

MEMORANDUM

TO: Town of South Hero

FROM: Steven LaRosa & Shane Mullen, PE - Weston & Sampson Engineers, Inc.

DATE: August 27, 2026

SUBJECT: Desktop Wastewater Capacity Analysis – Former Lavin Parcel

The following technical memorandum describes review of existing data and desktop analysis results for hydraulic wastewater disposal capacity evaluation at the former Lavin property in South Hero (see **Figure 1** for an overall parcel map). The analysis results include information gathered from several test pits installed by Weston & Sampson Engineers, Inc. (Weston and Sampson) in June 2026.

Key Wastewater System Parameters

On-site wastewater systems rely on infiltrating wastewater into the subsurface, where it is treated before reaching the groundwater table. This is typically accomplished via a bed of clean crushed stone with perforated piping distributing wastewater evenly across the bed's area. Per the Environmental Protection Rules Chapter 1: Wastewater System and Potable Water Supply Rules ("WW Rules"), a minimum separation distance between the bottom of the dispersal bed and the estimated seasonal high groundwater table (ESHWT) must be maintained. If the distance from existing grade to ESHWT does not meet the WW Rule's minimum, the separation may be achieved by adding sand, making a mound-style disposal system.

The amount of wastewater that can be applied to a disposal field is limited by the type of soil present, the slope of the ground, and the quality (concentration of Biological Oxygen Demand and Total Suspended Solids) of the effluent. The application rate allowed can be increased if a pre-treatment system is added to the treatment train to improve effluent quality. Typically, on-site wastewater systems consist of a septic tank, a pump station (for flat sites or where the fields are far from the buildings it serves) and a disposal field. Wastewater from this type of system is referred to as "primary" effluent. With a pre-treatment system, effluent quality is improved (i.e. lower BOD and TSS levels) and the application rates are allowed to increase which can either reduce the size of a disposal field or allow the field to accept more wastewater. This type of wastewater is referred to as "filtrate".

The amount of mound sand required and whether a pre-treatment system is used are key considerations when weighing the alternatives presented in this memo.

Existing Data Review

The following documents were reviewed to understand previous investigation efforts and hydraulic capacity assumptions for wastewater disposal areas identified at the Former Lavin Parcel:

- South Hero and Keeler Bay Wastewater Feasibility Study, South Hero, 2025; Otter Creek Engineering
- Town of South Hero Lavin Property – Summary of Potential Capacities, January 14, 2024; Otter Creek Engineering
- Water and Wastewater Permit WW-6-2858; David A. Tudhope, June 2014
- Water and Wastewater Permit WW-6-2858-1; Apex Engineering, LLC., February 2024
- Wetland Map, Fitzgerald Environmental Associates, LLC., June 8, 2026.

These documents provide information regarding soil conditions, design assumptions and calculations for wastewater disposal systems in two locations: the “Southern” and “Northern” areas. Test pit and wastewater disposal field locations from these documents are shown on **Figure 2**.

Southern Area

The Southern area contains a series of seven mound style disposal fields in the southwestern portion of Lot 8, labeled “Mound A” through “Mound G” on **Figure 2**. These systems, originally designed by David Tudhope and revised by Apex Engineering, serve multiple commercial and residential lots or buildings. Five of the seven disposal fields are sized to accept 980 gallons per day (gpd) of filtrate wastewater. The sixth and seventh fields would receive a total of 420 gpd of filtrate wastewater and were designed to serve one of the buildings proposed in the Tudhope design. The designs use the “Simplified Method of Completing a Hydrogeologic Analysis” described in Environmental Protection Rules Chapter 1: Wastewater System and Potable Water Supply Rules (“WW Rules”) to show compliance when using the higher application rates associated with filtrate effluent. The six individual disposal systems can accept a total of 5,320 gpd of filtrate effluent. In the Apex design, the Lavin parcel was subdivided into eight lots, with the flows distributed amongst these seven fields. See panel 1 of **Figure 2**.

Northern Area

The Northern wastewater disposal area was identified by Otter Creek Engineering (OCE) in their feasibility study. Two potential orientations of the mound were illustrated. Both configurations are mounds capable of handling 3,366 gpd of filtrate wastewater via a 300 foot by 10 foot dispersal stone bed atop 2.5 feet of mound sand (refer to panel 1 of **Figure 2**). This design meets the WW Rules but does not incorporate the reduction of vertical isolation distance from 3.0 feet to 1.5 feet. The OCE design utilized Darcy’s Law to predict the induced groundwater mounding associated with the disposal field.

The proposed disposal system meets the current WW Rules. This system would increase the capacity of the Lavin parcel to accept wastewater from higher-intensity uses on the property or serve other users offsite.

Permitted Flows

Based on a review of the current permit (WW-9-2858-1) and discussions with the Town, wastewater flow allocations assigned to each lot are shown in **Table 1** below. Note that these flows differ than those shown in the OCE summary letter of January 14, 2024. Flows shown below reflect addition of the “reserved” flow from Lot 3 to the Town and its purchase of Lot 4 discussed in our August 5 meeting.

Table 1: Permitted and Proposed Capacity

Lot	Flow Allocated to Town (gpd)	Flow Allocated to Private Owner (gpd)	Planned Use
1	980	0	Town retained flow
2	531	449	Mini Golf
3	0	980	CIDER/Granny's Attic
4	980	0	Town retained flow
5	980	0	Town retained flow
6	420	0	Town retained flow
7	0	0	Town retained flow
8	0	0	Town retained flow
	3,891	1,429	Total Southern Area
	3,366	0	Total Northern Area
	7,257	1,429	Grand Total

Proposed Changes to the Permitted Design

Figures 1 and 2 were created based on GIS data available from the Vermont Open Geodatabase. Additional information provided by prior consultants, including mound layout, utilities, test pit locations, and wetland boundaries overlaid the base maps. The wetland delineation (conducted by Fitzgerald Environmental Associates, LLC in April/May 2026) shows the delineation of wetlands and associated buffers significantly closer to both the Southern and Northern disposal areas than previous maps provided by OCE, which used the Vermont State Wetland Inventory Database, a desktop screening tool.

Due to the new wetland delineation, the potential east/west aligned disposal field in the Northern area is no longer viable. However, acceptable soil conditions available for the north/south aligned version of the OCE mound appear to extend beyond the original concept's boundary. OCE proposed a 300 foot long dispersal bed mound. We believe the dispersal bed can be extended to 360 feet in length and still

meet the requirements for isolation distances in the WW Rules. Expansion of the Southern disposal areas in the downhill (easterly) direction is not feasible due to wetland buffer encroachment.

Topographic mapping coupled with wetland locations, field observations, and discussions with VT DEC staff lead us to conclude that the proposed Northern and Southern disposal areas drain to separate watersheds (see **Figure 3**). The Northern disposal area drains northwest to a wetland on Lot 6, which drains north to Lake Champlain. The Southern disposal area drains east to a wetland on Lot 8. A study of the LiDAR topography shows a low ridge that separates the two receiving wetlands. Furthermore, there are two culverts crossing US Route 2; one associated with the northern area and other from the southern area. The two receiving streams converge north of Route 2 approximately 2,300 feet north of the Northern disposal area and approximately 550 feet from Lake Champlain. We believe the configuration of the receiving waters is sufficient for the Northern and Southern disposal areas to be considered hydraulically isolated.

Based on our analysis and discussions with VT DEC Environmental Analyst Achouak Arfaoui, there are two separate watersheds on the Lavin Parcel, each discharging to separate receiving waters (e.g. downgradient wetlands, streams). These receiving waters are very small and have limited flow. It is highly unlikely that the receiving waters would meet the aquatic permitting criteria of the Indirect Discharge Rules (§14-701). Therefore, the hydraulic capacity analyses performed for this study are based upon the requirements of the WW Rules. The maximum daily flow for a wastewater collection, treatment and disposal system using the WW Rules is 6,499 gpd. For this reason, the Northern and Southern disposal areas will need to receive wastewater from fully separated collection and treatment systems. The benefit of the two separate watersheds is that it allows for two separate systems to exist with capacities up to 6,499 gpd while staying under the jurisdiction of the WW Rule. Flows above 6,500 gpd must be permitted through the Indirect Discharge Program (IDP) and have more stringent requirements.

2026 Test Pit Assessment

Weston & Sampson observed excavation of 4 test pits in June 2026. Two test pits were excavated in both the Northern and Southern areas to confirm soil conditions reported by Tudhope and OCE and to determine if proposed disposal areas could be expanded. Test pit logs for TP-26-01 through TP-26-04 are included in **Appendix A**. The test pits are located downgradient of the prior investigation area (see **Figure 2**). Soils encountered at each test pit were similar to prior descriptions. Depths to limiting conditions (seasonal high groundwater, bedrock) were also the same or slightly shallower than those reported by OCE and Tudhope. The test pitting did not identify areas for potential expansion of the previously identified disposal areas.

Desktop Hydraulic Capacity Analyses

Weston & Sampson used the available land ownership, wastewater permit conditions, soils data, topography, and wetland boundary information to perform desktop hydraulic capacity calculations for

the Northern and Southern wastewater disposal areas. The goal of the analyses is to determine the maximum volume of wastewater disposal capacity available to the Town. Several iterations of hydraulic capacity analyses were performed on each disposal area to evaluate both primary septic tank (untreated) effluent and filtrate (treated) effluent. Varying mound sand thicknesses were also evaluated. The hydraulic capacities were determined utilizing the Simplified Method of Completing a Hydrogeologic Analysis in the WW Rules.

Northern Area

Evaluation of the Northern area hydraulic capacity was performed based upon the extended mound shown on panel 2 of **Figure 2**. Hydraulic capacity was calculated for primary effluent discharged to mounds with 1.0 and 2.5 feet of sand below the dispersal bed. A third scenario using filtrate effluent and 1.0 ft. of sand below the dispersal bed was also calculated. The calculations for each disposal scenario are included in **Appendix B**. A summary of the hydraulic capacities and the permitting limitations are included in **Table 2** below:

Table 2: Northern Area Hydraulic Capacity Summary

Effluent Type	Sand Thickness (feet)	Maximum Flow (gpd)	Limiting WW Rule Requirement
Primary	1.0	2,000	Linear Loading Rate
Primary	2.5	3,600	Application Rate Limited to 1 gpd/ft ²
Filtrate	1.0	6,499 (7,200)	Maximum System Size (Application Rate Limited to 2 gpd/ft ²)

Note that the maximum hydraulic capacity for filtrate effluent is 7,200 gpd, considerably greater than the 6,499 gpd volume allowable by the WW Rules. Therefore, the design maximum for this area is 6,499 gpd.

Southern Area

The current permitted capacity and disposal system layouts in the Southern area are not conducive to maximizing wastewater capacity. The wastewater mound locations for Lots 3 and 2 are interspersed with Town retained mound locations. In addition, utilization of Lots 2 & 3 existing mound designs by the Town for “conveyed” disposal capacity would require complex collection and pumping systems for both the Town and Lot owners. Therefore, we have assumed that the existing Lot 2 & 3 property owners and the Town are willing to amend the existing wastewater permit to simplify all disposal system designs and operations. Panel 2 of **Figure 2** shows the proposed adjustments to Lot 2 & 3 disposal mound locations and sizes. This proposed alignment will provide suitably sized, dedicated disposal mounds for each lot. This alignment provides a large contiguous area for the proposed Town disposal mound. We have assumed that the proposed adjustments will be acceptable to all parties and that a permit

amendment can be obtained prior to the need for construction of Lot 2 & 3. The modeled hydraulic capacities are based on a 400 foot long by 8 foot wide dispersal bed mound. Hydraulic capacity calculations were performed for primary effluent in 1.0 and 2.5 foot sand mounds. Filtrate capacity calculations assumed a 1 foot sand mound. Calculation details are included in **Appendix C** and are summarized in **Table 3** below.

Table 3: Southern Area Hydraulic Capacity Summary

Effluent Type	Sand Thickness (feet)	Maximum Flow (gpd)	Limiting WW Rule Requirement
Primary	1.0	0	Insufficient Vertical Isolation for Shallow High Groundwater
Primary	2.5	3,200	Application Rate Limited to 1 gpd/ft ²
Filtrate	1.0	4,200	Linear Loading Rate

Conclusions & Recommendations:

Weston & Sampson's hydraulic capacity evaluation of the former Lavin Property has identified two areas that will allow for design of mound style disposal systems that meet the existing WW Rules. The predicted capacities of the two proposed disposal areas assumes modification of the existing wastewater permit for the property, including moving the disposal mounds for Lots 2 and 3, which are not owned by the Town. The two proposed disposal areas drain into separate watersheds. This will allow for combined flows from the systems to exceed 6,500 gallons per day without triggering the Indirect Discharge Rules. However, the proposed Northern and Southern disposal areas will need to be operated as independent wastewater systems in order to comply with the WW Rules. This will require separate collection, treatment and distribution piping for each disposal field. If the IDP program is willing to relax some of their requirements, options such as a centralized collection system and foregoing a replacement area may be considered and should be investigated further in the next step of this process. However, this would involve a significant amount of time to negotiate with the regulator, a field study that lasts from spring until fall, processing said data and hoping for a favorable outcome. Even if this extensive process proves favorable, the modest increase in wastewater capacity would not justify the added expense and timeline to this project in our opinion. Our initial field observations do not lead us to believe that this is technically feasible at this time.

At the commencement of this project, the option of using drip irrigation as an alternative to conventional perforated pipe and stone trenches was discussed. However, due to the limiting requirements listed in Table 3, we do not believe that the technology would provide significant additional capacity. Furthermore, the issues with flows that push the site into the IDP program as discussed above would pose an additional obstacle to having this approach be a viable option.

Hydraulic capacities for each disposal area have been calculated for primary (septic tank) effluent and filtrate (treated) effluent. Primary effluent disposal mounds will require 2.5 feet of sand beneath the dispersal beds to achieve the predicted capacities. Filtrate effluent mounds would only require 1 foot of sand, but installation and operation of treatment systems would be necessary. The maximum hydraulic capacities of the Northern and Southern areas using primary and filtrate effluent are summarized in Table 4:

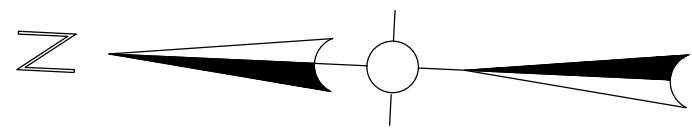
Table 4: Hydraulic Capacity Summary

Disposal Area	Primary (gpd)	Filtrate (gpd)
Northern	3,600	6,499
Southern	3,200	4,200
Total	6,800	10,499

With this information, the Town of South Hero can move forward with their planning process and determine what users will connect to these systems. Potential users include both residential and commercial lots. A force main pumping system can collect wastewater from outside the Lavin parcel, or if the Town wishes to maximize land use on the Lavin lots a smaller collection systems would be needed. Costs for either approach will have different capital and long-term (operations & maintenance (O&M)) requirements. Using a primary effluent mound will require more sand to meet permit requirements, but the filtrate effluent system needs a pre-treatment system which requires electricity and has more O&M needs.

Funding for this type of project may be able to be procured from the Clean Water State Revolving Fund (CWSRF) loan program. To move this project through that process, a three-step approach is needed. Step 1, the Preliminary Engineering Report (PER), requires specific project needs to be identified (e.g. provide wastewater disposal to the Lavin parcel lots plus off-site lots). Multiple engineering alternatives are developed to meet the proposed project needs and an economic analysis is provided to rank alternatives according to total project cost (e.g. engineering, permitting, construction, O&M). Step 2, Final Design, is where the chosen alternative is designed to a bid-ready state. Step 3 is Construction and begins with bidding the project, choosing a contractor, and executing the work. A PER was developed and approved previously; to further develop the approach discussed in this memo an amendment to the report will be needed.

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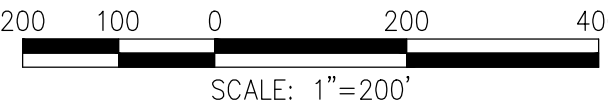


NOTES:

- 1. PARCEL BOUNDARIES, WELLS AND TOPOGRAPHY TAKEN FROM VCGI OPEN GEODATA PORTAL.
- 2. WASTEWATER MOUND LAYOUTS TAKEN FROM APEX ENGINEERING AND OTTER CREEK ENGINEERING.
- 3. WETLAND BOUNDARIES BY FITZGERALD ENVIRONMENTAL ASSOCIATES.
- 4. THE INTENT OF THIS PLAN SET IS TO ILLUSTRATE CURRENT WASTEWATER PLANNING CONCEPTS AND PROPOSE ALTERNATIVES TO MAXIMIZE SITE USE.



1 LAVIN PARCEL - OVERALL
SCALE: 1" = 200'



Project: TOWN OF SOUTH HERO

LAVIN PROPERTY WASTEWATER
CAPACITY DETERMINATION



Weston & Sampson Engineers, Inc.
98 South Main Street, Suite 2
Waterbury, VT 05676
978.532.1900 800.SAMPSON
www.westonandsampson.com

Consultants:

Revisions:		
No.	Date	Description

COA:

Seal:

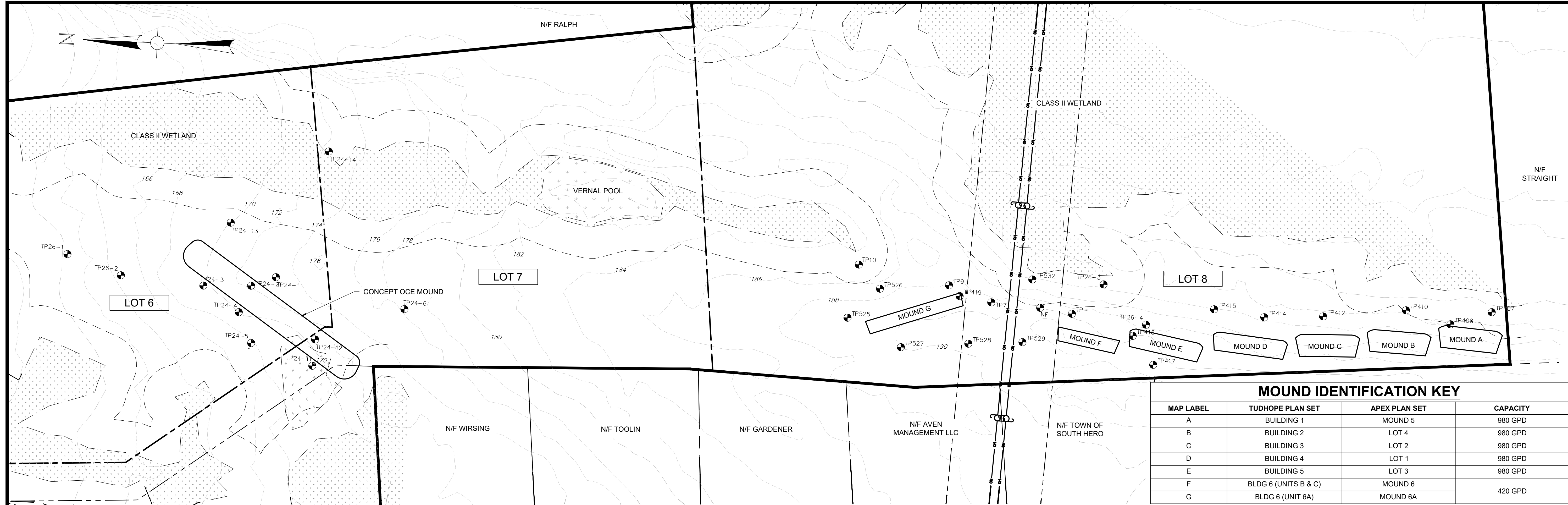
Issued For:
CLIENT REVIEW

Scale: 1" = 200'

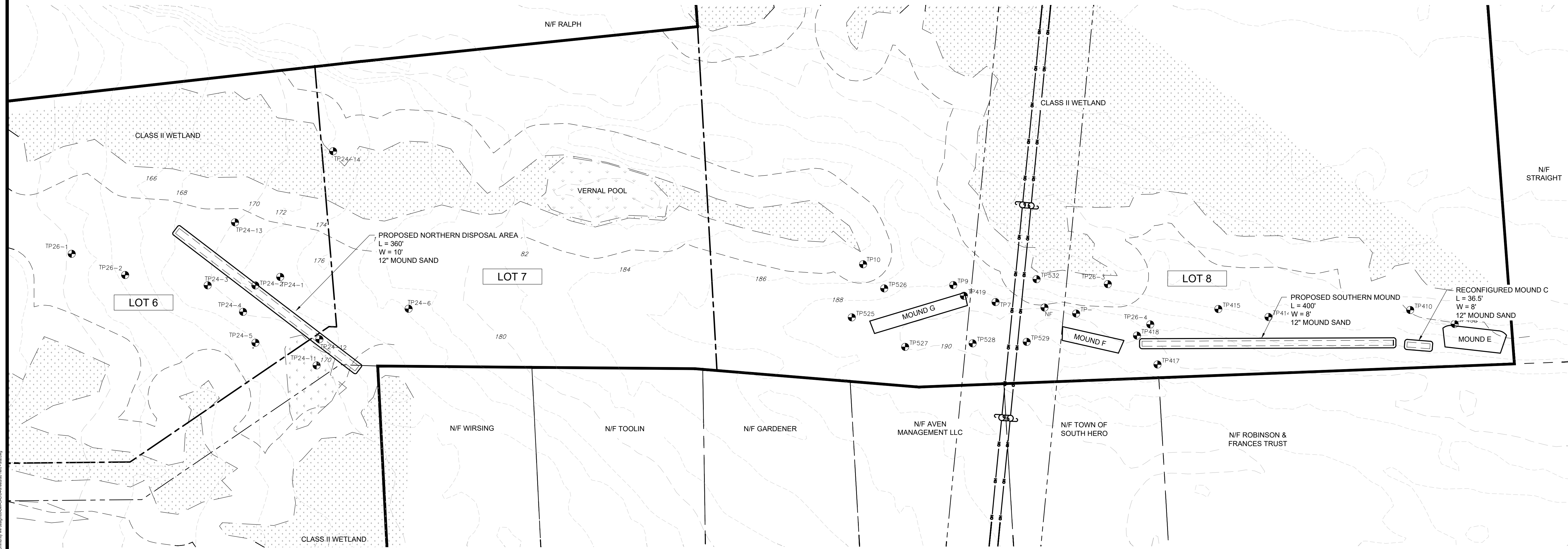
Date: 08/07/2026
Drawn By: SMM
Reviewed By: SJL
Approved By: SMM
W&S Project No.: ENG26-0295
W&S File No.:

Drawing Title:
**OVERALL SITE
PLAN**

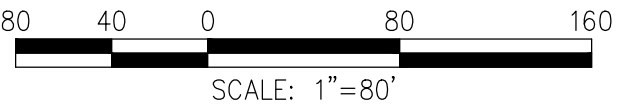
Sheet Number:
FIG 1



1 CURRENT CONCEPT SEPTIC LAYOUT
SCALE: 1" = 80'



2 PROPOSED CONCEPT SEPTIC LAYOUT
SCALE: 1" = 80'



Project:
TOWN OF SOUTH HERO

LAVIN PROPERTY WASTEWATER
CAPACITY DETERMINATION

Weston & Sampson

Weston & Sampson Engineers, Inc.
98 South Main Street, Suite 2
Waterbury, VT 05676
978.532.1900 800.SAMPSON
www.westonandsampson.com

Consultants:

Revisions:

No.	Date	Description
1	8/26/26	UPDATE TABLE PER ANR

COA:

Seal:

Issued For:

CLIENT REVIEW

Scale: 1" = 80'

Date: 08/07/2026

Drawn By: SMM

Reviewed By: SJL

Approved By: SMM

W&S Project No.: ENG26-0295

W&S File No.:

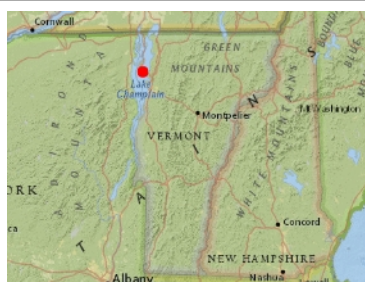
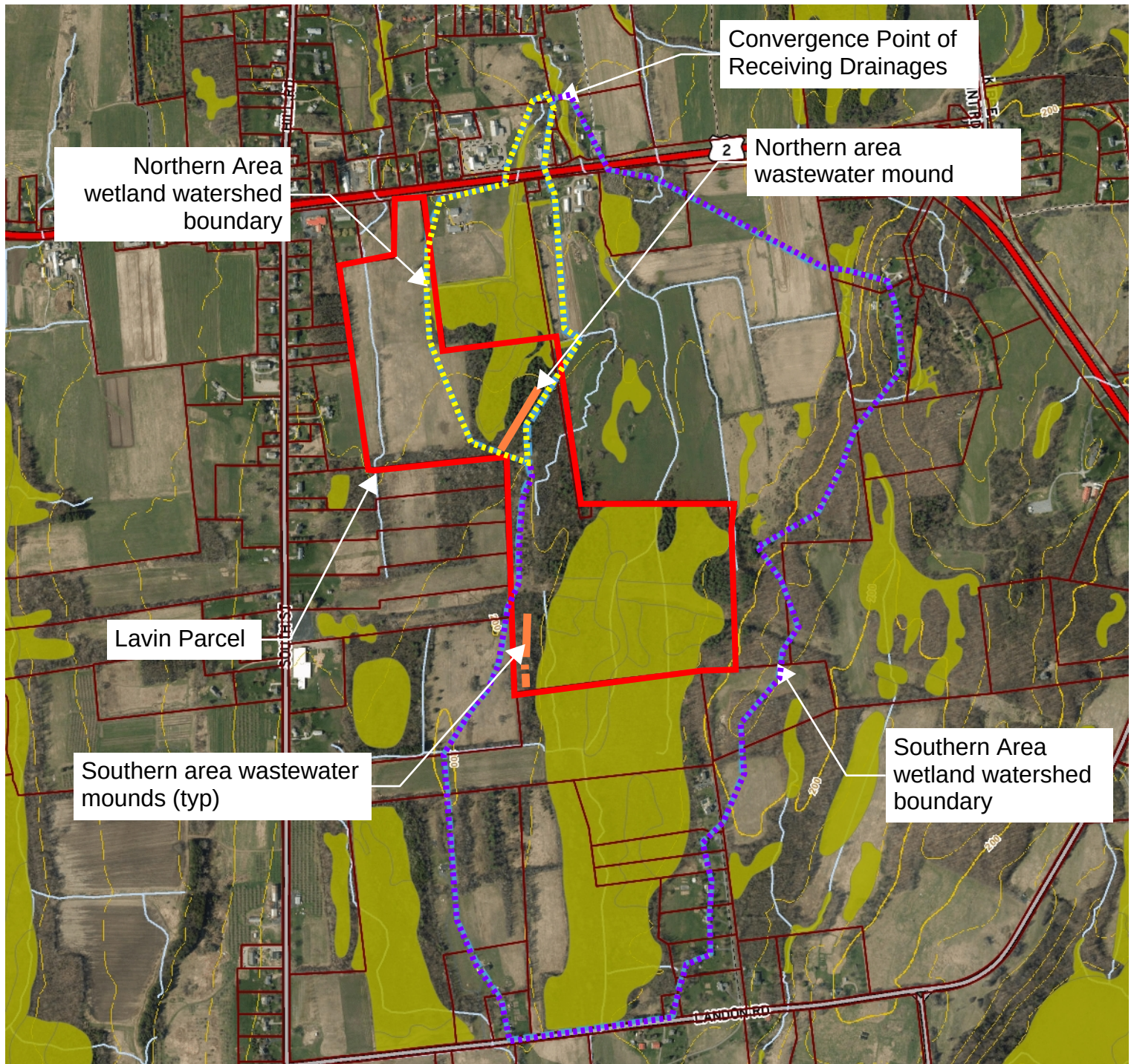
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SEPTIC LAYOUT
CONCEPTS

Sheet Number:

FIG 2

P:\17 South Hero\2026\2026 Lavins Property Wastewater Capacity Determination.dwg



- LEGEND**
- Wetland - VSWI
 - Class 1 Wetland
 - Class 2 Wetland
 - Wetland Buffer
 - Parcels (standardized)
 - Stream
 - Stream
 - Intermittent Stream

NOTES

Map created using ANR GIS mapping technology.

1: 13,677

August 26, 2026



695.0 0 348.00 695.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere
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1" = 1140 Ft. 1cm = 137 Meters
THIS MAP IS NOT TO BE USED FOR NAVIGATION

DISCLAIMER: This map is for general reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable. ANR and the State of Vermont make no representations of any kind, including but not limited to, the warranties of merchantability, or fitness for a particular use, nor are any such warranties to be implied with respect to the data on this map.

Appendix A

2026 Weston & Sampson Test Pit Logs



South Hero Lavin Property 06/22/26

Steven LaRosa, Weston & Sampson Engineers, Inc.

Test Pit #	26-01	
Depth	Description	Limiting Conditions
0-7"	Black, Duff, Silt Loam ; friable, granular, many roots	
7-14"	Brown and tan, Silt Loam ; loose, blocky, many roots; mottles at 12"	SHWT = 12"
14-40"	Olive brown, Clay Loam ; weak platy, somewhat firm, mottled, no roots.	
40-56"	Brown/olive, Clay Loam , massive, firm	

Test Pit #	26-02	
Depth	Description	Limiting Conditions
0-7"	Black, Duff, Silt Loam ; friable, granular, many roots	
7-16"	Brown and tan, Clayey Silt Loam ; loose, blocky, many roots;	
16-24"	Olive brown, Silt Loam ; weak platy, somewhat firm, mottled, no roots.	SHWT = 16"
24-39"	Brown/olive, Silt Loam , massive, firm	

Test Pit #	26-03	
Depth	Description	Limiting Conditions
0-7"	Brown, Loam ; friable, granular, many roots	
7-12"	Brown, Loam ; loose, blocky, some roots;	
12-24"	Olive brown, Silt Loam ; granular to weak blocky, somewhat firm, weakly mottled, no roots.	SHWT = 12"
24"	Fractured Shale , water seepage	

Test Pit #	26-04	
Depth	Description	Limiting Conditions
0-9"	Brown, Loam ; friable, granular, many roots	
9-36"	Weathered shale bedrock, highly fractured, no water	Bedrock = 9"

Appendix B

Northern Area Hydraulic Capacity Calculations



SIMPLIFIED METHOD of COMPLETING a HYDROGEOLOGICAL ANALYSIS (1-927)
HYDROGEOLOGIC CAPACITY ANALYSIS and CALCULATIONS
COMMUNITY WASTEWATER DISPOSAL SYSTEM
Lavin Property
South Hero

$$LLR = (h) \times (f)$$

$$SL = DF / LLR$$

	Northern Area				
	FILTRATE 1 Foot Mound		PRIMARY 1 Foot Mound		PRIMARY 2.5 Foot Mound
Design Flow (gpd)	7,200 gpd		2,000 gpd		3,600 gpd
Test Pits Used for Limiting Conditions	TP-24-12; 13		TP-24-12; 13		TP-24-12; 13
Depth to Limiting Condition	2.3 feet		2.3 feet		2.3 feet
Mound Sand Thickness (ft)	1 feet		1 feet		2.5 feet
Minimum Separation Distance to IDGM	1.5 feet		3 feet		3 feet
Available Soil Thickness (h)	1.8 feet		0.3 feet		1.8 feet
Soil Texture	Fine Sandy Loam		Fine Sandy Loam		Fine Sandy Loam
Slope	5 %		5 %		5 %
Linear Loading Rate Factor (f)	18.7		18.7		18.7
Maximum Linear Loading Rate	33.7 gpd/lf		5.6 gpd/lf		33.7 gpd/lf
Calculated System Length	214 feet		357 feet		107 feet
Design System Length	360 feet		360 feet		360 feet
Is Design > Calculated Length	YES		YES		YES
Design LLR	20.0		5.6		10.0
Is Design > Calculated LLR	YES		YES		YES
Application Rate Max (filtrate)	2 gpd/ft2		1 gpd/ft2		1 gpd/ft2
Design Length	360 ft		360 ft		360 ft
Design Width	10 ft		10 ft		10 ft
Design Application Rate	2.0 gpd/ft2		0.6 gpd/ft2		1.0 gpd/ft2
Is Design Application Rate below Max?	YES		YES		YES

Limiting Factor for Maximum Flow.

Appendix C

Southern Area Hydraulic Capacity Calculations



SIMPLIFIED METHOD of COMPLETING a HYDROGEOLOGICAL ANALYSIS (1-927)

HYDROGEOLOGIC CAPACITY ANALYSIS and CALCULATIONS

COMMUNITY WASTEWATER DISPOSAL SYSTEM

Lavin Property

South Hero

$$LLR = (h) \times (f)$$

$$SL = DF / LLR$$

	Southern Area			
	Primary 2.5 Foot Mound			Filtrate 1 Foot Mound
Design Flow (gpd)	3,200	gpd		4,200 gpd
Test Pits Used for Limiting Conditions	TP-412; 414; 416			TP-412; 414; 416
Depth to Limiting Condition	1.5	feet		1.5 feet
Mound Sand Thickness (ft)	2.5	feet		1 feet
Minimum Separation Distance to IDGM	3	feet		1.5 feet
Available Soil Thickness (h)	1.0	feet		1.0 feet
Soil Texture	Fine Sandy Loam			Fine Sandy Loam
Slope	7.3	%		7.3 %
Linear Loading Rate Factor (f)	10.5			10.5
Maximum Linear Loading Rate	10.5	gpd/lf		10.5 gpd/lf
Calculated System Length	305	feet		400 feet
Design System Length	400	feet		400 feet
Is Design > Calculated Length	YES			YES
Design LLR	8.0			10.5
Is Design > Calculated LLR	YES			YES
Application Rate Max (filtrate)	1 gpd/ft2			2 gpd/ft2
Design Length	400 ft			400 ft
Design Width	8 ft			8 ft
Design Application Rate	1.0 gpd/ft2			1.3 gpd/ft2
Is Design Application Rate below Max?	YES			YES

Limiting Factor for Maximum Flow.