-83-0	
Bismuth-212	EPA 901.1	**0.000 ± 46.219 (152.900) C:NA T:NA**	pCi/L	05/31/16 14:02	14913-49-6	
Bismuth-214	EPA 901.1	**0.000 ± 12.030 (25.370) C:NA T:NA**	pCi/L	05/31/16 14:02	14733-03-0	
Cesium-134	EPA 901.1	**4.324 ± 6.376 (7.154) C:NA T:NA**	pCi/L	05/31/16 14:02	13967-70-9	
Cesium-137	EPA 901.1	**-3.805 ± 11.382 (12.870) C:NA T:NA**	pCi/L	05/31/16 14:02	10045-97-3	
Lead-212	EPA 901.1	**1.214 ± 14.507 (18.130) C:NA T:NA**	pCi/L	05/31/16 14:02	15092-94-1	
Lead-214	EPA 901.1	**0.000 ± 11.346 (22.780) C:NA T:NA**	pCi/L	05/31/16 14:02	15067-28-4	
Potassium-40	EPA 901.1	**197.900 ± 94.924 (114.000) C:NA T:NA**	pCi/L	05/31/16 14:02	13966-00-2	
Radium-226	EPA 901.1	**0.000 ± 54.840 (249.500) C:NA T:NA**	pCi/L	05/31/16 14:02	13982-63-3	
Radium-228	EPA 901.1	**2.636 ± 26.970 (36.330) C:NA T:NA**	pCi/L	05/31/16 14:02	15262-20-1	
Thallium-208	EPA 901.1	**0.000 ± 3.268 (14.300) C:NA T:NA**	pCi/L	05/31/16 14:02	14913-50-9	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: R1604586
Pace Project No.: 30182709

Sample: Cell4-0516 **Lab ID: 30182709003** Collected: 05/04/16 11:25 Received: 05/10/16 09:55 Matrix: Water
PWS: Site ID: Sample Type:

Comments: • The sampler's name and signature were not listed on the COC.
• Upon receipt at the laboratory, 3 mls of nitric acid were added to the sample to meet the sample preservation requirement of pH <2 for radiochemistry analysis.

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Thorium-232	EPA 901.1	**2822.100 ± 4837.600 (5873.000) C:NA T:NA**	pCi/L	05/31/16 14:02	7440-29-1	
Thorium-234	EPA 901.1	**0.000 ± 112.960 (366.100) C:NA T:NA**	pCi/L	05/31/16 14:02	15065-10-8	
Radium-226	EPA 903.1	**3.28 ± 1.20 (0.278) C:NA T:87%**	pCi/L	06/01/16 13:25	13982-63-3	
Radium-228	EPA 904.0	**3.14 ± 0.847 (0.878) C:79% T:66%**	pCi/L	05/31/16 12:30	15262-20-1	1c
Total Uranium	EPA 908.0	**0.402 ± 0.314 (0.518) C:NA T:87%**	pCi/L	05/20/16 19:48	7440-61-1	

Sample: Cell4-0516 Dissolved **Lab ID: 30182709004** Collected: 05/04/16 11:25 Received: 05/10/16 09:55 Matrix: Water
PWS: Site ID: Sample Type:

Comments: • The sampler's name and signature were not listed on the COC.

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Actinium-228	EPA 901.1	**0.000 ± 11.596 (22.520) C:NA T:NA**	pCi/L	05/31/16 15:03	14331-83-0	
Bismuth-212	EPA 901.1	**0.000 ± 13.451 (88.260) C:NA T:NA**	pCi/L	05/31/16 15:03	14913-49-6	
Bismuth-214	EPA 901.1	**4.120 ± 10.106 (11.530) C:NA T:NA**	pCi/L	05/31/16 15:03	14733-03-0	
Cesium-134	EPA 901.1	**0.885 ± 4.648 (5.224) C:NA T:NA**	pCi/L	05/31/16 15:03	13967-70-9	
Cesium-137	EPA 901.1	**0.355 ± 4.492 (5.050) C:NA T:NA**	pCi/L	05/31/16 15:03	10045-97-3	
Lead-212	EPA 901.1	**12.925 ± 12.705 (9.224) C:NA T:NA**	pCi/L	05/31/16 15:03	15092-94-1	
Lead-214	EPA 901.1	**18.684 ± 14.090 (11.070) C:NA T:NA**	pCi/L	05/31/16 15:03	15067-28-4	
Potassium-40	EPA 901.1	**260.500 ± 66.627 (50.550) C:NA T:NA**	pCi/L	05/31/16 15:03	13966-00-2	
Radium-226	EPA 901.1	**36.587 ± 98.448 (122.200) C:NA T:NA**	pCi/L	05/31/16 15:03	13982-63-3	
Radium-228	EPA 901.1	**0.000 ± 11.596 (22.520) C:NA T:NA**	pCi/L	05/31/16 15:03	15262-20-1	
Thallium-208	EPA 901.1	**2.226 ± 3.095 (6.335) C:NA T:NA**	pCi/L	05/31/16 15:03	14913-50-9	
Thorium-232	EPA 901.1	**1659.500 ± 7064.900 (8744.000) C:NA T:NA**	pCi/L	05/31/16 15:03	7440-29-1	
Thorium-234	EPA 901.1	**0.000 ± 221.480 (509.100) C:NA T:NA**	pCi/L	05/31/16 15:03	15065-10-8	
Radium-226, Dissolved	EPA 903.1	**0.756 ± 0.493 (0.506) C:NA T:87%**	pCi/L	05/31/16 12:21	13982-63-3	
Radium-228, Dissolved	EPA 904.0	**3.38 ± 0.867 (0.891) C:79% T:73%**	pCi/L	05/26/16 11:32	15262-20-1	
Total Uranium	EPA 908.0	**0.806 ± 0.368 (0.484) C:NA T:87%**	pCi/L	05/20/16 19:48	7440-61-1	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: R1604586
Pace Project No.: 30182709

Sample: Cell5-0516 **Lab ID: 30182709005** Collected: 05/04/16 11:45 Received: 05/10/16 09:55 Matrix: Water
PWS: Site ID: Sample Type:

Comments: • The sampler's name and signature were not listed on the COC.

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Actinium-228	EPA 901.1	**0.000 ± 14.673 (46.240) C:NA T:NA**	pCi/L	05/31/16 15:04	14331-83-0	
Bismuth-212	EPA 901.1	**0.000 ± 40.028 (142.400) C:NA T:NA**	pCi/L	05/31/16 15:04	14913-49-6	
Bismuth-214	EPA 901.1	**0.000 ± 10.770 (28.050) C:NA T:NA**	pCi/L	05/31/16 15:04	14733-03-0	
Cesium-134	EPA 901.1	**-0.284 ± 7.800 (9.166) C:NA T:NA**	pCi/L	05/31/16 15:04	13967-70-9	
Cesium-137	EPA 901.1	**-3.126 ± 10.186 (11.630) C:NA T:NA**	pCi/L	05/31/16 15:04	10045-97-3	
Lead-212	EPA 901.1	**2.944 ± 15.715 (19.370) C:NA T:NA**	pCi/L	05/31/16 15:04	15092-94-1	
Lead-214	EPA 901.1	**11.896 ± 17.951 (22.210) C:NA T:NA**	pCi/L	05/31/16 15:04	15067-28-4	
Potassium-40	EPA 901.1	**0.000 ± 69.751 (181.800) C:NA T:NA**	pCi/L	05/31/16 15:04	13966-00-2	
Radium-226	EPA 901.1	**0.000 ± 139.040 (263.000) C:NA T:NA**	pCi/L	05/31/16 15:04	13982-63-3	
Radium-228	EPA 901.1	**0.000 ± 14.673 (46.240) C:NA T:NA**	pCi/L	05/31/16 15:04	15262-20-1	
Thallium-208	EPA 901.1	**0.000 ± 1.887 (12.820) C:NA T:NA**	pCi/L	05/31/16 15:04	14913-50-9	
Thorium-232	EPA 901.1	**2741.000 ± 4616.100 (5607.000) C:NA T:NA**	pCi/L	05/31/16 15:04	7440-29-1	
Thorium-234	EPA 901.1	**4.114 ± 269.030 (341.500) C:NA T:NA**	pCi/L	05/31/16 15:04	15065-10-8	
Radium-226	EPA 903.1	**1.27 ± 1.18 (1.55) C:NA T:85%**	pCi/L	06/01/16 13:29	13982-63-3	
Radium-228	EPA 904.0	**2.70 ± 0.770 (0.904) C:79% T:71%**	pCi/L	05/31/16 12:29	15262-20-1	1c
Total Uranium	EPA 908.0	**0.239 ± 0.307 (0.555) C:NA T:87%**	pCi/L	05/20/16 19:48	7440-61-1	

Sample: Cell5-0516 Dissolved **Lab ID: 30182709006** Collected: 05/04/16 11:45 Received: 05/10/16 09:55 Matrix: Water
PWS: Site ID: Sample Type:

Comments: • The sampler's name and signature were not listed on the COC.

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Actinium-228	EPA 901.1	**11.706 ± 14.674 (15.240) C:NA T:NA**	pCi/L	05/31/16 16:08	14331-83-0	
Bismuth-212	EPA 901.1	**17.473 ± 55.120 (61.640) C:NA T:NA**	pCi/L	05/31/16 16:08	14913-49-6	
Bismuth-214	EPA 901.1	**75.469 ± 14.748 (9.911) C:NA T:NA**	pCi/L	05/31/16 16:08	14733-03-0	
Cesium-134	EPA 901.1	**-0.043 ± 4.463 (5.079) C:NA T:NA**	pCi/L	05/31/16 16:08	13967-70-9	
Cesium-137	EPA 901.1	**0.000 ± 0.862 (7.693) C:NA T:NA**	pCi/L	05/31/16 16:08	10045-97-3	
Lead-212	EPA 901.1	**10.932 ± 18.133 (11.310) C:NA T:NA**	pCi/L	05/31/16 16:08	15092-94-1	
Lead-214	EPA 901.1	**75.215 ± 14.380 (9.459) C:NA T:NA**	pCi/L	05/31/16 16:08	15067-28-4	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
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ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: R1604586
Pace Project No.: 30182709

Sample: Cell5-0516 Dissolved **Lab ID: 30182709006** Collected: 05/04/16 11:45 Received: 05/10/16 09:55 Matrix: Water
PWS: Site ID: Sample Type:

Comments: • The sampler's name and signature were not listed on the COC.

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Potassium-40	EPA 901.1	**150.280 ± 55.673 (53.170) C:NA T:NA**	pCi/L	05/31/16 16:08	13966-00-2	
Radium-226	EPA 901.1	**97.244 ± 109.150 (128.900) C:NA T:NA**	pCi/L	05/31/16 16:08	13982-63-3	
Radium-228	EPA 901.1	**11.706 ± 14.674 (15.240) C:NA T:NA**	pCi/L	05/31/16 16:08	15262-20-1	
Thallium-208	EPA 901.1	**2.770 ± 3.703 (5.861) C:NA T:NA**	pCi/L	05/31/16 16:08	14913-50-9	
Thorium-232	EPA 901.1	**6190.000 ± 7584.700 (9106.000) C:NA T:NA**	pCi/L	05/31/16 16:08	7440-29-1	
Thorium-234	EPA 901.1	**47.940 ± 441.450 (560.800) C:NA T:NA**	pCi/L	05/31/16 16:08	15065-10-8	
Radium-226, Dissolved	EPA 903.1	**2.96 ± 0.968 (0.507) C:NA T:87%**	pCi/L	05/31/16 12:35	13982-63-3	
Radium-228, Dissolved	EPA 904.0	**0.00366 ± 0.308 (0.718) C:77% T:82%**	pCi/L	05/26/16 11:32	15262-20-1	
Total Uranium	EPA 908.0	**0.536 ± 0.340 (0.529) C:NA T:87%**	pCi/L	05/20/16 19:48	7440-61-1	

Sample: Cell6-0516 **Lab ID: 30182709007** Collected: 05/04/16 12:15 Received: 05/10/16 09:55 Matrix: Water
PWS: Site ID: Sample Type:

Comments: • The sampler's name and signature were not listed on the COC.

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Actinium-228	EPA 901.1	**17.400 ± 28.767 (36.330) C:NA T:NA**	pCi/L	05/31/16 16:09	14331-83-0	
Bismuth-212	EPA 901.1	**0.000 ± 32.683 (142.400) C:NA T:NA**	pCi/L	05/31/16 16:09	14913-49-6	
Bismuth-214	EPA 901.1	**74.751 ± 23.569 (22.520) C:NA T:NA**	pCi/L	05/31/16 16:09	14733-03-0	
Cesium-134	EPA 901.1	**2.219 ± 8.990 (10.270) C:NA T:NA**	pCi/L	05/31/16 16:09	13967-70-9	
Cesium-137	EPA 901.1	**3.194 ± 8.180 (9.422) C:NA T:NA**	pCi/L	05/31/16 16:09	10045-97-3	
Lead-212	EPA 901.1	**0.000 ± 9.036 (22.420) C:NA T:NA**	pCi/L	05/31/16 16:09	15092-94-1	
Lead-214	EPA 901.1	**99.876 ± 26.198 (21.360) C:NA T:NA**	pCi/L	05/31/16 16:09	15067-28-4	
Potassium-40	EPA 901.1	**209.210 ± 96.525 (114.000) C:NA T:NA**	pCi/L	05/31/16 16:09	13966-00-2	
Radium-226	EPA 901.1	**0.000 ± 70.798 (237.600) C:NA T:NA**	pCi/L	05/31/16 16:09	13982-63-3	
Radium-228	EPA 901.1	**17.400 ± 28.767 (36.330) C:NA T:NA**	pCi/L	05/31/16 16:09	15262-20-1	
Thallium-208	EPA 901.1	**0.000 ± 2.882 (12.280) C:NA T:NA**	pCi/L	05/31/16 16:09	14913-50-9	
Thorium-232	EPA 901.1	**2805.900 ± 4794.100 (5821.000) C:NA T:NA**	pCi/L	05/31/16 16:09	7440-29-1	
Thorium-234	EPA 901.1	**0.000 ± 190.660 (363.400) C:NA T:NA**	pCi/L	05/31/16 16:09	15065-10-8	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: R1604586
Pace Project No.: 30182709

Sample: Cell6-0516 **Lab ID: 30182709007** Collected: 05/04/16 12:15 Received: 05/10/16 09:55 Matrix: Water
PWS: Site ID: Sample Type:
Comments: • The sampler's name and signature were not listed on the COC.

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 903.1	**1.83 ± 1.02 (0.977) C:NA T:83%**	pCi/L	06/01/16 13:51	13982-63-3	
Radium-228	EPA 904.0	**3.27 ± 0.866 (0.879) C:80% T:67%**	pCi/L	05/31/16 12:29	15262-20-1	
Total Uranium	EPA 908.0	**0.262 ± 0.325 (0.585) C:NA T:87%**	pCi/L	05/20/16 19:48	7440-61-1	

Sample: Cell6-0516 Dissolved **Lab ID: 30182709008** Collected: 05/04/16 12:15 Received: 05/10/16 09:55 Matrix: Water
PWS: Site ID: Sample Type:
Comments: • The sampler's name and signature were not listed on the COC.

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Actinium-228	EPA 901.1	**8.192 ± 14.364 (15.240) C:NA T:NA**	pCi/L	05/31/16 17:16	14331-83-0	
Bismuth-212	EPA 901.1	**0.000 ± 33.494 (71.720) C:NA T:NA**	pCi/L	05/31/16 17:16	14913-49-6	
Bismuth-214	EPA 901.1	**107.450 ± 17.701 (9.759) C:NA T:NA**	pCi/L	05/31/16 17:16	14733-03-0	
Cesium-134	EPA 901.1	**0.325 ± 0.481 (5.767) C:NA T:NA**	pCi/L	05/31/16 17:16	13967-70-9	
Cesium-137	EPA 901.1	**0.000 ± 1.927 (5.685) C:NA T:NA**	pCi/L	05/31/16 17:16	10045-97-3	
Lead-212	EPA 901.1	**18.584 ± 16.533 (11.540) C:NA T:NA**	pCi/L	05/31/16 17:16	15092-94-1	
Lead-214	EPA 901.1	**112.210 ± 18.663 (10.900) C:NA T:NA**	pCi/L	05/31/16 17:16	15067-28-4	
Potassium-40	EPA 901.1	**194.110 ± 50.952 (43.070) C:NA T:NA**	pCi/L	05/31/16 17:16	13966-00-2	
Radium-226	EPA 901.1	**112.130 ± 124.210 (142.800) C:NA T:NA**	pCi/L	05/31/16 17:16	13982-63-3	
Radium-228	EPA 901.1	**8.192 ± 14.364 (15.240) C:NA T:NA**	pCi/L	05/31/16 17:16	15262-20-1	
Thallium-208	EPA 901.1	**3.686 ± 6.273 (5.861) C:NA T:NA**	pCi/L	05/31/16 17:16	14913-50-9	
Thorium-232	EPA 901.1	**921.920 ± 7622.700 (9453.000) C:NA T:NA**	pCi/L	05/31/16 17:16	7440-29-1	
Thorium-234	EPA 901.1	**0.000 ± 187.510 (551.700) C:NA T:NA**	pCi/L	05/31/16 17:16	15065-10-8	
Radium-226, Dissolved	EPA 903.1	**0.888 ± 0.642 (0.895) C:NA T:86%**	pCi/L	05/31/16 12:19	13982-63-3	
Radium-228, Dissolved	EPA 904.0	**0.957 ± 0.482 (0.860) C:74% T:80%**	pCi/L	05/26/16 14:48	15262-20-1	
Total Uranium	EPA 908.0	**0.742 ± 0.450 (0.716) C:NA T:87%**	pCi/L	05/20/16 19:48	7440-61-1	

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ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: R1604586
Pace Project No.: 30182709

Sample: Cell8B-0516 **Lab ID: 30182709009** Collected: 05/04/16 12:45 Received: 05/10/16 09:55 Matrix: Water
PWS: Site ID: Sample Type:

Comments: • The sampler's name and signature were not listed on the COC.

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Actinium-228	EPA 901.1	**0.000 ± 15.389 (54.220) C:NA T:NA**	pCi/L	05/31/16 17:17	14331-83-0	
Bismuth-212	EPA 901.1	**0.000 ± 73.084 (171.800) C:NA T:NA**	pCi/L	05/31/16 17:17	14913-49-6	
Bismuth-214	EPA 901.1	**0.000 ± 12.206 (26.300) C:NA T:NA**	pCi/L	05/31/16 17:17	14733-03-0	
Cesium-134	EPA 901.1	**-3.016 ± 10.794 (12.160) C:NA T:NA**	pCi/L	05/31/16 17:17	13967-70-9	
Cesium-137	EPA 901.1	**7.067 ± 6.059 (6.365) C:NA T:NA**	pCi/L	05/31/16 17:17	10045-97-3	
Lead-212	EPA 901.1	**2.013 ± 16.195 (19.960) C:NA T:NA**	pCi/L	05/31/16 17:17	15092-94-1	
Lead-214	EPA 901.1	**0.000 ± 9.755 (21.000) C:NA T:NA**	pCi/L	05/31/16 17:17	15067-28-4	
Potassium-40	EPA 901.1	**0.000 ± 90.521 (192.200) C:NA T:NA**	pCi/L	05/31/16 17:17	13966-00-2	
Radium-226	EPA 901.1	**0.000 ± 102.250 (256.400) C:NA T:NA**	pCi/L	05/31/16 17:17	13982-63-3	
Radium-228	EPA 901.1	**0.000 ± 15.389 (54.220) C:NA T:NA**	pCi/L	05/31/16 17:17	15262-20-1	
Thallium-208	EPA 901.1	**0.000 ± 5.660 (12.820) C:NA T:NA**	pCi/L	05/31/16 17:17	14913-50-9	
Thorium-232	EPA 901.1	**-2043.600 ± 5291.000 (6465.000) C:NA T:NA**	pCi/L	05/31/16 17:17	7440-29-1	
Thorium-234	EPA 901.1	**0.000 ± 110.800 (360.700) C:NA T:NA**	pCi/L	05/31/16 17:17	15065-10-8	
Radium-226	EPA 903.1	**0.211 ± 0.774 (1.27) C:NA T:85%**	pCi/L	06/01/16 13:52	13982-63-3	
Radium-228	EPA 904.0	**0.732 ± 0.475 (0.905) C:79% T:69%**	pCi/L	05/31/16 16:11	15262-20-1	1c
Total Uranium	EPA 908.0	**0.856 ± 0.445 (0.662) C:NA T:87%**	pCi/L	05/20/16 19:48	7440-61-1	

Sample: Cell8B-0516 Dissolved **Lab ID: 30182709010** Collected: 05/04/16 12:45 Received: 05/10/16 09:55 Matrix: Water
PWS: Site ID: Sample Type:

Comments: • The sampler's name and signature were not listed on the COC.

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Actinium-228	EPA 901.1	**0.448 ± 34.301 (43.220) C:NA T:NA**	pCi/L	05/31/16 19:58	14331-83-0	
Bismuth-212	EPA 901.1	**23.229 ± 129.950 (152.900) C:NA T:NA**	pCi/L	05/31/16 19:58	14913-49-6	
Bismuth-214	EPA 901.1	**0.000 ± 9.677 (28.890) C:NA T:NA**	pCi/L	05/31/16 19:58	14733-03-0	
Cesium-134	EPA 901.1	**0.569 ± 9.337 (10.780) C:NA T:NA**	pCi/L	05/31/16 19:58	13967-70-9	
Cesium-137	EPA 901.1	**-1.427 ± 10.640 (12.260) C:NA T:NA**	pCi/L	05/31/16 19:58	10045-97-3	
Lead-212	EPA 901.1	**10.600 ± 14.194 (17.140) C:NA T:NA**	pCi/L	05/31/16 19:58	15092-94-1	
Lead-214	EPA 901.1	**0.000 ± 11.947 (22.780) C:NA T:NA**	pCi/L	05/31/16 19:58	15067-28-4	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
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ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: R1604586
Pace Project No.: 30182709

Sample: Cell8B-0516 Dissolved **Lab ID: 30182709010** Collected: 05/04/16 12:45 Received: 05/10/16 09:55 Matrix: Water
PWS: Site ID: Sample Type:

Comments: • The sampler's name and signature were not listed on the COC.

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Potassium-40	EPA 901.1	**0.000 ± 73.330 (192.200) C:NA T:NA**	pCi/L	05/31/16 19:58	13966-00-2	
Radium-226	EPA 901.1	**0.000 ± 110.980 (240.100) C:NA T:NA**	pCi/L	05/31/16 19:58	13982-63-3	
Radium-228	EPA 901.1	**0.448 ± 34.301 (43.220) C:NA T:NA**	pCi/L	05/31/16 19:58	15262-20-1	
Thallium-208	EPA 901.1	**0.000 ± 4.219 (10.490) C:NA T:NA**	pCi/L	05/31/16 19:58	14913-50-9	
Thorium-232	EPA 901.1	**1621.900 ± 4696.100 (5768.000) C:NA T:NA**	pCi/L	05/31/16 19:58	7440-29-1	
Thorium-234	EPA 901.1	**10.514 ± 271.710 (344.300) C:NA T:NA**	pCi/L	05/31/16 19:58	15065-10-8	
Radium-226, Dissolved	EPA 903.1	**1.13 ± 0.622 (0.554) C:NA T:82%**	pCi/L	05/31/16 12:37	13982-63-3	
Radium-228, Dissolved	EPA 904.0	**0.669 ± 0.465 (0.897) C:73% T:68%**	pCi/L	05/26/16 14:48	15262-20-1	
Total Uranium	EPA 908.0	**1.48 ± 0.518 (0.588) C:NA T:87%**	pCi/L	05/20/16 19:48	7440-61-1	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
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QUALITY CONTROL - RADIOCHEMISTRY

Project: R1604586
Pace Project No.: 30182709

QC Batch: RADC/29468 Analysis Method: EPA 904.0
QC Batch Method: EPA 904.0 Analysis Description: 904.0 Radium 228
Associated Lab Samples: 30182709001, 30182709003, 30182709005, 30182709007, 30182709009

METHOD BLANK: 1076506 Matrix: Water
Associated Lab Samples: 30182709001, 30182709003, 30182709005, 30182709007, 30182709009

Parameter	Act ± Unc (MDC) Carr Trac	Units	Analyzed	Qualifiers
Radium-228	1.13 ± 0.496 (0.832) C:81% T:78%	pCi/L	05/31/16 12:28	1c
Radium-228	1.22 ± 0.433 (0.648) C:81% T:84%	pCi/L	05/25/16 23:19	

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REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL - RADIOCHEMISTRY

Project: R1604586
Pace Project No.: 30182709

QC Batch: RADC/29551 Analysis Method: EPA 903.1
QC Batch Method: EPA 903.1 Analysis Description: 903.1 Radium-226, Dissolved
Associated Lab Samples: 30182709002, 30182709004, 30182709006, 30182709008, 30182709010

METHOD BLANK: 1079573 Matrix: Water
Associated Lab Samples: 30182709002, 30182709004, 30182709006, 30182709008, 30182709010

Parameter	Act ± Unc (MDC) Carr Trac	Units	Analyzed	Qualifiers
Radium-226, Dissolved	0.0720 ± 0.329 (0.669) C:NA T:82%	pCi/L	05/31/16 12:00	

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REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL - RADIOCHEMISTRY

Project: R1604586
Pace Project No.: 30182709

QC Batch: RADC/29476 Analysis Method: EPA 908.0
QC Batch Method: EPA 908.0 Analysis Description: 908.0 Total Uranium
Associated Lab Samples: 30182709001, 30182709002, 30182709003, 30182709004, 30182709005, 30182709006, 30182709007, 30182709008, 30182709009, 30182709010

METHOD BLANK: 1077484 Matrix: Water
Associated Lab Samples: 30182709001, 30182709002, 30182709003, 30182709004, 30182709005, 30182709006, 30182709007, 30182709008, 30182709009, 30182709010

Parameter	Act ± Unc (MDC) Carr Trac	Units	Analyzed	Qualifiers
Total Uranium	-0.0861 ± 0.189 (0.387) C:NA T:88%	pCi/L	05/20/16 19:53	

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QUALITY CONTROL - RADIOCHEMISTRY

Project: R1604586
Pace Project No.: 30182709

QC Batch: RADC/29497 Analysis Method: EPA 904.0
QC Batch Method: EPA 904.0 Analysis Description: 904.0 Radium 228, Dissolved
Associated Lab Samples: 30182709002, 30182709004, 30182709006, 30182709008, 30182709010

METHOD BLANK: 1077505 Matrix: Water
Associated Lab Samples: 30182709002, 30182709004, 30182709006, 30182709008, 30182709010

Parameter	Act ± Unc (MDC) Carr Trac	Units	Analyzed	Qualifiers
Radium-228, Dissolved	0.327 ± 0.326 (0.673) C:81% T:85%	pCi/L	05/26/16 11:32	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL - RADIOCHEMISTRY

Project: R1604586
Pace Project No.: 30182709

QC Batch: RADC/29600 Analysis Method: EPA 903.1
QC Batch Method: EPA 903.1 Analysis Description: 903.1 Radium-226
Associated Lab Samples: 30182709001, 30182709003, 30182709005, 30182709007, 30182709009

METHOD BLANK: 1081656 Matrix: Water
Associated Lab Samples: 30182709001, 30182709003, 30182709005, 30182709007, 30182709009

Parameter	Act ± Unc (MDC) Carr Trac	Units	Analyzed	Qualifiers
Radium-226	-0.298 ± 0.360 (0.978) C:NA T:92%	pCi/L	06/01/16 13:37	

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REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL - RADIOCHEMISTRY

Project: R1604586
Pace Project No.: 30182709

QC Batch: RADC/29610 Analysis Method: EPA 901.1
QC Batch Method: EPA 901.1 Analysis Description: 901.1 Gamma Spec
Associated Lab Samples: 30182709001, 30182709002, 30182709003, 30182709004, 30182709005, 30182709006, 30182709007, 30182709008, 30182709009, 30182709010

METHOD BLANK: 1081681 Matrix: Water
Associated Lab Samples: 30182709001, 30182709002, 30182709003, 30182709004, 30182709005, 30182709006, 30182709007, 30182709008, 30182709009, 30182709010

Parameter	Act ± Unc (MDC) Carr Trac	Units	Analyzed	Qualifiers
Actinium-228	0.000 ± 6.143 (22.480) C:NA T:NA	pCi/L	05/26/16 08:35	
Bismuth-212	43.032 ± 83.017 (59.520) C:NA T:NA	pCi/L	05/26/16 08:35	
Bismuth-214	6.746 ± 11.607 (13.110) C:NA T:NA	pCi/L	05/26/16 08:35	
Cesium-134	0.442 ± 5.007 (5.624) C:NA T:NA	pCi/L	05/26/16 08:35	
Cesium-137	0.000 ± 0.745 (5.423) C:NA T:NA	pCi/L	05/26/16 08:35	
Lead-212	6.260 ± 4.693 (7.053) C:NA T:NA	pCi/L	05/26/16 08:35	
Lead-214	10.295 ± 5.891 (11.100) C:NA T:NA	pCi/L	05/26/16 08:35	
Potassium-40	0.000 ± 9.473 (78.780) C:NA T:NA	pCi/L	05/26/16 08:35	
Radium-226	0.000 ± 42.662 (124.200) C:NA T:NA	pCi/L	05/26/16 08:35	
Radium-228	0.000 ± 6.143 (22.480) C:NA T:NA	pCi/L	05/26/16 08:35	
Thallium-208	2.689 ± 4.112 (4.458) C:NA T:NA	pCi/L	05/26/16 08:35	
Thorium-232	3766.700 ± 5832.200 (7104.000) C:NA T:NA	pCi/L	05/26/16 08:35	
Thorium-234	15.565 ± 341.680 (443.100) C:NA T:NA	pCi/L	05/26/16 08:35	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

QUALIFIERS

Project: R1604586
Pace Project No.: 30182709

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Act - Activity

Unc - Uncertainty: SDWA = 1.96 sigma count uncertainty, all other matrices = Expanded Uncertainty (95% confidence interval). Gamma Spec = Expanded Uncertainty (95.4% Confidence Interval)

(MDC) - Minimum Detectable Concentration

Trac - Tracer Recovery (%)

Carr - Carrier Recovery (%)

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

ANALYTE QUALIFIERS

1c The MB failed high on the 1st and 2nd counts. All samples above 1.0 were re-ingrowthed, re-counted, and verifiied.

REPORT OF LABORATORY ANALYSIS

ALS Environmental Chain of Custody

1565 Jefferson Rd, Building 300 • Rochester, NY 14623 • 585-288-5380 • FAX 585-288-8475

ALS Contact: Janice Jaeger

30182709

Project Number: R1604586
Project Manager: Janice Jaeger
QAP: LAB QAP

Lab Code	Sample ID	# of Cont.	Matrix	Sample Date	Sample Time	Lab ID	Gamma Spec 901.1	Nat U 908.0	Radium 226 903.1	Radium 228 904.0	
[redacted]	Cell3-0516	4	Water	5/4/16	1105	Pace PA	X	X	X	X	001
[redacted]	Cell3-0516 Dissolved		Water	5/4/16	1105	Pace PA	X	X	X	X	002
[redacted]	Cell4-0516		Water	5/4/16	1125	Pace PA	X	X	X	X	003
[redacted]	Cell4-0516 Dissolved		Water	5/4/16	1125	Pace PA	X	X	X	X	004
[redacted]	Cell5-0516		Water	5/4/16	1145	Pace PA	X	X	X	X	005
[redacted]	Cell5-0516 Dissolved		Water	5/4/16	1145	Pace PA	X	X	X	X	006
[redacted]	Cell6-0516		Water	5/4/16	1215	Pace PA	X	X	X	X	007
[redacted]	Cell6-0516 Dissolved		Water	5/4/16	1215	Pace PA	X	X	X	X	008
[redacted]	Cell8B-0516		Water	5/4/16	1245	Pace PA	X	X	X	X	009
[redacted]	Cell8B-0516 Dissolved		Water	5/4/16	1245	Pace PA	X	X	X	X	010

WO#:30182709

Test Comments

Special Instructions/Comments

Excel EDD

Need In-lab filtering

NPDES

H - Test is On Hold P - Test is Authorized for Prep Only

Turnaround Requirements

____ **RUSH** (Surcharges Apply)

PLEASE CIRCLE WORK DAYS

1 2 3 4 5

X **STANDARD**

Requested FAX Date: _____

Requested Report Date: 05/16/16

Report Requirements

____ I. Results Only

X II. Results + QC Summaries

____ III. Results + QC and Calibration Summaries

____ IV. Data Validation Report with Raw Data

PQL/MDL/J N

EDD Y

Invoice Information

PO# 58R1604586

Bill to

Relinquished By: [signature] 5/9/16 1500 Received By: Karen E. Hill 0955 5/10/16 Airbill Number: _____

ALS Environmental Chain of Custody

1565 Jefferson Rd, Building 300 • Rochester, NY 14623 • 585-288-5380 • FAX 585-288-8475

ALS Contact: Janice Jaeger

30182709

Project Number:	R1604586		
Project Manager:	Janice Jaeger	,10	Sample Require In-Lab Filtering
QAPP	LAB QAP	R1604586-002,4,6,8,10	Sample Require In-Lab Filtering
Radium 226 - 903.1		R1604586-002,4,6,8,10	Sample Require In-Lab Filtering
Radium 228 - 904.0		R1604586-002,4,6,8,10	Sample Require In-Lab Filtering
Nat U - 908.0			

Folder Comments:

Gamma Isotope list Rad 226&228,Actinium 228,Bismuth 212&214,Cesium 134&137,Lead 212&214,Potssium 40,Thallium 208 & Thorium 232&234

Special Instructions/Comments	Turnaround Requirements	Report Requirements	Invoice Information
NPDES H - Test is On Hold P - Test is Authorized for Prep Only	____RUSH (Surcharges Apply) PLEASE CIRCLE WORK DAYS 1 2 3 4 5 ____ STANDARD Requested FAX Date: _____ Requested Report Date: 05/16/16	____ I. Results Only ____ II. Results + QC Summaries ____ III. Results + QC and Calibration Summaries ____ IV. Data Validation Report with Raw Data PQL/MDL/J N EDD Y	PO# 58R1604586 Bill to

Relinquished By: [signature] 5/9/16 1500 Received By: Kwon E. Till 0955 5/10/16 Airbill Number: _____

ALS Environmental Chain of Custody

1565 Jefferson Rd, Building 300 • Rochester, NY 14623 • 585-288-5380 • FAX 585-288-8475

ALS Contact: Janice Jaeger

Project Number: R1604586
Project Manager: Janice Jaeger
QAP: LAB QAP

30182709

R1604586

✓ **Ship To: Pace PA**
Pace Analytical Services
1638 Roseytown Road
Suites 2,3, & 4
Greensburg, PA 15601

PC VMS Date 5/9/16
SMO _____ Date _____

Instructions:

Ice _____
Dry Ice _____
No Ice _____

Shipping:

Overnight _____
2nd Day _____
Ground _____

Bill to Client Account _____

Comments:

Sample Condition Upon Receipt Pittsburgh

30182709

Pace Analytical

Client Name: ALS Environmental Project #

Courier: ☑ Fed Ex ☐ UPS ☐ USPS ☐ Client ☐ Commercial ☐ Pace Other

Tracking #: 6714 7717 8332

Custody Seal on Cooler/Box Present: ☑ yes ☐ no Seals intact: ☑ yes ☐ no

Thermometer Used 7 Type of Ice: (Wet) Blue None

Cooler Temperature Observed Temp 3.1 2.2 2.3 °C Correction Factor: +0.2 °C Final Temp: 3.3 2.4 2.5 °C

Temp should be above freezing to 6°C

Date and Initials of person examining contents: KH 5/10/2016

Comments:	Yes	No	N/A	
Chain of Custody Present:	✓			1.
Chain of Custody Filled Out:	✓			2.
Chain of Custody Relinquished:	✓			3.
Sampler Name & Signature on COC:	✓			4.
Sample Labels match COC: -Includes date/time/ID/Analysis Matrix: WT	✓			5.
Samples Arrived within Hold Time:	✓			6.
Short Hold Time Analysis (<72hr remaining):		✓		7.
Rush Turn Around Time Requested:		✓		8.
Sufficient Volume:	✓			9.
Correct Containers Used:	✓			10.
-Pace Containers Used:		✓		
Containers Intact:	✓			11.
Filtered volume received for Dissolved tests		✓		12.
All containers needing preservation have been checked.	✓			13. Added 3mL of HNO_3 to 003 (5 1L)
All containers needing preservation are found to be in compliance with EPA recommendation.		✓		
exceptions: VOA, coliform, TOC, O&G, Phenolics				Initial when completed KH; Date/time of preservation 5/10/16 17:30; Lot # of added preservative DL16-04006
Headspace in VOA Vials (>6mm):			✓	14.
Trip Blank Present:			✓	15.
Trip Blank Custody Seals Present			✓	

Client Notification/ Resolution:

Person Contacted: Date/Time: Contacted By:

Comments/ Resolution:

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e out of hold, incorrect preservative, out of temp, incorrect containers)

September 28, 2016 Service Request No:R1609014

Mr. Jerry Leone
Casella Waste Systems
Ontario County Landfill
1879 Rte. 5 & 20
Stanley, NY 14561

Laboratory Results for: Hakes C&D Landfill Leachate Tank Sediment

Dear Mr.Leone,

Enclosed are the results of the sample(s) submitted to our laboratory August 25, 2016
For your reference, these analyses have been assigned our service request number **R1609014.**

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

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

1565 Jefferson Rd, Building 300, Rochester, NY 14623 | 585-288-5380 | www.alsglobal.com

Client: Casella Waste Systems
Project: Hakes C&D Landfill Leachate Tank Sediment
Sample Matrix: Soil

Service Request:R1609014
Date Received:8/25/16

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

One soil samples were received for analysis at ALS Environmental on 08/25/2016. 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 9/28/2016

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 **Service Request:**R1609014

Project: Hakes C&D Landfill Leachate Tank Sediment

SAMPLE CROSS-REFERENCE

SAMPLE #	CLIENT SAMPLE ID	DATE	TIME
R1609014-001	PLCSSED-0816	8/24/2016	1030

Columbia Analytical Services

1565 Jefferson Road
Bldg 300, Suite 360
Rochester, NY 14623

800.695.7222
www.caslab.com

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

Project Manager: **Jerry Leone/Jon Brandes**

CHAIN of CUSTODY

Page 1 of 1

Project: Hakes - Leachate Tank Sediment

Telephone No.: 585-593-1824

Fax No.: 585-593-747

Method of Shipment: FED EX

Special Detection Limit / Reporting

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

Sample I.D.	Lab Sample No.	No. of Containers	Matrix: Soil	Water	Air	Other	Prsv.: Yes	No	Sampling Date	Sampling Time	Total: Gamma Spec (901.1), Ra-226 (903.1), Ra-228 (904.0)	Total: Uranium (908.0)	Turn Around Time (working days)
PLCSSED-0816		3	X					X	8-24-16	1030	X	X	

Sample Received Intact: Yes No

Temperature received: Ice No ice

Relinq. by sampler (Sign & Print Name)	Date	Time	Received by (Sign & Print Name)	Date	Time
Kevin Dye / Kevin Dye	8-24-16	1400	Tricia Sauter	8-25-16	1135
Relinquished by	Date	Time	Received by		
Relinquished by	Date	Time	Received by		
Relinquished by	Date	Time	Received by laboratory	Date	Time

Lab Work No.

R1609014 5
Casella Waste Systems
Hakes C&D Landfill

Cooler Receipt and Preservation Check Form

R1609014 5
Casella Waste Systems
Hakes C&D Landfill

Project/Client Casella Folder Number

Cooler received on 8-25-16 by: TS

COURIER: ALS UPS (FEDEX) VELOCITY CLIENT

1	Were **Custody seals** on outside of cooler?	(Y)	N
2	**Custody papers** properly completed (ink, signed)?	(Y)	N
3	Did all bottles arrive in good **condition** (unbroken)?	(Y)	N
4	Circle: **Wet Ice Dry Ice Gel packs** present?	(Y)	N

5a	**Perchlorate** samples have required headspace?	Y	N	(NA)
5b	Did VOA vials, Alk,or Sulfide have sig* **bubbles**?	Y	N	(NA)
6	Where did the bottles originate?	(ALS/ROC)	CLIENT	
7	Soil VOA received as: Bulk Encore 5035set			(NA)

8. Temperature Readings Date: 8-25-16 Time: 11 50 ID: IR#5 (IR#6) From: (Temp Blank) Sample Bottle

Observed Temp (°C)	3.5						
Correction Factor (°C)	+.2						
Corrected Temp (°C)	3.7						
Within 0-6°C?	(Y) N	Y N	Y N	Y N	Y N	Y N	Y N
If <0°C, were samples frozen?	Y N	Y N	Y N	Y N	Y N	Y N	Y N

If out of Temperature, note packing/ice condition: _____ Ice melted Poorly Packed Same Day Rule

&Client Approval to Run Samples: _____ Standing Approval Client aware at drop-off Client notified by: _____

All samples held in storage location: RC62 by TS on 8-25-16 at 1150
5035 samples placed in storage location: _____ by _____ on _____ at _____

Cooler Breakdown: Date: 8-25-16 Time: 1510 by: TS

1.	Were all bottle labels complete (*i.e.* analysis, preservation, etc.)?	(YES)	NO
2.	Did all bottle labels and tags agree with custody papers?	(YES)	NO
3.	Were correct containers used for the tests indicated?	(YES)	NO
4.	Were 5035 vials acceptable (no extra labels, not leaking)?	YES	NO
5.	Air Samples: Cassettes / Tubes Intact	Canisters Pressurized	Tedlar® Bags Inflated

(N/A) (N/A)

Explain any discrepancies:

pH	Reagent	Yes	No	Lot Received	Exp	Sample ID	Vol. Added	Lot Added	Final pH
≥12	NaOH								
≤2	HNO_3								
≤2	H_2SO_4								
<4	$NaHSO_4$								
Residual Chlorine (-)	For CN Phenol and 522			If +, contact PM to add $Na_2S_2O_3$ (CN), ascorbic (phenol).					
	$Na_2S_2O_3$	-	-						
	ZnAcetate	-	-						
	HCl	**	**						

**Not to be tested before analysis – pH tested and recorded by VOAs on a separate worksheet

Yes=All samples OK

No=Samples were preserved at The lab as listed

PM OK to Adjust: _____

Bottle lot numbers: 022216 - 113W14
Other Comments:

CLRES	BULK
DO	FLDT
HPROD	HGFB
HTR	LL3541
PH	SUB
SO3	MARRS
ALS	REV

PC Secondary Review: _____

*significant air bubbles: VOA > 5-6 mm : WC >1 in. diameter

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

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.
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/Arclors).
B	Analyte was also detected in the associated method blank at a concentration that may have contributed to the sample result.
E	Inorganics- Concentration is estimated due to the serial dilution was outside control limits.
E	Organics- Concentration has exceeded the calibration range for that specific analysis.
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.
*	Indicates that a quality control parameter has exceeded laboratory limits. Under the ñNotesò column of the Form I, this qualifier denotes analysis was performed out of Holding Time.
H	Analysis was performed out of hold time for tests that have an ñimmediateò hold time criteria.
#	Spike was diluted out.
+	Correlation coefficient for MSA is <0.995.
N	Inorganics- Matrix spike recovery was outside laboratory limits.
N	Organics- Presumptive evidence of a compound (reported as a TIC) based on the MS library search.
S	Concentration has been determined using Method of Standard Additions (MSA).
W	Post-Digestion Spike recovery is outside control limits and the sample absorbance is <50% of the spike absorbance.
P	Concentration >40% (25% for CLP) difference between the two GC columns.
C	Confirmed by GC/MS
Q	DoD reports: indicates a pesticide/Aroclor is not confirmed (Ó100% Difference between two GC columns).
X	See Case Narrative for discussion.
MRL LOQ	Method Reporting Limit. Also known as: Limit of Quantitation (LOQ) The lowest concentration at which the method analyte may be reliably quantified under the method conditions.
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).
LOD	Limit of Detection. A value at or above the MDL which has been verified to be detectable.
ND	Non-Detect. Analyte was not detected at the concentration listed. Same as U qualifier.

Rochester Lab ID # for State Certifications[1]

Connecticut ID # PH0556	Maine ID #NY0032	New Hampshire ID # 294100 A/B
Delaware Accredited	Nebraska Accredited	
DoD ELAP #65817	New Jersey ID # NY004	Pennsylvania ID# 68-786
Florida ID # E87674	New York ID # 10145	Rhode Island ID # 158
Illinois ID #200047	North Carolina #676	Virginia #460167

[1] Analyses were performed according to our laboratoryôs 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 http://www.alsglobal.com/en/Our-Services/Life-Sciences/Environmental/Downloads/North-America-Downloads

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.

The preparation methods associated with this report are found in these tables unless discussed in the case narrative.

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

Pace Analytical Services, Inc.
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

September 28, 2016

Ms. Janice Jaeger
ALS Environmental Columbia
1565 Jefferson Road
Building 300
Rochester, NY 14623

RE: Project: R1609014
Pace Project No.: 30194602

Dear Ms. Jaeger:
Enclosed are the analytical results for sample(s) received by the laboratory on August 30, 2016. The results relate only to the samples included in this report. Results reported herein conform to the most current, applicable TNI/NELAC standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Carin A. Ferris

Carin Ferris
carin.ferris@pacelabs.com
Project Manager

Enclosures

Pace Analytical Services, Inc.
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

CERTIFICATIONS

Project: R1609014
Pace Project No.: 30194602

Pennsylvania Certification IDs

1638 Roseytown Rd Suites 2,3&4, Greensburg, PA 15601
L-A-B DOD-ELAP Accreditation #: L2417
Alabama Certification #: 41590
Arizona Certification #: AZ0734
Arkansas Certification
California Certification #: 04222CA
Colorado Certification
Connecticut Certification #: PH-0694
Delaware Certification
Florida/TNI Certification #: E87683
Georgia Certification #: C040
Guam Certification
Hawaii Certification
Idaho Certification
Illinois Certification
Indiana Certification
Iowa Certification #: 391
Kansas/TNI Certification #: E-10358
Kentucky Certification #: 90133
Louisiana DHH/TNI Certification #: LA140008
Louisiana DEQ/TNI Certification #: 4086
Maine Certification #: PA00091
Maryland Certification #: 308
Massachusetts Certification #: M-PA1457
Michigan/PADEP Certification
Missouri Certification #: 235
Montana Certification #: Cert 0082
Nebraska Certification #: NE-05-29-14
Nevada Certification #: PA014572015-1
New Hampshire/TNI Certification #: 2976
New Jersey/TNI Certification #: PA 051
New Mexico Certification #: PA01457
New York/TNI Certification #: 10888
North Carolina Certification #: 42706
North Dakota Certification #: R-190
Oregon/TNI Certification #: PA200002
Pennsylvania/TNI Certification #: 65-00282
Puerto Rico Certification #: PA01457
Rhode Island Certification #: 65-00282
South Dakota Certification
Tennessee Certification #: TN2867
Texas/TNI Certification #: T104704188-14-8
Utah/TNI Certification #: PA014572015-5
USDA Soil Permit #: P330-14-00213
Vermont Dept. of Health: ID# VT-0282
Virgin Island/PADEP Certification
Virginia/VELAP Certification #: 460198
Washington Certification #: C868
West Virginia DEP Certification #: 143
West Virginia DHHR Certification #: 9964C
Wisconsin Certification
Wyoming Certification #: 8TMS-L

Pace Analytical Services, Inc.
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

SAMPLE SUMMARY

Project: R1609014
Pace Project No.: 30194602

Lab ID	Sample ID	Matrix	Date Collected	Date Received
30194602001	**PLCSSED-0816**	Solid	08/24/16 10:30	08/30/16 09:50

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1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

SAMPLE ANALYTE COUNT

Project: R1609014
Pace Project No.: 30194602

Lab ID	Sample ID	Method	Analysts	Analytes Reported
30194602001	**PLCSSED-0816**	EPA 901.1	MAH	13
		HSL-300	LAL	3

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PROJECT NARRATIVE

Project: R1609014
Pace Project No.: 30194602

Method: **EPA 901.1**
Description: 901.1 Gamma Spec INGROWTH
Client: ALS Environmental Columbia
Date: September 28, 2016

General Information:
1 sample was analyzed for EPA 901.1. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

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PROJECT NARRATIVE

Project: R1609014
Pace Project No.: 30194602

Method: **HSL-300**
Description: HSL300(AS) Actinides
Client: ALS Environmental Columbia
Date: September 28, 2016

General Information:
1 sample was analyzed for HSL-300. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

Analyte Comments:

QC Batch: 234096

N2: The lab does not hold NELAC/TNI accreditation for this parameter.

- BLANK (Lab ID: 1148019)
  - Uranium-234
  - Uranium-235
  - Uranium-238
- PLCSSED-0816 (Lab ID: 30194602001)
  - Uranium-234
  - Uranium-235
  - Uranium-238

This data package has been reviewed for quality and completeness and is approved for release.

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Greensburg, PA 15601
(724)850-5600

ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: R1609014
Pace Project No.: 30194602

Sample: PLCSSED-0816 **Lab ID: 30194602001** Collected: 08/24/16 10:30 Received: 08/30/16 09:50 Matrix: Solid
PWS: Site ID: Sample Type:

Results reported on a "dry-weight" basis
Comments: • The sampler's name and signature were not listed on the COC.

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Actinium-228	EPA 901.1	**2.454 ± 0.539 (0.342) C:NA T:NA**	pCi/g	09/27/16 17:21	14331-83-0	
Bismuth-212	EPA 901.1	**3.506 ± 1.366 (1.193) C:NA T:NA**	pCi/g	09/27/16 17:21	14913-49-6	
Bismuth-214	EPA 901.1	**1.677 ± 0.357 (0.227) C:NA T:NA**	pCi/g	09/27/16 17:21	14733-03-0	
Cesium-134	EPA 901.1	**0.040 ± 0.055 (0.136) C:NA T:NA**	pCi/g	09/27/16 17:21	13967-70-9	
Cesium-137	EPA 901.1	**0.026 ± 0.098 (0.103) C:NA T:NA**	pCi/g	09/27/16 17:21	10045-97-3	
Lead-212	EPA 901.1	**2.292 ± 0.369 (0.195) C:NA T:NA**	pCi/g	09/27/16 17:21	15092-94-1	
Lead-214	EPA 901.1	**1.910 ± 0.399 (0.253) C:NA T:NA**	pCi/g	09/27/16 17:21	15067-28-4	
Potassium-40	EPA 901.1	**32.709 ± 4.921 (1.198) C:NA T:NA**	pCi/g	09/27/16 17:21	13966-00-2	
Radium-226	EPA 901.1	**1.773 ± 0.370 (0.227) C:NA T:NA**	pCi/g	09/27/16 17:21	13982-63-3	
Radium-228	EPA 901.1	**2.454 ± 0.539 (0.342) C:NA T:NA**	pCi/g	09/27/16 17:21	15262-20-1	
Thallium-208	EPA 901.1	**0.694 ± 0.162 (0.112) C:NA T:NA**	pCi/g	09/27/16 17:21	14913-50-9	
Thorium-232	EPA 901.1	**64.939 ± 60.776 (71.210) C:NA T:NA**	pCi/g	09/27/16 17:21	7440-29-1	
Thorium-234	EPA 901.1	**1.787 ± 2.696 (4.539) C:NA T:NA**	pCi/g	09/27/16 17:21	15065-10-8	
Uranium-234	HSL-300	**1.00 ± 0.234 (0.084) C:NA T:103%**	pCi/g	09/26/16 16:00	13966-29-5	N2
Uranium-235	HSL-300	**0.047 ± 0.050 (0.073) C:NA T:103%**	pCi/g	09/26/16 16:00	15117-96-1	N2
Uranium-238	HSL-300	**0.962 ± 0.226 (0.056) C:NA T:103%**	pCi/g	09/26/16 16:00		N2

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

QUALITY CONTROL - RADIOCHEMISTRY

Project: R1609014
Pace Project No.: 30194602

QC Batch: 232752 Analysis Method: EPA 901.1
QC Batch Method: EPA 901.1 Analysis Description: 901.1 Gamma Spec Ingrowth
Associated Lab Samples: 30194602001

METHOD BLANK: 1140835 Matrix: Solid
Associated Lab Samples: 30194602001

Parameter	Act ± Unc (MDC) Carr Trac	Units	Analyzed	Qualifiers
Actinium-228	0.077 ± 0.217 (0.242) C:NA T:NA	pCi/g	09/28/16 08:23	
Bismuth-212	0.251 ± 0.292 (1.277) C:NA T:NA	pCi/g	09/28/16 08:23	
Bismuth-214	0.067 ± 0.101 (0.188) C:NA T:NA	pCi/g	09/28/16 08:23	
Cesium-134	0.026 ± 0.016 (0.088) C:NA T:NA	pCi/g	09/28/16 08:23	
Cesium-137	0.016 ± 0.049 (0.058) C:NA T:NA	pCi/g	09/28/16 08:23	
Lead-212	0.000 ± 0.015 (0.129) C:NA T:NA	pCi/g	09/28/16 08:23	
Lead-214	0.000 ± 0.067 (0.202) C:NA T:NA	pCi/g	09/28/16 08:23	
Potassium-40	0.214 ± 0.422 (0.731) C:NA T:NA	pCi/g	09/28/16 08:23	
Radium-226	0.067 ± 0.101 (0.188) C:NA T:NA	pCi/g	09/28/16 08:23	
Radium-228	0.077 ± 0.217 (0.242) C:NA T:NA	pCi/g	09/28/16 08:23	
Thallium-208	0.000 ± 0.024 (0.081) C:NA T:NA	pCi/g	09/28/16 08:23	
Thorium-232	16.221 ± 24.822 (31.920) C:NA T:NA	pCi/g	09/28/16 08:23	
Thorium-234	0.441 ± 0.533 (2.481) C:NA T:NA	pCi/g	09/28/16 08:23	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

QUALITY CONTROL - RADIOCHEMISTRY

Project: R1609014
Pace Project No.: 30194602

QC Batch: 234096 Analysis Method: HSL-300
QC Batch Method: HSL-300 Analysis Description: HSL300(AS) Actinides
Associated Lab Samples: 30194602001

METHOD BLANK: 1148019 Matrix: Solid
Associated Lab Samples: 30194602001

Parameter	Act ± Unc (MDC) Carr Trac	Units	Analyzed	Qualifiers
Uranium-234	-0.018 ± 0.042 (0.130) C:NA T:76%	pCi/g	09/26/16 16:00	N2
Uranium-235	0.059 ± 0.058 (0.040) C:NA T:76%	pCi/g	09/26/16 16:00	N2
Uranium-238	0.005 ± 0.042 (0.069) C:NA T:76%	pCi/g	09/26/16 16:00	N2

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

QUALIFIERS

Project: R1609014
Pace Project No.: 30194602

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Act - Activity

Unc - Uncertainty: SDWA = 1.96 sigma count uncertainty, all other matrices = Expanded Uncertainty (95% confidence interval). Gamma Spec = Expanded Uncertainty (95.4% Confidence Interval)

(MDC) - Minimum Detectable Concentration

Trac - Tracer Recovery (%)

Carr - Carrier Recovery (%)

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

ANALYTE QUALIFIERS

N2 The lab does not hold NELAC/TNI accreditation for this parameter.

REPORT OF LABORATORY ANALYSIS

ALS Environmental Chain of Custody

1565 Jefferson Rd, Building 300 • Rochester, NY 14623 • 585-288-5380 • FAX 585-288-8475

ALS Contact: Janice Jaeger

Project Number: R1609014
Project Manager: Janice Jaeger
QAP: LAB QAP

Lab Code	Sample ID	# of Cont.	Matrix	Sample Date	Sample Time	Lab ID	Gamma Spec 901.1	Misc Out ~~1~~ ~~None~~ U-ASTM D5174 KPA
~~R1609014-001~~	PLCSSED-0816	3	Soil	8/24/16	1030	Pace PA	X	X

WO#:30194602

Folder Comments:
Gamma isotope list-Rad 226&228,Actinium 228,Bismuth 212&214,Cesium 134&137,Lead 212&214,Potssium 40,Thallium 208,Torium 232&234

Special Instructions/Comments	Turnaround Requirements	Report Requirements	Invoice Information
excel EDD NPDES H - Test is On Hold P - Test is Authorized for Prep Only	____RUSH (Surcharges Apply) PLEASE CIRCLE WORK DAYS 1 2 3 4 5 X STANDARD Requested FAX Date: _____ Requested Report Date: 09/05/16	____ I. Results Only X II. Results + QC Summaries ____ III. Results + QC and Calibration Summaries ____ IV. Data Validation Report with Raw Data PQL/MDL/J N EDD N	PO# 58R1609014 Bill to

Relinquished By: [signature] 8-24-16 1435 Received By: Karen E. Thiel 8/30/16 0950 Airbill Number: _____

ALS Environmental Chain of Custody

1565 Jefferson Rd, Building 300 • Rochester, NY 14623 • 585-288-5380 • FAX 585-288-8475

ALS Contact: Janice Jaeger

Project Number: R1609014
Project Manager: Janice Jaeger
QAP: LAB QAP

R1609014

30194602

X **Ship To: Pace PA**
Pace Analytical Services
1638 Roseytown Road
Suites 2,3, & 4
Greensburg, PA 15601

PC JMJ Date 8/30/16
SMO _____ Date _____

Instructions:
Ice _____
Dry Ice _____
No Ice _____

Shipping:
Overnight _____
2nd Day _____
Ground _____

Bill to Client Account _____

Comments:

Sample Condition Upon Receipt Pittsburgh

Pace Analytical

Client Name: ALS Project # 30194602

Courier: ☑ Fed Ex ☐ UPS ☐ USPS ☐ Client ☐ Commercial ☐ Pace Other _____

Tracking #: 6826 9015 8178

Custody Seal on Cooler/Box Present: ☑ yes ☐ no Seals intact: ☑ yes ☐ no

Thermometer Used N/A Type of Ice: Wet Blue (None)

Cooler Temperature Observed Temp N/A °C Correction Factor: N/A °C Final Temp: N/A °C

Temp should be above freezing to 6°C

Date and Initials of person examining contents: KH 8/30/16

Comments:	Yes	No	N/A	
Chain of Custody Present:	✓			1.
Chain of Custody Filled Out:	✓			2.
Chain of Custody Relinquished:	✓			3.
Sampler Name & Signature on COC:		✓		4.
Sample Labels match COC: -Includes date/time/ID/Analysis Matrix: SL	✓			5.
Samples Arrived within Hold Time:	✓			6.
Short Hold Time Analysis (<72hr remaining):		✓		7.
Rush Turn Around Time Requested:		✓		8.
Sufficient Volume:	✓			9.
Correct Containers Used:	✓			10.
-Pace Containers Used:		✓		
Containers Intact:	✓			11.
Filtered volume received for Dissolved tests			✓	12.
All containers needing preservation have been checked.			✓	13.
All containers needing preservation are found to be in compliance with EPA recommendation.			✓	
exceptions: VOA, coliform, TOC, O&G, Phenolics				Initial when completed KH / Date/time of preservation
				Lot # of added preservative
Headspace in VOA Vials (>6mm):			✓	14.
Trip Blank Present:			✓	15.
Trip Blank Custody Seals Present			✓	
Rad Aqueous Samples Screened > 0.5 mrem/hr			✓	Initial when completed: KH / Date: 8/30/16

Client Notification/ Resolution:

Person Contacted: _____ Date/Time: _____ Contacted By: _____

Comments/ Resolution: _____

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e. out of hold, incorrect preservative, out of temp, incorrect containers)

***PM review** is documented electronically in LIMS. When the Project Manager closes the SRF Review schedule in LIMS. The review is in the Status section of the Workorder Edit Screen.