NHDES' REQUEST FOR ADDITIONAL BACKGROUND INFORMATION

Based on our November 29, 2018 telephone call with Jamie O'Rourke and Paul Rydel, we understand NHDES is requesting future tri-annual monitoring reports provide supplemental context for analyte concentrations which indicate exceedances of sitewide background values. Specifically, in cases where one or more analytes at a groundwater monitoring location may indicate concentrations exceeding background values/ranges, NHDES has requested information be provided which documents screening performed to evaluate the potential for a "release" from the lined landfill pursuant to the Env-Or 700 regulations.

As discussed in Appendix A.1, given the NCES Landfill has a long history of site operation, including the former unlined landfill which indicates residual impacts to groundwater quality, comparison of groundwater quality results from historically impacted locations to a single sitewide background value from generally upgradient locations is not necessarily a representative comparison for the purposes of release detection (as specified by the Env-Or 700 rules). Comparison to sitewide background conditions as described herein is a conservative approach to screen for the potential of a release from the lined facility. For example, the generally reducing conditions in groundwater within the GMZ has resulted in a long period of record at multiple locations indicating elevated concentrations of naturally-occurring metals (typically iron, arsenic, and manganese). In this case, the detection of elevated metals alone at groundwater monitoring wells in or near the GMZ does not indicate a release from the facility, but rather residual effects from historical conditions. Similarly, groundwater conditions are anticipated to vary naturally over time and along flow paths, which may lead to differences between upgradient and downgradient groundwater concentrations/conditions.

Because comparison to sitewide background values should not be used as a strict evaluation of a release from the lined facility, NHDES has requested additional context for individual analyte results at the monitoring wells. Pursuant to NHDES' request, we have taken the following actions to refine data evaluation:

- Revised the presentation of the historical groundwater and surface water quality data to include revised graphical presentations (refer to trend plots in Appendices C.1 and C.3). These trend plots indicate concentrations or values over time and will be used to supplement the data summary tables to aid in identifying if analytes have "well-specific" concentrations, or ranges of concentrations, that if exceeded may indicate a release.

- Developed criteria that may be used to aid identification of potential releases from the lined facility (summarized in Exhibit 5 below). Based on our understanding of site hydrogeology and contaminant behavior in the subsurface, we believe that a release from the lined facility could be identified using multiple lines of evidence. Specifically, a hypothetical release from the lined facility could be identified based on one or more of the conditions indicated in the table below.

Exhibit 5
Summary of Criteria Used for Identifying Potential Releases from the Lined Landfill

Anticipated Release Condition		Rationale
1A	Repeatable or persistent concentrations of analytes of interest over multiple sampling events above sitewide background concentrations. Repeat sampling has historically been performed at the site to confirm anomalous results.	Material releases from the facility would likely result from an on-going condition (i.e., one that persists unless/until corrected [e.g., liner defect, pipe break, landfill gas leakage]), and therefore include persistent detection of multiple analytes. "Isolated" or single analyte detections, if detected and confirmed by the laboratory, would be considered representative of a transient condition, rather than indicative of an on-going release.
1B	Consistent or increasing concentrations of analytes of interest.	Similar to 1A, material releases from the facility would likely result from an on-going condition. An on-going release would be anticipated to have associated consistent or increasing concentrations. Absent a consistent or increasing trend, the condition would likely be considered transient.
2	Multiple analytes of interest detected.	If released, material from the lined facility is anticipated to have a broad range of analytes detected. If single analytes are detected above sitewide background concentrations, an evaluation would be made regarding the potential source (e.g., leachate, landfill gas). For example, if VOCs were not detected but other indicator parameters were, leachate and landfill gas would not typically be suspected as a potential source as VOCs would be anticipated to be detected in a release from the lined facility.
3	Potentially (but not necessarily) identifiable in more than one monitoring location consistent with proximity to the landfill.	Based on inferred transport in groundwater, a material release from the lined facility may be detected in multiple monitoring locations. If analyte(s) of interest were detected, surrounding monitoring locations would be reviewed to evaluate if the condition is identified.
4	Operational observations substantiating a potential for release	The routine inspection and monitoring of the landfill is performed to identify conditions that may be indicative of a release. If analyte(s) of interest were detected, additional review of site operations/infrastructure would be performed to evaluate if the condition was related to a known or suspected release event (e.g., leachate breakout, broken leachate forcemain, landfill gas migration).

This list is not intended to address every possible hypothetical release from the lined facility, but rather serve as a basis for preliminary screening of data from the facility to supplement the existing Permit monitoring and reporting. This screening will focus on analytes in groundwater detected at concentrations above sitewide background concentrations.

We are in the process of reviewing the site information to further develop additional context for sitewide background exceedances. The approach will consider a number of aspects/ characteristics of the site, such as:

- The presence of the former unlined landfill, within the GMZ, which represents a residual "legacy" impact relative to redox conditions and groundwater quality;
- The multiple phases of lined landfill construction over the site's history;
- Operational modifications and historical corrective actions (e.g., leachate management improvement project); and
- Other historical site "milestones" (earthwork, stormwater management, infrastructure updates, etc.) that may be relevant to site environmental monitoring.

In early 2019, we propose to meet with NHDES to discuss our proposed approach and format for documenting in future tri-annual reports. We will contact you to arrange a date and time for the meeting.

CONCLUSIONS

As described herein, the overall results for the November 2018 monitoring round are generally consistent with the findings from recent monitoring rounds and the conceptual model of hydrogeologic conditions at the Site, including comparison to site background conditions as identified at the upgradient monitoring wells. Monitoring results will continue to be tracked as indicated above. The next tri-annual water quality sampling event is planned to be performed in April 2019.

We trust that this report satisfies NHDES' requirements for November 2018 water quality monitoring and reporting under the Permit.

Very truly yours,
SANBORN, HEAD & ASSOCIATES, INC.

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Encl.

Table 1 – Summary of Background Groundwater Exceedances – November 2018

Figure 1 – Site Features Plan

Appendix A – Summary of Background Groundwater Conditions
A.1 – Site Background Groundwater Quality Time-Series Plots
Appendix B – Summary of Historical Monitoring Data
B.1 – Groundwater Elevations

B.2 – Groundwater Analytical Results
B.3 – Surface Water Analytical Results
Appendix C – Time-Series Plots
C.1 – Groundwater Analytical Results (Field and Indicator Parameters, VOCs)
Background Wells
Release Detection Wells Outside the GMZ
Release Detection Wells Inside the GMZ
Groundwater Management Wells Inside the GMZ
C.2 – Groundwater Analytical Results (PFAS)
C.3 – Surface Water Analytical Results
Appendix D – Sanborn Head Field Sampling Summary Forms
Appendix E – EAI Analytical Data Reports

cc: w/Appendices: Mr. Joe Gay, NCES
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Town of Bethlehem

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