AGENCY OF TRANSPORTATION **OFFICE MEMORANDUM**

To: Bruce Martin, P.E.

From: Liam Degener, Geotechnical Engineer, via, Callie Ewald, P.E., Senior Geotechnical Engineer

Date: June 10th, 2026

Subject: Andover ER P23-1(223) – Geotechnical Data Report

1.0 INTRODUCTION

As requested, we have completed our geotechnical analyses of the spread footing foundation for the proposed pipe arch with an inlet headwall as part of the Andover ER P23-1(223) project. The project consists of the full replacement of the existing culvert located on VT Route 11 over an unnamed tributary along the Middle Branch Williams River in the Town of Andover, Vermont. Contained herein are the geotechnical design parameter recommendations for use in the design of the proposed replacement structure, as determined using the 2024 AASHTO LRFD Bridge Design Specifications.

2.0 FIELD INVESTIGATION

A field investigation was conducted by VTrans between September 23rd and September 29th, 2025. Three standard penetration borings were advanced to evaluate the subsurface profile for design and construction of the replacement structure. Boring locations were provided by Bruce Martin, P.E. in a Geotechnical Request Form dated August 6th, 2025. The borings were located in the field by personnel from the Geotechnical Section using the Geotechnical Section's handheld Trimble TDC600 and Trimble DA2 GNSS GPS receiver with submeter accuracy. A summary of the final location of each boring and corresponding ground surface elevation can be found in Table 2.1 and in the attached boring location plan. The values for the Northings and Eastings are based on the Vermont State Plane Grid Coordinate System NAD 83. Northings, Eastings, and elevations for the borings, based on the North American Vertical Datum, NAVD 88, were estimated using the design file z23d793sv.dgn, dated July 2024. The locations and elevations for the borings should be considered accurate only to the degree implied by the method used to determine them.

Table 2.1 Boring Locations and Elevations.

Boring No.	Northing (ft)	Easting (ft)	Station	Offset (ft)	Approximate Ground Surface Elevation (ft)
B-101	276642.7	1590392.7	181+89.1	15.9	977.2
B-102	276658.7	1590412.1	181+99.2	7.1	976.9
B-103	276691.7	1590417	181+88.7	-38.8	972.6

The borings were performed in general accordance with AASHTO T206, *Standard Method of Test for Penetration Test and Split-Barrel Sampling of Soils.* During boring operations, split spoon samples and standard penetration tests (SPT) were taken for each boring. For B-101 samples were

taken continuously from 6 feet (ft) below ground surface (bgs) to 16 ft bgs. For B-102 and B-103 samples were taken continuously from ground surface to 16 ft bgs and then at 5 ft intervals starting at 20 ft to 29.9 and 31.4 ft bgs, respectively. A roller cone bit was advanced in B-102 from 29.9 to 35.5 ft bgs without sampling to confirm bedrock was not present. Bedrock was not encountered to depth in any of the borings.

During drilling operations soil samples were visually identified in the field and SPT blow counts were recorded on the boring logs when applicable. Soil samples were preserved and returned to the VTrans Construction and Materials Bureau Central Laboratory for testing and further evaluation. Upon completion of the laboratory testing, the boring logs were revised to reflect the results of the laboratory classification analysis. The attached boring logs in Appendix A display the types of soil strata encountered and include the laboratory test data, SPT data, and any pertinent observations made by the boring crew.

3.0 FIELD AND LABORATORY TESTINGS

The standard penetration resistance of the in-situ soil is determined by the number of blows required to drive a 2-inch outside diameter (OD) split-barrel sampler into the soil with a 140-pound hammer dropped from a height of 30 inches, in accordance with procedures specified in AASHTO T 206. The number of blows required to drive the sampler each 6-inch increment is recorded, and the Standard Penetration Resistance (N-Value) is calculated as the sum of the blows over the second and third 6-inch intervals. The SPT N-value is commonly used with established correlations to estimate several soil parameters, particularly the shear strength and density of cohesionless soils. The N-values provided on the boring logs are raw values and have not been corrected for energy, borehole diameter, rod length, or overburden pressure.

The Vermont Agency of Transportation Geotechnical Section has determined a hammer correction value, C_E, to account for the efficiency of the SPT hammers on its drill rigs. All borings were advanced with an Acker Renegade track rig. Because this is a new drill rig, a hammer energy correction factor has yet to be determined. As a result, a conservative C_E value of 1.3, based on a standard value for an automatic hammer, should be used in all soil parameter calculations.

Geotechnical laboratory tests were performed on samples to assist with soil classification and evaluate engineering properties of the soil. Grain size analyses were performed on soil samples in accordance with AASHTO T 88, *Standard Method of Test for Particle Size Analysis of Soils.* Results from this testing can be found on the attached boring logs.

4.0 SOIL PROFILE

The following soil strata have been identified based on our review of the boring logs and laboratory testing. It should be noted that groundwater elevations are subject to change given the fact that boreholes were generally left open for a short period of time. Because groundwater elevations can fluctuate seasonally and are affected by temperature and precipitation, groundwater may be encountered during construction when not previously noted on the logs.

4.1 Boring B-101 (Inlet)

The ground surface elevation at B-101 was approximately 977.7 feet (ft). Groundwater was observed after drilling operations on September 29th, 2025, at a depth of 3.9 ft below ground surface (bgs), corresponding to an approximate elevation of 973.8 ft.

Approximate Elevation (ft)	Soil Profile
977.7 – 961.7 ft	Dense GRAVEL, some Sand, some Silt

4.2 Boring B-103 (Outlet)

The ground surface elevation at B-103 was approximately 972.6 ft. Groundwater was observed after drilling operations on September 24th, 2025, at a depth of 2.5 ft bgs, corresponding to an approximate elevation of 970.1 ft.

Approximate Elevation (ft)	Soil Profile
972.6 – 968.6 ft	Very Loose SAND, some Gravel, little Silt
968.6 – 956.6 ft	Medium Dense SAND, some Gravel, some Silt
956.6 – 950.6 ft	Medium Dense SILT and SAND, some Gravel
950.6 – 939.6 ft	Very Dense SAND, some Gravel, little Silt

5.0 SHALLOW FOUNDATION ANALYSIS

AASHTO's LRFD Bridge Design Specifications Manual (2024) was used as the reference for bearing resistance equations. Section 10.6.3.1.2 contains the equation used for bearing resistance. Neither depth factors nor load inclination factors were used in the analysis as they were not considered pertinent due to the designed embedment of the structure, per Section C.10.6.3.1.2a.

It is recommended that the bottom of the headwall footing be at least 4 ft below the ground surface based on frost susceptibility and bearing stratum at the site. An embedment value of 4 ft was used for the strength limit state analysis, and an embedment value of 0 ft was used for service limit state analysis, which tends to control the design, to account for potential scour conditions at the design flood elevation per Section 2.6.4.4.2. A conservative groundwater elevation of 973.3 ft was used in design at the inlet.

As per section 10.5.5.1 of the 2024 AASHTO LRFD Bridge Design Specifications, a resistance factor of 1.0 should be applied to the unfactored bearing resistance for use in service limit state design. Service limit state design includes, but is not limited to, settlement and scour. Section 10.5.5.2.2 specifies that a resistance factor of 0.45 should be applied to the unfactored bearing resistance for use in strength limit state design for spread footings on rock and soil. Strength limit state design includes but is not limited to; checks for bearing resistance, sliding, and constructability. Potential for overturning is limited by controlling the location of the resultant of the reaction forces (eccentricity). Eccentricity, e, shall be limited as follows:

Foundations on soil: $|e| < b/3$
Foundations on rock: $|e| < 0.45b$

Eccentricity should be considered for settlement and bearing resistance design of spread footings by using effective footing widths based on AASHTO Section 10.6.1.3. All footing widths

presented in this report are *effective* footing widths. The soil profiles used in these analyses can be found below in Section 3.1 and 3.2.

5.1 Bearing Resistance (Inlet)

The maximum length of headwall used in the analysis was 12.0 ft based on the Pipe Arch Detail Sheet from the Preliminary Plans dated February 6th, 2025. The bottom of footing elevation was also provided as 966.64 ft at the inlet. Based on the geometry and elevations, it appears that the inlet footing will bear on a very dense sandy gravel layer. Based on the boring information and subsequent calculations, these materials were assigned a friction angle of $\phi = 38°$ and a unit weight of $\gamma = 135$ lb/ft³.

For effective footing widths of 3 ft through 8 ft, the maximum factored bearing resistances for the strength and service limit states are given in Table 5.1.1 Bearing pressure values were applied to the same footing widths as used to calculate bearing resistance. Considering the granular nature of the foundation soils and proposed structure, negligible settlement is anticipated to occur and is expected to happen during or immediately after construction. Attached to this report as Appendix B, are graphs that detail the corresponding bearing resistances for various effective footing widths based on various bearing pressures.

Table 5.1.1 Factored Bearing Resistances at Various Effective Footing Widths at the Inlet

Maximum Wingwall Length (ft)	Effective Footing Width (ft)	Factored Bearing Resistance, Strength Limit State (ksf)	Factored Bearing Resistance, Service Limit State (ksf)
12.0	3.0	17.3	13.3
	4.0	18.9	15.1
	5.0	20.5	16.6
	6.0	22.0	18.1
	7.0	23.5	19.5
	8.0	24.8	20.4

6.0 RECOMMENDATIONS

Shallow foundations appear to be feasible for the proposed headwall as detailed in the Preliminary Plans dated February 2025. Factored bearing resistances for various footing widths were calculated for the headwall and can be found in Table 5.1.1. These calculations are based on the geometric and geotechnical assumptions outlined in Section 5.0 of this report. The bearing resistances presented in this report at the service limit state were calculated assuming a conservative scour condition (0 ft embedment). Sections 10.5.2 and 10.5.3 of AASHTO outline all design states relevant to spread footing design and their respective resistance factors. Eccentricity should be considered for bearing resistance design of spread footings by using effective footing widths based on AASHTO Section 10.6.1.3. Table 6.1 shows the appropriate resistance factors for various design states.

Table 6.1: Summary of Resistance Factors

Design State	Resistance Factor, φ
Scour	1.0
Bearing Resistance	0.45
Sliding*	0.90

*Assumes precast concrete placed on sand

6.1 Plan Notes & Details

Based on the results of the borings and the above analysis, we recommend including the following information on the plans:

- For strength limit state, using a resistance factor of 0.45, the factored bearing resistance is 17 ksf
- For service limit state, using a resistance factor of 1.0, the factored bearing resistance is 13 ksf

6.2 Design Parameters

Table 6.2.1 highlights engineering properties assigned to the in-situ soils as well as the engineering properties of common construction materials. These values should be used when designing any substructure units. It is recommended that values of K_o be used for calculating earth pressures where the structure is not allowed to deflect longitudinally, away from or into the retained soil mass. Values for K_a should be utilized for an active earth pressure condition where the structure is moving away from the soil mass and K_p where the structure is moving toward the soil mass. The design earth pressure coefficients are based on horizontal surfaces (non-sloping backfill) and a vertical wall face.

Table 6.2.1:

Engineering Properties of In-Situ and Construction Materials

	703.04 – Granular Borrow	**704.08 – Granular Backfill for Structures**	**Very Dense GRAVEL (Inlet Bearing Stratum)**
Unit Weight, γ (lbs/ft^3):	130	140	135
Internal Friction Angle, φ (degrees):	32	34	38
Coefficient of Friction, f			
- mass concrete cast against soil:	0.45	0.55	0.57
- soil against precast/formed concrete:	0.50	0.54	0.44
Active Earth Pressure Coef., K_a:	0.31	0.28	0.24
Passive Earth Pressure Coef., K_p:	3.26	3.54	4.20
At-Rest Earth Pressure Coefficient, K_o:	0.47	0.44	0.38

6.3 Construction Considerations

6.3.1 Cofferdams/Temporary Earthwork Support

The Contractor should be reminded that Section 208.06 of VTrans' *2024 Standard Specifications for Construction* indicates that "The Contractor shall prepare detailed plans and a schedule of operations for each cofferdam specified in the Contract. Construction drawings shall be submitted in accordance with Subsection 105.06."

6.3.2 Construction Dewatering

The borings were only open for a short time, so the water table elevation is unknown at this site. The bottom of footing elevation for the headwall may be below the natural water table therefore temporary construction dewatering may be required to construct the foundations. Temporary dewatering will also be necessary to limit disturbance to and maintain the integrity of the bearing surface.

Temporary dewatering can likely be accomplished by open pumping from shallow sumps, temporary ditches, and trenches within and around the excavation limits. Sumps should be provided with filters suitable to prevent pumping of fine-grained soil particles. The water trapped by the temporary dewatering controls should be discharged to settling basins or an approved filter "sock" so that the fine particles

suspended in the discharge have adequate time to "settle out" prior to discharge. All effluent water, or discharge, should comply with all applicable permits and regulations.

Sumps and trenches should lie outside a 1V:1H line extending downward and outward from the edge of footing. Installation and operation of the Contractor's dewatering system should be integrated with other earthwork operations and sequence of cutting, filling, foundation construction, and backfilling.

6.3.3 Placement and Compaction of Soils

Fills should be placed systematically in horizontal layers not more than 12 inches in thickness, prior to compaction. Cobbles larger than 8 inches should be removed from the fill prior to placement. Compaction equipment should preferably consist of large, self-propelled vibratory rollers. Where hand-guided equipment is used, such as a small vibratory plate compactor, the loose lift thickness shall not exceed 6 inches. For this case, cobbles larger than 4 inches should be removed from the fill prior to placement.

Embankment fills should be compacted to a dry density of no less than 95% of the maximum dry density determined in accordance with AASHTO T-99, Method C. Granular Backfill for Structures, or other select materials placed within the roadway base section shall be compacted to a dry density equal to 95% of the maximum dry density as determined in accordance with AASHTO T-99.

7.0 CONCLUSION

If you have any questions or would like to discuss this report, please contact the Geotechnical Engineering Section via email. Computer generated boring logs are attached and available in the M:\Projects\23d793\MaterialsResearch Folder.

END

Reviewed by: Eric Denardo, P.E., Senior Geotechnical Engineer

Enclosures: Appendix A: Boring Locations (1 Page)
Appendix B: Boring Logs (5 Pages)
Appendix C: Inlet Bearing Resistance Graph (1 Page)

cc: Project File
LHD

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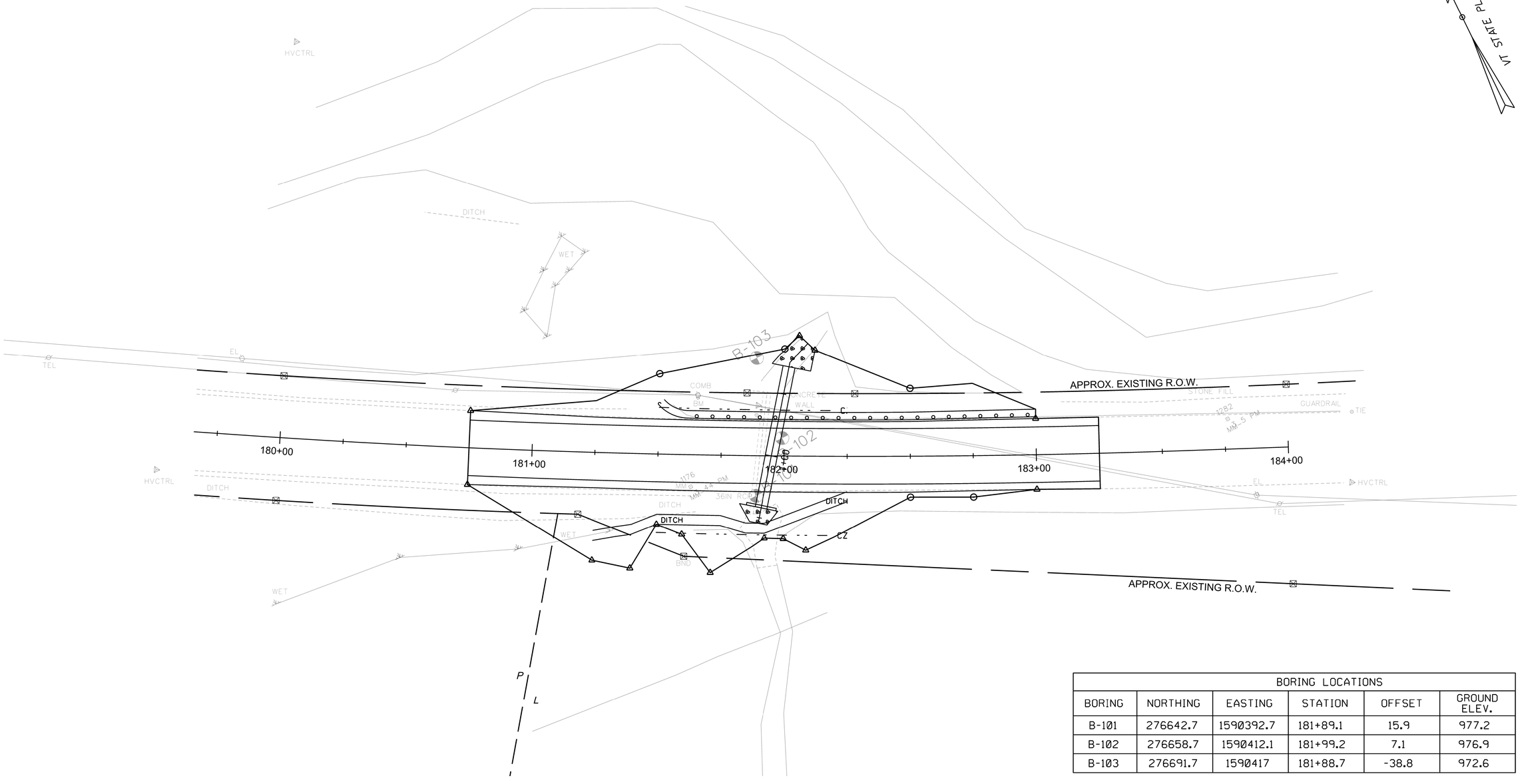
STEEL BEAM GUARDRAIL
STA 181+50 - STA 183+25 LT

ANCHOR FOR STEEL BEAM GUARDRAIL
AS SHOWN IN PLANS

REMOVING AND RESETTING SIGNS
STA 181+63 RT

N

VT STATE PLANE GRID



BORING LOCATIONS					
BORING	NORTHING	EASTING	STATION	OFFSET	GROUND ELEV.
B-101	276642.7	1590392.7	181+89.1	15.9	977.2
B-102	276658.7	1590412.1	181+99.2	7.1	976.9
B-103	276691.7	1590417	181+88.7	-38.8	972.6

PROJECT NAME: ANDOVER
PROJECT NUMBER: ER P23-1(223)

FILE NAME: boring layout.dgn
PROJECT LEADER: B. MARTIN
DESIGNED BY: M. GAMELIN
BORING LAYOUT

PLOT DATE: $$$$DATE$$$
DRAWN BY: M. GAMELIN
CHECKED BY: J. KIERNAN
SHEET 1 OF 1

VERMONT AGENCY OF TRANSPORTATION

HIGHWAY DIVISION
CONSTRUCTION MATERIALS BUREAU
GEOTECHNICAL ENGINEERING SECTION

SOIL BORING

Andover
ER P23-1(223)
VT Route 11 MM 3.465

Boring No.: B-101
Page No.: 1 of 1
Pin No.: 23D793
Checked By: MNM

Boring Crew: Thurston, Lubas, Degener
Date Started: 09/29/2025 Date Finished: 09/29/2025
Coordinates: N:276642.7, E:1590392.7
Station: 181+89.1 Offset: 15.9
Ground Elevation: 977.2 ft

	Casing	Sampler
Type:	Wash Bore	SS
I.D.:	4 in	1.5 in
Hammer Wt:	N.A.	140 lb
Hammer Fall:	N.A.	30 in
Hammer/Rod type:	Auto / AWJ	
Rig:	Acker Renegade	C_E = 1.3

Groundwater Observations

Date	Depth (ft)	Status
09/29/2025	3.9'	After Drilling (AD)

Depth (ft)	Graphic Log	AASHTO Classification	Material Description and Notes	Field Data: Recovery (ft) (%)	Field Data: Blow Counts (N-Value)	Lab Data: Moisture Content (%)	Lab Data: Gravel (%)	Lab Data: Sand (%)	Lab Data: Fines (%)
5			6.0 ft - 8.0 ft, Field Note: Roller rock clean out. Suspected boulder or cobbles.						
		A-1-b	8.0 ft - 10.0 ft, Lab Classification: Dry to Moist, Brown, Dense, GRAVEL and SAND, some Silt	1.3	13-15-16-17 (31)	12.1	43.4	35.1	21.6
10			10.0 ft - 12.0 ft, Field Description: Dry to Moist, Brown, Very Dense, SILT and GRAVEL, some Fine-grained Sand	0.8	20-27-22-17 (49)				
		A-1-b	12.0 ft - 13.4 ft, Lab Classification: Moist, Brown, Very Dense, GRAVEL, some Sand, little Silt, Refusal at 13.4 ft. 50 blows per 6 in.	0.6	5-8-50/5" (R)	13.6	51.1	31.8	17.2
			13.0 ft - 14.0 ft: Roller rock clean out						
15			14.0 ft - 16.0 ft, Field Description: Moist, Brown, Very Dense, SILT, some Sand, some Gravel		6-11-31-32 (42)				

End of Boring at 16.0 ft.
Hole Collapse at 6.9 ft.

Notes:
1. Stratification lines represent approximate boundary between material types. Transitions may be gradual.
2. N-values have not been corrected for hammer energy. CE is the hammer energy correction factor.
3. Water level readings have been made at times and under conditions stated. Water levels are likely to vary.

VERMONT AGENCY OF TRANSPORTATION

HIGHWAY DIVISION
CONSTRUCTION MATERIALS BUREAU
GEOTECHNICAL ENGINEERING SECTION

SOIL BORING

Andover
ER P23-1(223)
VT Route 11 MM 3.465

Boring No.: B-102
Page No.: 1 of 2
Pin No.: 23D793
Checked By: MNM

Boring Crew: Lubas, Thurston, Messina
Date Started: 09/23/2025 Date Finished: 09/23/2025
Coordinates: N:276658.7, E:1590412.1
Station: 181+99.2 Offset: -7.1
Ground Elevation: 976.9 ft

	Casing	Sampler
Type:	Wash Bore	SS
I.D.:	4 in	1.5 in
Hammer Wt:	N.A.	140 lb
Hammer Fall:	N.A.	30 in
Hammer/Rod type:	Auto / AWJ	
Rig:	Acker Renegade	C_E = 1.3

Groundwater Observations

Date	Depth (ft)	Status
09/23/2025	4'	After Drilling (AD)

Depth (ft)	Graphic Log	AASHTO Classification	Material Description and Notes	Field Data: Recovery (ft) (%)	Field Data: Blow Counts (N-Value)	Lab Data: Moisture Content (%)	Lab Data: Gravel (%)	Lab Data: Sand (%)	Lab Data: Fines (%)
			0.0 ft - 0.5 ft: Asphalt 0.5 ft - 2.0 ft, Field Description: Dry, Grayish Brown, Dense, SAND and GRAVEL Asphalt in sampler.	1.1	12-11-10-8 (21)				
			2.0 ft - 4.0 ft, Field Description: Dry to Moist, Grayish Brown, Medium Dense, Well-graded, GRAVEL and Very Fine Grained SAND, trace Silt	1.5	9-6-8-8 (14)				
5			4.0 ft - 6.0 ft, Field Description: Moist to Wet, Grayish Brown, Medium Dense, Fine Grained SAND, some Well-graded Gravel	1.6	9-7-4-3 (11)				
		A-2-4	6.0 ft - 8.0 ft, Lab Classification: Moist to Wet, Dark Brown, Medium Dense, Well-graded SAND, little Silt, little Gravel, Wood in end of sampler. Roller rock clean out. Wood pieces flowing in drill water return during roller rock clean out.	0.8	8-7-3-2 (10)	25.7	11.3	72.1	16.7
			8.0 ft - 10.0 ft: Moist to Wet, Dark Brown, Medium Dense, Well-graded SAND, trace Gravel, Peat in sample, dark brown and rotting organic odor during drilling operations.	0.2	10-10-9-8 (19)				
10			10.0 ft - 12.0 ft: Moist to Wet, Dark Brown, Dense, Well-graded SAND, some Gravel, Field Note: Roller rock and NXDC clean out barrel used. Rig chatter while using NXDC cleanout.	0.7	7-9-12-11 (21)				
			12.0 ft - 14.0 ft: Moist to Wet, Dark Brown, Very Dense, SAND, some, Well -graded Gravel, trace Silt, fractured rock at end of sampler. Roller rock clean out.	1	9-21-28-38 (49)				
15		A-2-4	14.0 ft - 15.4 ft, Lab Classification: Moist, Brownish Gray, Very Dense, Fine Grained SAND, some Silt, some Gravel, Refusal at 15.4 ft. 50 blows per 6.0 in.	1	19-37-50/5" (R)	13.0	28.2	42.2	29.6

Notes:
1. Stratification lines represent approximate boundary between material types. Transitions may be gradual.
2. N-values have not been corrected for hammer energy. CE is the hammer energy correction factor.
3. Water level readings have been made at times and under conditions stated. Water levels are likely to vary.

VERMONT AGENCY OF TRANSPORTATION

HIGHWAY DIVISION
CONSTRUCTION MATERIALS BUREAU
GEOTECHNICAL ENGINEERING SECTION

SOIL BORING

Andover
ER P23-1(223)
VT Route 11 MM 3.465

Boring No.: B-102
Page No.: 2 of 2
Pin No.: 23D793
Checked By: MNM

Boring Crew: Lubas, Thurston, Messina
Date Started: 09/23/2025 Date Finished: 09/23/2025
Coordinates: N:276658.7, E:1590412.1
Station: 181+99.2 Offset: -7.1
Ground Elevation: 976.9 ft

	Casing	Sampler
Type:	Wash Bore	SS
I.D.:	4 in	1.5 in
Hammer Wt:	N.A.	140 lb
Hammer Fall:	N.A.	30 in
Hammer/Rod type:	Auto / AWJ	
Rig:	Acker Renegade	C_E = 1.3

Groundwater Observations

Date	Depth (ft)	Status
09/23/2025	4'	After Drilling (AD)

Depth (ft)	Graphic Log	AASHTO Classification	Material Description and Notes	Field Data: Recovery (ft) (%)	Field Data: Blow Counts (N-Value)	Lab Data: Moisture Content (%)	Lab Data: Gravel (%)	Lab Data: Sand (%)	Lab Data: Fines (%)
			19.0 ft - 20.4 ft, Field Description: Dry to Moist, Brown, Dense, Very Fine Grained SAND, little Silt, little Gravel	1	19-37-50/5" (R)				
20									
		A-1-a	24.0 ft - 25.4 ft, Lab Classification: Moist, Brownish Gray, Very Dense, GRAVEL, some Sand, little Silt, Refusal at 25.4 ft. 10 blows, no movement.	0.6	7-18-10/5" (R)	8.2	60.0	29.4	10.6
25									
			28.0 ft - 29.0 ft, Field Note: Roller rock clean out.						
			29.0 ft - 29.9 ft, Field Description: Dry to Moist, Brownish Gray, Very Dense, Coarse SAND and Well-graded GRAVEL, trace Silt. Refusal at 29.9 ft. 10 blows, no movement.	0.4	3-10/5" (R)				
30			29.9 ft - 35.5 ft, Field Note: Roller rock used to confirm no bedrock.						
35									

End of Boring at 35.5 ft.
Hole Collapse at 19.4 ft.

Notes:
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HIGHWAY DIVISION
CONSTRUCTION MATERIALS BUREAU
GEOTECHNICAL ENGINEERING SECTION

SOIL BORING

Andover
ER P23-1(223)
VT Route 11 MM 3.465

Boring No.: B-103
Page No.: 1 of 2
Pin No.: 23D793
Checked By: MNM

Boring Crew: McGinley, Lubas, Thurston, Messina
Date Started: 09/24/2025 Date Finished: 09/24/2025
Coordinates: N:276691.7, E:1590417.0
Station: 181+88.7 Offset: -38.8
Ground Elevation: 972.6 ft

	Casing	Sampler
Type:	Wash Bore	SS
I.D.:	4 in	1.5 in
Hammer Wt:	N.A.	140 lb
Hammer Fall:	N.A.	30 in
Hammer/Rod type:	Auto / AWJ	
Rig:	Acker Renegade	C_E = 1.3

Groundwater Observations

Date	Depth (ft)	Status
09/24/2025	2.5'	After Drilling (AD)

Depth (ft)	Graphic Log	AASHTO Classification	Material Description and Notes	Field Data: Recovery (ft) (%)	Field Data: Blow Counts (N-Value)	Lab Data: Moisture Content (%)	Lab Data: Gravel (%)	Lab Data: Sand (%)	Lab Data: Fines (%)
			0.0 ft - 2.0 ft, Field Description: Dry, Brown, Very Loose, Well-graded, SAND and GRAVEL, Organics	0.5	5-WOH-WOH-WOH (0)				
			2.0 ft - 4.0 ft, Field Description: Moist to Wet, Brown, Very Loose, Fine to Medium Grained Well-graded SAND, some Gravel, little Silt,	0.5	WOH-WOH-2-8 (2)				
5			4.0 ft - 6.0 ft, Field Description: Moist to Wet, Brown, Dense, Well-graded SAND, little Silt, trace Gravel	0.6	2-7-15-14 (22)				
		A-2-4	6.0 ft - 8.0 ft, Lab Classification: Wet, Grayish Brown, Fine to Medium Grained SAND, some Gravel, some Silt, 7.4 ft - 8.0 ft, Field Note: Roller rock clean out	1.4	5-5-6-7 (11)	16.0	34.4	42.4	23.2
			8.0 ft - 10.0 ft, Field Description: Wet, Gray, Medium Dense, SAND, some Silt, trace Gravel	0.7	9-6-6-5 (12)				
10			10.0 ft - 12.0 ft, Field Description: Wet, Medium Dense, Fine Grained SAND, some Silt, some coarse grained Gravel, Field Note: Roller rock clean out.	0.8	4-6-8-6 (14)				
			12.0 ft - 14.0 ft, Field Description: Moist to Wet, Brown, Dense, Well-graded SAND, some Gravel, little Silt, Fractured rock in sampler.	1	28-27-17-13 (44)				
15		A-4	14.0 ft - 15.5 ft, Lab Classification: Moist to Wet, Brown, Very Dense, Well-graded, SILT and SAND, some Gravel, Refusal at 15.5 ft. 10 blows, no movement.	1	6-6-12-10/0" (18)	17.10	26.2	36.4	37.4

Notes:
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3. Water level readings have been made at times and under conditions stated. Water levels are likely to vary.

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HIGHWAY DIVISION
CONSTRUCTION MATERIALS BUREAU
GEOTECHNICAL ENGINEERING SECTION

SOIL BORING

Andover
ER P23-1(223)
VT Route 11 MM 3.465

Boring No.: B-103
Page No.: 2 of 2
Pin No.: 23D793
Checked By: MNM

Boring Crew: McGinley, Lubas, Thurston, Messina
Date Started: 09/24/2025 Date Finished: 09/24/2025
Coordinates: N:276691.7, E:1590417.0
Station: 181+88.7 Offset: -38.8
Ground Elevation: 972.6 ft

	Casing	Sampler
Type:	Wash Bore	SS
I.D.:	4 in	1.5 in
Hammer Wt:	N.A.	140 lb
Hammer Fall:	N.A.	30 in
Hammer/Rod type:	Auto / AWJ	
Rig:	Acker Renegade	C_E = 1.3

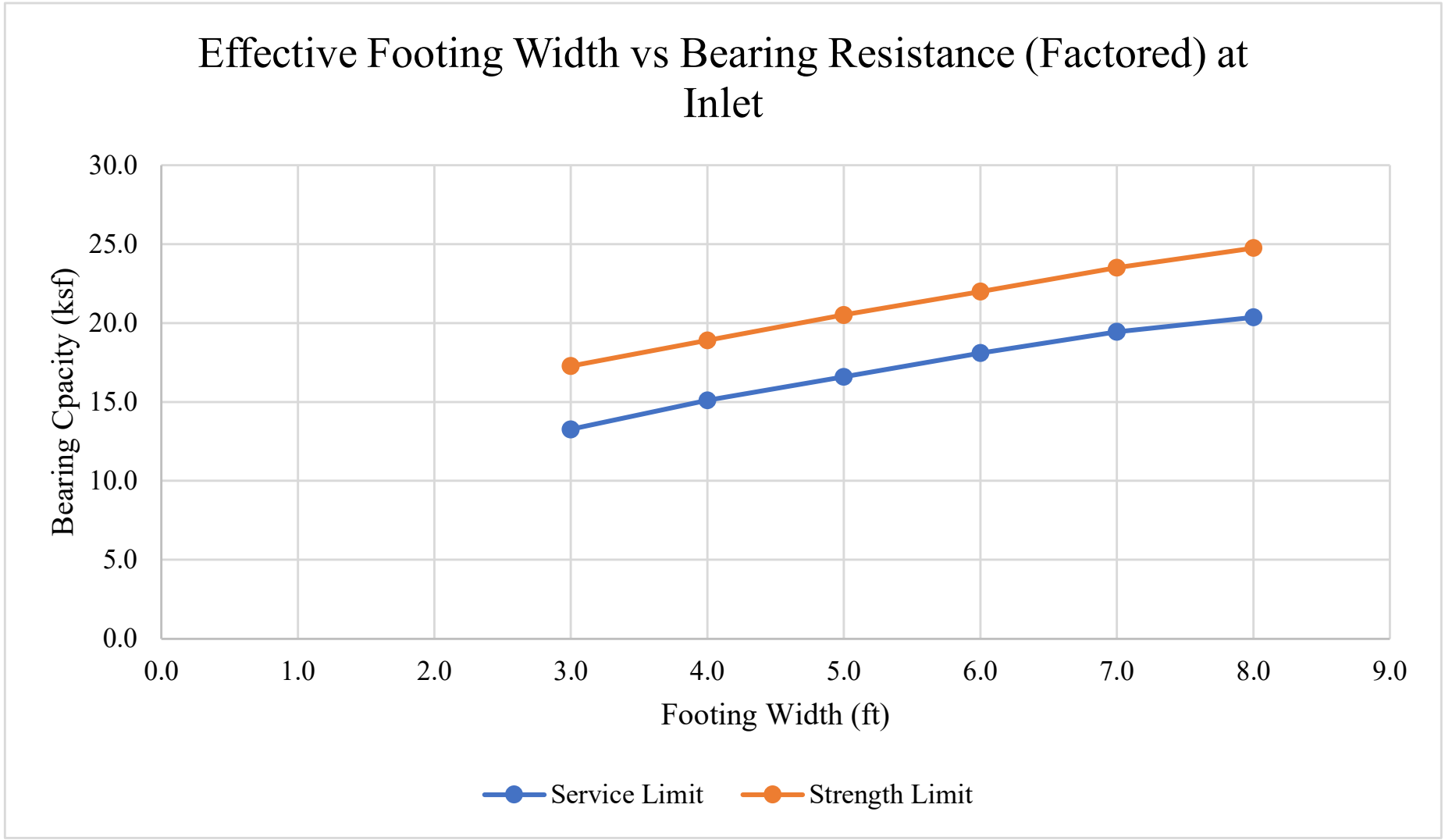
Groundwater Observations

Date	Depth (ft)	Status
09/24/2025	2.5'	After Drilling (AD)

Depth (ft)	Graphic Log	AASHTO Classification	Material Description and Notes	Field Data: Recovery (ft) (%)	Field Data: Blow Counts (N-Value)	Lab Data: Moisture Content (%)	Lab Data: Gravel (%)	Lab Data: Sand (%)	Lab Data: Fines (%)
			18.5 ft - 20.0 ft, Field Note: Roller rock clean out.						
20			20.0 ft - 20.9 ft, Field Description: Moist to Wet, Brown, Very Dense, GRAVEL and Well-graded SAND, little Silt, Fractured rock in Sampler. Refusal at 20.9 ft. 50 blows per 6 in.	0.7	15-50/5" (R)				
			24.0 ft - 25.0 ft, Field Note: Roller rock clean out.						
25		A-1-b	25.0 ft - 27.0 ft, Lab Classification: Dry to Moist, Brown, Very Dense, SAND, some Gravel, little Silt, Fractured rock in sampler.	0.8	12-28-29-25 (57)	12.1	34.5	55.2	10.4
			28.5 ft - 30.0 ft, Field Note: Roller rock clean out. Suspected nested cobbles.						
30			30.0 ft - 31.4 ft, Field Description: Dry to Moist, Orangish Brown, Very Dense, Well-graded GRAVEL and Fine to Medium Grained SAND, little Silt	0.8	15-32-50/5" (R)				

End of Boring at 31.4 ft.
Hole Collapse at 6.8 ft.

Notes:
1. Stratification lines represent approximate boundary between material types. Transitions may be gradual.
2. N-values have not been corrected for hammer energy. CE is the hammer energy correction factor.
3. Water level readings have been made at times and under conditions stated. Water levels are likely to vary.


Effective Footing Width vs Bearing Resistance (Factored) at Inlet
Bearing Cpacity (ksf)
30.0
25.0
20.0
15.0
10.0
5.0
0.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
Footing Width (ft)
Service Limit
Strength Limit