STATE OF VERMONT
AGENCY OF TRANSPORTATION

Scoping Report

FOR

Huntington BO 1445(38)

Town Highway 22, BRIDGE 32 over Brush Brook

January 14, 2019

I. Contents

I. Site Information

Bridge 32 is a Town owned bridge located on Town Highway 22, Camel's Hump Road in the Town of Huntington, approximately 1.5 miles east of the intersection with TH-1, Main Road, in the Town of Huntington. Camel's Hump Road is a gravel dead end road. The existing conditions were gathered from a combination of a Site Visit, the Inspection Report, the Route Log and the existing Survey. See correspondence in the Appendix for more detailed information.

Roadway Classification	Local Road
Bridge Type	Timber Deck on Rolled Steel Beams
Bridge Span	37 feet
Existing Skew	15 degrees
Year Built	1925, deck reconstructed in 1990
Ownership	Town of Huntington
County	Chittenden

Need

Bridge 32 carries Camel's Hump Road across Brush Brook. The following is a list of the deficiencies of Huntington Bridge 32 and TH-22 in this location.

1. The bridge is considered "structurally deficient".
    a. While the steel superstructure is in fair condition with a rating of 5, there is significant deterioration of the girders and cross bracing. All diaphragms have heavy rusting and there is a large hole in the first diaphragm on the upstream side at the western abutment.
    b. The substructures are also in fair condition. Voids can be seen under the edges of the substructures where some streambed material has been washed out. Additionally, the western abutment has cracking with efflorescence and the eastern abutment has cracking with a full height vertical crack and temporary shoring installed.
2. The bridge and approach roadway do not have adequate width for the speed and traffic volume present.
3. The vertical curve on the west approach is substandard in K value and sight distance.

Traffic

A traffic study of this site was performed by the Vermont Agency of Transportation. The traffic volumes are projected for the years 2018 and 2038.

TRAFFIC DATA	2018	2038
AADT	230	260
DHV	55	60
ADTT	15	30
%T	7.9	11.3
%D	61	61

Design Criteria

The design standards for this bridge project are the Vermont State Standards (VSS), dated October 22, 1997. Minimum standards are based on an ADT < 400 and a design speed of 30 mph.

Design Criteria	Source	Existing Condition	Minimum Standard	Comment
Approach Lane and Shoulder Widths	VSS Table 6.3	9/0.5' (19')	9/2 (22')	Substandard
Bridge Lane and Shoulder Widths	VSS Section 6.6	14.3 rail-to-rail	9/2 (22')[1]	Substandard
Clear Zone Distance	VSS Table 6.5	Unshielded utility pole at approx. sta. 43+79 rt	7' all conditions	Substandard
Banking	VSS Section 6.12	Varies between 3-6%, slightly adverse on bridge	6% max for unpaved roads	Substandard
Speed	VSS Section 6.2	30 mph in general 20 mph at one lane bridge	30 mph (Design) 20 mph on one lane bridges and winding road sections	
Horizontal Alignment	AASHTO Green Book Table 3-10b	100' radius curve comes approximately 3.5 ft. onto bridge	An 5.8% bank is appropriate for a 106' radius at 20 mph	Substandard
Vertical Grade	VSS Table 3.5	Bridge located on a sag curve – max grade on both approaches is 7.57%	14% (max) for mountainous terrain	
K Values for Vertical Curves	VSS Table 6.1	K=20 (sag) on each approach	30 crest / 40 sag for 30 mph, 20 crest/ 30 sag for 25 mph	Probably very close for the posted speed of 20 mph
Vertical Clearance Issues	VSS Section 6.7	None noted	14' (min)	
Stopping Sight Distance	VSS Table 6.1	132', both approaches	200' for 30 mph, 150' for 25 mph	Probably very close for the posted speed of 20 mph
Bicycle/Pedestrian Criteria	VSS Table 3.7	+/- 0.5 ft.	2' Shoulder[2]	
Bridge Railing	Structures Manual Section 13	W beam rail mounted on timber curb and bolted through timber deck	TL-2	Substandard
Hydraulics	VTrans Hydraulics Section	Passes Q_{25} storm event with 3.8 ft. freeboard Clearspan: 30'	Pass Q_{25} storm event with 1' of freeboard Minimum BFW: 34'	Substandard Clearspan
Structural Capacity	SM, Ch. 3.4.1	Structurally Deficient	Design Live Load: HL-93	Substandard

[1] The minimum width of a new one lane bridge would be 18', as shown in VSS Table 6.4 for bridges to remain in place.

[2] Table 6.7 of the VSS states that a 2' shoulder should be provided on bridges or where ADTT will exceed 10%. This is consistent with the lane and shoulder width standards for this roadway. Bicycle traffic is likely to be light, according to local input, and is not well accommodated by unpaved surfaces.

Inspection Report Summary

Deck Rating	6 Satisfactory
Superstructure Rating	5 Fair
Substructure Rating	5 Fair
Channel Rating	5 Fair

From the Structure Inspection, Inventory, and Appraisal Sheet:

"9/25/2017 – Full width runner planks have been added and a added layer of decking all 3X6. Superstructure will need recon in the near future. ~FRE/MAC"

"04/14/2016 – Special request/QCQA inspection check. * The steel superstructure has some advanced deterioration, with extensive corrosion. The interior beam ends at the west abutment are particularly poor, with heavy loss along the webs over the bearing area. These beams are subject to crushing effects, with some light distortion already evident. Considering the section loss along the steel, the 16,000 load posting should be adhered to, and the entire superstructure considered for full replacement within the next year. ~ MJ/SP"

"9/17/2015 – Runner planks will need replacing in the near future. Beams should be cleaned and painted. Structure should be considered for a rehab soon. Debris in the channel should be removed. ~ FRE/TJB"

"9/20/13 – Deck is in fair condition. Some runner planks should be replaced. All the beams should be cleaned of all rust scale and painted. Approach rail on the upstream side of abutment #2 should be repaired. ~ FRE/MK"

Hydraulics

An abbreviated Preliminary Hydraulics Report was produced for this project. It addressed only an analysis of existing conditions.

The structure is hydraulically adequate because there is 3.8' of freeboard at Q_{25}, and 2.7' at Q_{100}. Hydraulic standards require a minimum of 1 foot of freeboard for the Q_{25} discharge for Local Highways.

The existing skew is approximately 15 degrees as measured from the surveyed layout. The Bank Full Width (BFW) of the stream, confirmed by representatives of ANR, should be a minimum of 34'-38' perpendicular to the stream. The existing structure only provides a clearspan of 30'and as such slightly constricts the channel.

As this project continues in development, additional information will be computed for specific alternatives so that low beam elevations are defined for all configurations.

Utilities
The existing utilities are shown on the Resource Site Plan in Appendix M, and are as follows:

Underground: There do not appear to be any buried utilities close to the bridge, either municipal water and sewer, or electric or communication services.

Aerial: There are overhead electric and communication utility lines passing over the project. It is expected that relocation of communication utilities will be required, but relocation of the electric lines may not be required due to their height. This will have to be confirmed during the design phase.

Right of Way

The existing Right-of-Way is shown on the Resource Site Plan in Appendix M. The width appears to be a constant width 49.5 ft., or 3 rods. Depending on the alternative chosen, additional Right-of-Way may be required for the project.

Resources

The resources present at this project are shown on the Resource Site Plan, and are as follows:

Biological:

Wetlands/Watercourses

There are no wetlands in the immediate vicinity of the project area, but the stream is a cold water fishery with more than half of its watershed within the Camels Hump State Forest. The stream may have a tendency to be flashy. Any impacts below Ordinary High Water will require a Section 404 permit from the US Army Corps of Engineers.

Wildlife Habitat

"The project is located along a rural town highway with relatively low traffic volumes and low travel speeds. These conditions are not expected to change after the construction of the project, and since most wildlife safely crosses this roadway now, provision for additional shelf for wildlife under the crossing is not necessary."

Rare, Threatened and Endangered Species

The project is within the habitat range of the Northern Long Eared Bat, a federally protected species, and it appears that there may be suitable habitat within the project area. Avoidance and Minimization measures may be required if cutting certain trees during certain ties of year.

Agricultural
There are no Prime Agricultural soils within the project area.

Archaeological:

The northwest quadrant of the bridge site contains the remains of dry laid stone work associated with a saw mill that was present in the 1800s. These remains should be protected from disturbance during all bridge work. Further Archaeological investigation will be required if this cannot be avoided. These areas can be seen in Appendix H.

Historic:

This bridge is not historic, and there are no adjacent historic resources.

Hazardous Materials:

There are no known hazardous materials in the project area.

Stormwater:

There are no stormwater concerns for this project.

II. Safety

No crashes have been reported during the period from 01/01/2012 – 12/31/2016. Nonetheless, consideration is made to achieving geometric standards within the project area to a reasonable extent.

III. Alternatives Discussion

Bridge 32 has a deck rating of 6 (satisfactory), a superstructure rating of 5 (fair), a substructure rating of 5 (fair), and is described as structurally deficient on the latest Bridge Inspection Report. It is also substandard for lane and shoulder widths. The existing channel configuration is rated 5, fair. The bridge meets the hydraulic standard for capacity but does not meet the minimum bank full width requirements. Minor horizontal geometry deficiencies exist.

No Action

This alternative leaves the bridge in its current condition. One rule of thumb typically used for the "No Action" alternative is to determine whether the existing bridge can stay in place for the next 10 years without maintenance that seriously impacts traffic flow. Another rule is avoiding "4" ratings for bridge elements. Given the condition of the superstructure and substructure, this bridge will require work within the next 10 years and is likely to have a "4" rating within the next 10 years. From the standpoint of safety, economics, and convenience, this alternative is not recommended and will not be considered further.

Alternative 1: Rehabilitation

Deck

The existing deck is constructed of timber planks and is rated 6 (satisfactory). Timber planks typically have a lifespan of 10 years. If the superstructure gets replaced, the deck could be removed and then re-installed on top of a new superstructure. However, it is not likely that new railings can be attached that

comply with crash-tested requirements. There may be other ways to attach new railings that are designed for the required loading, but they would not be considered crash-tested. Continued use of the timber plank deck is not recommended. A new cast-in-place concrete deck and new crash-tested bridge and approach rail would be recommended for a rehabilitation. A width of 16' rail to rail would be considered minimum.

Superstructure

The superstructure, referring to the rolled steel beams, is rated 5 ("fair"). Depending on the nature of the deterioration, it is sometimes appropriate to rehabilitate existing steel sections by removing all rust and recoating the surfaces. Sometimes it is appropriate to add steel plates in areas where deterioration is more advanced. In the case of Bridge 32, some of the steel beams are suffering from extreme section loss, particularly near the ends, to the point where it is not possible to add steel plates and expect them to act in composite action with the beams. In fact, work has been done to add support to the beams on one end in order to relocate the bearing points to a more intact area of the beams. The bearings on the other end are in very rough shape. For this reason, rehabilitation of the superstructure is not recommended and will not be considered further in this report.

Substructure

The substructure is rated 5 (fair). Scour has occurred at the base of both abutments, but particularly at the east abutment. There are also cracks in both abutments. These deficiencies can be rehabilitated, but it is felt that the abutments, if rehabilitated, would give approximately 30 more years of service.

Rehabilitation of the existing substructures would include preparation of the concrete substructure surfaces for a new seal coat, and filling cracks with a cementitious or epoxy sealer to limit water entry. Scour protection measures would be required by adding stable material to the voids around and under the substructures, and minor erosion control work would be needed to stabilize and protect the stream banks in the project area. The bridge seats would have to be rehabilitated by removing the top 6"-8" of concrete and adding new grout or concrete. New bearings would be required.

The lane and shoulder widths could be slightly improved, but they could not be made compliant with the standard without replacing the substructures. The existing substandard roadway geometry features would remain if this alternative is chosen.

The only method of traffic maintenance available for this alternative would be a temporary bridge, since a closure on a dead-end road is not feasible and the bridge is too narrow to rehabilitate in phases. It is estimated that rehabilitated substructures would provide another 30 years of service before needing replacement.

Temporary Right of Way would be required for the temporary bridge.

Alternatives 2 and 3: Complete Bridge Replacement, On or Off Alignment

A complete new bridge would be expected to provide a minimum of 75 years of service, with periodic maintenance and preservation treatments. An integral abutment or a spread footing abutment could be considered for this site, constructed on the existing alignment or on a new alignment with some minor improvements to substandard features such as banking.

Other variables include:

a. Width

The current roadway width varies, but is generally 19', and the current bridge width is slightly over 14', well below the standard of 22'. Since a complete new bridge can be expected to be in place for 75 years, it is recommended that it meet the minimum standard width of 22', with 9' lanes and 2' shoulders. The Town, as the Owner, may request that a new bridge occupy the same curb to curb width, or alignment, or both, as the existing in accordance with VSS Section 6.6, as long as it meets the minimum width of 16' for a one-lane structure. A new bridge replacement was recently completed for Bridge 30, further up TH-22 toward the Camels Hump trail head. That bridge was constructed with an 18' clear width and is operated as a one lane bridge. A 30' width could also be considered, as this width would allow major maintenance projects to take place while phasing the work. Phasing work would be a major advantage in accomplishing future maintenance activities.

b. Span and skew

The clear distance between faces of the existing abutments is measured from the survey as approximately 31.5' with a 15 degree skew. The Bank Full Width (BFW) as determined in the field, and corroborated with the Agency of Natural Resources River Management Engineer, is 34' at the existing bridge site. The waterway width increases slightly and the skew becomes slightly more pronounced if the new alignment is downstream of the current location, so an allowance for a BFW of 38' is made. If an integral abutment bridge is designed, the new span would start with the BFW and would slope up at 1:1.5 maximum slope to the abutment. A 5' retaining condition at the abutment is assumed for an integral abutment, with skew limited to 20 degrees to be eligible for the simplified design method.

Alternatively, shallow spread footing abutments could be used here. Three borings were taken on the upstream side of the bridge showing bedrock at approximately elevation 928 to 938, or 13 feet to 23 feet below finish grade. As such, if an integral abutment is chosen, pre-boring holes for the piles would likely be required. In approximating the span of a shallow abutment bridge, a small batter is assumed.

Approximate span and skew geometry for various new bridge alternatives:

- Integral Abutment Bridge On alignment: Span 60' Skew 15 degrees
- Integral Abutment Bridge Off alignment: Span 65' Skew 20 degrees
- Shallow Abutment Bridge On alignment: Span 45' Skew 15 degrees
- Shallow Abutment Bridge Off alignment: Span 50' Skew 20 degrees

c. Horizontal Alignment

The existing roadway on the west approach is on a sharp horizontal curve with a radius of 100'. The curve runs approximately 3.5'onto the bridge. The banking through the bridge area is variable and is slightly adverse on the bridge itself. Gravel surfaced roads generally shift slightly over time as wear and tear and occasional grading and maintenance take place. For a bridge built on a new alignment, it would be possible to make minor improvements to the road curvature and banking, although it is not going to be possible to bring it up to standard without large takings of ROW. The bridge should be constructed wholly on a tangent or wholly on a curve. On or off alignment can be considered for a new bridge.

d. Vertical Alignment

The existing bridge is on a short tangent sloped at -0.633% between two vertical sag curves. Currently the low point is just off the bridge. The K-values are fairly low but are probably okay for the 20 mph speed limit posted for single lane bridges. There is plenty of freeboard for the hydraulic standard, so raising the bridge for hydraulic reasons is not anticipated. Note that if the bridge is replaced with a new two lane bridge, the speed limit could go to 30 mph as allowed by Town ordinance, and the K values would then be substandard unless increased to at least 40 for the sag curves.

e. Superstructure Type

The most common superstructure types for comparable spans in Vermont are steel beams/girders with concrete decks, cast-in-place concrete slabs, or precast concrete. Cast-in-place methods might be an economical solution if rapid construction is not chosen. Precast NEXT-D beams, precast concrete slabs, or Prefabricated Bridge Units (PBUs) could be used if a rapid construction technique is desired. There are numerous options available for this project depending on the future alignment and method of traffic maintenance ultimately chosen. The superstructures will be designed in a later phase of project planning.

f. Substructure Type

Integral abutment bridges are the first choice of VTrans for bridges, as they are resilient and allow bridge construction without expansion joints. The conditions required for simplified design of integral abutment bridges appear to be attainable at this site. These conditions include straight superstructure, abutment height less than 13', and skew less than 20 degrees. Pre-drilling or pre-boring is likely to be necessary due to bedrock locations ranging from 12'-15' below road grade in preliminary explorations.

A shallow abutment bridge may have expansion joints, which if not maintained, tend to allow deterioration to accelerate, shortening the life of the bridge. The abutments can likely bear either directly on rock, or on suitable soils bearing on rock. If on soils, the base of the foundation would need to bear at least 6' below the stream bed to provide a measure of protection against scour. Spans for shallow abutment bridges tend to be shorter because the faces of the abutments can be nearly vertical and retain a greater height of soil.

IV. Maintenance of Traffic

The Vermont Agency of Transportation reviews each new project to determine suitability for the Accelerated Bridge Program, which focuses on faster delivery of construction plans, permitting, and Right-of-Way, as well as faster construction of projects in the field. One practice that will help in this endeavor is closing bridges for portions of the construction period, rather than providing temporary bridges. For this project, because it is on a dead-end road with residences and a popular recreational area beyond the bridge, a road closure and off-site detour will not be considered in this report.

Option 1: Off-Site Detour

Road closures and off-site detours were not considered for this dead-end road due to the lack of feasible detours or bypasses.

Option 2: Phased Construction

Phased construction is the maintenance of one lane for traffic on the existing bridge while building one lane at a time of the proposed structure. This allows keeping the road open during construction, while having minimal impacts to resources and adjacent property owners. There are advantages and disadvantages to phasing construction, but this report will not get into the details because the current bridge is considerably too narrow to allow a project to be built in two phases without becoming considerably wider.

Option 3: Temporary Bridge

A one lane bridge with alternating one-way traffic would be adequate to manage traffic during a project at this bridge. No temporary traffic signals would be necessary as long as adequate sight distance is achieved. Currently, the normal traffic condition is one-lane, alternating since the existing bridge is one lane.

Due to terrain, a temporary bridge on the upstream (south) side was considered less desirable than the downstream option. A significant number of trees would be lost and the steep embankment on that side would pose a serious challenge. A downstream location on the north side would be more easily managed. The temporary bridge would occupy at least a portion of a residential front yard and could adversely impact an archaeologically sensitive area. Additional ROW would be required.

Although traffic flow would be maintained through the project corridor during construction, this option would require the relatively high cost of erecting and dismantling a temporary bridge and would have impacts to resources and neighboring properties. There would be some delays and disruption to traffic, with the speed limit reduced.

The temporary bridge layout can be seen in the Appendix.

Option 4: New Bridge Off-Alignment

In this option, the existing bridge remains in use while a new bridge is constructed on a new alignment adjacent to it. The bridge in this alternative has several potential adverse impacts on neighboring properties and resources. New Right of Way would be required.

V. Alternatives Summary

Based on the existing site conditions, bridge condition, and recommendations from hydraulics, there are the following viable alternatives:

Alternative 1: Deck and Superstructure Replacement with Temporary Bridge
Alternative 2a: New Integral Abutment Bridge On-Alignment with Temporary Bridge, Standard Width
Alternative 2b: New Integral Abutment Bridge Off-Alignment, Standard Width
Alternative 3a: New Shallow Abutment Bridge On-Alignment with Temporary Bridge, Standard Width
Alternative 3b: New Shallow Abutment Bridge Off-Alignment, Standard Width

VI. Cost Matrix[3]

Huntington BO 1445(38)		Alternative 1 Deck and Superstructure Replacement Temporary Bridge	Alternative 2a New Integral Abutment Bridge On Alignment Temporary Bridge	Alternative 2b New Integral Abutment Bridge Off Alignment Use Existing Bridge	Alternative 3a New Shallow Abutment On Alignment Temporary Bridge	Alternative 3b New Shallow Abutment Off Alignment Use Existing Bridge
COST	Bridge Cost	430,700	770,600	785,800	699,000	725,300
	Removal of Structure	29,160	54,675	54,675	54,675	54,675
	Roadway	164,000	206,000	516,000	211,000	553,000
	Maintenance of Traffic	230,920	231,540	104,040	231,540	104,040
	Construction Costs	854,780	1,262,815	1,460,515	1,196,215	1,437,015
	Construction Engineering + Contingencies	170,956	315,704	365,129	299,054	359,254
	Total Construction Costs w CEC	1,025,736	1,578,519	1,825,644	1,495,269	1,796,269
	Preliminary Engineering[4]	299,173	252,563	292,103	239,243	287,403
	Right-of-Way	30,000	30,000	65,000	30,000	65,000
	Total Project Costs	**1,354,909**	**1,861,082**	**2,182,747**	**1,764,512**	**2,148,672**
	Town Share	**67,750 (5%)**	**186,110 (10%)**	**218,280 (10%)**	**176,460 (10%)**	**214,870 (10%)**
	Annualized Project Cost	45,170	24,820	29,110	23,530	28,650
SCHEDULING	Project Development Duration[5]	4 years	4 years	4 years	4 Years	4 Years
	Construction Duration	18 months	18 months	8 months	18 months	8 months
	Closure Duration (If Applicable)	NA	N/A	N/A	NA	NA
ENGINEERING	Typical Section - Roadway (feet)	18’	22'	22’	22’	22’
	Typical Section - Bridge (feet)	2-14-2	2-9-9-2	2-9-9-2	2-9-9-2	2-9-9-2
	Geometric Design Criteria	Substandard width Substandard curve at western approach	Substandard curve at western approach	Meets Standard	Substandard curve at western approach	Meets Standard
	Traffic Safety	Improved	Improved	Improved	Improved	Improved
	Alignment Change	No	No	Yes	No	Yes
	Bicycle Access	Improved	Improved	Improved	Improved	Improved
	Hydraulic Performance	Substandard BFW	Meets Standard	Meets Standard	Meets Standard	Meets Standard
	Pedestrian Access	Improved	Improved	Improved	Improved	Improved
	Utility	Relocated	Relocated	Relocated	Relocated	Relocated
OTHER	ROW Acquisition	Yes	Yes	Yes	Yes	Yes
	Road Closure	No	No	No	No	No
	Design Life	30 Years	75 Years	75 Years	75 Years	75 Years

[3] Costs are estimates only, used for comparison purposes.
[4] Preliminary Engineering costs are estimated starting from the end of the Project Definition Phase.
[5] Project Development Durations are starting from the end of the Project Definition Phase.

VII. Conclusion

Alternative 3a is recommended; to replace the bridge with a new shallow foundation bridge on alignment while maintaining traffic on a downstream temporary bridge.

Structure:

A complete replacement was chosen for this bridge for the following reasons

- While the superstructure replacement option has the lowest upfront cost, the full bridge replacement option has a lower annualized cost.
- The structural capacity of this bridge is reduced and is dependent on the temporary supports installed at mid-span. The mid-span supports are highly susceptible to scour and high flow conditions.
- The superstructures and substructures are rated 5 (Fair). Rehabilitation of these elements will be difficult and will offer a limited continued life of approximately 30 years.
- A replacement project offers some limited opportunity to improve horizontal geometry, although it is unlikely that all standards will be met.
- A rehabilitation would require the use of a temporary bridge, a costly expense to extend the life of the bridge only 30 years.

The proposed structure would have two 9-foot travel lanes with 2-foot shoulders. Due to shallow bedrock, it is recommended that both abutments are founded on footings poured to bedrock. The bridge will have a single span of approximately 45 feet with a 15-degree skew to match the channel and meet minimum bankfull width requirements. Since traffic will be maintained through the project site during construction, all bridge elements should be cast-in-place for cost effectiveness. The superstructure depth is not critical for meeting hydraulic standards, so the superstructure type shall be determined during the design phase.

Traffic Control:

Camel's Hump Road, TH-22, is a dead-end road, with many residential properties and recreational opportunities beyond the bridge, which eliminates an off-site detour. The width of the existing bridge prohibits constructing a project in phases as well. The only remaining options are a temporary bridge or a new bridge off-alignment. A temporary bridge is recommended to minimize encroachment on the property in the NE quadrant. The temporary bridge option is also less expensive than the off-alignment option. It is recommended that the temporary bridge is put on the downstream side of the bridge. The project site does not offer reasonable opportunities for doing much on the upstream (south) side of the bridge due to terrain and bank stability concerns, so a temporary or permanent relocation to the south is not considered.

VIII. Appendices

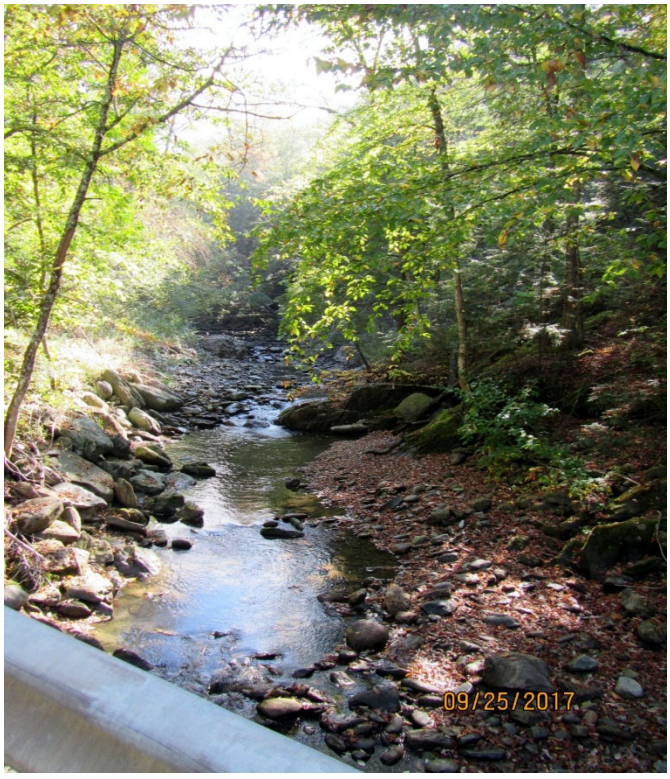
A: Site Pictures
B: Town Map
C: Bridge Inspection Report
D: Preliminary Hydraulics
E: Preliminary Geotechnical Information
F: Natural Resources Memo
G: Natural Resources ID
H: Archeology Memo
I: Historic Memo
J: Stormwater ID
K: Crash Data
L: Local Input
M: Plans

Appendix A: Site Pictures

Picture 1: Bridge 32 Looking West

Picture 2: Bridge 33 Looking East

Picture 3: Brush Brook Looking Downstream



Picture 4: Brush Brook Looking Upstream

Picture 5: Temporary Mid-Span Support – Note undermining at far abutment

Picture 6: Significant Corrosion of Beams

Appendix B: Town Map

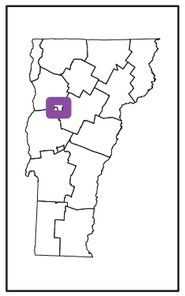
Huntington
TH-22, Br 32.

Scale 1:61,320

N

- INTERSTATE
- STATE LONG
- STATE SHORT
- TOWN LONG
- FAS/FAU
- INTERSTATE
- STATE HIGHWAY
- CLASS 1
- CLASS 2
- CLASS 3
- CLASS 4
- LEGAL TRAIL
- PRIVATE
- DISCONTINUED
- DISTRICT
- POLITICAL BOUNDARY
- NAMED RIVERS-STREAMS
- UNNAMED RIVERS-STREAMS
- VOBCIT Bridge Data
- VOBCIT Culvert Data

Produced by:
Mapping Unit
Vermont Agency of Transportation
June 2014



HUNTINGTON
CHITTENDEN COUNTY
DISTRICT # 5

Appendix C: Bridge Inspection Report

STRUCTURE INSPECTION, INVENTORY and APPRAISAL SHEET

Vermont Agency of Transportation ~ Structures Section ~ Bridge Management and Inspection Unit

Inspection Report for HUNTINGTON **bridge no.:** 00032 **District:** 5

Located on: C3022 **over** BRUSH BROOK **approximately** 0.7 MI TO JCT W CL3 TH **Owner:** 03 TOWN-OWNED

CONDITION

Deck Rating: 6 SATISFACTORY

Superstructure Rating: 5 FAIR

Substructure Rating: 5 FAIR

Channel Rating: 5 FAIR

Culvert Rating: N NOT APPLICABLE

Federal Str. Number: 100408003204081

Federal Sufficiency Rating: 022.6

Deficiency Status of Structure: SD

AGE and SERVICE

Year Built: 1925 **Year Reconstructed:** 1990

Service On: 1 HIGHWAY

Service Under: 5 WATERWAY

Lanes On the Structure: 01

Lanes Under the Structure: 00

Bypass, Detour Length (miles): 99

ADT: 000100 **% Truck ADT:** 02

Year of ADT: 2007

GEOMETRIC DATA

Length of Maximum Span (ft): 0037

Structure Length (ft): 000045

Lt Curb/Sidewalk Width (ft): 0

Rt Curb/Sidewalk Width (ft): 0

Bridge Rdwy Width Curb-to-Curb (ft): 14.3

Deck Width Out-to-Out (ft): 16.2

Appr. Roadway Width (ft): 019

Skew: 10

Bridge Median: 0 NO MEDIAN

Min Vertical Clr Over (ft): 99 FT 99 IN

Feature Under: FEATURE NOT A HIGHWAY OR RAILROAD

Min Vertical Underclr (ft): 00 FT 00 IN

STRUCTURE TYPE and MATERIALS

Bridge Type: ROLLED BM W TMBR DK

Number of Approach Spans 0000 **Number of Main Spans:** 001

Kind of Material and/or Design: 3 STEEL

Deck Structure Type: 8 TIMBER

Type of Wearing Surface: 7 WOOD OR TIMBER

Type of Membrane 0 NONE

Deck Protection: 7 CCA.CREOSOTED WOOD

APPRAISAL *AS COMPARED TO FEDERAL STANDARDS

Bridge Railings: 0 DOES NOT MEET CURRENT STANDARD

Transitions: 0 DOES NOT MEET CURRENT STANDARD

Approach Guardrail 0 DOES NOT MEET CURRENT STANDARD

Approach Guardrail Ends: 0 DOES NOT MEET CURRENT STANDARD

Structural Evaluation: 2 INTOLERABLE, REPLACEMENT NEEDED

Deck Geometry: 6 EQUAL TO MINIMUM CRITERIA

Underclearances Vertical and Horizontal: N NOT APPLICABLE

Waterway Adequacy: 6 OCCASIONAL OVERTOPPING OF ROADWAY WITH INSIGNIFICANT TRAFFIC DELAYS

Approach Roadway Alignment: 6 EQUAL TO MINIMUM CRITERIA

Scour Critical Bridges: 3 SCOUR CRITICAL

DESIGN VEHICLE, RATING, and POSTING

Load Rating Method (Inv): 2 ALLOWABLE STRESS (AS)

Posting Status: P POSTED FOR LOAD

Bridge Posting: 4 POSTING REQUIRED

Load Posting: 02 BRIDGE IS LEGALLY LOAD POSTED AT BOTH ENDS

Posted Vehicle: 6 GROSS LOAD ONLY

Posted Weight (tons): 08

Design Load: 0 OTHER OR UNKNOWN

INSPECTION and CROSS REFERENCE

X-Ref. Route:

Insp. Date: 092017 **Insp. Freq. (months)** 24 **X-Ref. BrNum:**

INSPECTION SUMMARY and NEEDS

9/25/2017 Full width runner planks have been added and a added layer of decking all 3X6. Superstructure will need recon in the near future. ~FRE/MAC

*04/14/2016 - Special request/QCQA inspection check. * The steel superstructure has some advanced deterioration, with extensive corrosion. The interior beam ends at the west abutment are particularly poor, with heavy loss along the webs over the bearing area. These beams are subject to crushing affects, with some slight distortion already evident. Considering the section loss along the steel, the 16,000 load posting should be adhered too, and the entire superstructure considered for full replacement within the next year. ~ MJ/SP*

9/17/2015 Runner planks will need replacing in the near future. Beams should be cleaned and painted. Structure should be considered for a rehab soon. Debris in the channel should be removed. ~FRE/TJB

9/20/2013 Deck is in fair condition. Some runner planks should be replaced. All the beams should be cleaned of all rust scale and painted. Approach rail on the upstream side of abutment #2 should be repaired. ~FRE/MK

Appendix D: Preliminary Hydraulics Report

Stone, Laura

From: Cote, Cassidy
Sent: Monday, August 14, 2017 4:51 PM
To: Sweeny, Gary
Cc: Wark, Nick
Subject: Huntington BO 144-5(38)

Good afternoon,

This message serves to address the preliminary hydraulic analysis for Bridge 32 over Brush Brook, located in Huntington along TH-22, Camels Hump Road, at a distance of 0.6 miles east of TH-21, Salvas Road.

The existing structure has a 33.5' clear span between abutments. The abutments however, are not aligned with the channel. As a result, the hydraulic clear span is only 30', measured perpendicular to the flow. Bridge 32, constricts the channel and does not meet the state stream equilibrium standards for bankfull width. As confirmed with ANR, any replacement structure will need to provide a minimum bankfull width of 34'.

Our calculations, field observations and measurements indicate the existing structure does meet the current standards of the VTrans Hydraulic Manual. The existing low beam elevation is 948.59', as quantified by the survey. This configuration provides 3.8' of freeboard at the 4% AEP design flow, and 2.7' of freeboard at the 1% AEP check flow. Low beam elevation for any new structure may be as low as approximately 947'.

It should be noted that this structure is within a mapped FEMA Flood Insurance Study. Any proposed alternative will need to meet a 'no rise' criteria, in which water surface elevations upstream do not exceed those of the existing configuration. Please contact the VTrans Hydraulics Section with alternative inlet geometry so headwater depths may be calculated. Furthermore, please contact us for assistance developing the structure layout when you have proposed alternatives for this project.

Thank you,

Cassidy B. Cote
Hydraulics and Structures Design Engineer
Vermont Agency of Transportation
(802) 828-2757
Cassidy.Cote@vermont.gov

Appendix E: Preliminary Geotechnical Information

Geotechnical Engineering Report

Huntington BO 1445(38)
Camel's Hump Road over Brush Brook
Huntington, Vermont
PIN: 12j630
January 17, 2018
Terracon Project No. J1135159

Prepared for:
Vermont Agency of Transportation
Montpelier, Vermont

Prepared by:
Terracon Consultants, Inc.
Manchester, New Hampshire

January 17, 2018

Vermont Agency of Transportation
Materials and Research
One National Life Drive
Montpelier, Vermont 05633

Attn: Ms. Callie Ewald, PE
P: [802] 828-1235
E: Callie.Ewald@state.vt.us

Re: Geotechnical Engineering Report
Huntington BO 1445(38)
Camel's Hump Road over Brush Brook
Huntington, Vermont
PIN: 12j630
Terracon Project Number: J1135159

Dear Ms. Ewald:

Terracon Consultants, Inc. (Terracon) has completed the geotechnical engineering services for the above referenced project. This study was performed in general accordance with our proposal number PJ1130203 dated October 11, 2013 (Revised October 17, 2013) and subsequent email communications with Mr. Benda dated November 12, 2013. This report presents the findings of the subsurface exploration and laboratory testing for the proposed project.

We appreciate the opportunity to be of service to you on this project. If you have questions concerning this report, or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.

Anant Panwalkar
Senior Project Engineer

Lawrence J. Dwyer, P.E.
Principal

Enclosures
cc: 1 – Client (PDF)
1 – File

GEOTECHNICAL ENGINEERING REPORT
Huntington BO 1445(35), Camels Hump Road Over Brush Brook
HUNTINGTON, VERMONT

PIN:12j162
Terracon Project No. J1135159
January 17, 2018

1.0 INTRODUCTION

This report presents the results of our geotechnical engineering services performed for the proposed replacement bridge carrying Camel's Hump Road over Brush Brook in Huntington, Vermont.

Our geotechnical engineering scope of services included advancing up to four test borings, designated B-1 thru B-4, to depths of up to 70 feet below the existing ground surface. Boring B-3 was not accessible and a test pit, TP2, was hand excavated at this location. Subsequently an additional test pit, TP1, was machine excavated between B-1 and TP-2 as shown on the Exploration Location Plan and Geologic Cross Sections in Appendix A. Logs of the borings and test pits along with a site location map are also included in Appendix A.

The purpose of these services is to provide subsurface information relative to:

- Subsurface soil conditions
- Groundwater conditions
- Earthwork
- Foundation design and construction
- Seismic considerations

2.0 PROJECT INFORMATION

2.1 Project Description

Item	Description
Site Layout	See Appendix A, Exhibit A-2: Exploration Location Plan and Geologic Cross Sections.
Structure	The project consists of replacing existing single span bridge with a new single span bridge.
Maximum Loads	Loads are not known at this time.
Cut and Fill Slopes	Existing steep slopes may need to be addressed.
Finish Elevation	Anticipated to be similar grade as the existing bridge.

2.2 Site Location and Description

Item	Description
Location	The proposed bridge is located on Camels Hump Road where it crosses Brush Brook in Huntington, Vermont (Approximtely 0.7 miles from Town Highway 22 and Town Highway 1 (Main Road).
Existing Improvements	The existing bridge is a timber deck on rolled steel beams..
Current Ground Cover	Paved roadway with sloping embankment shoulders and boulder riprap.
Existing Topography	Approximate elevation (El) 950 feet at the road surface and El 940 feet at the brook bed. Steeply sloping ground at the southeast corner of the bridge.

3.0 SUBSURFACE CONDITIONS

3.1 Geology

The geology for the project site is briefly described in the Vtrans Memorandum dated June 21, 2012 titled "Huntington BO 1445(38) Bridge #32 Town Highway 22 Over Brush Brook, Preliminary Geotechnical Information". As described in this memorandum and mapped in the Surficial Geology Map of Vermont (1970), surficial material at the project site consists of glacial till deposits blanketing the bedrock with several bedrock outcrops in the vicinity. The glacial till typically reflects the topography of the underlying bedrock surface. The bedrock is identified as Hazens Notch Formation. The formation is described as "Dark-rusty-brown graphitic biotite-muscovite-chlorite-quartz (±garnet) schist and gneiss, dark-albite porphyroblasts, large euhedral pyrite, and beds of dark-gray quartzite are common."

3.2 Typical Profile

Based on the results of the borings, subsurface conditions can be generalized as follows:

Stratum	Approximate Depth to Bottom of Stratum (feet)	Material Description	Consistency/ Density
Fill	0 to 5	Fine to medium sand and gravel, little silt.	Medium dense
Glacial Till	5.4 to 14.5	Fine to coarse sand and gravel, with silt.	Very dense
Bedrock	Undetermined	Muscovite-quartz Schist, gray-green	Moderately hard

Rock core samples obtained from the test borings are generally characterized as moderately hard, fresh, muscovite-quartz schist. The rock quality designation ranged from 41 to 100 percent indicating a rock mass quality of good to excellent for the intervals sampled.

Conditions encountered at each boring location are indicated on the individual boring and test pit logs. Stratification boundaries on the exploration logs represent the approximate location of changes in soil types; in situ, the transition between materials may be gradual. Details for each of the explorations can be found on the logs in Appendix A of this report.

3.3 Groundwater

Explorations were observed during and after drilling for the presence of groundwater. Observed groundwater depths varied from 7.0 feet to 8.3 feet below ground surface (bgs) (El 941 feet to El 942 feet) 16 hours or more after drilling. Groundwater level fluctuations occur due to seasonal variations in the amount of rainfall, runoff, brook elevation, and other factors not evident at the time the explorations were performed. Therefore, groundwater levels during construction or at other times in the life of the structure may be higher or lower than the levels indicated on the boring logs. Groundwater level fluctuations should be considered when developing the design and construction plans for the project.

3.4 Laboratory Testing

Laboratory testing was performed on soil samples obtained from the test borings to assist in classification and evaluate engineering properties. Laboratory testing was performed by VTrans staff in the VTrans facility located in Berlin, Vermont. The results of the laboratory tests are summarized below:

Sample Identification	Depth (feet)	AASHTO Classification	Gravel Content (%)	Sand Content (%)	Fines Content (%)	Moisture Content (%)
B-1	0.3 – 1.8	A-1-b	34.1	41.2	24.7	12.3
B-1	2.0 – 4.0	A-2-4	48.4	24.8	26.8	7.4
B-1	5.5 – 6.0	A-4	28.5	31.4	40.1	40.6
B-1	6.0 – 8.0	A-2-4	29.4	42.4	28.2	31.8
B-1	8.0 – 10.0	A-2-4	30.8	36.7	32.5	11.5
B-1	10.0 – 10.5	A-1-b	43.2	34.3	22.5	10.8
B-1	10.5 – 10.75	A-1-b	62.0	22.4	15.6	7.7
B-2	0.0 – 2.0	A-2-4	28.6	44.4	27.0	15.7
B-2	2.0 – 4.0	A-2-4	38.7	32.8	28.5	6.7

Sample Identification	Depth (feet)	AASHTO Classification	Gravel Content (%)	Sand Content (%)	Fines Content (%)	Moisture Content (%)
B-2	5.0 – 6.0	A-1-b	46.6	40.5	13.0	14.9
B-2	6.0 – 8.0	A-1-a	66.1	25.2	8.7	7.3
B-2	8.0 – 10.0	A-1-a	56.7	34.7	8.6	12.2
B-2	10.0 – 10.6	A-1-a	66.3	29.8	3.9	14.9
B-2	12.0 – 13.7	A-4	27.5	22	50.5	11.5
B-2	14.0 – 14.5	A-4	30.6	24.3	45.1	10.0
B-4	0.3 – 1.5	A-4	2.6	59.9	37.5	37.5
B-4	2.0 – 4.0	A-1-b	40.8	42.8	16.4	11.6
B-4	4.0 – 5.8	A-1-a	59.4	25.2	15.3	7.8
B-4	6.0 – 8.0	A-1-b	55.1	28.5	16.4	10.7
B-4	8.0 – 9.6	A-1-b	51.1	24.5	24.4	8.9
B-4	10.0 – 12.0	A-1-a	58.6	26.2	15.1	9.9
B-4	12.0 – 12.4	A-4	22.1	29.9	48.1	14.3
B-4	14.0 – 15.1	A-4	24.7	27.3	48.0	9.7
B-4	18.0 – 18.3	A-1-a	63.9	23.0	13.1	9.7

Laboratory testing was also performed on samples of rock core to evaluate compressive strength. The results of these tests are summarized below:

Sample Identification	Rock Lithology	Depth (feet)	Length/ Dia Ratio	Young's Modulus (x10^3 ksi)	Unconfined Compressive Strength (psi)
B1R1S1	Gray greenish gray, muscovite-quartz schist.	12.3	2.55	8.675	6,510
B1R2S2	Gray greenish gray, muscovite-quartz schist.	19.4	2.48	8.829	3,797
B2R1S1	Gray greenish gray, muscovite-quartz schist.	16.3	2.51	3.510	2,666
B2R1S2	Gray greenish gray, muscovite-quartz schist.	17.8	2.48	4.707	1,926
B2R1S3	Gray greenish gray, muscovite-quartz schist.	19.0	2.44	7.096	5,750
B2R1S4	Gray greenish gray, muscovite-quartz schist.	20.5	2.43	9.488	4,929

Sample Identification	Rock Lithology	Depth (feet)	Length/ Dia Ratio	Young's Modulus (x10^3 ksi)	Unconfined Compressive Strength (psi)
B2R2S1	Gray greenish gray, muscovite-quartz schist.	21.4	2.49	6.245	4,179
B2R2S2	Gray greenish gray, muscovite-quartz schist.	23.4	2.54	6.164	3,946

4.0 RECOMMENDATIONS FOR DESIGN AND CONSTRUCTION

4.1 Geotechnical Considerations

Based on the subsurface conditions encountered, spread foundations bearing directly on clean intact bedrock or on lean concrete overlying clean intact bedrock are a suitable foundation option for the proposed replacement bridge. Weathered bedrock, if encountered, should be removed below the bridge foundation. We recommend a geotechnical engineer evaluate the exposed subgrades after bedrock removal and excavation to proposed grade before placing concrete, or lean concrete fill. The recommendations for foundation design presented herein were developed using the 2012 *American Association of State Highway and Transportation Officials* (AASHTO) *LRFD Bridge Design Specifications with Interim Revisions.*

Alternative design parameters for pile foundations are also provided. In-line wing walls may be supported on either pile or spread footing foundations using the design parameters presented herein.

4.2 Spread Footing Design Recommendations

Alternate design recommendations for shallow foundations for the proposed bridge and related structural elements are presented in the following table.

Description	Value
Foundation Type	Conventional shallow spread footings
Bearing Materials	Clean, intact bedrock or lean concrete placed above clean, intact bedrock
Bearing Resistance Factor, j_b	0.45 (AASHTO 10.5.5.2.2)
Nominal Sliding Resistance, R_t	0.7 * Total Vertical Force, V (kips) (AASHTO 10.6.3.4) (1)
Sliding Resistance Factor, j_t	0.80 (AASHTO 10.5.5.2.2)
Young's Modulus, E_s	6.839 x 10^3 kips per square inch (ksi)
Moist Unit Weight, g_m	160 pcf
Effective Unit Weight, g_s	97.6 pcf
Minimum Footing Embedment below Finished Grade for Frost Protection	60 inches or bedrock

1. Nominal sliding resistance for cast-in-place concrete. Multiply cast-in-place value by 0.8 for precast concrete footings.

Foundation excavations should be observed by a geotechnical engineer. If the soil conditions encountered differ significantly from those presented in this report, supplemental recommendations will be required.

The maximum factored bearing resistance is 9 ksf and is based on a nominal bearing resistance of 20 ksf and a reistance factor of 0.45. Settlement for footings placed on intact rock is estimated to be less than 0.5 inch.

4.2 Integral Abutment Design Recommendations

Integral abutments are typically supported on driven H-pile foundations to allow free movement. At this site shallow bedrock restricts the use of driven piles, however, integral abutments may still be constructed using the following alternatives:

1. GRS-IBS technology provided the bridge is non-scour critical;
2. Steel H-piles installed in pre-drilled holes and grouted in bedrock below the point of fixity. Holes above the grouted section should be backfilled with pea gravel or similar loosely compacted round stone.

Design loads are not available at this time, therefore detailed design of deep foundations is not possible. We recommend following soil parameters and resistance factors, summarized in the following table, for use in the pile foundation analysis. To reduce stiffness, the rock socket can be backfilled with sand or pea stone around the pile. This is then modeled as a pile reinforced rock socket and very low strength concrete. Lateral analysis of H-piles grouted in bedrock may be completed by modeling the grouted portion in bedrock as pile embedded in "Strong Rock".

The portion of the pile above the grouted section can be analyzed as pile in very loose granular material.

Description	Value
Backfill (in pre-drilled hole)	
Drained Friction Angle, f_f	34 degrees (AASHTO 10.4.6.2.4)
Effective Unit Weight, g'	140 pounds per cubic foot (pcf)
Glacial Till	
Drained Friction Angle, f_f	40 degrees (AASHTO 10.4.6.2.4)
Effective Unit Weight, g'	70 pcf
Undrained Cohesion, c_u	1,000 pounds per square foot (psf)
Combined Axial and Flexure Resistance Factors	
H-pile, axial resistance, f_c	0.70 (AASHTO 6.5.4.2)
H-pile, flexural resistance, f_f	1.00 (AASHTO 6.5.4.2)

4.2.1 Axial Capacity

Since the piles will be installed and grouted in pre-drilled holes to an end bearing condition in bedrock, the structural capacity will control pile design, as discussed in AASHTO Article 10.7.3.2.3. Based on AASHTO Article 6.9.4.1, the nominal structural pile resistance is calculated as $P_n = [0.658^{(Po/Pe)}]P_o$. Per VTrans for the initial pile selection, the nominal structural pile resistance can be approximated by $P_n = CF_yA_s$, where C = 0.8.

4.2.2 Pile Cap Design

The backwall can be designed as a horizontal beam resisting lateral earth pressures generated by movement of the abutment, due to expansion and contraction of the superstructure, either into (passive earth pressure) or away from (active earth pressure) the soil mass. Assuming the abutment will experience all of the lateral movement, the full passive pressure condition will be met, producing a passive pressure coefficient larger than an active earth pressure coefficient. Therefore, it is conservative to design for the full passive pressure condition at the abutment.

Equation 1: $K_p = (1+\sin\phi)/(1-\sin\phi)$

Equation 2: $P_p = \frac{1}{2}\, \gamma\, H^2\, K_p$

The passive earth pressure per unit length of wall, P_p, can be calculated using the above equations. Backfill unit weight is assumed to be equal to 140 pcf with a drained friction angle, ϕ, of 34 degrees.

4.2.3 Down Drag

Negative skin friction, or down drag, is considered when the relative settlement between the pile and soil equals or exceeds 0.5 inch. The proposed bridge and approach slab are anticipated to

be near existing grade with shallow bedrock. Neither settlement nor down drag due to fill placement or roadway surcharge is expected.

4.3 General Construction Considerations

Based on an estimated bottom of footing and river near El 940 feet, cofferdams may be necessary for abutment construction. The individual contractor(s) is responsible for designing and constructing stable, temporary excavations, as required, to maintain stability of the excavation sides and the excavation bottom.

Based upon the encountered subsurface conditions, subgrade soils exposed during construction are anticipated to be relatively stable. However, the subgrade stability may be affected by precipitation, repetitive construction traffic, or other factors.

Construction dewatering should be anticipated for foundation construction. The contractor should select a dewatering method to facilitate footing construction.

4.4 Seismic Considerations

Description	Value
Reference Used	AASHTO
Site Class	B (AASHTO 3.10.3.1)
Seismic Zone	1 (AASHTO 3.10.6)
Maximum Considered Earthquake Ground Motions (5 percent damping)	S_s - 0.194g (0.2 second spectral response acceleration) (AASHTO 3.10.2)
	S_1 - 0.053g (1.0 second spectral response acceleration) (AASHTO 3.10.2)
Liquefaction Potential in Event of an Earthquake	Not susceptible

1. In general accordance with the *American Association of State Highway and Transportation Officials LRFD Bridge Design Specifications 5th Edition with 2010 Interim Revisions* (AASHTO), Site Class is based on the average characteristics of the upper 100 feet of the subsurface profile. The current scope requested does not include the required 100-foot soil profile determination. The borings extended to a maximum depth of 29 feet, and this seismic site class definition considers that bedrock continues below the maximum depth of the exploration.

5.0 GENERAL COMMENTS

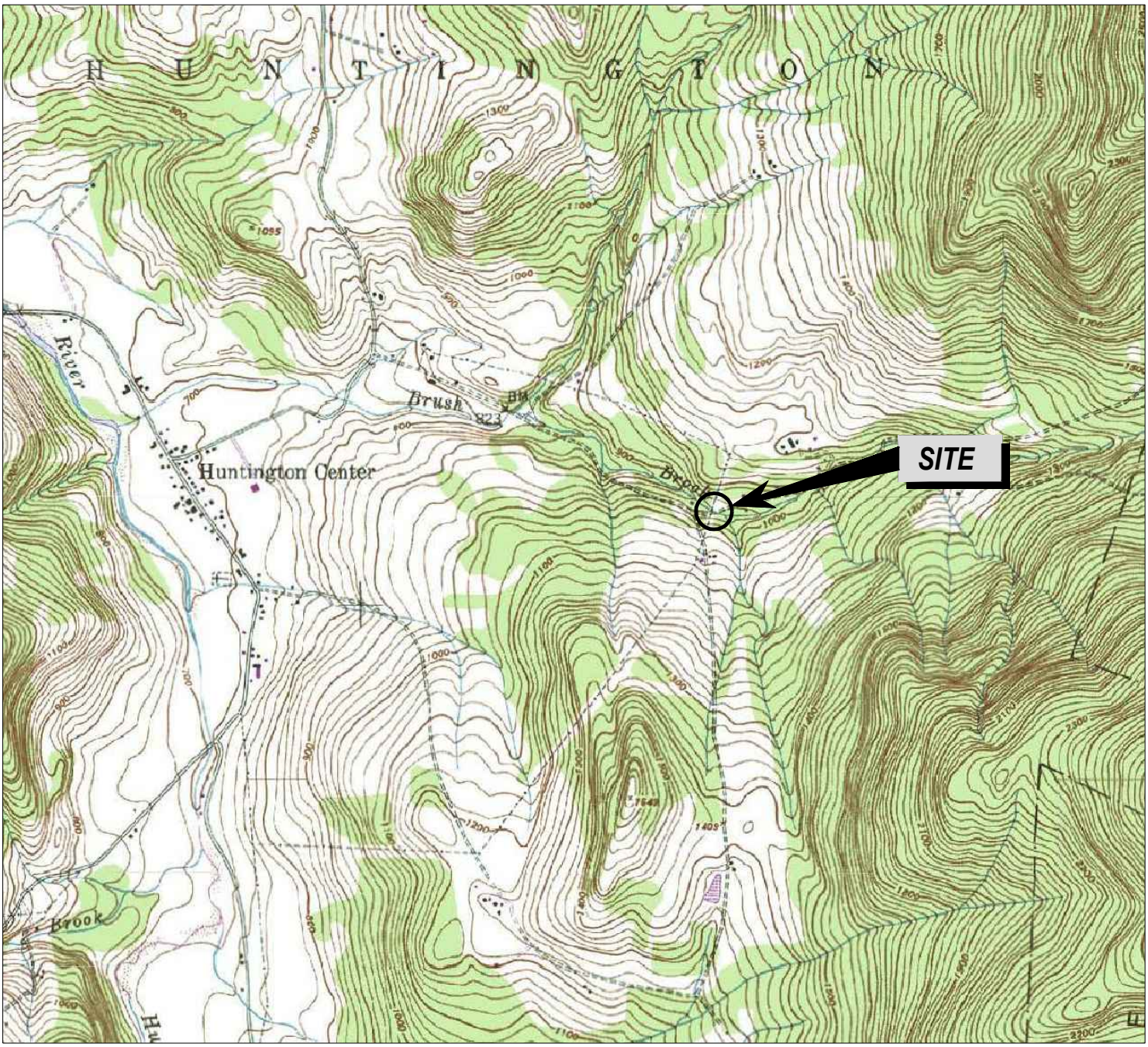
The analysis and recommendations presented in this report are based upon the data obtained from the borings performed at the indicated locations and from other information discussed in this report. This report does not reflect variations that may occur between borings, across the site, or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. If variations appear, we

should be immediately notified so that further evaluation and supplemental recommendations can be provided.

The scope of services for this project does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either express or implied, are intended or made. Site safety, excavation support, and dewatering requirements are the responsibility of others. In the event that changes in the nature, design, or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless Terracon reviews the changes and either verifies or modifies the conclusions of this report in writing.

APPENDIX A
FIELD EXPLORATION



SCALE: 1:24 000

N

1 1/2 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

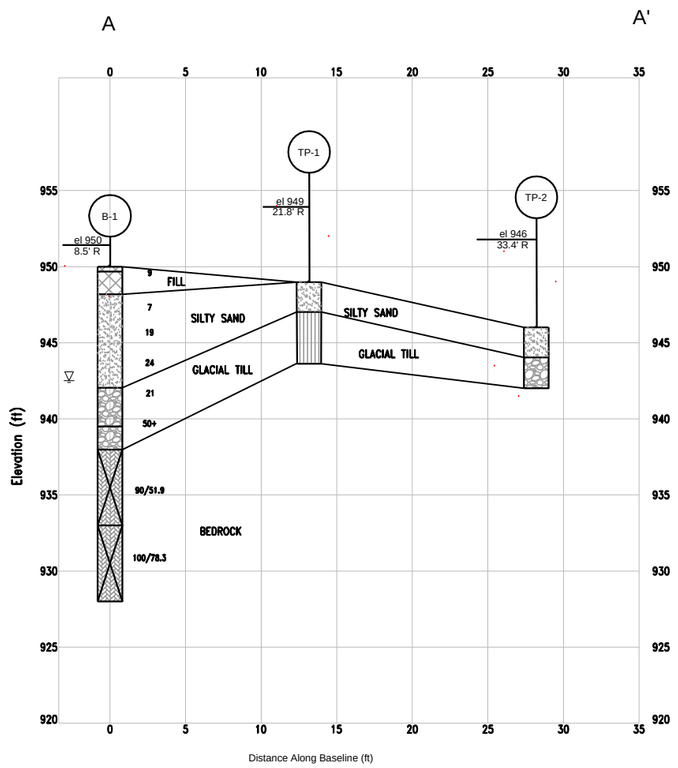
1 5 0 1 KILOMETER

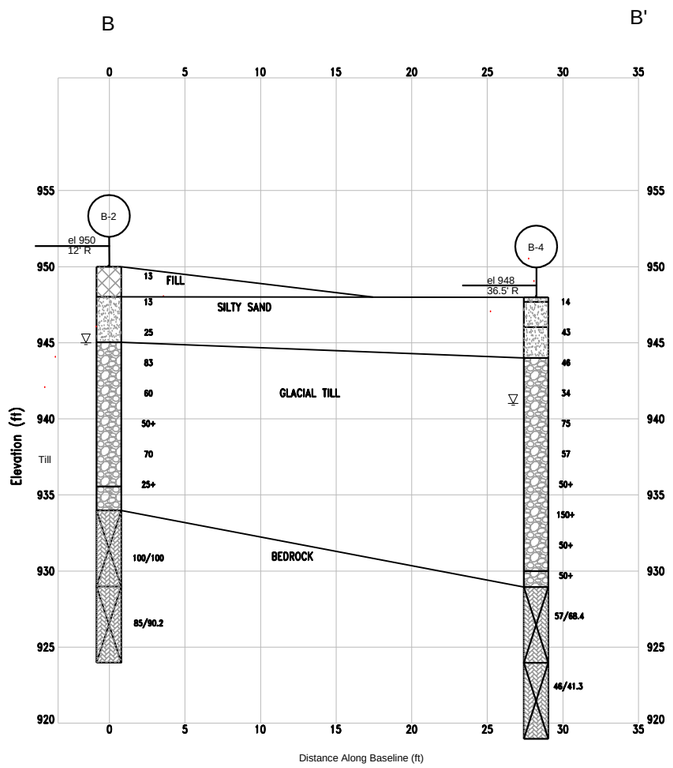
CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

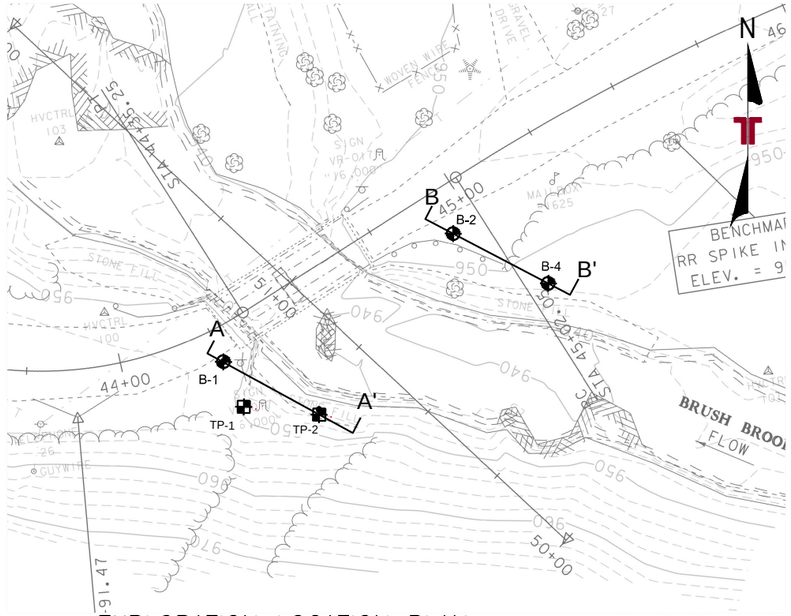
QUADRANGLE LOCATION

SOURCE:
USGS BARRE WEST, VT
1978

Project Mngr: AP	Project No. J1135159	Terracon	SITE LOCATION MAP
Drawn By: MCR	Scale: AS SHOWN	77 Sundial Ave. Manchester, NH 03103	**HUNTINGTON BO 1445 (38)** **CAMELS HUMP ROAD OVER BRUSH BROOK** **HUNTINGTON, VERMONT**
Checked By: AP	File No. J1135159.dwg	PH. (603)647-9700 FAX (603) 647-4432	EXHIBIT A-1
Approved By: LJD	Date: January 2018		



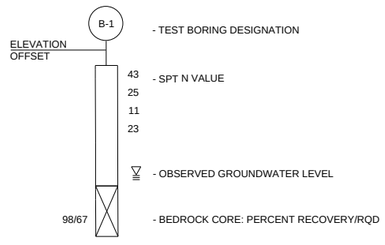




EXPLORATION LOCATION PLAN

0 10 20 40
GRAPHIC SCALE IN FEET

LEGEND:



BORING	STATION	OFFSET	NORTHING	EASTING
B-1	44+24	8.5 R	1525232.7737	654519.4739
B-2	44+93	12.0 R	1525258.0104	654505.5274
B-4	45+90	36.5 R	1525318.4941	654540.1792
TP-1	44+24	21.8 R	1525238.1087	654507.6014
TP-2	44+38	33.4 R	1525258.0104	654505.5274

NOTES:

1. EXPLORATION LOCATION PLAN WAS PREPARED FROM A PLAN PROVIDED BY THE VERMONT AGENCY OF TRANSPORTATION.

2. TEST BORINGS SHOWN AS B-1, B-2. AND B-4, AND TEST PITS TP-1 AND TP-2 WERE ADVANCED/EXCAVATED ON NOVEMBER 11 THROUGH 15, 2013 AND AND DECEMBER 9, 2013 UNDER THE DIRECTION OF TERRACON WITH EQUIPMENT OWNED AND OPERATED BY NEW HAMPSHIRE BORING INC. OF DERRY, NEW HAMPSHIRE.

3. DATA CONCERNING THE VARIOUS STRATA HAVE BEEN INTERPOLATED AT BORING LOCATIONS ONLY. THE STRATIGRAPHY BETWEEN BORINGS MAY VARY FROM THAT SHOWN.

4. THE APPROXIMATE LOCATIONS OF THE TEST BORINGS AND TEST PITS WERE LOCATED BY MEASURING FROM EXISTING SITE FEATURES. THE LOCATIONS SHOULD BE CONSIDERED ACCURATE TO THE DEGREE IMPLIED BY THE METHOD USED.

5. USE OF THIS PLAN IS LIMITED TO THE ILLUSTRATION OF THE APPROXIMATE LOCATION OF THE TEST BORINGS AND OTHER PERTINENT SITE FEATURES. OTHER USE OF THIS PLAN WITHOUT PERMISSION FROM TERRACON IS PROHIBITED.

VTrans Working to Get You There
Vermont Agency of Transportation

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH SECTION
SUBSURFACE INFORMATION

Terracon

EXHIBIT A-2

EXPLORATION LOCATION PLAN AND GEOLOGIC CROSS SECTIONS

Project Name: Huntington BO 1445 (38)
Location: Huntington, Vermont
Number: BO 1445 (38)

J1135159.DWG

Field Exploration Description

Three test borings and two test pits were completed at the site on November 11 through November 15, 2013 and December 9, 2013. Terracon personnel monitored the advancement of the soil borings and excavation of test pits within the project site. Soil borings were advanced using an all-terrain vehicle mounted rotary drill rig, owned and operated by New Hampshire Boring, Inc. of Derry, New Hampshire. Three borings (B-1, B-2 and B-4) were advanced using an ATV mounted drill rig using mud rotary drilling method to depths ranging from approximately 22 to 29 feet below existing grade. Test Pit, TP1, excavated using a Kubota KX71-3 to 5.4 feet below existing grade and test pit, TP2, was excavated by hand to 4 feet below existing grade.

The proposed boring locations were laid out in the field by a Terracon representative using a scaled site plan provided by VTrans. Ground surface elevations indicated on the boring logs were estimated based on the grading plan provided by VTrans. The locations and elevations of the borings should be considered accurate only to the degree implied by the means and methods used to define them.

Samples of the soil encountered in the borings were obtained using the split-barrel sampling procedures. In the split-barrel sampling procedure, the number of blows required to advance a standard 2-inch O.D. split-barrel sampler the last 12 inches of the typical total 18-inch penetration by means of a 140-pound hammer with a free fall of 30 inches, is the standard penetration resistance value (SPT-N). This value is used to estimate the in situ relative density of cohesionless soils and consistency of cohesive soils.

The samples were tagged for identification, sealed to reduce moisture loss, and taken to VTrans laboratory for further examination, testing, and classification. Information provided on the boring logs attached to this report includes soil descriptions, consistency evaluations, boring depths, sampling intervals, and groundwater conditions. The borings were backfilled with cuttings prior to the drill crew leaving the site.

A field log of each boring was prepared by the drill crew. These logs included visual classifications of the materials encountered during drilling as well as the driller's interpretation of the subsurface conditions between samples. Final boring logs and test pit logs included with this report represent the engineer's interpretation of the field logs and include modifications based on laboratory observation and tests of the samples.

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH SECTION
SUBSURFACE INFORMATION

BORING LOG

Huntington BO 1445(38)

Boring No.: **B-1**
Page No.: 1 of 1
Pin No.: 12j630
Checked By: ASP

Boring Crew: New Hampshire Boring, Derry, NH, CBR
Date Started: 11/14/13 Date Finished: 11/15/13
VTSPG NAD83: N 1525232.77 ft E 654519.47 ft
Station: 44+24.00 Offset: 8.5 R
Ground Elevation: 950.0 ft

	Casing	Sampler
Type:	WB	SS
I.D.:	4.25 in	1.38 in
Hammer Wt:	N.A.	N.A.
Hammer Fall:	N.A.	N.A.
Hammer/Rod Type:	Manual	
Rig:	CME 45C SKID	C_E = 1.3

Groundwater Observations

Date	Depth (ft)	Notes
11/14/13	7.5	WS
11/15/13	8.0	ACR
11/15/13	8.3	BCR

Depth (ft)	Strata (1)	CLASSIFICATION OF MATERIALS (Description)	Run (Dip deg.)	Core Rec. % (RQD %)	Blows/6" (N Value)	Moisture Content %	Gravel %	Sand %	Fines %
		Rec. = 0.5 ft, 0.0 ft - 0.33 ft, 4-inches topsoil							
		A-1-b, SaGrSi, brn, Moist, FILL			2-3-6-7 (9)	12.3	34.1	41.2	24.7
		A-2-4, GrSiSa, brn, Moist Rec. = 0.5 ft			4-3-4-5 (7)	7.4	48.4	24.8	26.8
5		A-4, SiSaGr, brn, Wet, Rec. = 0.75 ft			3-3-16-15 (19)	40.6	28.5	31.4	40.1
		A-2-4, SaGrSi, red-brn, with organics from 6-8 feet Rec. = 1.16 ft			15-16-8-28 (24)	31.8	29.4	42.4	28.2
		A-2-4, SaSiGr, brn-gry, Rec. = 0.5 ft			5-9-12-20 (21)	11.5	30.8	36.7	32.5
10		A-1-b, GrSaSi, gry-brn, Rec. = 0.75 ft			25-50/3" (50+)	10.8	43.2	34.3	22.5
		A-1-b, GrSaSi, brn, Weathered bedrock				7.7	62.0	22.4	15.6
		10.75 ft - 12.0 ft, Weathered bedrock							
		12.0 ft - 17.0 ft, Bedrock. Gray, greenish gray muscovite-quartz SCHIST, magnetite rich zone at 14.5'. moderately hard, moderately weathered from 15' to 16', remainder of run unweathered	1	90 (51.9)	Top of Bedrock @ 12.0 ft				
15									
		17.0 ft - 22.0 ft, Bedrock. Gray, greenish gray muscovite-quartz SCHIST, moderately hard, unweathered	2	100 (78.3)					
20									
		Hole stopped @ 22.0 ft							
25		Remarks: Elevations are approximate.							
30									

Notes:
1. Stratification lines represent approximate boundary between material types. Transition may be gradual.
2. N Values have not been corrected for hammer energy. C_E is the hammer energy correction factor. C_E is an estimated value.
3. Water level readings have been made at times and under conditions stated.
Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.
4. Ground surface elevations indicated on the boring logs were estimated based on the grading plan provided by VAOT.

Terracon

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STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH SECTION
SUBSURFACE INFORMATION

BORING LOG

Huntington BO 1445(38)

Boring No.: **B-2**
Page No.: 1 of 1
Pin No.: 12j630
Checked By: ASP

Boring Crew: New Hampshire Boring, Derry, NH, CBR
Date Started: 11/11/13 Date Finished: 11/12/13
VTSPG NAD83: N 1525258.01 ft E 654505.53 ft
Station: 44+93.00 Offset: 12.0 R
Ground Elevation: 950.0 ft

	Casing	Sampler
Type:	WB	SS
I.D.:	4.25 in	1.38 in
Hammer Wt:	N.A.	N.A.
Hammer Fall:	N.A.	N.A.
Hammer/Rod Type:	Manual	
Rig:	CME 45C SKID	C_E = 1.3

Groundwater Observations

Date	Depth (ft)	Notes
11/12/13	5.0	ACR
11/13/13	8.0	16 hrs

Depth (ft)	Strata (1)	CLASSIFICATION OF MATERIALS (Description)	Run (Dip deg.)	Core Rec. % (RQD %)	Blows/6" (N Value)	Moisture Content %	Gravel %	Sand %	Fines %
		A-2-4, SaGrSi, brn, Moist, Rec. = 1.5 ft, FILL			6-6-7-9 (13)	15.7	28.6	44.4	27.0
		A-2-4, GrSaSi, brn, Moist, Rec. = 0.7 ft			10-6-7-8 (13)	6.7	38.7	32.8	28.5
		A-1-a, GrSaSi, brn-gry, Moist, Rec. = 0.8 ft			5-4-21-42 (25)	14.9	46.6	40.4	13.0
5		A-1-b, GrSaSi							
		A-1-a, GrSaSi, Rec. = 1.3 ft			23-39-44-50 (83)	7.3	66.1	25.2	8.7
		A-1-a, GrSaSi, Rec. = 1.0 ft			40-40-20-41 (60)	12.2	56.7	34.7	8.6
10		A-1-a, GrSaSi, Rec. = 0.5 ft, same as above with probable cobbles or boulder			13-50/1" (50+)	14.9	66.3	29.8	3.9
		10.58 ft - 12.0 ft							
		A-4, SiGrSa, brn-gry, Moist, Rec. = 0.8 ft			22-34-36-100/20" (70)	11.5	27.5	22.0	50.5
		A-4, GrSiSa, Rec. = 0.4 ft			35-25/0" (25+)	10.0	30.6	24.3	45.1
15		14.5 ft - 16.0 ft, Probable weathered bedrock							
		16.0 ft - 21.0 ft, Gray, greenish gray muscovite-quartz SCHIST, moderately hard, unweathered	1	100 (100)	Top of Bedrock @ 16.0 ft				
20									
		21.0 ft - 26.0 ft, Gray, greenish gray muscovite-quartz SCHIST, moderately hard, unweathered	2	85 (90.2)					
25									
		Hole stopped @ 26.0 ft							
30									

Remarks:
Elevations are approximate.

Notes:
1. Stratification lines represent approximate boundary between material types. Transition may be gradual.
2. N Values have not been corrected for hammer energy. C_E is the hammer energy correction factor. C_E is an estimated value.
3. Water level readings have been made at times and under conditions stated.
Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.
4. Ground surface elevations indicated on the boring logs were estimated based on the grading plan provided by VAOT.

Terracon

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STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH SECTION
SUBSURFACE INFORMATION

BORING LOG

Huntington BO 1445(38)

Boring No.: **B-4**
Page No.: 1 of 1
Pin No.: 12j630
Checked By: ASP

Boring Crew: New Hampshire Boring, Derry, NH, CBR
Date Started: 11/13/13 Date Finished: 11/13/13
VTSPG NAD83: N 1525318.49 ft E 654540.18 ft
Station: 45+90.00 Offset: 36.5 R
Ground Elevation: 948.0 ft

	Casing	Sampler
Type:	WB	SS
I.D.:	4.25 in	1.38 in
Hammer Wt:	N.A.	N.A.
Hammer Fall:	N.A.	N.A.
Hammer/Rod Type:		Manual
Rig:	CME 45C SKID	C_E = 1.3

Groundwater Observations

Date	Depth (ft)	Notes
11/13/13	7.0	ACR
11/14/13	7.0	16 hrs

Depth (ft)	Strata (1)	CLASSIFICATION OF MATERIALS (Description)	Run (Dip deg.)	Core Rec. % (RQD %)	Blows/6" (N Value)	Moisture Content %	Gravel %	Sand %	Fines %
		Rec. = 1.2 ft, 0.0 ft - 0.33 ft, 4-inches topsoil A-4, SaSiGr, brn, Moist			2-6-8-4 (14)	37.5	2.6	59.9	37.5
		A-1-b, SaGrSi, brn, Rec. = 0.9 ft			3-6-37-22 (43)	11.6	40.8	42.8	16.4
5		A-1-a, GrSaSi, gry-brn, Rec. = 0.5 ft			27-27-19-100 (46)	7.8	59.4	25.3	15.3
		A-1-b, GrSaSi, gry-brn, Rec. = 0.3 ft			8-17-17-34 (34)	10.7	55.1	25.5	19.4
		A-1-b, GrSaSi, brn, Rec. = 1.3 ft			23-35-40-100 (75)	8.9	51.1	24.5	24.4
10		A-1-a, GrSaSi, gry-brn, Rec. = 0.5 ft			22-24-33-45 (57)	9.9	58.6	26.3	15.1
		A-4, SiSaGr, gry-brn, Rec. = 0.4 ft			50 (50+)	14.3	22.1	29.8	48.1
15		A-4, SiSaGr, brn, Rec. = 0.4 ft			35-50-100 (150+)	9.7	24.7	27.3	48.0
		A-4, SiSaGr, gry-brn, Rec. = 0.2 ft, Soil classification for this sample based on visual observation			49-50 (50+)				
		A-1-a, GrSaSi, brn, Rec. = 0.2 ft, Probable weathered bedrock			50 (50+)	9.7	63.9	23.0	13.1
20		19.0 ft - 24.0 ft, Gray, greenish gray muscovite-quartz SCHIST, moderately hard, unweathered	1	57 (68.4)	Top of Bedrock @ 19.0 ft				
25		24.0 ft - 29.0 ft, Gray, greenish gray muscovite-quartz SCHIST, moderately hard, slight weathering along foliation	2	46 (41.3)					
30		Hole stopped @ 29.0 ft							

Remarks:
Elevations are approximate.

Notes:
1. Stratification lines represent approximate boundary between material types. Transition may be gradual.
2. N Values have not been corrected for hammer energy. C_E is the hammer energy correction factor. C_E is an estimated value.
3. Water level readings have been made at times and under conditions stated.
Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.
4. Ground surface elevations indicated on the boring logs were estimated based on the grading plan provided by VAOT.

Terracon

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STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH SECTION
SUBSURFACE INFORMATION

BORING LOG

Huntington BO 1445(38)

Boring No.: **TP-1**
Page No.: 1 of 1
Pin No.: 12j630
Checked By: ASP

Boring Crew: New Hampshire Boring, Derry, NH, RJF
Date Started: 12/06/13 Date Finished: 12/06/13
VTSPG NAD83: N 1525238.11 ft E 654507.60 ft
Station: 44+24.00 Offset: 21.8 R
Ground Elevation: 949.0 ft

	Casing	Sampler
Type:		
I.D.:		
Hammer Wt:	N.A.	N.A.
Hammer Fall:	N.A.	N.A.
Hammer/Rod Type:		
Rig: KX71-3 Excavator	C_E =	

Groundwater Observations

Date	Depth (ft)	Notes
12/06/13		None observed

Depth (ft)	Strata (1)	CLASSIFICATION OF MATERIALS (Description)	Blows/6" (N Value)	Moisture Content %	Gravel %	Sand %	Fines %
		0.0 ft - 0.8 ft, Topsoil/roots/organics, moist to wet					
		A-4, SiSaGr, brn, trace roots, soil classification for this sample based on visual observation					
		A-4, SiSaGr, olive-brn, trace weathered rock and occasional boulders ~12", soil classification for this sample based on visual observation					
5		5.3 ft, Apparent weathered rock					
		Hole stopped @ 5.4 ft					
		Top of Bedrock @ 5.4 ft					

Remarks:
Test pit excavated by New Hampshire Boring.
Excavator: Kubota KX71-3
Operator: Mike

Although water was present within excavation, there did not appear to be a static GWL encountered. Water present in excavation appeared to be from surface run-off.

Ground surface elevation at top of test pit 3.5 feet below bridge deck based on visual observation.

10
15
20
25
30

Notes:
1. Stratification lines represent approximate boundary between material types. Transition may be gradual.
2. N Values have not been corrected for hammer energy. C_E is the hammer energy correction factor. C_E is an estimated value.
3. Water level readings have been made at times and under conditions stated.
Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.
4. Ground surface elevations indicated on the boring logs were estimated based on the grading plan provided by VAOT.

Terracon

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STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH SECTION
SUBSURFACE INFORMATION

BORING LOG

Huntington BO 1445(38)

Boring No.: **TP-2**
Page No.: 1 of 1
Pin No.: 12j630
Checked By: ASP

Boring Crew: New Hampshire Boring, Derry, NH, CBR
Date Started: 11/15/13 Date Finished: 11/15/13
VTSPG NAD83: N 1525258.01 ft E 654505.53 ft
Station: 44+38.00 Offset: 33.4 R
Ground Elevation: 946.0 ft

	Casing	Sampler
Type:		
I.D.:		
Hammer Wt:	N.A.	N.A.
Hammer Fall:	N.A.	N.A.
Hammer/Rod Type:		
Rig: Hand dug		C_E =

Groundwater Observations

Date	Depth (ft)	Notes
11/15/13		None observed

Depth (ft)	Strata (1)	CLASSIFICATION OF MATERIALS (Description)	Blows/6" (N Value)	Moisture Content %	Gravel %	Sand %	Fines %
		0.0 ft - 0.5 ft, 6-inches topsoil, organics, moist, brown					
		A-4, SiSaGr, brn					
		A-4, SiSaGr, gray, Moist, weathered bedrock					
		Hole stopped @ 4.0 ft					
		Top of Bedrock @ 4.0 ft					

Remarks:
Hand dug by New Hampshire Boring.
Metal rod probed throughout approximate 10-foot radius around TP-2, rod hit probable bedrock at approximately 4 feet.
Elevations are approximate.

Notes:
1. Stratification lines represent approximate boundary between material types. Transition may be gradual.
2. N Values have not been corrected for hammer energy. C_E is the hammer energy correction factor. C_E is an estimated value.
3. Water level readings have been made at times and under conditions stated.
Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.
4. Ground surface elevations indicated on the boring logs were estimated based on the grading plan provided by VAOT.

Terracon

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Appendix F: Resources ID Completion Memo

OFFICE MEMORANDUM

AOT - PDB - ENVIRONMENTAL SECTION

RESOURCE IDENTIFICATION COMPLETION MEMO

TO: Nick Wark, Project Manager
FROM: Jeff Ramsey, Environmental Specialist Supervisor
DATE: June 7, 2017
Project: Huntington BO 1445(38)

ENVIRONMENTAL RESOURCES:

Archaeological Site:	X Yes	___ No	See Archaeological Resource ID Memo
Historic/Historic District:	___ Yes	X No	See Historic Resource ID Memo
4(f) Property:	___ Yes	X No	
Wetlands:	___ Yes	X No	See Natural Resource ID Memo
Agricultural Land:	___ Yes	X No	
Fish & Wildlife Habitat:	___ Yes	X No	
Wildlife Habitat Connectivity:	___ Yes	X No	
Endangered Species:	X Yes	___ No	See Natural Resource ID Memo. This project is within the range of the Northern Long Eared bat, and time of year cutting restrictions will apply.
Invasive Species:	___ Yes	X No	
Stormwater:	___ Yes	X No	
Landscaping:	___ Yes	X No	
6(f) Property:	___ Yes	X No	
Hazardous Waste:	___ Yes	X No	
Contaminated Soils:	___ Yes	X No	
USDA-Forest Service Lands:	___ Yes	X No	
Scenic Highway/Byway:	___ Yes	X No	
Act 250 Permits:	___ Yes	X No	
FEMA Floodplains:	X Yes	___ No	Depending on the scope of work, a FHARC permit may be required.
Flood Hazard Area/ River Corridor:	X Yes	___ No	This project is located over Brush Book and any work below OHW will require a Section 404 permit, a US Army Corps of Engineers permit, and Title 19 Consultation.
US Coast Guard:	___ Yes	X No	
Lakes and Ponds:	___ Yes	X No	
Environmental Justice:	___ Yes	X No	
303D List/ Class A Water/ Outstanding Resource Water	___ Yes	X No	
Source Protection Area:	___ Yes	X No	
Public Water Sources/ Private Wells:	___ Yes	X No	
Other:	___ Yes	X No	

cc:
Project File

Appendix G: Natural Resource ID

VERMONT

State of Vermont
Program Development Division
One National Life Drive
Montpelier, VT 05633-5001
www.aot.state.vt.us

Agency of Transportation

[phone] 802-828-3979
[fax] 802-828-2334
[ttd] 800-253-0191

Memorandum

To: Jeff Ramsey, VTrans Environmental Specialist Supervisor

From: John Lepore, VTrans Senior Biologist

Date: November 23, 2016

Subject: HUNTINGTON BO 1445 (38)
Natural Resource Identification

Project Description:
This project involves Bridge #32 on Town Highway #22 (Camels Hump Road) over Brush Brook.

Wetlands/Watercourses:
There are no wetlands in the immediately vicinity of this project, but does involve the crossing of Brush Brook. Above this crossing, Brush Brook has a steep channel gradient (16%), and is a cold-water brook trout stream with a drainage area of 5.7 square miles which is mostly forested and flows in a west to southwesterly direction from the peak of Camels Hump. More than half of the streams drainage basin is with the Camels Hump State Forest. With that said, its substrate is a combination of ledge, boulders and cobbles and the flows can be flashy. The structure was retrofitted with a temporary center pier in recent years, but due to the amount of wooded debris in the channel, it is recommended that this bridges replacement spans the entire channel. Any impacts below OHW will require a Section 404 permit from the U.S. Army Corps of Engineers.

Rare, Threatened and Endangered (R/T/E) Species:
This project is within the range of the Northern Long Eared bat, a federally protected species, and site visit was conduct on 18-November-2016 as the project is subject to avoidance and minimization measures which protect their habitat and hibernacula. Based upon the site visit, it was concluded that suitable habitat may be impacted by the project, particularly if a temporary bridge is required. As the project is outside of the range of the Indiana Bat, conservation measures would be targeted toward the protection of the northern long-eared bats and their habitat. Although the bridge itself is does not contain suitable habitat features for bats, any tree cutting in this area would be subject to time of year restrictions unless and acoustical survey is conducted. For this location and without an acoustic survey, tree cutting would be limited between September 1st and April 15th.

In addition, all off-site construction activities, which include, but are not limited to, waste, borrow and staging areas, and dewatering sites are subject to review prior to use, and the cutting of trees larger than 3" in diameter outside of the project limits shall require a review under Section 105.25 of the Standard Specifications for Construction, Control of Waste, Borrow and Staging Areas, and may still require time of year restrictions if suitable habitat is present.

There are no other species and/or habitats of special concern in the vicinity of this project, to include, the Indiana Bat.

Agricultural Soils:
Prime agricultural are not present in the project area.

Fish and Wildlife Habitat:
This project is located along a rural town highway with relatively low traffic volumes and low travel speeds. These conditions are not expected to change after the construction of the project, and since most wildlife safely cross this roadway now, the provision for additional shelf for wildlife under the crossing is not necessary.

Appendix H: Archaeological Memo

VERMONT

Jeannine Russell
VTrans Archaeology Officer
State of Vermont
Environmental Section
One National Life Drive
Montpelier, VT 05633-5001
www.aot.state.vt.us

Agency of Transportation

[phone] 802-828-3981
[fax] 802-828-2334
[ttd] 800-253-0191

To: Jeff Ramsey, Environmental Specialist Supervisor

From: Jeannine Russell, VTrans Archaeology Officer

Date: June 5, 2017

Subject: Huntington BO 1445(38) Archaeological Resource ID

The scope for this project has not been fully defined but it involves potential work on and around Bridge 32 over Brush Brook on Town Highway 22 in Huntington, Vermont.

The VTrans Archaeology Officer conducted a site visit to the project area on April 20th, 2017 to assess the potential for archaeological resources. The project area is mostly wooded and situated along a roadway that climbs into the hills and mountains surrounding Huntington. The southwest quadrant slopes steeply upward directly adjacent to the bridge. The southeastern and northeastern quads consisted of low and small level areas adjacent to the stream but neither exhibited archaeological sensitivity.

The northwestern quadrant contained dry laid stone work remains associated with a saw mill that was present in the 1800s and is illustrated on the attached Beers map. These mill remains are located close to the bridge in the northwestern quadrant and should be avoided during construction. If this area cannot be avoided, then further archaeological work may be necessary.

All areas of archaeological sensitivity are noted on the attached map. Please let me know if you have any questions.

Thank you,
Jen Russell
VTrans Archaeology Officer

VTrans Working to Get You There
Vermont Agency of Transportation

Figure 1: ArcMap showing project location and archaeologically sensitive area containing mill remains in red

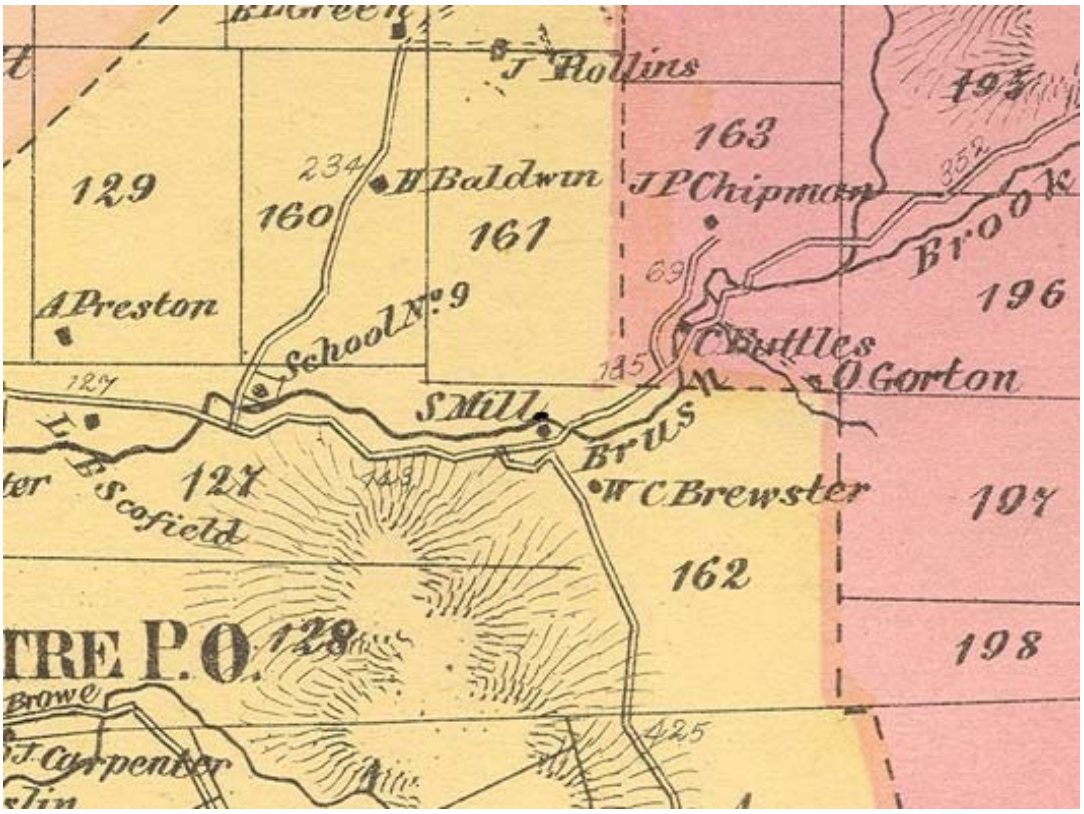


Figure 2: Saw mill illustrated in center of map (Beers 1869-1873)

Figure 3: photo facing southwest. Low cobbled area in foreground. Steep slope behind bridge.

Figure 4: Photo showing mill remains in the northwest quadrant

Figure 5: Another view of mill remains

Appendix I: Historic Memo

VERMONT

Vermont Agency of Transportation
Project Delivery Bureau - Environmental Section
One National Life Drive
Montpelier, VT 05633-5001
Tel: 802.828.1708

To: Jeff Ramsey, Environmental Specialist Supervisor

From: Judith Williams Ehrlich, VTrans Historic Preservation Officer

Date: June 5, 2017

Subject: Historic Resource Identification for Huntington BO 1445(38)

I have completed a resource identification (ID) for Huntington BO 1445(38).

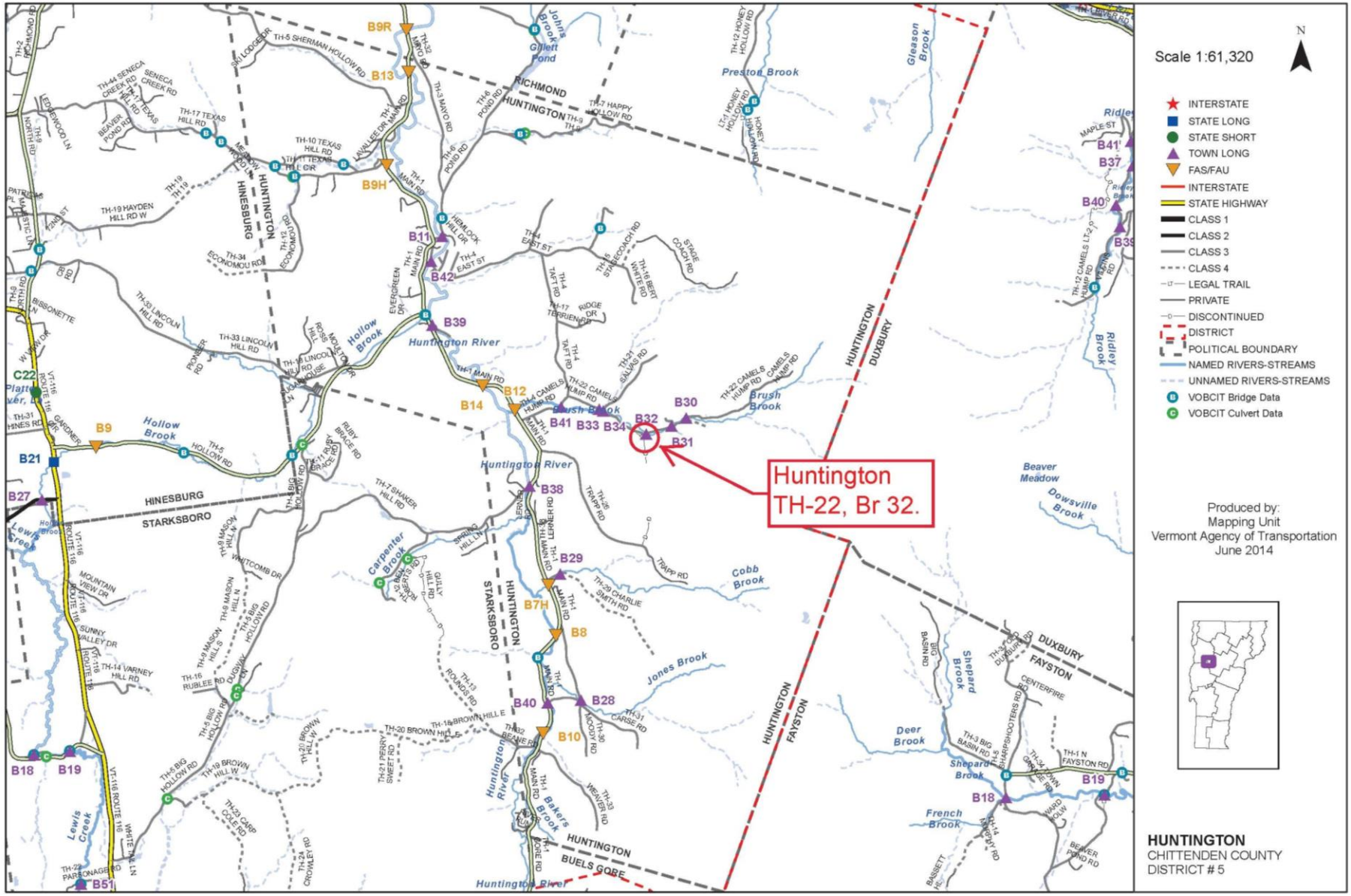
Constructed originally in 1925 and reconstructed in 1990, Bridge No. 32 on Town Highway 22/Camels Hump Road in Huntington is a 45' long rolled beam bridge with a timber deck and W-beam bridge and approach railings. The bridge is located approximately 0.5 miles southeast of Salvas Road and carries Town Highway 22 over Brush Brook.

I made a site visit to Bridge No. 32 on June 5, 2017. I studied the bridge and a one-story cross-gable house located in the northeast quadrant of the bridge. Based on field observations and the information available through VTrans records and the Vermont Division for Historic Preservation Online Resource Center, I have determined that neither the bridge nor the adjacent house are considered historic as they do not possess the level of historic, engineering or architectural significance required for inclusion in the National Register of Historic Places (NRHP) individually or as contributing historic resources to a potential historic district.

Please do not hesitate to contact me should you require additional information.

Attachments

- Map
- Photos



Location of Bridge No. 32, Huntington

Bridge No. 32, Town Highway 22, Huntington.

House in northeast quadrant of Bridge No. 32, Huntington.

Appendix J: Stormwater Resource ID

Armstrong, Jon

From: Armstrong, Jon
Sent: Wednesday, June 07, 2017 2:40 PM
To: Ramsey, Jeff
Subject: RE: Environmental Request NOTIFICATION: HUNTINGTON BO 1445(38)

Hi Jeff,
I don't anticipate stormwater related concerns with this project at this time.
Jon

From: Ramsey, Jeff
Sent: Thursday, November 17, 2016 9:04 AM
To: Armstrong, Jon <Jon.Armstrong@vermont.gov>; Lepore, John <John.Lepore@vermont.gov>; Russell, Jeannine <Jeannine.Russell@vermont.gov>; Ehrlich, Judith <Judith.Ehrlich@vermont.gov>
Cc: Fitch, Jennifer <Jennifer.Fitch@vermont.gov>
Subject: FW: Environmental Request NOTIFICATION: HUNTINGTON BO 1445(38)

Hi all,
This is a request for Resource ID.

Link:
M:\Projects\12j630\Environmental

Please see info below as well.
Thanks,
Jeff

Jeff Ramsey
Environmental Specialist Supervisor
Vermont Agency of Transportation
Environmental Section
1 National Life Drive
Montpelier, VT 05633
(802) 828-1278
jeff.ramsey@vermont.gov
VTrans Environmental Section Website

From: EnterpriseSQL@vermont.gov [mailto:EnterpriseSQL@vermont.gov]
Sent: Wednesday, November 16, 2016 2:32 PM
To: Ramsey, Jeff <Jeff.Ramsey@vermont.gov>; Ramsey, Jeff <Jeff.Ramsey@vermont.gov>; Ramsey, Jeff <Jeff.Ramsey@vermont.gov>; Slesar, Chris <Chris.Slesar@vermont.gov>; Wright, Andrea <Andrea.Wright@vermont.gov>
Cc: Spencer, Lisa <Lisa.Spencer@vermont.gov>; Dion, Michelle <Michelle.Dion@vermont.gov>
Subject: Environmental Request NOTIFICATION: HUNTINGTON BO 1445(38)

Please do not reply to this email.

NOTIFICATION EMAIL

Appendix K: Local Response and Input

This project, BO 1445(38), focuses on bridge 32 on town highway 22 in Huntington, Vermont. The bridge is deteriorating and is in need of either a major maintenance action or replacement. Potential options being considered for this project include replacement of the current superstructure and deck, replacement with a new bridge placed in the same location, or removal of the existing bridge and replacement in a new location.

Community Considerations

1. Are there regularly scheduled public events in the community that will generate increased traffic (e.g. vehicular, bicycles and/or pedestrians), or may be difficult to stage if the bridge is closed during construction? Examples include annual bike races, festivals, parades, cultural events, weekly farmers market, concerts, etc. that could be impacted? If yes, please provide approximate date, location and event organizers' contact info.

There are no regularly scheduled public events on Camels Hump Road beyond the Salvas Road intersection. A week-long annual summer gathering occurs on Salvas Road and an annual bicycle race on the last Saturday of June turns around at the Salvas Road intersection.

However, traffic to the Camels Hump State Park has increased dramatically over the years. This is one of the most popular hiking trails in Vermont. Full-size busses of children and adults park at parking lot which is beyond Bridge 32. Hiking is not limited to weekends – but has now become popular activity all year long on weekdays and weekends.

2. Is there a "slow season" or period of time from May through October where traffic is less or no events are scheduled?

Weekday hiking is certainly less popular than weekend hiking. Data from last year indicates that 290 hikers signed in on July 30, 2016 alone (a Saturday) and from January – August 2016 17,000 hikers signed in at the Huntington trail head access points.

3. Please describe the location of the Town garage, emergency responders (fire, police, ambulance) and emergency response routes that might be affected by the closure of the bridge, one-way traffic, or lane closures and provide contact information (names, address, email addresses, and phone numbers.

The Town Garage, 1st Response, and Fire Departments are located on the Main Road in Huntington Center. Richmond Rescue provides ambulance services. Access for all emergency and Town vehicles will be necessary in the event of medical, fire or other emergency. Our Fire Department also provides Wilderness Rescue services for hikers on the Camels Hump State Park trails accessed from Huntington.

Contact can be made through the Town Administrator who can coordinate communication to departments or individually as follows:

*Town Administrator: Barbara Elliott (*townhunt@gmavt.net */ 434-4779)*

*Road Foreman: Yogi Alger (*yogialger@gmail.com*) 802-434-2710*
*Fire Chief: Tate Jeffrey (*huntingtonfd@gmavt.net*) 802-363-0389*
*Richmond Rescue Director of Operations: Michael Chiarella (*director@richmondrescue.org*) 802-434-2394)*

4. Are there businesses (including agricultural operations and industrial parks) or delivery services (fuel or goods) that would be adversely impacted either by a detour or due to work zone proximity?

Residential fuel deliveries.

5. Are there important public buildings (town hall, community center, senior center, library) or community facilities (recreational fields, town green, etc.) close to the project?

No.

6. Is there a local business association, chamber of commerce, regional development corporation, or other downtown group that we should be working with? If known, please provide name, organization, email, and phone number.

No.

7. Are there any public transit services or stops that use the bridge or transit routes in the vicinity that may be affected if they become the detour route?

No.

Schools

1. Where are the schools in your community and what are their schedules?

The last day of school for in 2017 will be June 20 (depending on snow days). School resumes the week before Labor Day.

Brewster-Pierce Elementary School, 25 School Street, off of lower Camels Hump Road:
Camels Hump Middle School, 173 School St, Richmond
Mount Mansfield Union High School, 211 Browns Trace Road, Jericho

2. Is this project on specific routes that school buses or students use to walk to and from school?

School busses stop at the turnaround before Bridge 32.

3. Are there recreational facilities associated with the schools nearby (other than at the school)?

No, other than the State Park.

Pedestrians and Bicyclists

1. What is the current level of bicycle and pedestrian use on the bridge?

A number of residents (adults, children, pets) use the road and bridge for recreational walks. Fewer people ride bicycles due to the steepness of the road. There is also talk of using lower portions of Camels Hump Road for hikers to park and have them walk up the road. This has not yet been implemented.

2. Are the current lane and shoulder widths adequate for pedestrian and bicycle use?

No.

3. Is pedestrian and bicycle traffic heavy enough that it should be accommodated during construction?

Yes – since there are houses beyond the bridge.

4. In the vicinity of the bridge, is there a land use pattern, existing generators of pedestrian and/or bicycle traffic, or zoning that will support development that is likely to lead to significant levels of walking and bicycling?

No.

Design Considerations

1. Are there any concerns with the alignment of the existing bridge? For example, if the bridge is located on a curve, has this created any problems that we should be aware of?

Yes, it is on a sharp curve. The traffic should be (although not necessarily is) going slowly anyway. However it would be good if access could be improved.

2. Are there any concerns with the width of the existing bridge?

Yes. Too narrow. Should be same Bridge 30 which was just replaced.

3. Are there any special aesthetic considerations we should be aware of?

No.

4. Does the location have a history of flooding? If yes, please explain.

Not really. The river does get high but has not gone over the banks.

5. Are there any known Hazardous Material Sites near the project site?

No.

6. Are there any known historic, archeological and/or other environmental resource issues near the project site?

The State Park is a significant environmental resource.

7. Are there any utilities (water, sewer, communications, power) attached to the existing bridge? Please provide any available documentation.

No.

8. Are there any existing, pending, or planned municipal utility projects (communications, lighting, drainage, water, wastewater, etc. near the project that should be considered?

No.

9. Are there any other issues that are important for us to understand and consider?

No.

Land Use & Zoning

1. Please provide a copy of your existing and future land use map or zoning map, if applicable.

Attached.

2. Are there any existing, pending or planned development proposal that would impact future transportation patterns near the bridge? If so, please explain.

No.

3. Is there any planned expansion of public transit service in the project area? Please provide the name and contact information for the relevant public transit provider.

No.

Communications

1. Please identify any local communication outlets that are available for us to use in communicating with the local population. Include weekly or daily newspapers, blogs, radio, public access TV, Facebook, Front Page Forum, etc. Also include any unconventional means such as local low-power FM.

Front Porch Forum (Huntington)
Town Website (notify via email Town Administrator at townhunt@gmavt.net)
State Parks and Green Mt. Club websites
Times Ink monthly paper (Richmond, Huntington, Bolton)
Huntington Town Clerk Email Distribution list.

2. Other than people/organizations already referenced in this questionnaire, are there any others who should be kept in the loop as the project moves forward?

Yes. Residents, the Selectboard and Forest, Parks & Rec.

Appendix L: Crash Data

Vermont Agency of Transportation

General Yearly Summaries - Town Highway Crash Listing: Non-Federal Aid Highways-Local

From 01/01/12 To 12/31/16 General Yearly Summaries Information

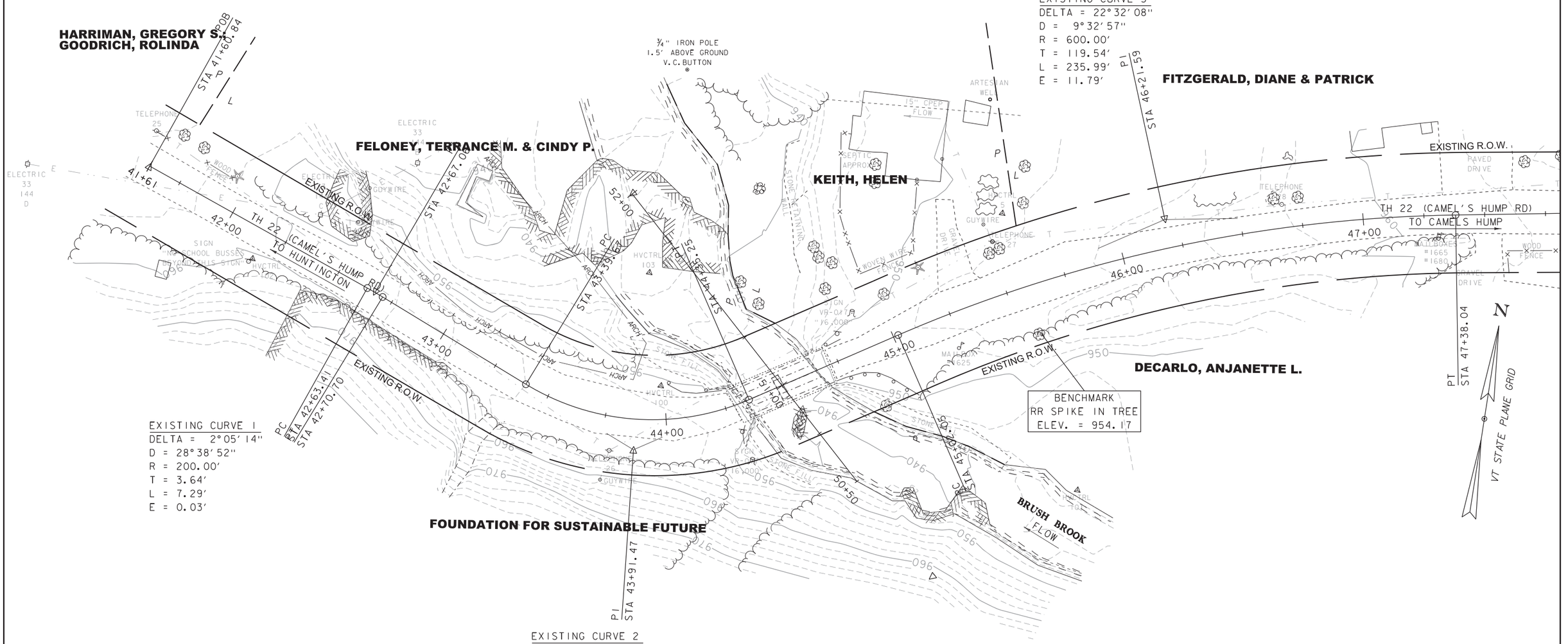
Reporting Agency/ Number	County	Town	Route	Date MM/DD/YY	Time	Weather	Contributing Circumstances	Direction Of Collision	Number Of Injuries	Number Of Fatalities	Number Of Untimely Deaths	Location
VT0041200/12 HB00103	Chittenden	Hinesburg	T0023	01/21/2012	09:45	Snow	Driving too fast for conditions	Single Vehicle Crash	0	0	0	TH-23 Baldwin Rd at Drinkwater Rd
VT0041200/13 HB01176	Chittenden	Hinesburg	T0023	10/02/2013	18:42	Clear	Swerving or avoiding due to wind, slippery surface, vehicle, object, non-motorist in roadway etc	Same Direction Sideswipe	0	0	0	TH-23 Baldwin Rd at Charlotte Rd
VT0041200/15 HB00571	Chittenden	Hinesburg	T0023	05/20/2015	08:59	Clear	Failure to keep in proper lane	Same Direction Sideswipe	0	0	0	TH-23 Baldwin Rd at Burritt Rd
VT0041200/15 HB01485	Chittenden	Hinesburg	T0023	12/17/2015	16:50	Rain	Swerving or avoiding due to wind, slippery surface, vehicle, object, non-motorist in roadway etc	Single Vehicle Crash	0	0	0	TH-23 (2188 Baldwin Rd) at Drinkwater Rd
VT0041200/13 HB00629	Chittenden	Hinesburg	T0025	06/05/2013	09:09	Clear	No improper driving	Single Vehicle Crash	0	0	0	TH-25 Drink Water Rd at Baldwin Rd
VT0041200/12 HB01233	Chittenden	Hinesburg	T0028	11/03/2012	13:03	Clear	Unknown	Single Vehicle Crash	0	0	0	TH-28 Lewis Creek Rd at Turkey Ln
VT0041200/15 HB00798	Chittenden	Hinesburg	T0028	07/13/2015	14:10	Clear	Failed to yield right of way, No improper driving	Other - Explain in Narrative	0	0	0	TH-28 Lewis Creek Rd at Silver St
VT0041200/15 HB00131	Chittenden	Hinesburg	T0033	02/05/2015	00:19	Snow	Driving too fast for conditions	Single Vehicle Crash	0	0	0	TH-33 Lincoln Hill Rd at North Rd
VT0041200/13 HB00183	Chittenden	Hinesburg	T0036	02/23/2013	09:00	Cloudy	Other improper action	Single Vehicle Crash	0	0	0	TH-36 Beecher Hill Rd at Vt Rt 116
VT0041200/12 HB00563	Chittenden	Hinesburg	T0043	06/01/2012	18:33	Clear	Driving too fast for conditions, No improper driving	Rear End	1	0	0	TH-43 Commerce St at Vt Rt 116
VT0041200/14 HB01711	Chittenden	Hinesburg	T0043	12/18/2014	16:40	Snow	Followed too closely, No improper driving	Rear End	0	0	0	Commerce St at Vt Rt 116
VT0041200/15 HB01370	Chittenden	Hinesburg	T0043	11/16/2015	12:30	Clear	No improper driving	No Turns, Thru moves only, Broadside ^<	0	0	0	Commerce St at Vt Rt 116
VT0041200/15 HB00241	Chittenden	Hinesburg	T0300	02/28/2015	23:30	Cloudy	Driving too fast for conditions	Single Vehicle Crash	0	0	0	Gilman at Vt Rt 116
VTVSP0100/13 A102655	Chittenden	Huntington	T0004	07/09/2013	22:19	Clear	Swerving or avoiding due to wind, slippery surface, vehicle, object, non-motorist in roadway etc	Single Vehicle Crash	1	0	0	TH-4 Taft Rd at Bert White Rd
VTVSP0100/15 A100151	Chittenden	Huntington	T0004	01/10/2015	10:08	Cloudy	Failure to keep in proper lane, No improper driving	Opp Direction Sideswipe	0	0	0	TH-4 (170 East St)
VTVSP0100/15 A106293	Chittenden	Huntington	T0004	12/12/2015	20:13	Clear	No improper driving	Single Vehicle Crash	1	0	0	TH-4 (700 East St) at Huntington Woods
VTVSP0100/15 A102711	Chittenden	Huntington	T0006	05/30/2015	10:48	Clear	Driving too fast for conditions	Single Vehicle Crash	1	0	0	TH-6 Gillette Pond Road at .1 Mile South Of Bridge St/mayo Road
VTVSP0100/15 A105468	Chittenden	Huntington	T0016	10/22/2015	16:57				0	0	0	TH-16 (19 Bert White Rd.)
VTVSP0100/12 A102676	Chittenden	Huntington	T0030	07/18/2012	07:45	Clear	Inattention	Single Vehicle Crash	1	0	0	TH-30 (649 Moody Rd) at Main Rd
VTVSP0100/13 A101259	Chittenden	Huntington	T0038	04/01/2013	14:52	Cloudy	Other improper action	Other - Explain in Narrative	0	0	0	TH-38 Roberts Park Rd at East St
VTVSP0100/13 A101740	Chittenden	Huntington	T0042	05/08/2013	20:28	Rain	Driving too fast for conditions, Under the influence of medication/drugs/alcohol	Single Vehicle Crash	1	0	0	125 Huntington Woods at East St
VTVSP0100/15 A104855	Chittenden	Jericho	0000	09/16/2015	12:48	Clear	Failed to yield right of way, No improper driving	Left Turn and Thru, Angle Broadside -->v--	0	0	0	25 Jericho Center Circle at Browns Trace Road
VTVSP0100/13 A100340	Chittenden	Jericho	S0730	01/26/2013	01:37				0	0	0	Min. C 0730 (97 Barber Farm Rd.)
VTVSP0100/13 A100572	Chittenden	Jericho	S0730	02/09/2013	16:53	Clear		Opp Direction Sideswipe	0	0	0	Min. C 0730 Barber Farm Rd at Hilltop Dr
VTVSP0100/13 A100764	Chittenden	Jericho	S0730	02/24/2013	18:57				0	0	0	Min. C 0730 Barber Farm Rd. at Browns Trace Rd.
VTVSP0100/13 A100861	Chittenden	Jericho	S0730	03/04/2013	03:50				0	0	0	Min. C 730 (110 Barber Farm Rd.)
VTVSP0100/13 A101093	Chittenden	Jericho	S0730	03/20/2013	07:29				0	0	0	Min. C 0730 barber farm at VT-117
VT0040800/13 RM00785	Chittenden	Jericho	S0730	08/08/2013	16:53	Clear	Followed too closely	Rear End	0	0	0	Min. C 0730 Barber Farm Road at Vt Rt 117
VTVSP0100/13 A104858	Chittenden	Jericho	S0730	11/29/2013	16:41				0	0	0	Min. C 0730 BARBER FARM at SCHILLHAMMER RD

Source: SQL Server VCSG

Appendix M: Plans

INDEX OF SHEETS

SHEET NO.	SHEET DESCRIPTION
1	Resource Site Plan
2	Existing TH 22 Profile
3	Deck and Superstructure Replacement Typical Sections
4	Deck and Superstructure Replacement Layout
5	Full Bridge Replacement Typical Sections
6	Full Bridge Replacement On-Alignment Integral Abutment Layout
7	Full Bridge Replacement Off-Alignment Integral Abutment Layout
8	Full Bridge Replacement On-Alignment Shallow Foundation Layout
9	Full Bridge Replacement Off-Alignment Shallow Foundation Layout
10	Off-Alignment Profile
11	Temporary Bridge Layout



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DELTA = 22°32'08"
D = 9°32'57"
R = 600.00'
T = 119.54'
L = 235.99'
E = 11.79'

EXISTING CURVE 1
DELTA = 2°05'14"
D = 28°38'52"
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T = 3.64'
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EXISTING CURVE 2
DELTA = 54°46'05"
D = 57°17'45"
R = 100.00'
T = 51.80'
L = 95.59'
E = 12.62'

BENCHMARK
RR SPIKE IN TREE
ELEV. = 954.17

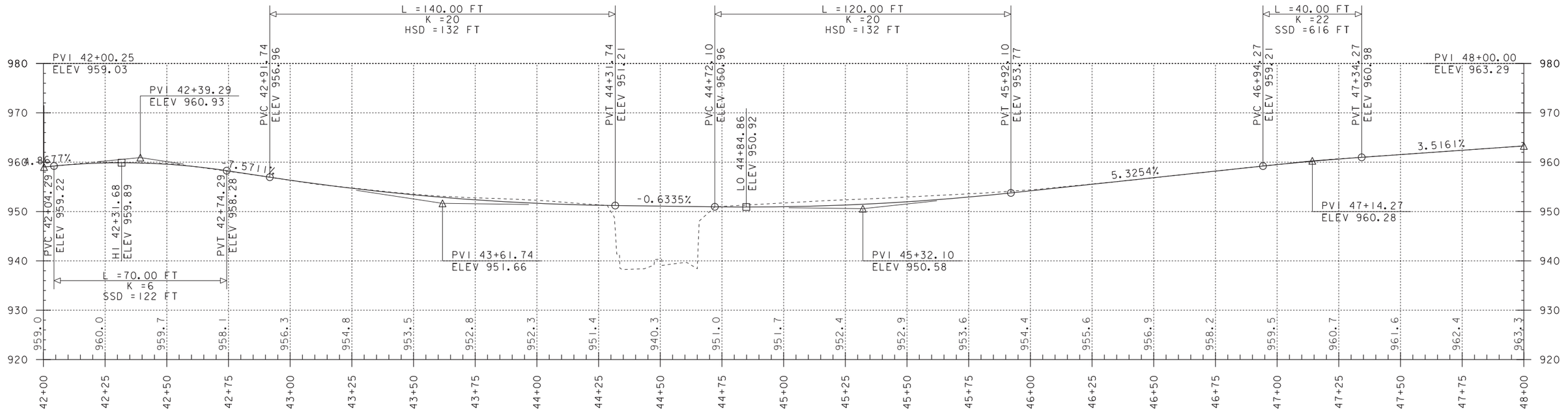
FOUNDATION FOR SUSTAINABLE FUTURE

EXISTING BRIDGE INFORMATION
SINGLE SPAN, BUILT 1925
ROLLED BEAM WITH TIMBER DECK
45' STRUCTURE LENGTH
16'-3" FASCIA TO FASCIA WIDTH

RESOURCE SITE PLAN

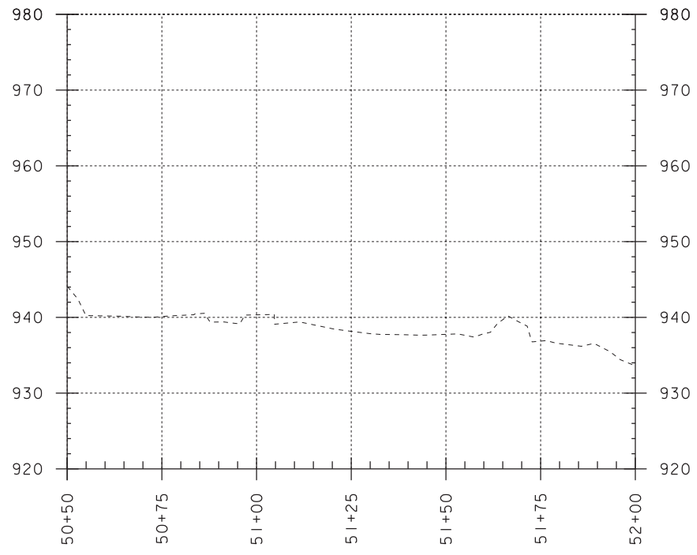
SCALE 1" = 20'-0"
20 0 20

PROJECT NAME:	HUNTINGTON
PROJECT NUMBER:	BO 1445(38)
FILE NAME:	12j630/sl2j630border.dgn
PROJECT LEADER:	N.WARK
DESIGNED BY:	G.SWEENY
RESOURCE SITE PLAN	
PLOT DATE:	05-SEP-2018
DRAWN BY:	D.D.BEARD
CHECKED BY:	G.SWEENY
SHEET	I OF II



TOWN HIGHWAY 22 PROFILE

SCALE: HORIZONTAL 1"=20'-0"
VERTICAL 1"=10'-0"



BRUSH BROOK CHANNEL PROFILE

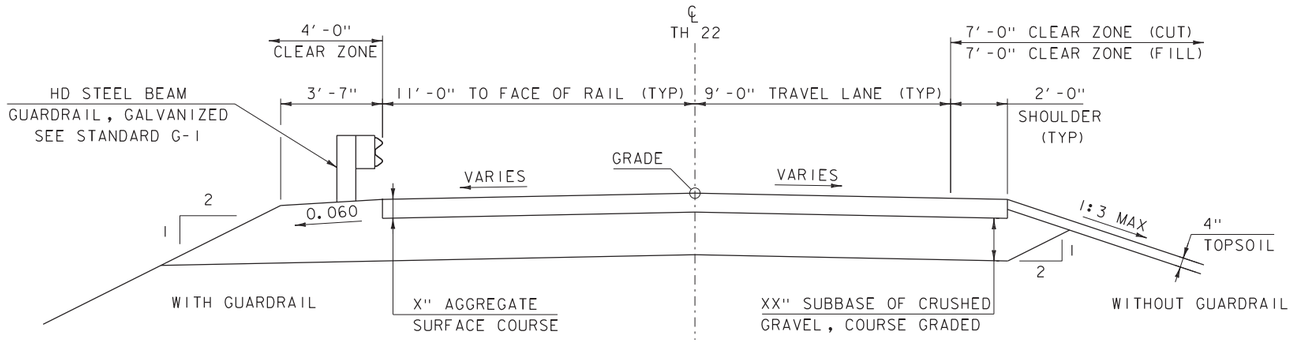
SCALE: HORIZONTAL 1"=20'-0"
VERTICAL 1"=10'-0"

NOTE:
GRADES SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG ℄
GRADES SHOWN TO THE NEAREST HUNDREDTH ARE FINISH GRADE ALONG ℄

PROJECT NAME: HUNTINGTON
PROJECT NUMBER: BO 1445(38)

FILE NAME: 12j630/sl2j630profile.dgn
PROJECT LEADER: N.WARK
DESIGNED BY: G.SWEENY
PROFILE SHEET

PLOT DATE: 05-SEP-2018
DRAWN BY: D.D.BEARD
CHECKED BY: G.SWEENY
SHEET 2 OF 11



PROPOSED TH 22 TYPICAL SECTION

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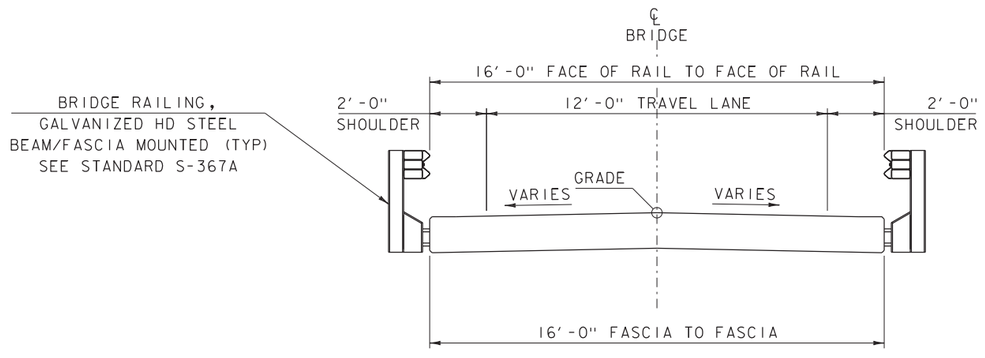

DECK & SUPERSTRUCTURE REPLACEMENT TYPICAL SECTION

SCALE 3/8" = 1'-0"

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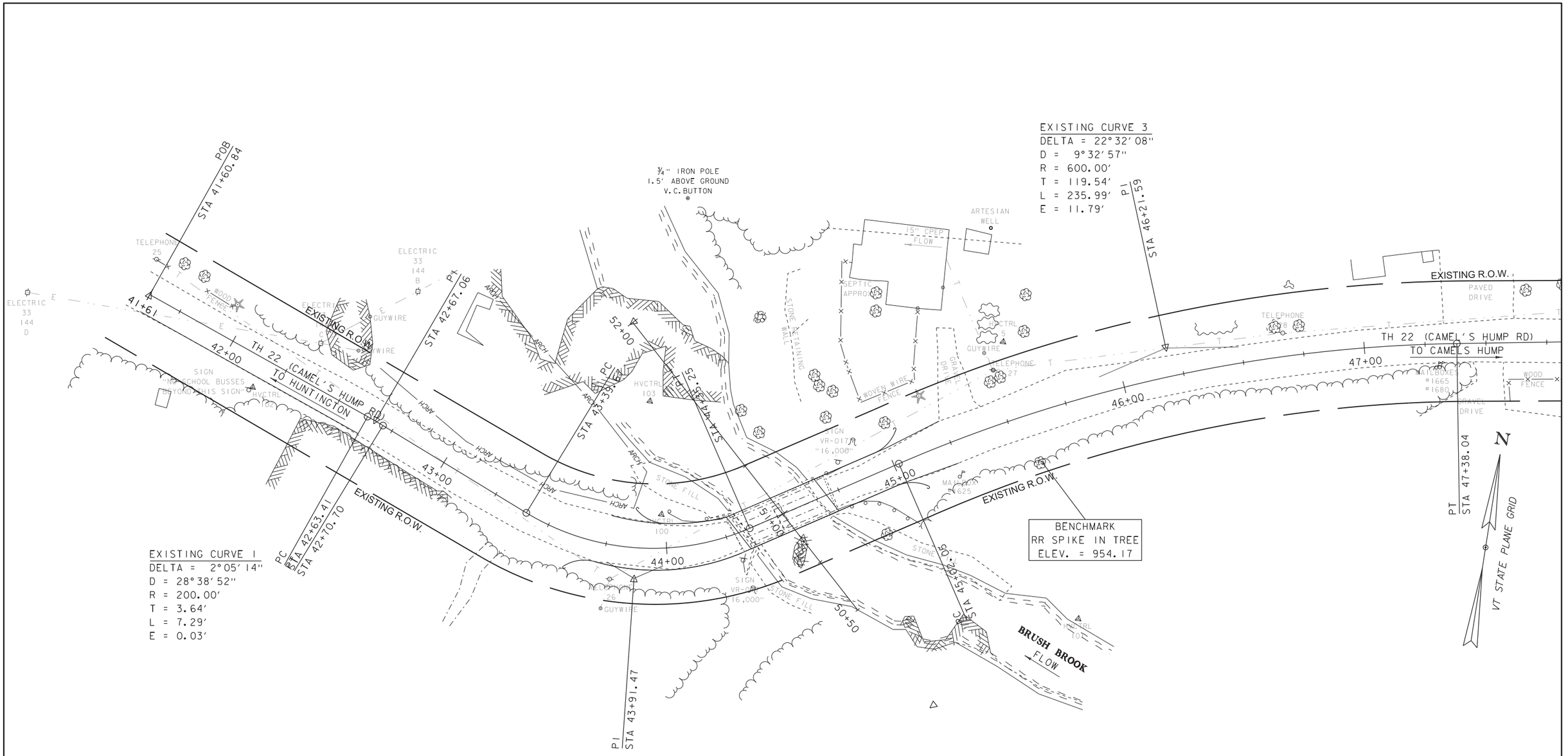
PROJECT NUMBER:	BO 1445(38)
FILE NAME: 12j630\sl2j630typical.dgn	PLOT DATE: 05-SEP-2018
PROJECT LEADER: N.WARK	DRAWN BY: D.D.BEARD
DESIGNED BY: G.SWEENY	CHECKED BY: G.SWEENY
DECK REPLACEMENT TYPICAL SECTIONS	SHEET 3 OF 11



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EXISTING CURVE 2
DELTA = 54°46'05"
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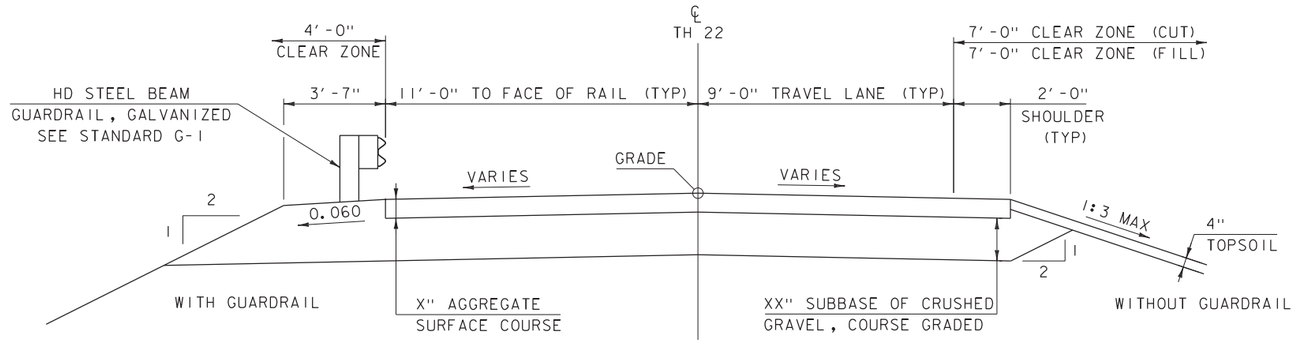
E = 12.62'

EXISTING BRIDGE INFORMATION
SINGLE SPAN, BUILT 1925
ROLLED BEAM WITH TIMBER DECK
45' STRUCTURE LENGTH
16'-3" FASCIA TO FASCIA WIDTH

DECK AND SUPERSTRUCTURE REPLACEMENT LAYOUT

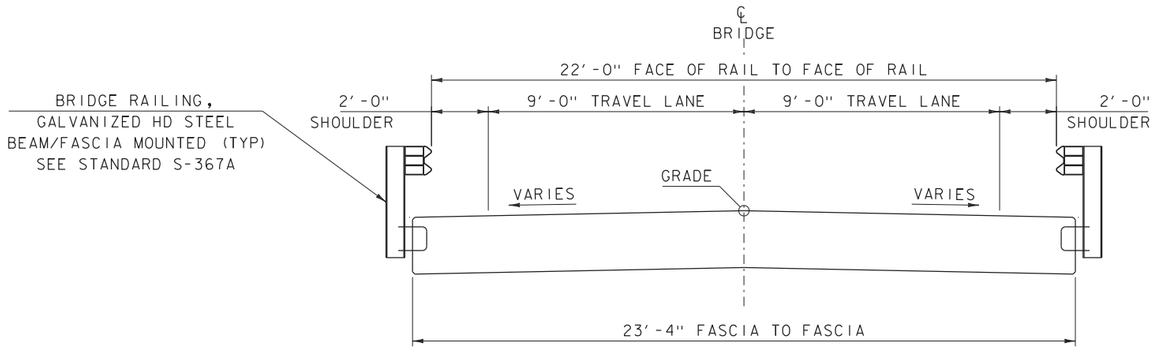
SCALE 1" = 20'-0"
20 0 20

PROJECT NAME:	HUNTINGTON
PROJECT NUMBER:	BO 1445(38)
FILE NAME:	12j630/sl2j630border.dgn
PROJECT LEADER:	N.WARK
DESIGNED BY:	G.SWEENY
DECK & SUPER REPLACMENT LAYOUT	
PLOT DATE:	05-SEP-2018
DRAWN BY:	D.D.BEARD
CHECKED BY:	G.SWEENY
SHEET	4 OF 11



PROPOSED TH 22 TYPICAL SECTION

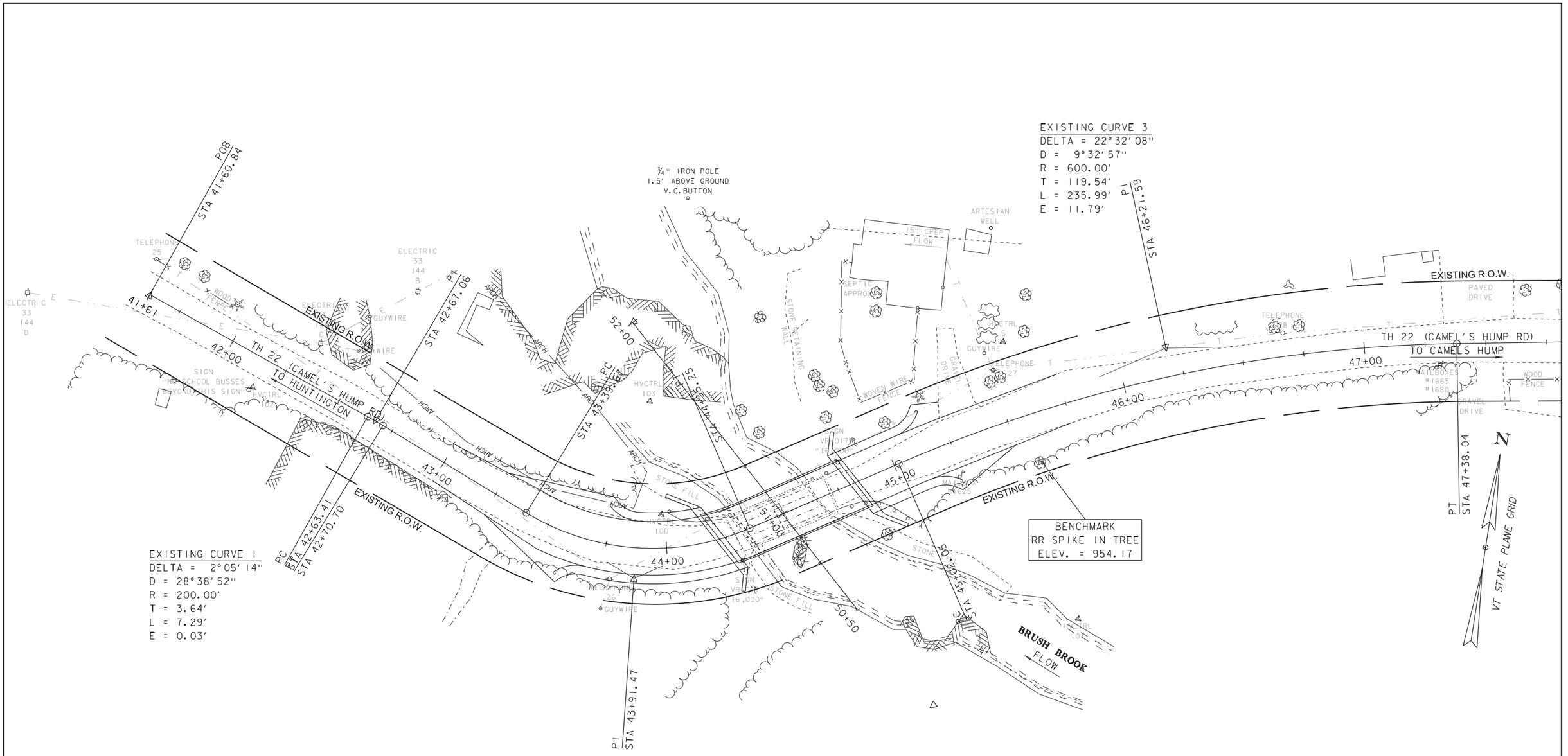
SCALE 3/8" = 1'-0"



BRIDGE REPLACMENT TYPICAL SECTION

SCALE 3/8" = 1'-0"

PROJECT NAME:	HUNTINGTON
PROJECT NUMBER:	BO 1445(38)
FILE NAME: 12j630\sl2j630typical.dgn	PLOT DATE: 05-SEP-2018
PROJECT LEADER: N.WARK	DRAWN BY: D.D.BEARD
DESIGNED BY: G.SWEENY	CHECKED BY: G.SWEENY
BRIDGE REPLACMENT TYPICAL SECTIONS	SHEET 5 OF 11



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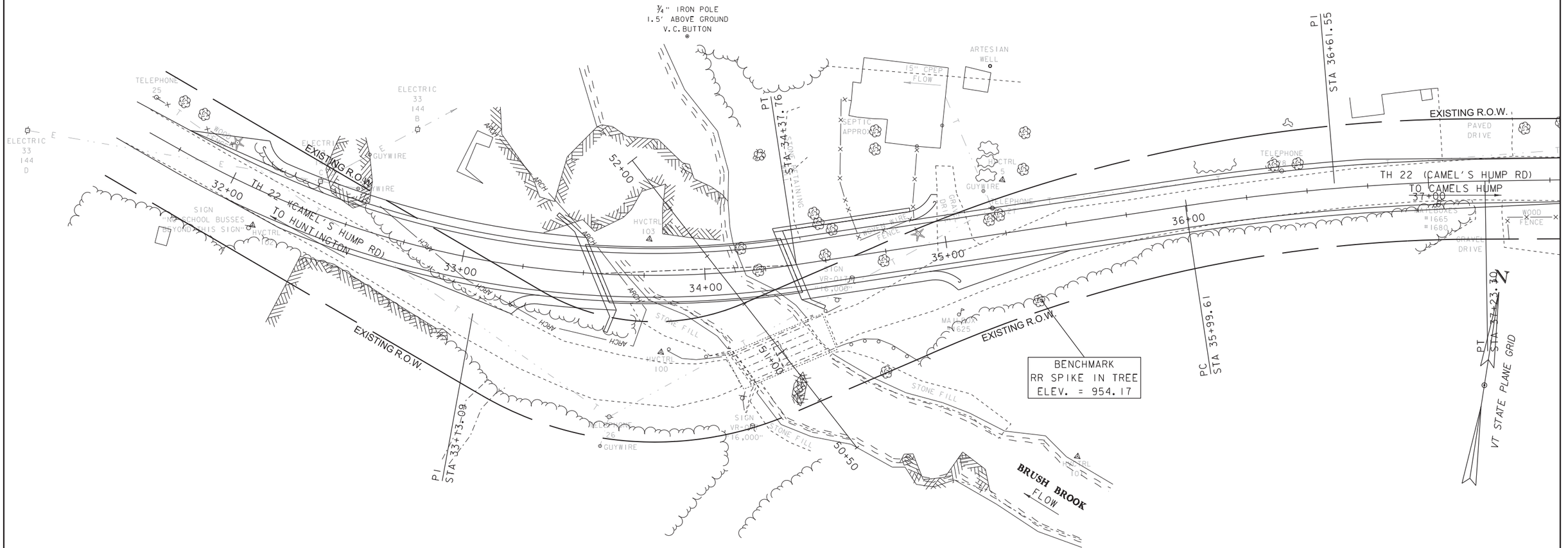
SINGLE SPAN, BUILT 1925
ROLLED BEAM WITH TIMBER DECK
45' STRUCTURE LENGTH
16'-3" FASCIA TO FASCIA WIDTH

INTEGRAL ABUTMENT BRIDGE ON ALIGNMENT

SCALE 1" = 20'-0"
20 0 20

PROJECT NAME:	HUNTINGTON
PROJECT NUMBER:	BO 1445(38)
FILE NAME:	12j630/sl2j630border.dgn
PROJECT LEADER:	N.WARK
DESIGNED BY:	G.SWEENY
ALTERNATIVE 2A LAYOUT SHEET	
PLOT DATE:	05-SEP-2018
DRAWN BY:	D.D.BEARD
CHECKED BY:	G.SWEENY
SHEET	6 OF 11

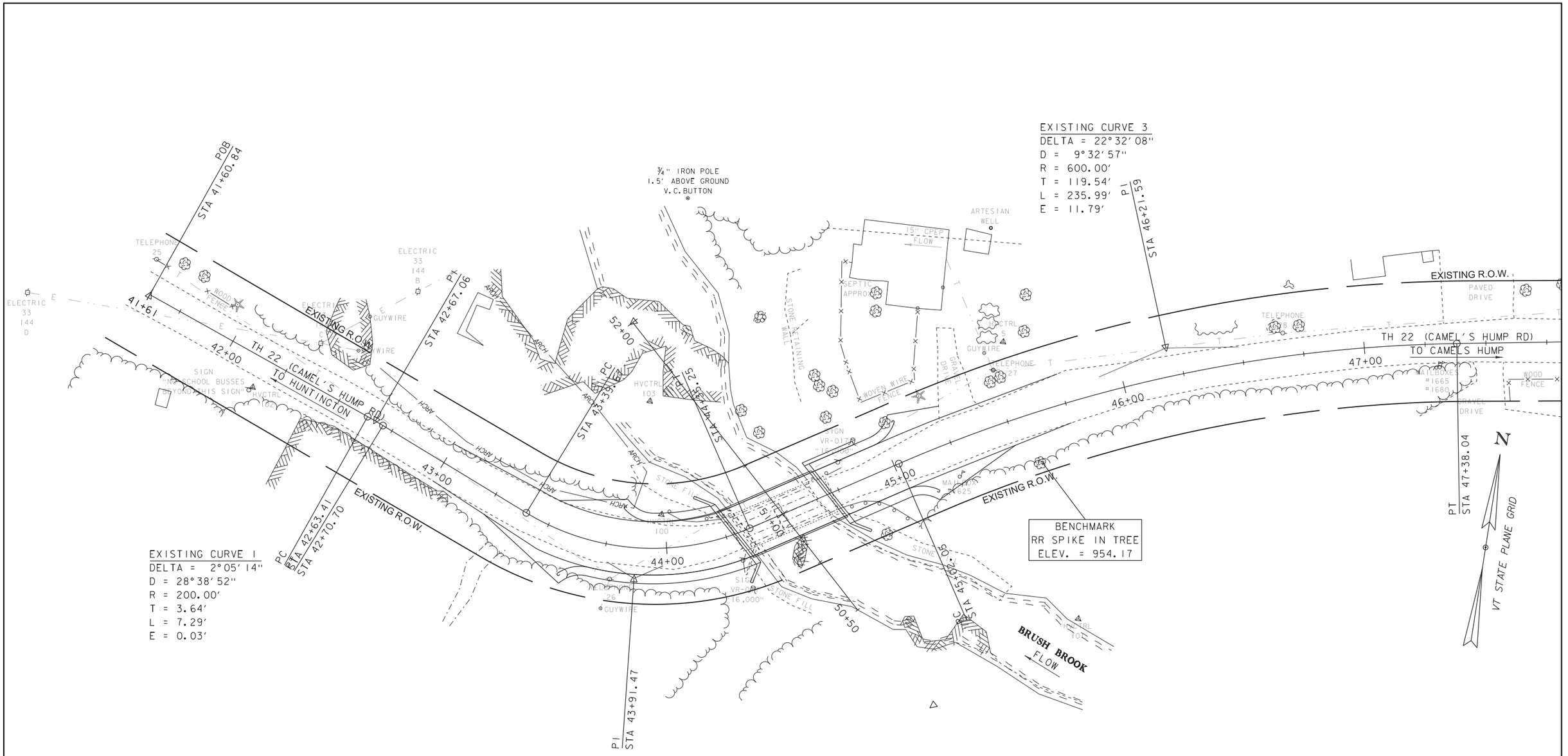


EXISTING BRIDGE INFORMATION
SINGLE SPAN, BUILT 1925
ROLLED BEAM WITH TIMBER DECK
45' STRUCTURE LENGTH
16'-3" FASCIA TO FASCIA WIDTH

INTEGRAL ABUTMENT OFF ALIGNMENT ALTERNATIVE LAYOUT

SCALE 1" = 20'-0"
20 0 20

PROJECT NAME:	HUNTINGTON
PROJECT NUMBER:	BO 1445(38)
FILE NAME: 12j630/s12j630border.dgn	PLOT DATE: 05-SEP-2018
PROJECT LEADER: N.WARK	DRAWN BY: D.D.BEARD
DESIGNED BY: G.SWEENY	CHECKED BY: G.SWEENY
ALTERNATIVE 2B LAYOUT SHEET	SHEET 7 OF 11



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EXISTING BRIDGE INFORMATION
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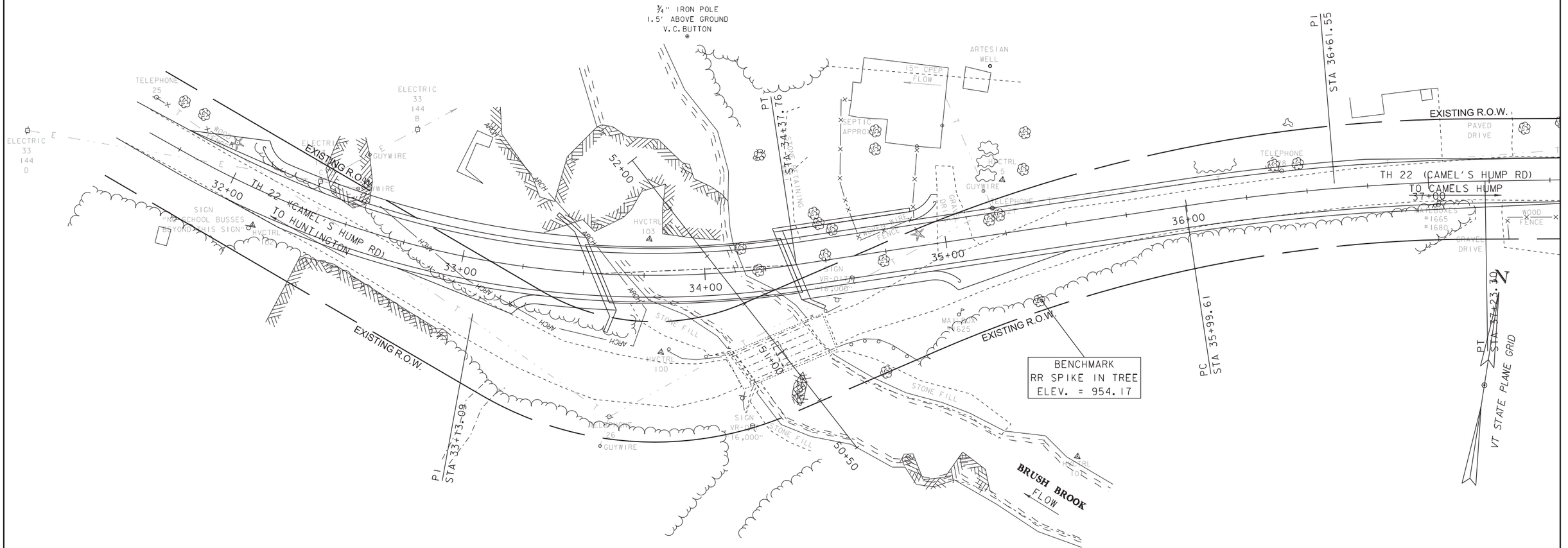
ROLLED BEAM WITH TIMBER DECK
45' STRUCTURE LENGTH
16'-3" FASCIA TO FASCIA WIDTH

SHALLOW ABUTMENT ON ALIGNMENT LAYOUT

SCALE 1" = 20'-0"
20 0 20

PROJECT NAME:	HUNTINGTON
PROJECT NUMBER:	BO 1445(38)
FILE NAME:	12j630/sl2j630border.dgn
PROJECT LEADER:	N.WARK
DESIGNED BY:	G.SWEENY
ALTERNATIVE 3A LAYOUT SHEET	
PLOT DATE:	05-SEP-2018
DRAWN BY:	D.D.BEARD
CHECKED BY:	G.SWEENY
SHEET	8 OF 11



EXISTING BRIDGE INFORMATION
SINGLE SPAN, BUILT 1925
ROLLED BEAM WITH TIMBER DECK
45' STRUCTURE LENGTH
16'-3" FASCIA TO FASCIA WIDTH

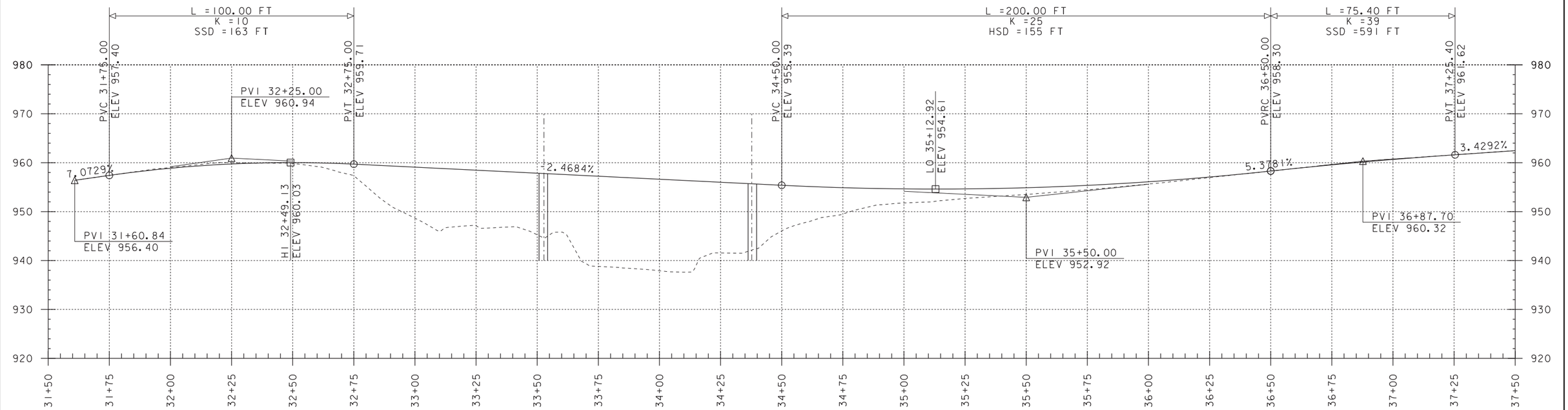
SHALLOW ABUTMENT OFF ALIGNMENT ALTERNATIVE LAYOUT

SCALE 1" = 20'-0"
20 0 20

PROJECT NAME: HUNTINGTON
PROJECT NUMBER: BO 1445(38)

FILE NAME: 12j630/s12j630border.dgn
PROJECT LEADER: N.WARK
DESIGNED BY: G.SWEENY
ALTERNATIVE 3B LAYOUT SHEET

PLOT DATE: 05-SEP-2018
DRAWN BY: D.D.BEARD
CHECKED BY: G.SWEENY
SHEET 9 OF 11



OFF-ALIGNMENT PROFILE

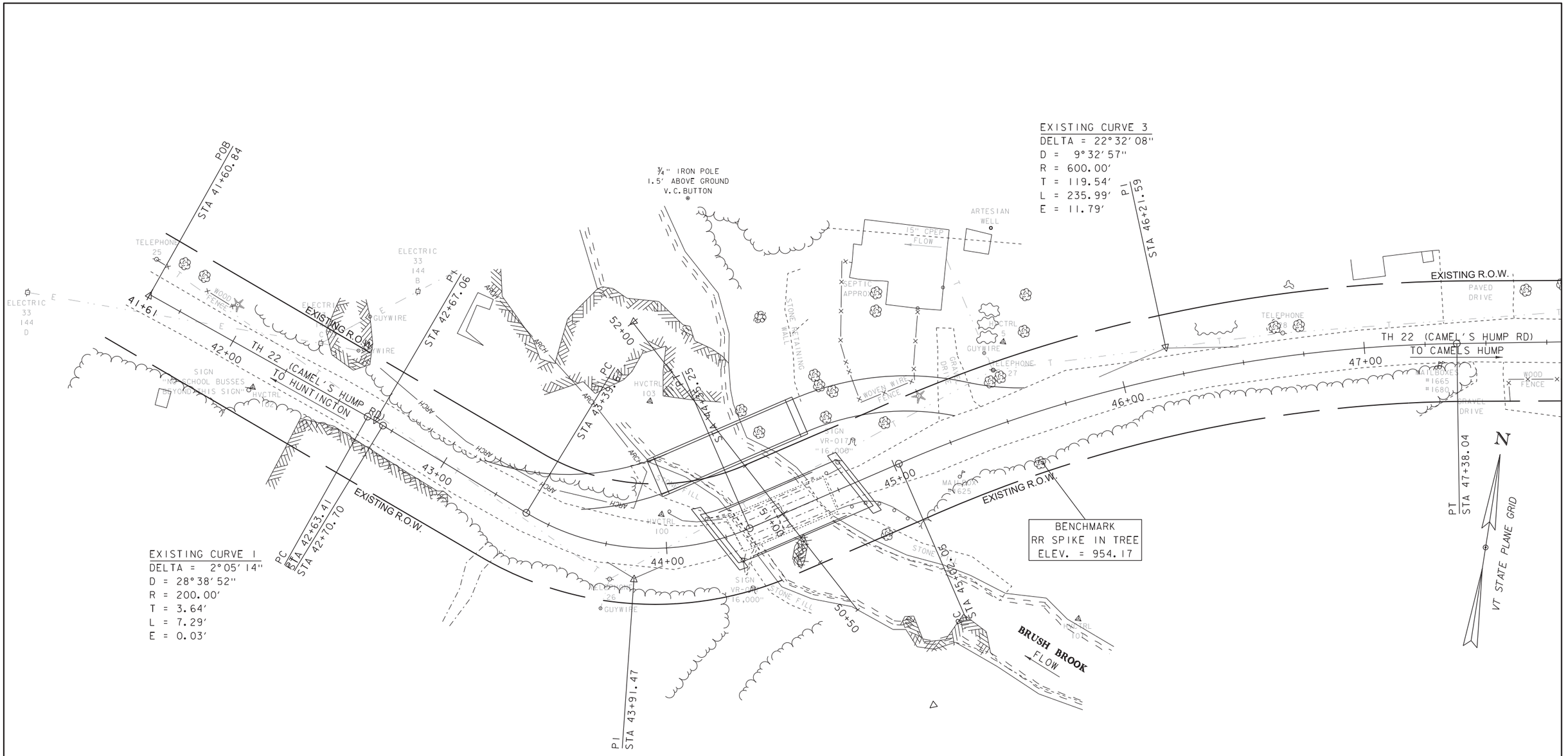
SCALE: HORIZONTAL 1"=20'-0"
VERTICAL 1"=10'-0"

NOTE:
GRADES SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG ℄
GRADES SHOWN TO THE NEAREST HUNDREDTH ARE FINISH GRADE ALONG ℄

PROJECT NAME: HUNTINGTON
PROJECT NUMBER: BO 1445(38)

FILE NAME: 12j630/sl2j630profile.dgn
PROJECT LEADER: N.WARK
DESIGNED BY: G.SWEENY
OFF-ALIGNMENT PROFILE SHEET

PLOT DATE: 05-SEP-2018
DRAWN BY: D.D.BEARD
CHECKED BY: G.SWEENY
SHEET 10 OF 11



EXISTING CURVE 3
DELTA = 22°32'08"
D = 9°32'57"
R = 600.00'
T = 119.54'
L = 235.99'
E = 11.79'

EXISTING CURVE 1
DELTA = 2°05'14"
D = 28°38'52"
R = 200.00'
T = 3.64'
L = 7.29'
E = 0.03'

EXISTING CURVE 2
DELTA = 54°46'05"
D = 57°17'45"
R = 100.00'
T = 51.80'
L = 95.59'
E = 12.62'

BENCHMARK
RR SPIKE IN TREE
ELEV. = 954.17

EXISTING BRIDGE INFORMATION
SINGLE SPAN, BUILT 1925
ROLLED BEAM WITH TIMBER DECK
45' STRUCTURE LENGTH
16'-3" FASCIA TO FASCIA WIDTH

DOWNSTREAM TEMPORARY BRIDGE

SCALE 1" = 20'-0"
20 0 20

PROJECT NAME: HUNTINGTON
PROJECT NUMBER: BO 1445(38)

FILE NAME: 12j630/sl2j630border.dgn
PROJECT LEADER: N.WARK
DESIGNED BY: G.SWEENY
DOWNSTREAM TEMP BRIDGE LAYOUT

PLOT DATE: 05-SEP-2018
DRAWN BY: D.D.BEARD
CHECKED BY: G.SWEENY
SHEET II OF II