

MEMO

To: Peter Britz and Coakley Landfill Group
From: Sue Yerina, Chris Buckman
Re: Proposed Groundwater Sampling Program Revisions
Date: March 23, 2020

On behalf of the Coakley Landfill Group (CLG), CES, Inc. (CES) is hereby submitting proposed revisions to the semi-annual groundwater sampling program. These revisions include a reduction in analysis of some compounds and reduction in sampling frequency for select locations. The CLG currently samples a total of eight surface water, seven sediment, forty-nine groundwater, one landfill seep, and twenty-four private water supply locations to meet requirements of the July 2018 Sampling and Analysis Plan (SAP) prepared by CES and subsequent revisions to the SAP based on email correspondence with United States Environmental Protection Agency (USEPA). The SAP incorporated requirements contained in the New Hampshire Department of Environmental Services (NHDES) Groundwater Management Permit (GMP, GWP-198712001-N-002) and revised Cleanup Levels (CLs) established in the Fifth Explanation of Significant Differences (ESD) dated August 4, 2015.

Environmental monitoring at the Coakley Landfill is separated into two areas, or Operable Units. Operable Unit 1 (OU-1) includes the area in the immediate vicinity of the landfill where source control actions were completed to reduce impacts to surface water and groundwater quality and to eliminate potential threats posed by direct contact with or ingestion of contaminated media at the Site. Operable Unit 2 (OU-2) includes the area beyond the landfill where the objectives are to monitor the natural attenuation of water quality impacts and minimize exposure to potential receptors caused by groundwater and surface water migrating away from the Site.

Long-term monitoring at the Coakley Landfill has been ongoing since the landfill capping was completed in 1998. The long-term monitoring of groundwater, surface water, sediment, and seep quality following landfill capping and Site closure was initially conducted in accordance with the 1999 Environmental Monitoring Plan (EMP). The scope of environmental monitoring activities has since been modified since development of the EMP, with sediment and water quality monitoring (groundwater and residential drinking water) currently performed in accordance with the current agency-approved SAP (CES, 2018).

Surface Water/Sediment Sampling

Surface water and sediment are sampled in part to assess the effectiveness of the cover system in eliminating erosion and transport of impacted sediments, as well as to evaluate potential toxicity to ecological receptors. A total of eight surface water and seven sediment samples are currently collected at locations in accordance with the SAP. Surface water (SW) locations include SW-4, SW-5, SW-103, SW-110, SW-111, SW-LR, SW-BB1, and SW-BB2 and are sampled twice annually (Spring and Fall). Analyses include total metals, volatile organic compounds (VOCs),

per- and polyfluoroalkyl substances (PFAS), 1,4-dioxane, ammonia, and water quality parameters. Sediment (SED) samples are collected at SED-4, SED-5, SED-110, SED-111, SED-LR, SED-BB1, and SED-BB2 and are sampled once annually based on recommendations made in the 2018 Annual Summary Report and approved by USEPA via email correspondence on August 22, 2019. Sediment analyses include total metals, 1,4-dioxane, and PFAS. We propose to revise the current sampling program as follows:

- ◆ Remove VOC analysis from surface water samples.

VOCs have not been reported above the acute or chronic surface water standard for at least the last five years.

OU-1 Wells

The CLG currently samples a total of 11 OU-1 groundwater monitoring wells during Spring and Fall semi-annual events. In accordance with USEPA approval provided in August 2019, OU-1 groundwater monitoring wells are sampled once per year (Spring) for all parameters. These parameters include VOCs, 1,4-dioxane, total and dissolved metals, PFAS, and general water quality field parameters. OU-1 wells sampled during the second semi-annual event (Fall) are analyzed for 1,4-dioxane and PFAS only. In general, parameter concentrations reported for samples collected during the Spring and Fall 2019 sampling event are consistent with historical results. Of the 11 OU-1 wells sampled in 2019, 90% continue to show decreasing trends or stability in most parameters. We propose to revise the current sampling program as follows:

- ◆ Reduce sampling of OU-1 wells to once per year for all parameters outlined in the current SAP as listed above.

There have not been significant increases in concentrations of monitored constituents within OU-1 wells with sufficient information for PFAS (specifically perfluorooctanoic acid [PFOA] and perfluorooctanesulfonic acid [PFOS] combined) and 1,4-dioxane concentrations provided from OU-2 well sampled as outlined below. Only one well (MW-5D) has a reported increasing trend for 1,4-dioxane since Fall 2018. However, recent concentrations for 1,4-dioxane remains below its respective historical high at this location (140 micrograms per liter [ug/L] - Fall 2017). Only one well (MW-9) had a reported historical high for 1,4-dioxane during 2019 with concentrations only slightly higher than those reported in adjacent OU-2 wells (FPC-5A, AE-3A). Remaining OU-1 wells continue to have decreasing or stable trends (**Attachment A**).

Only two wells (BP-4 and MW-11) had historical highs for PFOA/PFOS reported during 2019 with concentrations consistent with those reported in adjacent OU-2 wells. The increase in concentration for PFOA/PFOS for MW-11 was approximately 100 ng/L since 2017 while the concentration of PFOA/PFOS combined in BP-4 (76.7 nanograms per liter [ng/L]) is only slightly above the USEPA Health Advisory (HA) and NHDES Ambient Groundwater Quality Standard (AGQS) of 70 ng/L. MW-10 has shown fluctuations in concentrations of PFOS/PFOA combined, as illustrated in the time-series plots included as **Attachment A**, with MW-8 and MW-11 exhibiting visual increasing trends since monitoring began in 2016. Remaining OU-1 wells continue to have decreasing or stable trends in concentrations for PFOS/PFOA combined.

Two wells (MW-5D and MW-8) have reported concentrations of tert-butyl alcohol (TBA) above the regulatory standard (40 ug/L) but have shown a general stable trend in concentration since 2010 with periodic fluctuations in 2014 and 2019 (**Attachment A**).

OU-2 Wells

OU-2 groundwater monitoring wells are currently sampled twice annually. As of Fall 2019, the CLG currently samples a total of 38 OU-2 groundwater monitoring wells. This includes the 27 wells sampled as per the current SAP, with the addition of FPC-2A/-2B in the Fall 2019 and the installation and sampling of nine new overburden/bedrock well couplets (MW-20S/-D1/-D2, MW-21S/-D1/-D2, MW-22S/-D1/-D2). In accordance with USEPA approval, OU-2 groundwater monitoring wells have been sampled once per year (Spring) for VOCs, 1,4-dioxane, total and dissolved metals, PFAS, and general water quality field parameters. OU-2 wells sampled during the second semi-annual event (Fall) are currently analyzed for 1,4-dioxane and PFAS only. We propose to revise the current sampling program as follows:

- ◆ Sample only OU-2 wells located at the perimeter of the GMZ (e.g. MW-20/-21/-22, FPC-2/-3/-4/-7/-9/-11 series wells, AE-1A/-1B, AE-4A/-4B). These wells will be sampled during the Fall event and sampled for PFAS, 1,4-dioxane, and water quality parameters only.
- ◆ Continue to monitor FPC-2A/2B at the south end of the GMZ.

There have not been significant increases in concentrations of monitored constituents in wells proposed to be sampled once per year. Reported concentrations of 1,4-dioxane and PFOA/PFOS in several wells proposed for reduced sampling frequency have been reported above the applicable standard; however, only PFAS in FPC-6A is reported at a historical high (211.3 ng/L PFOS/PFOA combined) in 2019. The reported concentrations for PFAS in FPC-6A are consistent with those reported in MW-21S (237.1 ng/L PFOS/PFOA combined), located down gradient from MW-21S, and remains on the list to be sampled twice per year.

Private Supply Wells

A total of 24 offsite private water supply wells are sampled as part of the current groundwater monitoring program. On September 1, 2018, the NHDES AGQS for 1,4-dioxane was lowered from 3.0 micrograms per liter (ug/L) to 0.32 ug/L, resulting in two private water supply wells (339 and 368 Breakfast Hill Road) to exceed the new AGQS. Although these exceedances were not due to a change in conditions at the Site and concentrations have remained relatively stable since monitoring began, the CLG installed water treatment systems at both locations in November 2018. Subsequent testing has shown that the treatment systems are effective in reducing 1,4-dioxane concentrations to below the AGQS. Information related to the treatment systems and test results have been provided to USEPA and NHDES in separate submittals.

Sampling of private supply wells remains in accordance with the current SAP, with sampling analysis reduced to include PFAS, 1,4-dioxane, and general water quality field parameters during Fall 2019. Due to being in closer proximity to the Coakley Landfill, 14 Pinewood Circle (14PWC) was added to the sampling program in the Fall of 2019 and 67 Ridgecrest Drive (67RCD) was removed. 14 PWC is approximately 800 feet closer to the Landfill than 67RCD. We propose to revise the current sampling program as follows:

- ◆ Develop a schedule that will sample half of the private supply wells every six months. The alternating groups of wells will be selected to provide an approximately equal spatial distribution among the existing wells currently being sampled as part of the program. This will result in one sample being collected at each property during the year with the exception of R-3 (368 Breakfast Hill Road) and the Breakfast Hill Golf Club (339 Breakfast Hill Road) well. These locations will continue to be sampled twice annually due to AGQS exceedances of 1,4-dioxane as discussed above.

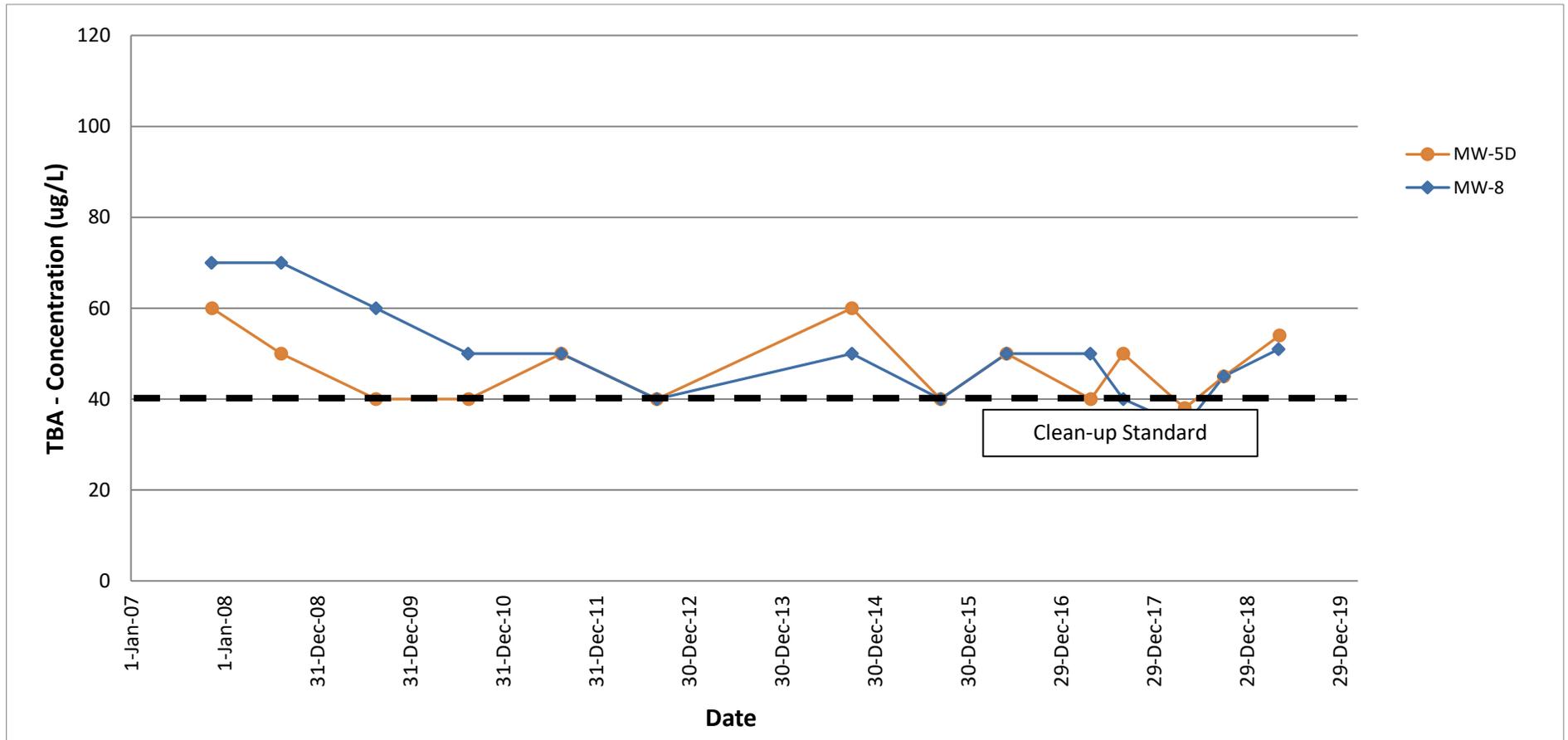
By maintaining an equal spatial distribution of locations, sampling half of the properties every six months provides an opportunity to assess changes in overall contaminant distribution and water quality every six months.

Consistent with previous sampling events and historical data, 1,4-dioxane was not detected above the AGQS in 21 of the 24 private water supply wells sampled in 2019. Concentrations of 1,4-dioxane continue to be stable below the AGQS in these 21 wells. Detections of 1,4-dioxane were also reported in off-site well located at 178A Lafayette Road (178ALR) at a concentration of 0.182 ug/L during Fall 2019, below the AGQS.

Although very low concentrations of PFOA, PFOS, and/or PFOA/PFOA combined were detected in one or more private supply wells in 2019, there were no exceedances of the USEPA Health Advisory (HA) or NHDES AGQS for PFOA, PFOS, or PFOA/PFOS combined in any of the private supply wells sampled in 2019. This is consistent with results since sampling and analysis for PFAS began in May 2016. The number of private well locations sampled has increased from four locations in 2016 to 24 locations in 2019. PFAS analytical results from the two rounds of sampling completed in 2019 along with analytical results for 1,4-dioxane, arsenic and manganese are consistent with results from 2018, and demonstrate plume stability with no evidence of plume expansion near private supply wells.

ATTACHMENT A
TIME SERIES PLOTS

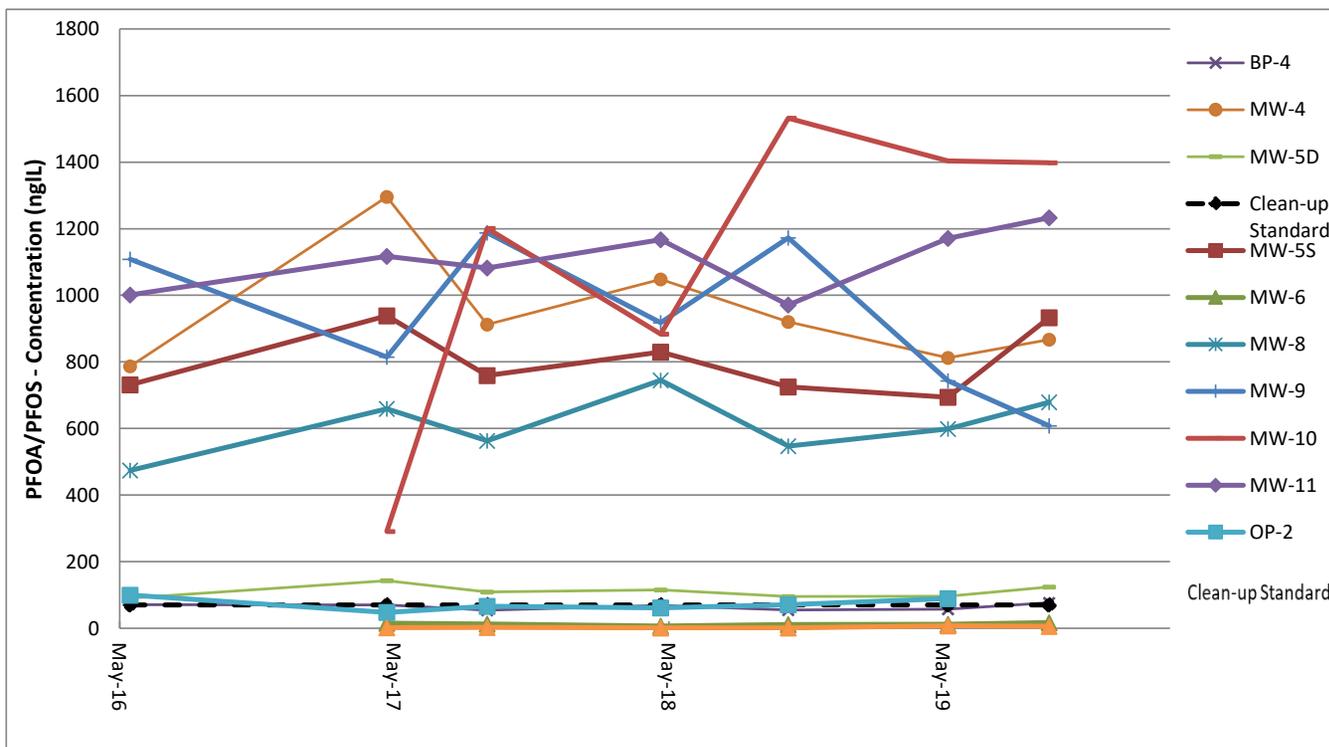
**Time vs Concentration Graphs - Tertiary-butyl Alcohol (TBA)
2019 Bi-Annual Report
Coakley Landfill - North Hampton, New Hampshire**



NOTES:

1. Clean-up Standard for Tertiary-butyl Alcohol (TBA) is 40 ug/L.
2. Since 2006, TBA has been reported at groundwater sampling points MW-5D and MW-8, only.

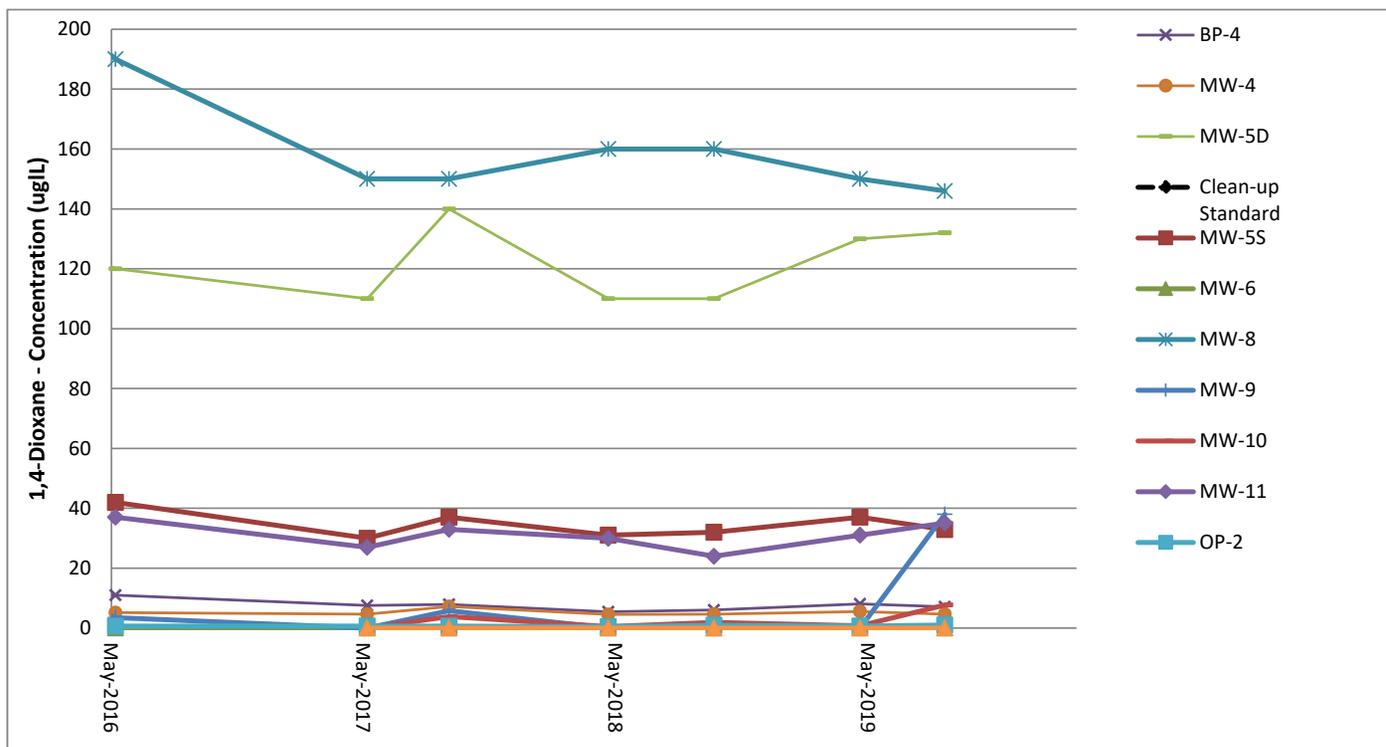
**Time Series Plots - PFOA/PFOS Combined in OU-1 Wells
2019 Bi-Annual Report
Coakley Landfill - North Hampton, New Hampshire**



NOTES:

1. USEPA Health Advisory (HA) and NHDES Ambient Groundwater Quality Standard (AGQS) for PFOA/PFOS Combined is 70 ng/L.
2. Non-Detects are plotted at zero.
3. In instances where primary and duplicate samples were collected, the higher value is plotted.

**Time Series Plots - 1,4-Dioxane in OU-1 Wells
2019 Bi-Annual Report
Coakley Landfill - North Hampton, New Hampshire**



NOTES:

1. NHDES Ambient Groundwater Quality Standard (AGQS) for 1,4-dioxane is 0.32 ug/L.
2. Non-Detects are plotted at zero.
3. In instances where primary and duplicate samples were collected, the higher value is plotted.