
MEMORANDUM

TO: Joe Gay, Kevin Roy, NCES

FROM: Robert Grillo, P.E., CMA Engineers, Inc.

RE: NCES – 2019 Annual Facility Report
Remaining Capacity
Bethlehem, New Hampshire
CMA #665

DATE: 09/15/2020

This memorandum provides calculations determining the volume remaining at the NCES Landfill on December 31, 2019 for the Annual Facility Report. We wrote this memorandum to provide information requested by NHDES in a letter dated September 1, 2020 including:

- Plan(s) showing the surveyed footprint of the landfill, surveyed surface topography, and permitted final grades, stamped by the qualified licensed professional(s) that performed the survey and prepared the plan(s).
- Calculations for determining remaining capacity, showing the method and assumptions, submitted under cover of the qualified licensed professional who performed the work.

Topographic Surfaces - Aerial Survey & Ground Surveys:

Topographic surfaces used to calculate the volume remaining include a site aerial survey performed on June 7, 2019 by Aerial Survey and Photo, Inc. with ground control provided by Horizons Engineering, Inc., and two ground surveys performed within the active filling areas by Horizons Engineering, Inc on October 1, 2019 and January 7, 2020. Figures displaying each of these surveys, stamped by the appropriate surveyor, are enclosed.

CMA Engineers created a composite topographic surface using these three survey plans, shown on Drawing 1. Starting with the aerial survey of the entire landfill flown on June 7, 2019, we inserted and tied in the October 1, 2019 ground survey of the area filled since the June 7 to create a single topographic surface for the October date. Next, we inserted and tied in the January 7, 2020 survey to create an “end of year” waste surface for use in calculating remaining capacity.

Volume Remaining Calculations

The end of year waste surface was compared to a top of waste grading plan to calculate volume remaining. The top of waste grading plan is shown on Drawing 2. The top of waste plan was based on the Stage V Closure Plan lowered by the thickness of the landfill final cover with side slopes steepened from 3H:1V to 2.7H:1V to account for pre-settlement waste grades. Areas excluded from these volume calculations are the Eastern and Western slope final capped areas and the northern facing Stage V side slope which is already or nearly filled to capacity. It is not practical to fill side slope areas with thin layers of available air space, so available capacity on the north slope was ignored in the calculation. Areas included in the calculation are within the orange dashed line on Drawing 3.

The capacity calculation also conservatively ignored any waste settlement (gained capacity) that would have occurred in unfilled areas since the June aerial survey.

The volume remaining values were calculated by comparing the end of year waste topography surface to the top of waste grades using the Volume Analysis tools within Autodesk Civil 3D. The resulting 323,040 cubic yards capacity is shown on attached Drawing 3. This value represents capacity remaining on January 7, 2020 when the ground survey was conducted. To determine capacity on December 31, 2019, waste disposed at the site between January 1 and 7, 2020 was added to the calculated capacity, as described in the attached volume remaining calculation. We relied on scale receipt data provided by NCES for that period and converted weighed tonnage to cubic yards using a factor of 0.80 tons per cubic yard. With this adjustment, capacity remaining at the end of 2019 is 331,056 cubic yards, or approximately 331,000 as reported.

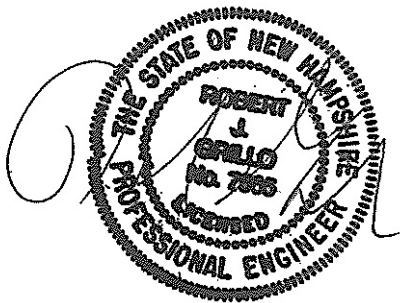
Enclosed:

Horizons Engineering, Inc.

- Survey – June 7, 2019 Aerial Survey
- Survey – October 1, 2019 Ground Survey
- Survey – January 7, 2020 Ground Survey

CMA Engineers, Inc.

- Drawing 1 – Topography on January 7, 2020
- Drawing 2 – Top of Waste Closure Grades
- Drawing 3 – January 7, 2020 Site Survey Volume Remaining
- Volume Remaining Calculation – December 31, 2019





TOPOGRAPHIC PLAN OF THE
TRUDEAU ROAD LANDFILL
BETHLEHEM, NEW HAMPSHIRE
FOR
HORIZONS ENGINEERING

PREPARED BY: AERIAL SURVEY & PHOTO, INC.
NORRIDGEWOCK, MAINE

100 50 0 100 200 300 400 500 FEET

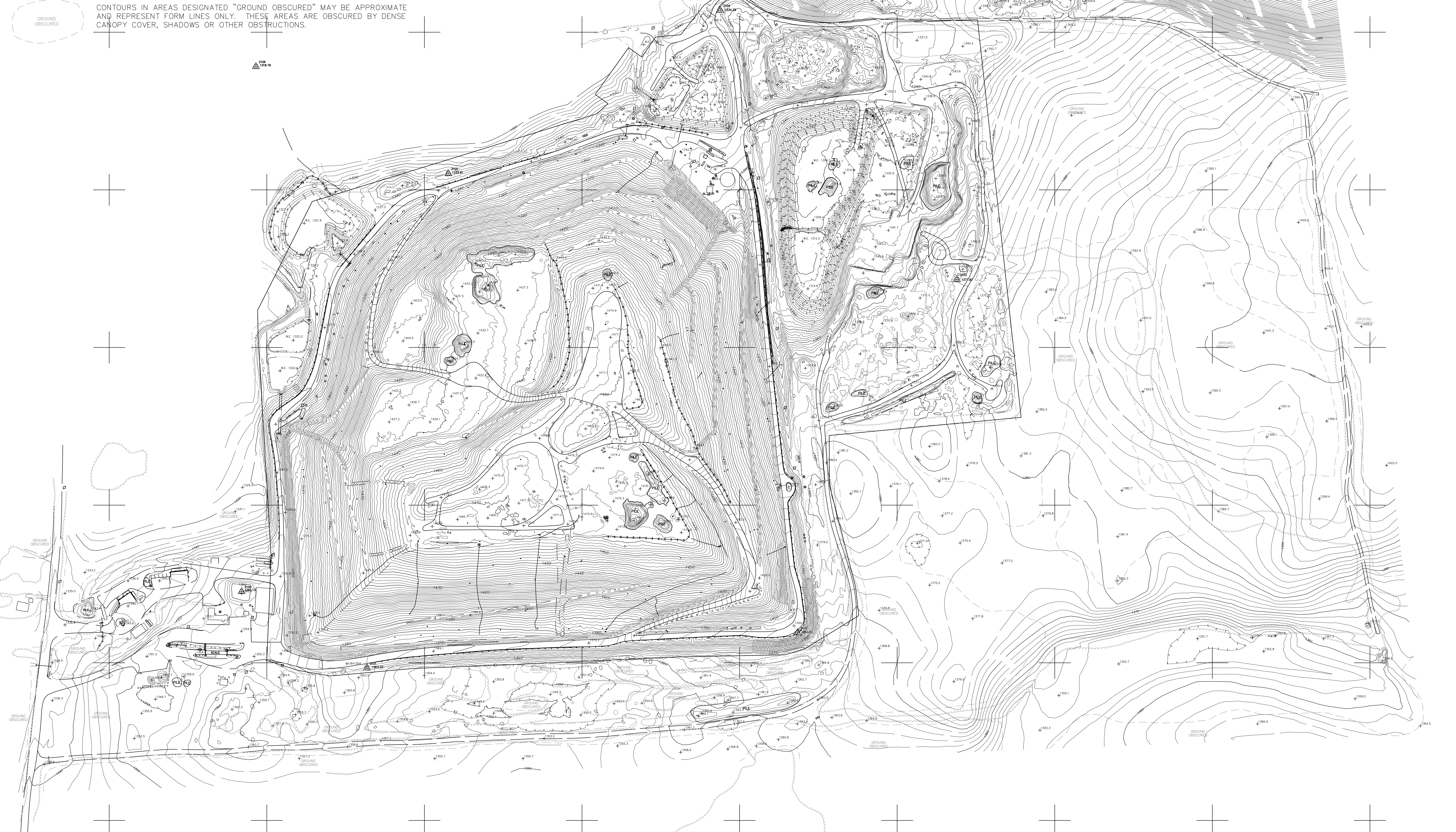
COMPILATION SCALE: 1"=100' CONTOUR INTERVAL: 2' DATE OF PHOTOGRAPHY: 06-07-2019

GROUND CONTROL BY: HORIZONS ENGINEERING, LITTLETON, NEW HAMPSHIRE PROJECT NO. AS19005

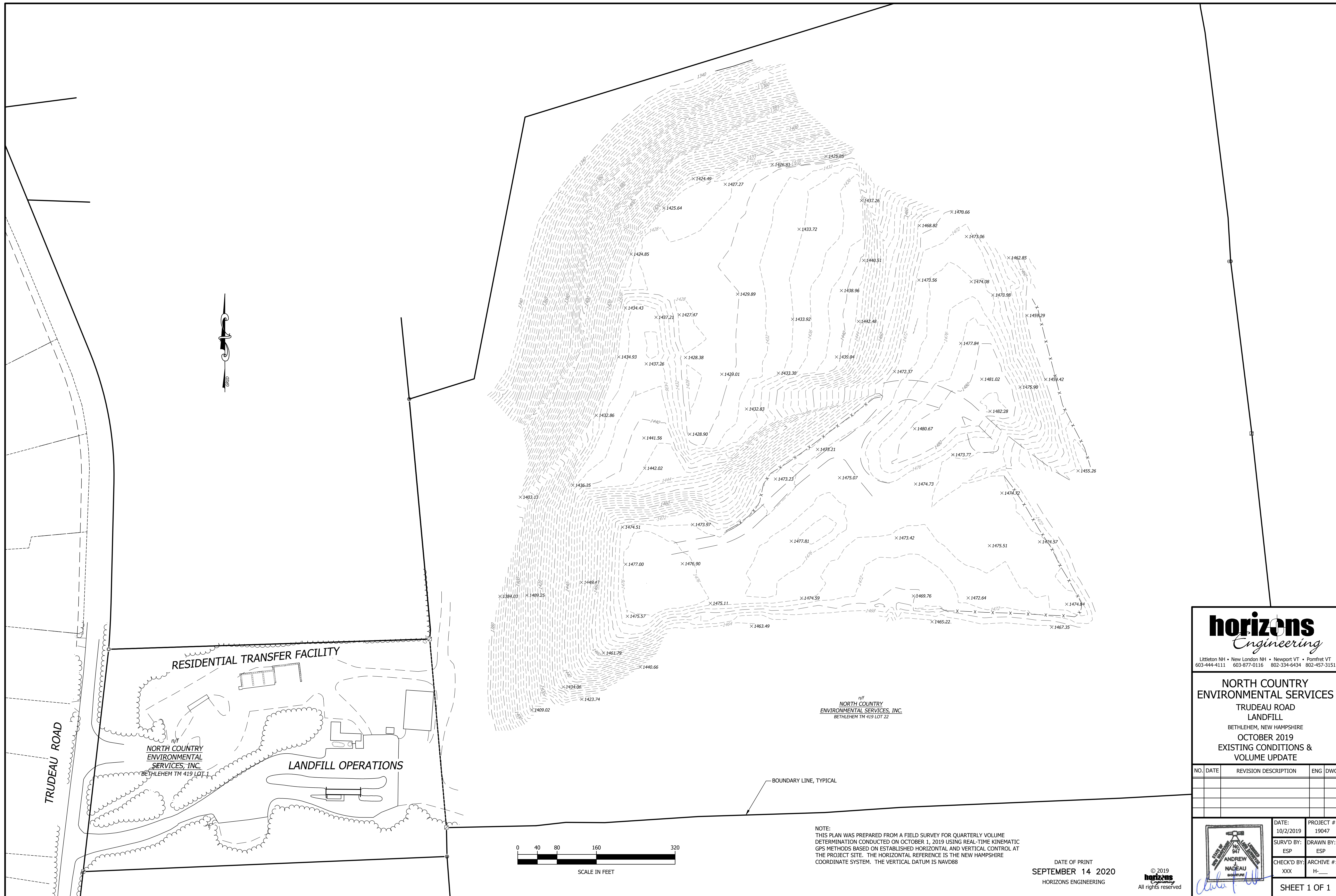
HORIZONTAL DATUM: NEW HAMPSHIRE STATE PLANE COORDINATES, NAD 83 VERTICAL DATUM: N.A.V.D. 1988

DATE MAPPING COMPLETED: 06-20-2019

CONTOURS IN AREAS DESIGNATED "GROUND OBSCURED" MAY BE APPROXIMATE AND REPRESENT FORM LINES ONLY. THESE AREAS ARE OBSCURED BY DENSE CANOPY COVER, SHADOWS OR OTHER OBSTRUCTIONS.



WA19047 NCEES - Bethlehem.DWG-TO-FRQ-2019-1002 to Kevin/2019-1001 Volume_Topo with boundary.dwg, 2019-1001 Volume_9/14/2020 10:36:43 AM, K.Phillbrick



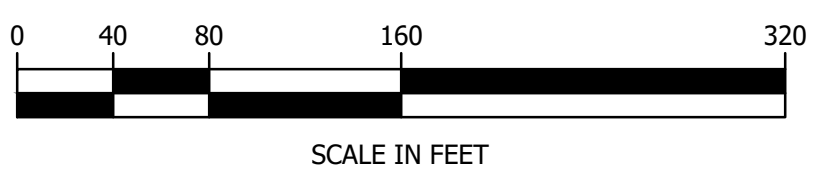
RESIDENTIAL TRANSFER FACILITY

n/c
NORTH COUNTRY
ENVIRONMENTAL
SERVICES, INC.
BETHLEHEM TM 419 LOT 1

LANDFILL OPERATIONS

n/c
NORTH COUNTRY
ENVIRONMENTAL SERVICES, INC.
BETHLEHEM TM 419 LOT 22

BOUNDARY LINE, TYPICAL



NOTE:
THIS PLAN WAS PREPARED FROM A FIELD SURVEY FOR QUARTERLY VOLUME DETERMINATION CONDUCTED ON OCTOBER 1, 2019 USING REAL-TIME KINEMATIC GPS METHODS BASED ON ESTABLISHED HORIZONTAL AND VERTICAL CONTROL AT THE PROJECT SITE. THE HORIZONTAL REFERENCE IS THE NEW HAMPSHIRE COORDINATE SYSTEM. THE VERTICAL DATUM IS NAVD88

DATE OF PRINT
SEPTEMBER 14 2020
HORIZONS ENGINEERING

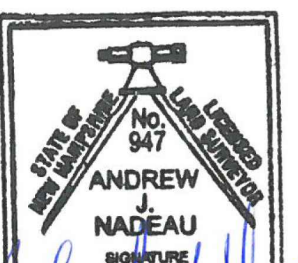
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**NORTH COUNTRY
ENVIRONMENTAL SERVICES**
TRUDEAU ROAD
LANDFILL
BETHLEHEM, NEW HAMPSHIRE
OCTOBER 2019
EXISTING CONDITIONS &
VOLUME UPDATE

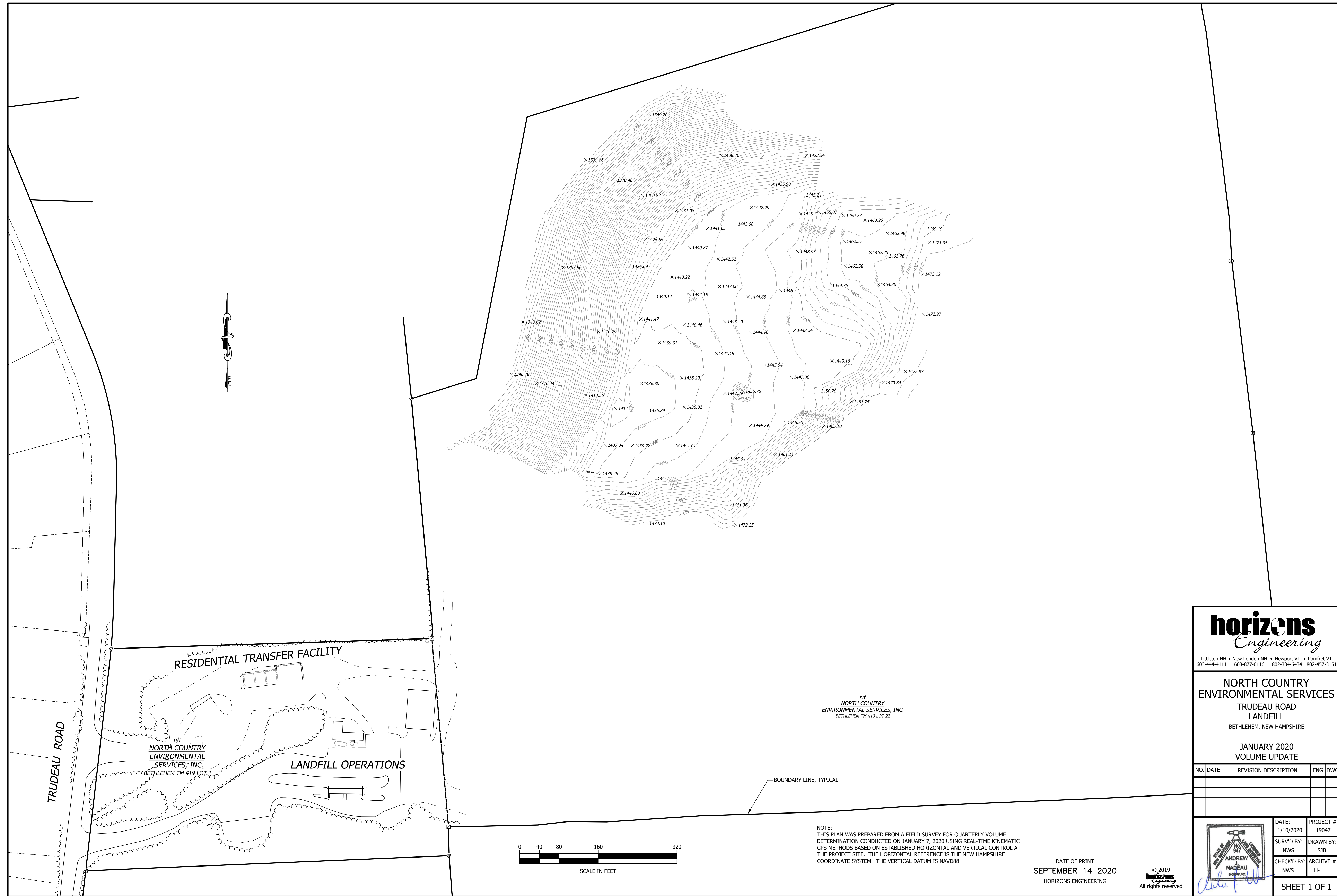
NO.	DATE	REVISION DESCRIPTION	ENG	DWG



DATE:	PROJECT #:
10/2/2019	19047
SURV'D BY:	DRAWN BY:
ESP	ESP
CHECK'D BY:	ARCHIVE #:
XXX	H-___

SHEET 1 OF 1

W:\19047 NCEES - Bethlehem\DWG-TO-FRQ\2020-0109 VOLUME\2019-0110 Volume_Top with boundary.dwg, 2019-1001 Volume, 9/14/2020 10:49:11 AM, K. Philbrick



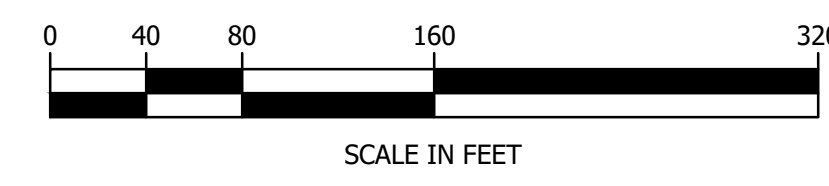
RESIDENTIAL TRANSFER FACILITY

n/f
NORTH COUNTRY
ENVIRONMENTAL
SERVICES, INC.
BETHLEHEM TM 419 LOT 1

LANDFILL OPERATIONS

n/f
NORTH COUNTRY
ENVIRONMENTAL SERVICES, INC.
BETHLEHEM TM 419 LOT 22

BOUNDARY LINE, TYPICAL



NOTE:
THIS PLAN WAS PREPARED FROM A FIELD SURVEY FOR QUARTERLY VOLUME DETERMINATION CONDUCTED ON JANUARY 7, 2020 USING REAL-TIME KINEMATIC GPS METHODS BASED ON ESTABLISHED HORIZONTAL AND VERTICAL CONTROL AT THE PROJECT SITE. THE HORIZONTAL REFERENCE IS THE NEW HAMPSHIRE COORDINATE SYSTEM. THE VERTICAL DATUM IS NAVD88

DATE OF PRINT
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**NORTH COUNTRY
ENVIRONMENTAL SERVICES**
TRUDEAU ROAD
LANDFILL
BETHLEHEM, NEW HAMPSHIRE

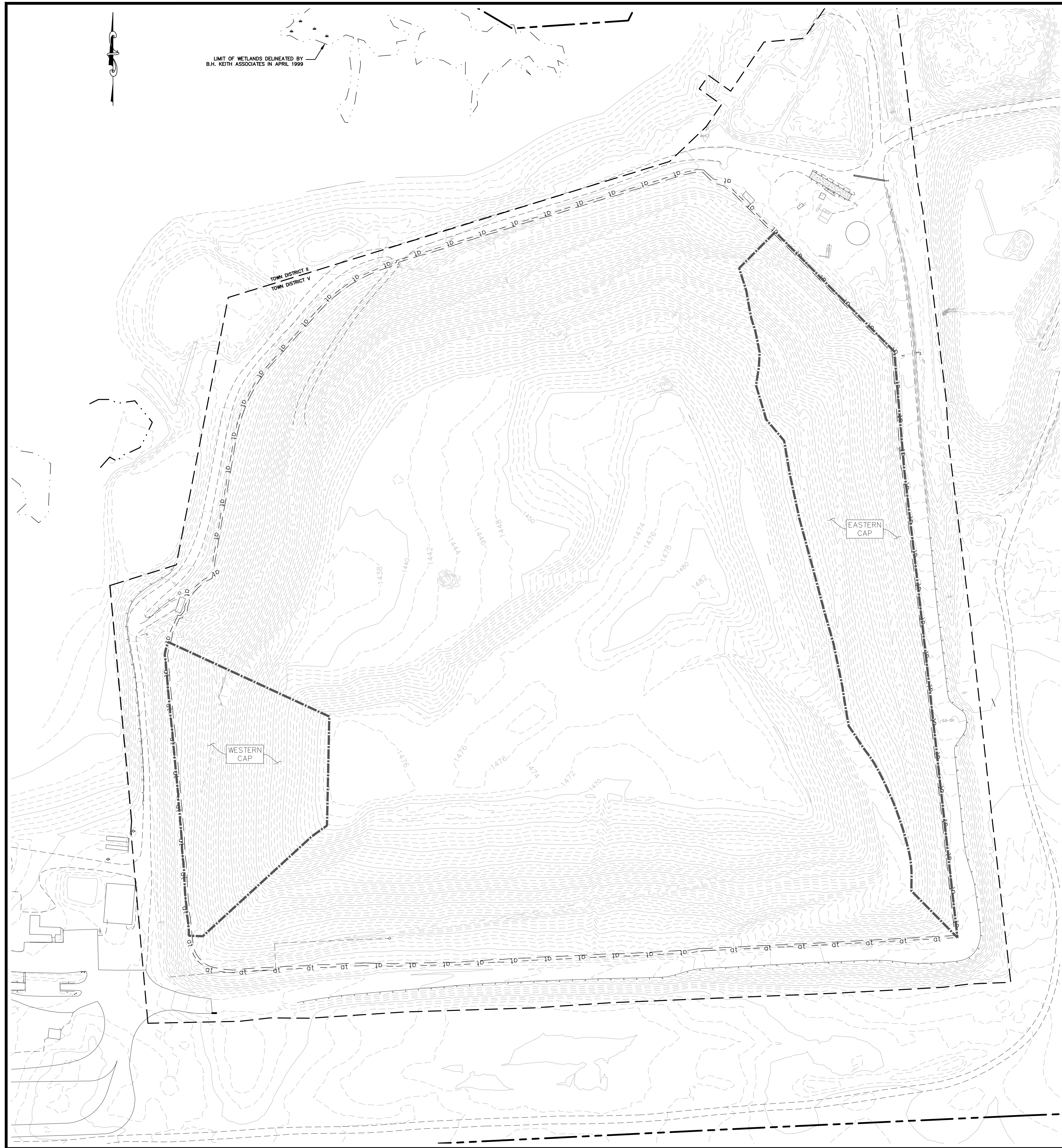
**JANUARY 2020
VOLUME UPDATE**

NO.	DATE	REVISION DESCRIPTION	ENG	DWG

DATE: 1/10/2020
SURV'D BY: NWS
CHECK'D BY: NWS
PROJECT #: 19047
DRAWN BY: SJB
ARCHIVE #: H-
SHEET 1 OF 1

ANDREW NADEAU
SIGNATURE

DATE: 1/10/2020
PROJECT #: 19047
DRAWN BY: SJB
ARCHIVE #: H-
SHEET 1 OF 1



Notes:

- Existing topography surface is developed from aerial photography performed by Aerial Survey and Photo, Inc. on June 7, 2019 combined with site surveys performed by Horizons Engineering, Inc on October 1, 2019 and January 7, 2020.

Legend:

- January 7, 2020 2' Contour
- January 7, 2020 10' Contour
- Approximate Property Line
- Limit of Landfill District V Zone
- Anchor Trench

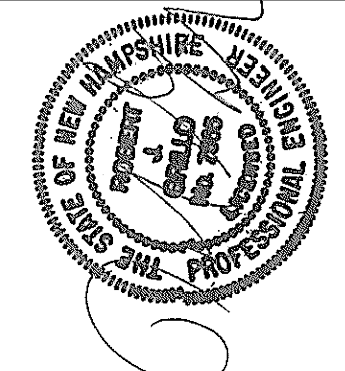
<p>North Country Environmental Services Bethlehem New Hampshire</p>		<p>designed by: R/J</p>	<p>date: September 2020</p>
<p>2019 AFR Volume Remaining</p>		<p>drawn by: ATR</p>	<p>project no: 665</p>
<p>Topography on January 7, 2020</p>		<p>approved by:</p>	<p>file name:</p>
<p>drawing no. 1</p>		<p>scale: 1" = 100' 2" = 200'</p>	
<p>sheet: 1 of 3</p>		<p>no. revision by date</p>	

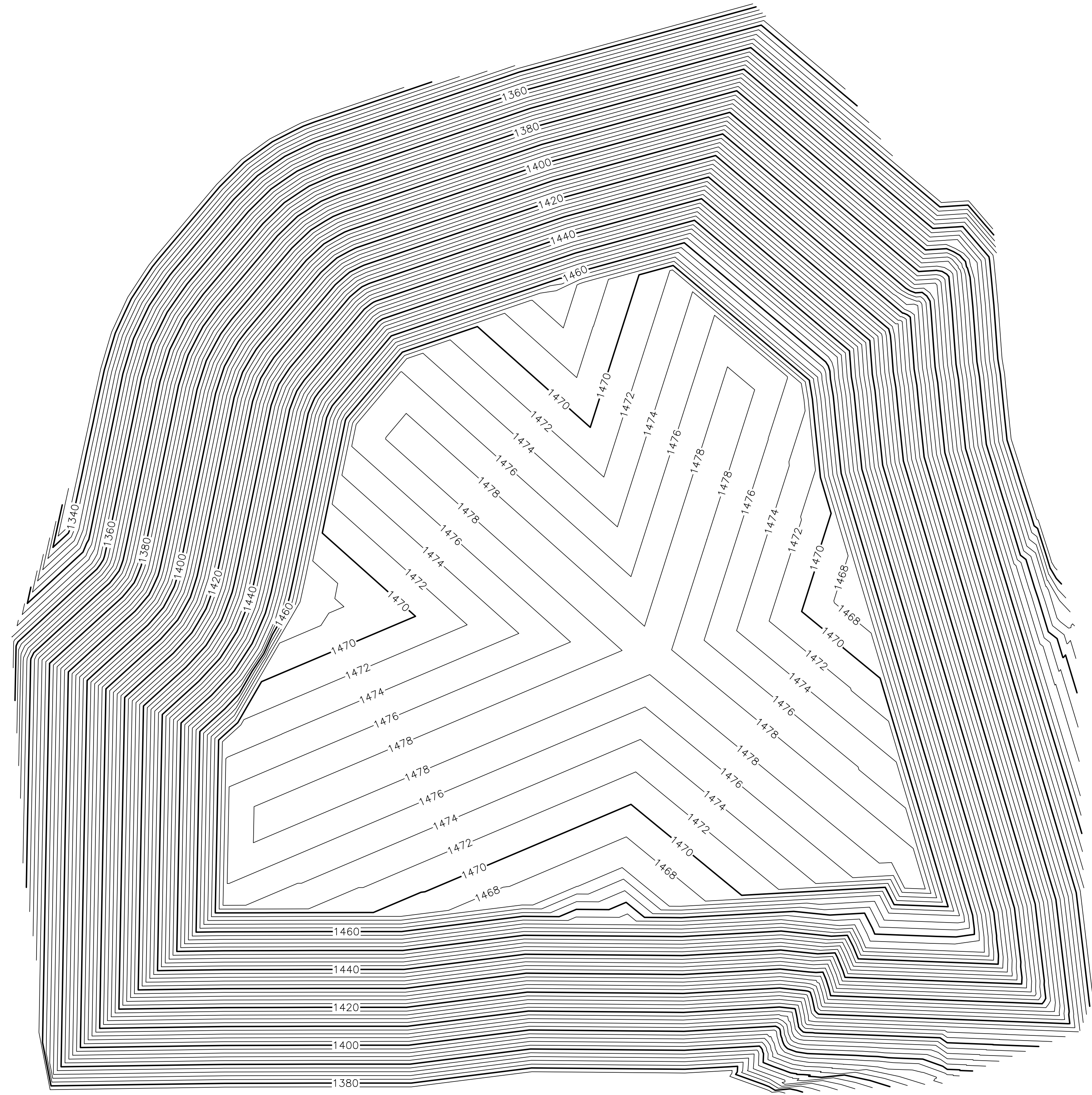
CMA ENGINEERS

CIVIL/ENVIRONMENTAL/STRUCTURAL

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603/431-6196 • 603/627-0708 • 207/541-4223

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Notes:

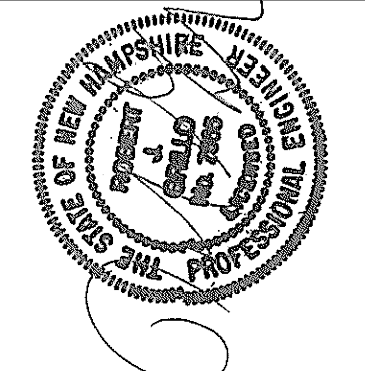
- 1. Surface shown is top of waste grades from the closure plan, with side slopes steepened from 3:1 to 2.7:1 pre-settled waste grades.

Legend:

- _____ Top of Waste Closure 2' Contour
- 1440————— Top of Waste Closure 10' Contour

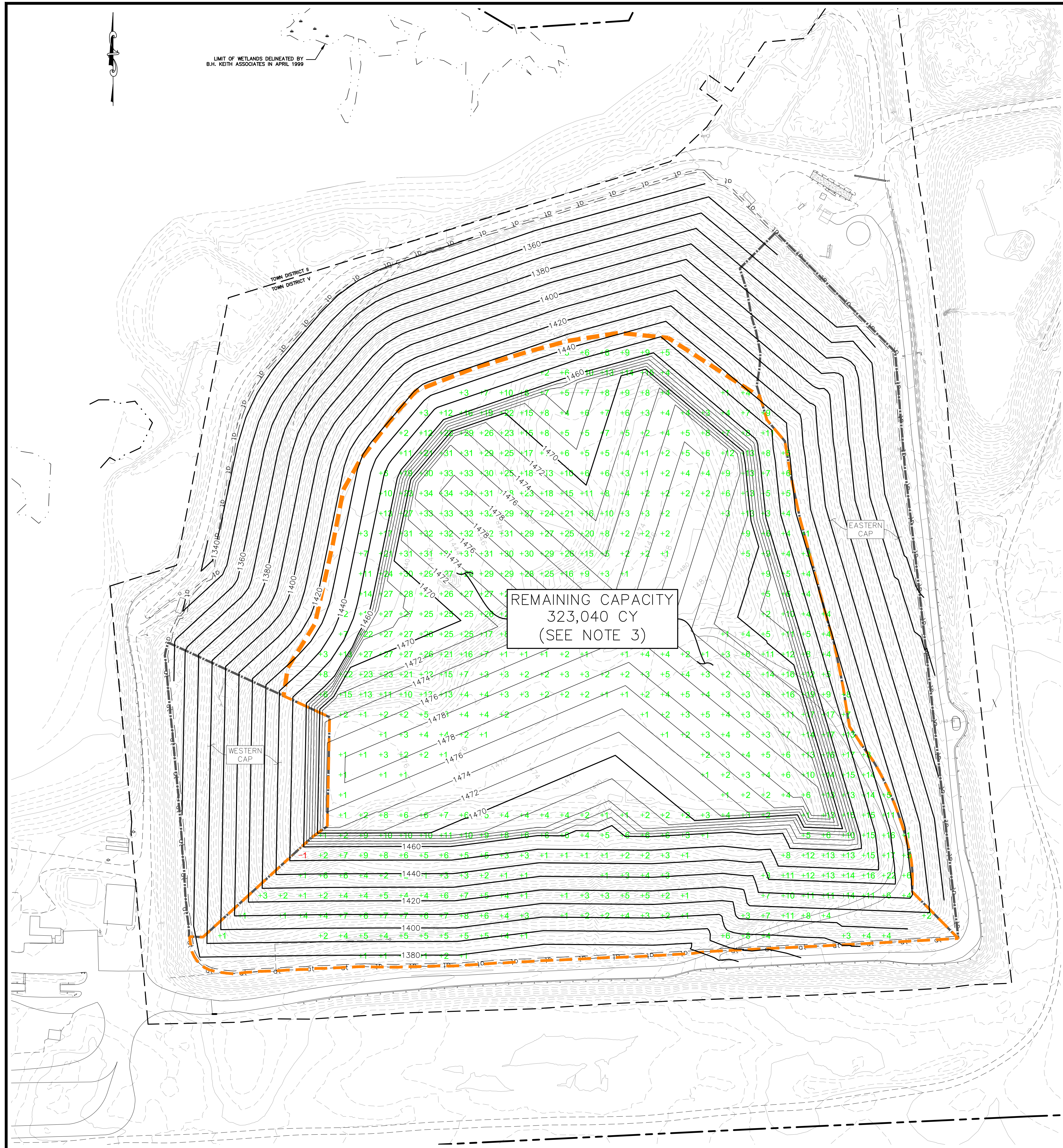
no.	revision	date	by

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date:	September 2020	designed by:	RIG	scale:	100'	20'
project no:	665	drawn by:	ATR	Scale: 1" = 100'	0	
file name:		approved by:				

North Country Environmental Services
Bethlehem New Hampshire
2019 AFR
Volume Remaining
Top of Waste Closure Grades



LIMIT OF WETLANDS DELINEATED BY
B.H. KEITH ASSOCIATES IN APRIL 1999

Notes:

1. Upper surface is top of waste grades from the closure plan, with side slopes steepened from 3:1 to 2.7:1 pre-settled waste grades.
2. Lower surface developed from aerial photography performed by Aerial Survey and Photo, Inc. on June 7, 2019 combined with site surveys performed by Horizons Engineering, Inc on October 1, 2019 and January 7, 2020.
3. The volume calculation is based on a comparison of the above surfaces. Remaining capacity was calculated using the Volume Analysis tool within Autodesk AutoCAD Civil 3D. Areas excluded from the analysis include the Stage V northern facing side slopes and the Eastern and Western final capped areas.

Legend:

- January 7, 2020 2' Contour
- January 7, 2020 10' Contour
- Top of Waste Closure 2' Contour
- Top of Waste Closure 10' Contour
- Approximate Property Line
- Limit of Landfill District V Zone
- Anchor Trench
- Volume Boundary
- Spot Remaining Fill Thickness

CIVIL/ENVIRONMENTAL/STRUCTURAL Portsmouth, NH • Manchester, NH • Portland, ME 603/431-6196 • 603/627-0708 • 207/541-4223 cmaengineers.com	
date: September 2020 project no: 665 file name: designed by: RIG drawn by: ATR approved by:	scale: 1" = 100' 200'
North Country Environmental Services Bethlehem New Hampshire 2019 AFR Volume Remaining January 9, 2020 Site Survey Volume Remaining	
drawing no. 3	
sheet: 3 of 3	



35 Bow Street
Portsmouth, NH 03801

Project: NCES Landfill
 Project No: 665
 Date: 09/15/20
 Calc. By: ATR
 Chkd. By: RJG
 Sheet: 1 of 1

NCES - Volume Remaining Calculation Bethlehem, New Hampshire

Volume Remaining Calculation

Surface 1 January 7, 2020 Site Survey
 Surface 2 Permitted Top of Waste Closure Grades w/2.7:1 pre-settlement side slopes

Volume Remaining on January 7, 2020 **323,040 CY** (SEE CMA DRAWING 3)

NCES Scale Material Report (1/1/20 to 1/9/20)

Net Tons **8,245.52 TONS**
 Calendar Days **9 Days ***
 Tons/Day **916.169 TONS/DAY**

Volume Remaining on December 31, 2019 - (Back Calculation)

Tonnage for 1/1-1/7 **6413.18 TONS**
 Compaction Rate **0.80 CY/TON**
 Conversion to CY **8,016 CY**

Volume Remaining on 12/31/19 = 323,040 + 8,016 = 331,056 CY

Say Volume Equals **331,000 CY**

