

**DES Waste Management Division
29 Hazen Drive; PO Box 95
Concord, NH 03302-0095**

**Response to NHDES'
March 23, 2020 Letter
North Country Environmental Services, Inc.
(NCES) Landfill
Bethlehem, New Hampshire**

**NHDES Site #: 198704033
Project Type: Water Quality Monitoring
Project Number: 1737**

Prepared For:
North Country Environmental Services, Inc. (NCES)
Trudeau Road, P.O. Box 9
Bethlehem, New Hampshire 03574-0009
Phone Number (603) 869-3366
RP Contact Name: Mr. Joe Gay
RP Contact Email: John.Gay@casella.com

Prepared By:
Sanborn, Head & Associates, Inc.
20 Foundry Street
Concord, New Hampshire 03301
Phone Number: (603) 229-1900
Contact Name: Timothy M. White, P.G.
Contact Email: twhite@sanbornhead.com

Date of Report: April 7, 2020

Mr. James W. O'Rourke, P.G.
New Hampshire Department of Environmental Services
Waste Management Division
29 Hazen Drive, P.O. Box 95
Concord, New Hampshire 03302-0095

April 7, 2020
File No. 1003.17

Re: Response to NHDES' March 23, 2020 Letter
Groundwater Management and Release Detection Permit GWP-198704033-B-007
North Country Environmental Services, Inc. (NCES) Landfill
Bethlehem, New Hampshire

Dear Mr. O'Rourke:

On behalf of NCES, Sanborn, Head & Associates, Inc. (Sanborn Head) is submitting this response to the Department's March 23, 2020 letter¹ requiring a Supplemental Site Investigation with additional monitoring locations to be installed near monitoring well B-304UR. For reference, B-304UR is located within the Groundwater Management Zone (GMZ) and is shown on the attached figure (Figure 1 from the November 2019 Water Quality Monitoring Results report²). B-304UR has a deeper monitoring well (B-304DR) installed nearby. These wells are referred to collectively herein as "the B-304 wells", or the "B-304 couplet".

BACKGROUND

B-304 Monitoring History

Monitoring for 1,4-dioxane at B-304UR has been on-going since March 2009. In response to correspondence from NHDES, investigation of 1,4-dioxane at B-304UR has been underway since February 2019. The timeline of recent correspondence between NHDES and NCES regarding the B-304 wells is summarized below:

- The November 2018 Water Quality Monitoring Results report³ indicated that 1,4-dioxane was detected at a concentration of 0.71 microgram per liter ($\mu\text{g}/\text{l}$) at monitoring well B-304UR; and although above the recently-revised AQGS⁴, was consistent with the recent

¹ March 23, 2020 Letter from Mr. James O'Rourke (NHDES) to Mr. John Gay (NCES): "November 2019 Water Quality Monitoring Results North Country Environmental Services, Inc., prepared by Sanborn, Head & Associates, Inc., and dated December 20, 2019"; and "January 2020 Assessment Monitoring Results, prepared by Sanborn, Head & Associates, Inc., and dated February 19, 2020".

² November 2019 Water Quality Monitoring Results North Country Environmental Services, Inc., prepared by Sanborn, Head & Associates, Inc., and dated December 20, 2019.

³ November 2018 Water Quality Monitoring Results, prepared by Sanborn, Head & Associates, Inc., and dated January 4, 2019.

⁴ The New Hampshire Chapter of Administrative Rules, Env-Or 600 was revised on September 1, 2018 (approximately 2 months prior to sampling at B-304UR) and included the lowering of the AGQS for 1,4-dioxane to 0.32 $\mu\text{g}/\text{L}$, down from 3.0 $\mu\text{g}/\text{L}$.

prior detections at B-304UR. 1,4-Dioxane had sporadically been detected at B-304UR at concentrations between the reporting limit (<0.25 µg/l) and 0.85 µg/l, beginning in April 2014.

- Based on the November 2018 results, NHDES issued a February 7, 2019 letter⁵ indicating that:

“Concentrations of 1,4-dioxane in the groundwater samples collected from monitoring wells B-304UR should continue to be tracked carefully by SHA. If an increasing trend of 1,4-dioxane is noted at B-304UR or other monitoring location within the GMZ, then an expanded explanation and evaluation of the monitoring network should be provided.”

- On behalf of NCES, Sanborn Head prepared a February 28, 2019 response letter⁶ to NHDES’ comments, which stated:

“Consistent with requirements of the Groundwater Management and Release Detection Permit, the groundwater sample from B-304UR will be analyzed for 1,4-dioxane as part of the April 2019 sampling event, currently scheduled for the week of April 22. The 1,4-dioxane concentration at B-304UR, as well as at other site sampling locations, will be evaluated as indicated in NHDES’ comment.”

- The 1,4-dioxane concentration at B-304UR in April 2019 was discussed in Sanborn Head’s April 2019 Report⁷, which stated:

“B-304UR: 1,4-Dioxane was detected at B-304UR (located within the GMZ) at 1.8 µg/l, above the GW-1/AGQS of 0.32 µg/l and higher than the previous maximum concentration (0.85 µg/l recorded in April 2018). The bromide, chloride, nitrate, and 1,4-dioxane data suggest the residual impacts of a surficial leachate release (generally oxidizing environment based on presence of nitrate, but not TKN) where metals and other VOCs do not indicate elevated concentrations, but more mobile analytes that are generally unaffected by volatilization, adsorption, and degradation are present at low, but above background concentrations. Results from nearby wells indicate these impacts are limited to the B-304U/B-304DR area.

B-304DR: 1,4-Dioxane was detected at B-304DR (located within the GMZ) at 0.27 µg/l in the duplicate sample (0.25 µg/l in the primary sample). We note B-304DR has some similarities to B-304UR for some of the mobile analytes (chloride, 1,4-dioxane) discussed above.

Regarding the 1,4-dioxane concentration at B-304UR, consistent with NHDES’ February 7, 2019 letter, NCES is in the process of reviewing the monitoring network and historical

⁵ February 7, 2019 Letter from Mr. Jamie O’Rourke (NHDES) to Mr. John Gay (NCES): “November 2018 Water Quality Monitoring Results, prepared by Sanborn, Head & Associates, Inc., and dated January 4, 2019.”

⁶ February 28, 2019 Letter Mr. Tim White (Sanborn Head) to Mr. Jamie O’Rourke (NHDES) “Response to NHDES’ February 7, 2019 Letter”, prepared by Sanborn, Head & Associates, Inc., and dated February 28, 2019.

⁷ April 2019 Water Quality Monitoring Results, prepared by Sanborn, Head & Associates, Inc., and dated June 7, 2019.

activities inside the GMZ. The potential for impacts from historical leachate infrastructure upgradient of the B-304UR/B-304DR location is being evaluated. The bromide, chloride, nitrate, and 1,4-dioxane data at B-304UR suggest the residual impacts of a surficial leachate release (generally oxidizing environment based on presence of nitrate, but not TKN) where metals and other VOCs do not indicate elevated concentrations, but more mobile analytes that are generally unaffected by volatilization, adsorption, and degradation are present at low, but above background concentrations. Results from nearby wells indicate these impacts are limited to the B-304U/B-304DR area. Once we have the information compiled, we will contact NHDES regarding our findings and proposed next steps.”

- On behalf of NCES, on June 26, 2019, Sanborn Head transmitted a Work Plan⁸ to NHDES to provide a technical scope of services which included decommissioning an unused piezometer, and documentation of the removal of unused subsurface infrastructure associated with the former landfill gas (LFG) flare in the area north of Detention Pond No. 4. The work plan stated:

“Pursuant to NHDES’ request in the February 7, 2019 letter, we have performed an expanded evaluation of the monitoring network in the vicinity of the B-304UR/B-304DR monitoring wells. As part of this evaluation, NCES identified two items that may influence groundwater quality at B-304UR/B-304DR:

- 1. The presence of unused piezometer B-304; and*
- 2. Historical subsurface infrastructure related to the former landfill gas flare.*

As indicated on the site plan in Attachment 2, piezometer B-304 is located north of Stormwater Pond No. 4. We understand piezometer B-304 was installed as a couplet piezometer (two ¾-inch PVC pipes installed to a total depth of 74.7 feet below ground surface) in 1986 as part of a network of piezometers to record groundwater levels at the site; the log for B-304 is provided as Attachment 3. The other piezometers installed at the same time as B-304 (i.e., B-301, B-302, B-303, B-305, B-306, B-307, and B-308) have been decommissioned previously. B-304 is the only piezometer from this era known to remain at the site. The B-304UR/B-304DR couplet was installed in February 2006 to obtain groundwater quality samples in this area of the site. Because piezometer B-304 has not been used in many years, it is proposed for decommissioning to eliminate a potential connection between vertical intervals.

As part of review of historical information in the same general area as piezometer B-304, NCES identified unused infrastructure that was associated with the former LFG flare (refer to site plan in Attachment 2 for location), which consisted of piping that was disconnected when the LFG flare was decommissioned in 2010. In June 2019 as part of modifications to stormwater detention pond No. 4, NCES removed this piping, which was the last of the

⁸ Work Plan for Monitoring Well Redevelopment, Piezometer Decommissioning, and Subsurface Infrastructure Removal Documentation, prepared by Sanborn, Head & Associates, Inc., and dated June 26, 2019.

remaining subsurface infrastructure associated with the LFG flare. Our work plan includes a task to document the work performed by NCES.”

- In summer 2019, following the earthwork performed by NCES as part of the modifications to Stormwater Pond No. 4, and decommissioning of the B-304 piezometer observed by Sanborn Head, Sanborn Head included a summary update in the July 2019/2019 Annual Report⁹, which indicated the following:

“As summarized below, pursuant to Sanborn Head’s June 26, 2019 Work Plan, NCES performed earthwork in the vicinity of Stormwater Pond 4, including removal of historical subsurface infrastructure related to the former landfill gas flare. In addition, unused piezometer B-304 was decommissioned.

B-304UR/B-304DR are scheduled to be sampled next for VOCs in November 2019, at which time we will review the 1,4-dioxane results with comparison to previous results from these wells in light of the activities discussed below.”

- In an October 21, 2019¹⁰, NHDES issued the following comment regarding the B-304 wells:

“Concentrations of 1,4-dioxane in the groundwater samples collected from monitoring wells B-304UR and B-304DR should be revaluated following the November 2019 Permit monitoring round. The results should be transmitted to NHDES as part of the November 2019, due in January 2020, and include an evaluation of the results and any associated recommendations.”

- In the November 2019 Report, Sanborn Head reported a summary of results for B-304UR (5.4 µg/l; 6.9 µg/l in a follow-up sample) and B-304DR (1.0 µg/l; 1.4 µg/l in a follow-up sample), including the following:

“Concentrations of 1,4-dioxane, bromide, and chloride in November 2019 were the highest recorded at B-304UR and B-304DR. The manganese concentration at B-304DR in November 2019 was also slightly elevated above its period of record maximum concentration.

B-304UR and B-304DR were re-sampled on November 22 for 1,4-dioxane, bromide, and chloride to confirm the early November results. The results of re-sampling were generally slightly higher than the results from earlier in the month. A summary of these results is provided below in Exhibit 5.

Notably, VOCs including 1,4-dioxane were not detected at monitoring wells (e.g., MW-802, MW-803, B-919 U/M) upgradient from and closer to the landfill than the B-304UR and B-

⁹ July 2019 Tri-Annual/2019 Annual Water Quality Monitoring Results, prepared by Sanborn, Head & Associates, Inc., and dated August 22, 2019.

¹⁰ October 21, 2019 Letter from Mr. James O’Rourke (NHDES) to Mr. John Gay (NCES): “July 2019 Tri-Annual/2019 Annual Water Quality Monitoring Results, prepared by Sanborn, Head & Associates, Inc., and dated August 22, 2019”; and “August 2019 PFAS Groundwater Results Data Transmittal, prepared by Sanborn, Head & Associates, Inc., and dated September 3, 2019”.

304DR couplet, consistent with a relatively localized, residual source of 1,4-dioxane, bromide, and chloride in soil near B-304UR/B-304DR. The result of elevated concentrations of these three analytes is inferred to be related to residual mass present in the soil in the area modified as part of the stormwater pond expansion in summer 2019. The excavation/stormwater management activities are inferred to have resulted in increased infiltration, and hence elevated concentrations of soluble and conservative constituents, such as 1,4-dioxane, bromide, and chloride detected at B-304UR/B-304DR. Although not a period of record maximum, the nitrate concentration at B-304UR in November 2019 (3.4 mg/l) was the highest at this location since April 2017 (5.9 mg/l).

We note previous phases of earthwork at the site have resulted in relatively short-lived increases in VOCs, bromide, and chloride in groundwater at downgradient locations. Manganese, although generally less soluble than 1,4-dioxane, bromide, and chloride, may also have been mobilized due to the earthwork, and hence resulted in its concentration being elevated above previous results.

The concentrations of 1,4-dioxane, chloride, bromide, and manganese will continue to be closely tracked at B-304UR and B-304DR and nearby monitoring locations.”

Adequacy of Seep Monitoring Network

NHDES’ March 23, 2020 letter states the following:

“The increase in 1,4-dioxane concentrations at B-304UR, along with the lowering of the 1,4-dioxane Ambient Groundwater Quality Standard (AGQS), has caused B-304UR to no longer be adequate to monitor the downgradient extent of the 1,4-dioxane impact.”; and

“We note that 1,4-dioxane has not been detected at the further-downgradient seep locations since the pond work was completed; as such it appears that the observed 1,4-dioxane impact is constrained to within the site Groundwater Management Zone (GMZ). However, the existing network of seep monitoring locations does not appear adequate to fully monitor the extent of the 1,4-dioxane plume downgradient from B-304UR, and one or more similarly-constructed additional monitoring wells installed downgradient of this area appears warranted”.

The Department’s conclusion that the seep monitoring network is not adequate to monitor groundwater impacts downgradient [north] of the monitoring well network is inconsistent with the role the seeps have played over the 25- to 35-year period (depending upon seep location) of historical monitoring performed at the site. As described in the September 1, 1995 Delineation of Groundwater Management Zone Report¹¹, the seep network was used to delineate the northern extent of the GMZ along the hillslope above the Ammonoosuc River. The GMZ was approved by NHDES in the January 3, 1996 Groundwater Management and Release Detection Permit¹², and the GMZ has been regulated by NHDES since that time.

¹¹ Delineation of Groundwater Management Zone, prepared by Sanborn, Head & Associates, Inc., and dated September 1, 1995.

¹² GWP-198704033-B-002, issued by NHDES on January 3, 1996.

The hillslope north of the B-304 wells serves to limit the extent of groundwater in overburden downgradient of these wells, and results in the groundwater discharging as “seeps”. As indicated in NHDES’ comment above, 1,4-dioxane has not been detected at these seep locations since the pond work was completed. As summarized most recently in Appendix B.3 of the November 2019 report, 1,4-dioxane has not been detected in any of the downgradient seep or surface water samples with the exception of three low-level detections below the AGQS at SF-1 in November/December 2016 and April 2017. This record of surface water results demonstrates that the potential area of 1,4-dioxane impacts is relatively small, and well defined based on the existing network. Furthermore and importantly, we note that this entire area is within the GMZ, is controlled by NCES, and has no human receptors.

DISCUSSION

As NHDES notes in the March 23, 2020 comment letter, the 1,4-dioxane concentrations at the B-304 wells do not represent a new impact from landfill operations. Rather, the 1,4-dioxane detections are related to activities that are part of an on-going investigation initiated in response to NHDES’ request for additional information regarding groundwater impacts at the B-304 wells.

The source of 1,4-dioxane in the B-304 wells is understood to be localized to the area of former landfill infrastructure upgradient of the B-304 couplet. Soil disturbance in the area upgradient of the B-304 wells in summer 2019 related to earthwork to remove unused landfill infrastructure resulted in increases in 1,4-dioxane concentrations at the B-304 wells. Based on previous investigations performed at the site, increasing VOC concentrations following earth disturbance are generally short-lived, and the recent increases at the B-304 couplet are consistent with a transient “slug” of contamination. Accordingly, we think that it is premature to draw any conclusions about the broader scope of monitoring at the site.

For the following reasons, we believe the appropriate next step based on the site data is continued 1,4-dioxane monitoring at the B-304 wells and nearby locations, including the downgradient seeps:

- The 1,4-dioxane source has been reasonably identified, is limited in extent, and is understood to be within the GMZ;
- There are no human groundwater receptors between the B-304 wells and the discharge location(s) along the hillslope.
- The recent increases in 1,4-dioxane are understood to be related to the nearby earth disturbance in summer 2019; and
- The transient nature of such conditions in site groundwater based on previous monitoring at the site.

The next round of site monitoring is planned for April 2020. As part of the April site monitoring, we propose to collect VOC (including 1,4-dioxane) data from the B-304 wells,

the Main Seep (S-1), and surface flow (SF-1) as indicated in the Groundwater Management and Release Detection Permit¹³. In addition, we propose to collect samples for 1,4-dioxane analysis from the other seep locations: S-101, S-108, and S-109.

CLOSING

Based on the above data and discussion, on behalf of NCES, we respectfully request that NHDES suspend the requirement for preparation of a Supplemental Site Investigation, including installation of additional monitoring locations near B-304UR, until additional data are collected from B-304UR, B-304DR, and the seeps as part of the Permit monitoring, and the trend in 1,4-dioxane concentrations can be further evaluated.

We request an opportunity to discuss this matter with the Department. Given the current social distancing requirements related to COVID-19, we suggest a conference call.

We look forward to an opportunity to discuss this matter with you.

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



Timothy M. White, P.G.
Project Director

TMW/CAC: tmw

Enclosure: Figure 1 - Site Plan from November 2019 Water Quality Monitoring Results Report

cc: Mr. Joe Gay, NCES
Mr. Kevin Roy, NCES
Town of Bethlehem

P:\1000s\1003.17\Source Files\B-304UR\20200407_B304_ltr.docx

¹³ GWP-198704033-B-007 (the "Permit"), issued by NHDES on April 12, 2018, revised on October 19, 2018.

For Reference: Figure 1 - Site Plan from November 2019 Water Quality Monitoring Results Report

File: P:\2600s\2637.06\Graphics Files\CAD\2019 Nov Rpt\NovRpt\Figures_2019.dwg Plot Date: 12-9-19

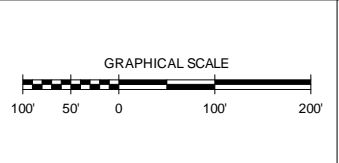
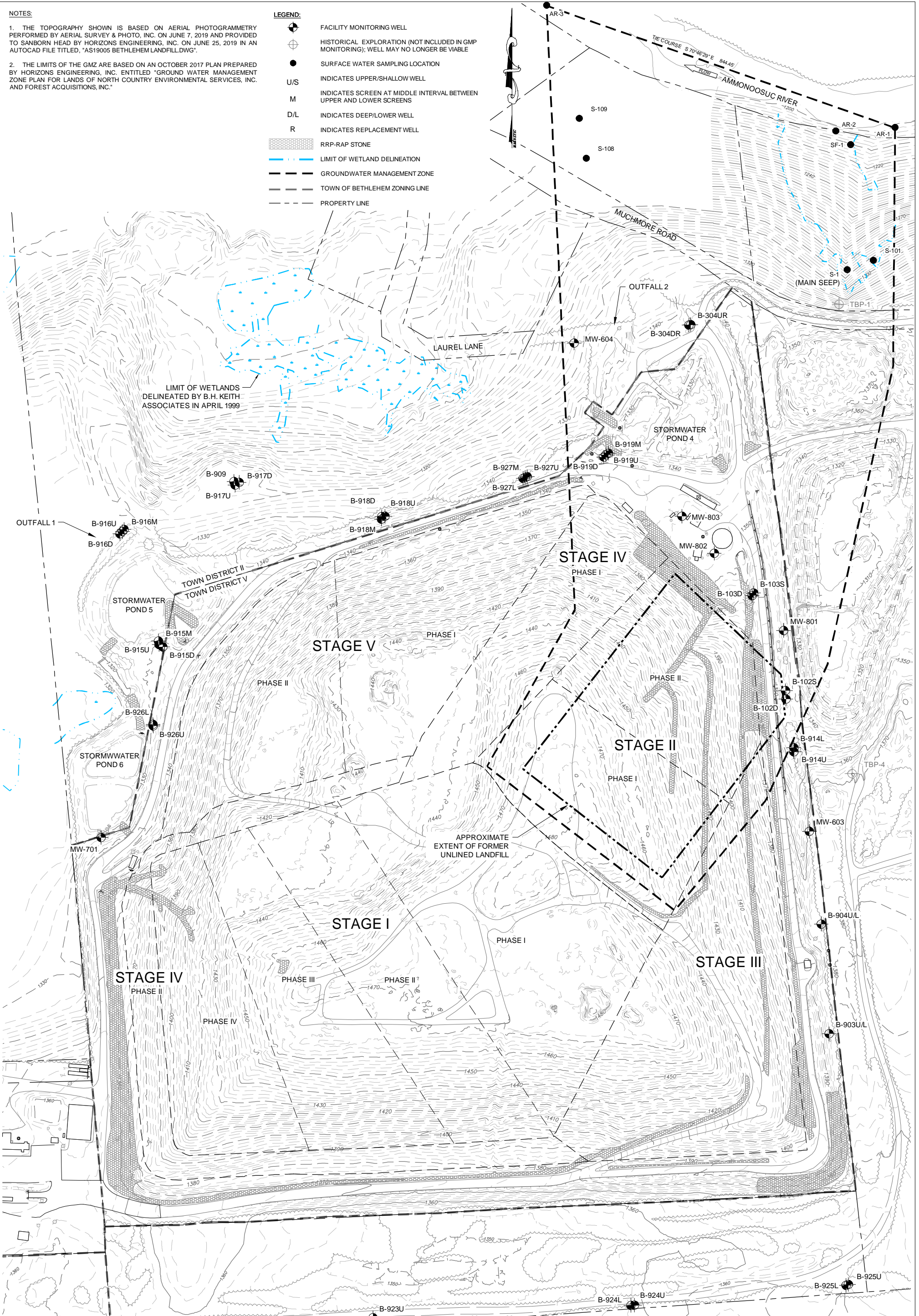
©2019 SANBORN, HEAD & ASSOCIATES, INC.

NOTES:

1. THE TOPOGRAPHY SHOWN IS BASED ON AERIAL PHOTOGRAMMETRY PERFORMED BY AERIAL SURVEY & PHOTO, INC. ON JUNE 7, 2019 AND PROVIDED TO SANBORN HEAD BY HORIZONS ENGINEERING, INC. ON JUNE 25, 2019 IN AN AUTOCAD FILE TITLED, "AS19005 BETHLEHEM LANDFILL.DWG".
2. THE LIMITS OF THE GMZ ARE BASED ON AN OCTOBER 2017 PLAN PREPARED BY HORIZONS ENGINEERING, INC. ENTITLED "GROUND WATER MANAGEMENT ZONE PLAN FOR LANDS OF NORTH COUNTRY ENVIRONMENTAL SERVICES, INC. AND FOREST ACQUISITIONS, INC."

LEGEND:

- FACILITY MONITORING WELL
- HISTORICAL EXPLORATION (NOT INCLUDED IN GMP MONITORING); WELL MAY NO LONGER BE VIABLE
- SURFACE WATER SAMPLING LOCATION
- U/S INDICATES UPPER/SHALLOW WELL
- M INDICATES SCREEN AT MIDDLE INTERVAL BETWEEN UPPER AND LOWER SCREENS
- D/L INDICATES DEEP/LOWER WELL
- R INDICATES REPLACEMENT WELL
- RRP-RAP STONE
- LIMIT OF WETLAND DELINEATION
- GROUNDWATER MANAGEMENT ZONE
- TOWN OF BETHLEHEM ZONING LINE
- PROPERTY LINE



DRAWN BY: E. WRIGHT
 DESIGNED BY: T. WHITE
 REVIEWED BY: C. CROCKETT
 PROJECT MGR: T. WHITE
 PIC: C. CROCKETT
 DATE: DEC 2019

NORTH COUNTRY ENVIRONMENTAL SERVICES, INC.
 BETHLEHEM, NEW HAMPSHIRE

SITE FEATURES PLAN

PROJECT NUMBER:
 2637.06

FIGURE NUMBER:
 1