STATE OF VERMONT
AGENCY OF TRANSPORTATION

Scoping Report

FOR

Highgate BO 1448(43)

TH 4 (Machia Road), Bridge 25 over the Missisquoi River

December 4, 2013

I. Contents

I. Site Information

Bridge 25 is located on Machia Road (TH 4) approximately 150 feet from the intersection on VT 78 and TH 4. The bridge is located in East Highgate on the border of a High Density Residential area with an apartment house and four way intersection off the east end of the bridge and a Medium Density Residential area with a farm and several residences on the west side of the bridge. 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	Rural Local (Class 2)
Bridge Type	Two Span Through Truss
Bridge Span	292 feet long
Year Built	1928
Ownership	Town of Highgate

Need

The following are needs of Machia Road near the intersection with VT 78.

1. The lane and shoulder widths are too narrow for the traffic volume, design speed and roadway classification.

2. The horizontal curves on and off the bridge are too tight for the superelevation provided.

3. The K values and sight distance are substandard for the vertical curves over the bridge.

4. The bridge rail, approach railing and terminal sections are substandard.

5. There are several improperly shielded fixed obstructions in the clear zone.

6. Bridge 25 is structurally deficient and unable to carry design loads.

Traffic

A traffic study of this site was performed by the Vermont Agency of Transportation. The traffic volumes are projected for the years 2016 and 2036.

TRAFFIC DATA	2016	2036
AADT	750	790
DHV	95	100
ADTT	30	45
%T	4.4	6.1
%D	67	67

Design Criteria

The design standards for this bridge project are the Vermont State Standards, dated October 22, 1997. Minimum standards are based on an ADT < 1500 and a design speed of 35 mph.

Design Criteria	Source	Existing Condition	Minimum Standard	Comment
Approach Lane and Shoulder Widths	VSS Table 6.3	9'/1' (20')	9'/2' (22')	Substandard
Bridge Lane and Shoulder Widths	VSS Table 6.3	8'/0.25' (16.5')	9'/2' (22')	Substandard
Clear Zone Distance	VSS Table 6.5	Utility Pole, House	12’ fill / 10’ cut	Substandard
Banking	VSS Section 6.12	3.1%	8% (max)	
Speed		35 mph (Posted)	35 mph (Design)	
Horizontal Alignment	AASHTO Green Book Table 3-10b	R = 350'	R_{min} = 314’ @ 8%	Substandard
Vertical Grade	VSS Table 6.6	2.0%	10% (max) for rolling terrain	
K Values for Vertical Curves	VSS Table 6.1	10 sag	40 crest / 50 sag	Substandard
Vertical Clearance Issues	VSS Section 6.7	15'-4"	14’-3” (min)	
Stopping Sight Distance	VSS Table 6.1	84'	225'	Substandard
Bicycle/Pedestrian Criteria	VSS Table 6.7	1' Shoulder on Approach 0.25' on Bridge	1’ Shoulder Approach 2' Shoulder Bridge	Substandard
Bridge Railing (and Approach Railing)	Structures Design Manual Section 13.2	Built-up steel shapes	TL-2	Substandard
Hydraulics	VTrans Hydraulic Section	Pass Q_{25} storm event with 9.7’ of freeboard	Pass Q_{25} storm event with 1.0’ of freeboard	
Structural Capacity	S.M., Ch. 3.4.1	Structurally Deficient	Design Live Load: HL-93	Substandard

Inspection Report Summary

Deck Rating	5 Fair
Superstructure Rating	4 Poor
Substructure Rating	4 Poor
Channel Rating	8 Very Good

9/9/2013 This structure is in need of a full deck replacement. Steel repairs/replacement of floorbeam 1 and multiple stringers are necessary. More steel repairs may be found necessary after any cleaning before a paint project. The portal over abutment 1 has been bent and torn heavily on the upstream side due to collision damage. JWW/JDM

10/11/2011 This structure remains in serious to critical condition due to the seating area settlement on the upstream corner area of abutment No.1 and heavy cracking on the downstream end area of the pier. The deck soffit area continues to slowly deteriorate. Scattered steel members forming the under carriage remains weak due to holes, heavy section loss or rust scaling. The upstream corner area of the abutment No.1 stemwall can experience sudden collapse or failure at

anytime without notice. The downstream end area of the pier cap and granite blocks are slightly flexing with horizontal movement when the trusses experience heavy loading. This structure is in need of full rehab. PLB

Hydraulics
From preliminary hydraulics report:

Existing:
The existing bridge meets the hydraulic standard. The bridge passes the Q25 storm (with 9.7 feet of freeboard). The standard requires a minimum of 1 foot of freeboard for the Q25 discharge for town routes.

Recommendations:
The first option analyzed maintains the existing two span bridge with a maximum span of 143 feet, an overall structure length of 292 feet, and vertical abutments with no stone fill above the existing ground. This option maintains the existing pier dimensions and location. The low chord elevation may be as low as 209.70 and meet the hydraulic standard without impacting the Q100 water surface elevation.

A second option assumes integral abutments with stone fill at a 1.5(h):1(v) slope. The integral abutments result in widening of the existing two span bridge to an overall structure length of 332 feet, maximum span of 163 feet. This option maintains the existing pier dimensions and location. The low chord elevation may be as low as 211.00 and meet the hydraulic standard without impacting the Q100 water surface elevation.

Utilities

The utility information is shown in the Appendix.

There are no municipal water or sewer facilities within the project area.

There are several poles along Machia Road which have risers for both electric and telephone. These underground facilities are service lines to the first three or four houses along Machia Road.

There are aerial electric (single phase) and communication cables which run along the northerly side of the existing bridge on Machia Road; these aerial facilities are owned by Vermont Electric Cooperative, FairPoint and Comcast.

There are aerial electric and telephone service lines which cross Machia Road between the existing bridge and VT Route 78, approximately 75 feet from the end of the bridge.

There are aerial electric and telephone service lines which cross Machia Road at the far end of the bridge as well; these aerial crossings are approximately 10 feet and 75 feet from the end of the bridge.

It is anticipated that the existing aerial utilities will have to be moved for any complete replacement alternatives considered. Minor rehabilitation could be accomplished without the need to relocate any utilities.

Right Of Way

The existing Right of Way (ROW) is shown on the Layout sheet. The ROW has been verified as 3 rods along this corridor. The existing abutments and superstructures are within the existing ROW, however, the pier is not within the existing Town ROW. Thus, it is anticipated that additional temporary rights will need to be acquired to allow access to repair or replace the pier.

Resources

The resources present at this project are shown on the layout sheets.

Archaeological:
Archaeological deposits related to Native American habitation in the area are highly likely given the high concentration of known precontact sites in the area. In addition, historic maps show a number of structures in the general area in the mid-late 1800s. One structural foundation was located during field reconnaissance in the SE quadrant. This structure may predate the 1850s historic map judging by construction techniques and general size.

Historic:
The only historic/4(f) resource in the project area is the 2-span metal truss. Any adverse effects to the span will trigger reviews under both laws.

Natural Resources:
There are no wetlands within the immediate area of the project.

The Missisquoi has been officially designated by Congress as a "study river" under the National Wild and Scenic River System. Impacts to this waterway will need to be avoided and minimized to the maximum extent practicably. Timing restrictions will be likely within this watercourse if in-stream work is anticipated on existing abutments or piers.

No improvements to wildlife movement are warranted at this location.

According to the VT Fish and Wildlife Natural Heritage Database there are state listed mapped threatened or endangered plants or animals within the project corridor. There are no federally listed species within this project corridor.

No prime agricultural soils are present.

Hazardous Materials:
There are various hazardous sites in Highgate and Sheldon, but there are no known sites near the subject bridge.

Stormwater:
No known issues.

II. Maintenance of Traffic

The Vermont Agency of Transportation has developed an 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. In addition to saving money, the intention is to minimize the closure period with faster construction techniques and incentives to contractors to complete projects early. The Agency will consider the closure option on most projects where rapid reconstruction or rehabilitation is feasible. The use of prefabricated elements in new bridges will also expedite construction schedules. This can apply to decks, superstructures, and substructures. Accelerated Construction should provide enhanced safety for the workers and the travelling public while maintaining project quality. The following options have been considered:

Option 1: Temporary Bridge

Providing a temporary bridge allows vehicular traffic to be maintained along the corridor during construction. Some of the existing constraints at this site which would affect the location or ability to construct a temporary bridge are the overhead utility lines to the north of the existing bridge, the archaeologically sensitive area to the south of the bridge, and the buildings at the northeast and southwest corners of the bridge. Based on the close proximity of the building on the northeast corner of the bridge, one would have to get very creative with the horizontal alignment, which would include placing fill in the river, to get a temporary bridge on the north side of the existing bridge without removing all or some portion of the building on that corner. Thus, any further consideration of a temporary bridge in this report will assume that it is placed on the southern, or upstream, side of the existing bridge.

Based on traffic volumes, the restrictions on the current structure and limiting impacts to the surrounding properties and resources, the proposal will be for a single lane temporary bridge with alternating one-way traffic without traffic signals.

For the convenience of maintaining traffic through the corridor, temporary bridges bring with them a plethora of disadvantages. Constructing a temporary bridge would require an additional construction season to install and remove the temporary. A temporary bridge of this size would add approximately $750,000 in extra construction costs. Constructing a temporary bridge at this location would require the acquisition of additional temporary rights and additional time and cost to acquire them. The tree removal, impacts to the Missisquoi, impacts to adjacent properties and impacts to other adjacent resources would increase. The archaeologically sensitive lands to the south of the bridge would need to be cleared for construction activities. Finally, placing vehicular traffic in close proximity to construction workers decreases the safety to the workers and the traveling public more than if the vehicles were removed from the construction site.

For all of these reasons, providing a temporary bridge is not the preferred method of maintaining traffic during construction. However, it will be considered for comparison purposes further in this report.

Option 2: Phased Construction

Phased construction is the maintenance of one lane of two-way traffic on the existing bridge while building one lane at a time of the proposed structure. This allows one to maintain traffic along the

corridor during construction while mitigating the extra expense and impacts required by a temporary bridge.

Because of the non-redundant nature of the truss and the existing narrow width, using phased construction to maintain traffic through the corridor is not feasible at this site. It would require the construction of complex and expensive temporary supports, similar to constructing a temporary bridge to support a lane of traffic on the existing bridge while the components of the bridge are repaired or replaced. This option will only be considered where a new structure is being constructed on a different alignment. This will allow the traffic to be maintained on the existing bridge while the bridge on the new alignment is being constructed, and traffic can be maintained on the new bridge while the truss is being rehabilitated.

Option 3: Off-Site Detour

This option entails utilizing accelerated construction materials and methods to reduce the length of construction to one construction season and reduce the length of time that the road is closed to a 12 week period. Since the bridge is currently weight restricted, closing the bridge for 3 months in the summer should not present an extreme hardship on the Town. Because the bridge is located on a Class 2 town highway, an official detour would be determined by the Town, who would also be responsible for installing, maintaining and paying for all necessary signing and traffic control. One possible detour route would divert TH 4 (Machia Road) to VT 78 to VT 207 to TH 6 (Brosseau Road and Morey Road) and back to TH 4 (Machia Road) for an end to end distance of 8.1 miles.

A map of this possible detour route can be found in the Appendix.

The advantages of utilizing an off-site detour during construction are numerous. It would eliminate the need to use a temporary bridge or phase construction to maintain traffic. This would decrease the cost and amount of time required to construct a project in this location. The impacts and amount of temporary rights required to construct a project in this location would also be reduced for this option. The safety of both construction workers and the travelling public will be improved by removing traffic from the construction site.

While the only disadvantage of utilizing an off-site detour during construction is that lightweight vehicles, bicycles and pedestrians would not be able to use the Machia Road corridor from beginning to end during construction.

III. Alternatives Discussion

Bridge 25 is structurally deficient with failing substructure units and deteriorated superstructures. The lane and shoulder widths are too narrow, the horizontal and vertical curves are substandard, and the guardrail is substandard along this section of road.

Existing Conditions

Width

The current curb to curb width of Bridge 25 is just under 16'. As such, the bridge has been considered a one lane bridge for many years. Based on expectations, human nature and traffic volumes, however, people have been attempting to utilize the bridge in a two way fashion. Thus, around 2009 the town posted signs at either end of the bridge providing notice that the bridge is a one lane structure. In addition to the one-lane bridge signs, reduced speed warnings signs were also installed at the ends of the bridge.

Even with the posting, there continue to be accidents in this location. During the 5 year period between 2007 and 2011, there was one officially reported accident in which a vehicle sideswiped another vehicle at this location. See the Appendix for the Crash Data. Based on anecdotal evidence, there have been other accidents in this location which were not reported.

Indications of vehicles impacting the sides of the narrow bridge can be seen in the image below.

Weight Restrictions

Based on a recommendation from the Structures Section in 2009 after a biennial bridge inspection, the bridge was posted for 5 tons. Some actively cultivated farm land exists immediately to the west of Bridge 25. The individual who owns the farm land on the west side of the bridge also owns farm land on the east side of the bridge on Pine Plains Road and Rice Hill Road. Some of the agricultural vehicles which should be able to utilize Machia Road and are no longer able to because of the weight restrictions are heavy feed and fuel trucks. While the bridge

and Machia Road service more than the landowners on each side of the bridge, having restrictions on the usage of the bridge are particularly cumbersome for this small business operator.

Even if the truss bridge were completely rehabilitated to "like new" condition, the bridge would only have an HS-15 (27 ton) capacity. This is not considered sufficient to handle the axle weights of modern trucks and large agricultural equipment, which can include multiple 16 ton axles.

Height Restrictions

Some of the large agricultural equipment also has attachments that can extend vertically over the 14'-3" clearance envelop provided by the bridge. Indications of vehicles impacting the top lateral bracing of the height restricted bridge can also be seen in the image below.

Traffic Volumes

Machia Road and this bridge are utilized by residential and agricultural traffic. The road also carries traffic taking shortcuts between state highways, whether bypassing the High Density Residential areas of East Highgate, Highgate Center and Highgate Falls when travelling between VT 78 and VT 207 or traveling between VT 105 and VT 78. In addition, Machia Road is used as a detour route when VT 78 floods in the low lying regions. This flooding occurs at least once a year and sends all of VT 78's and Machia Road's traffic over Bridge 25 during these events.

Even with the height restrictions, width restrictions and weight restrictions, Machia Road sees an average of 750 vehicles per day (vpd). The traffic counts from 2007 before the bridge was posted for 5 tons and a single lane, Machia Road saw an average of 1200 vpd. To put this in context, US 7 only averages 550 vpd south of Rheaume Road and 960 north of Monument Road in Highgate and VT 78 only averages 1700 vpd between Franklin Road and the Sheldon Town Line.

Because of the amount and type of traffic traveling along Machia Road, it was recently upgraded from a Class 3 to Class 2 town highway. The Town Plan[1] states "Class 2 roads are the most important highways in Town. As far as practical, they shall be selected with the purpose of

[1] Highgate Town Plan, http://highgate.weebly.com/uploads/2/4/6/0/2460358/chapter_6.doc.

securing trunk lines of improved highways from town to town and to places which by their nature have a more than normal amount of traffic."

Machia Road at the intersection of VT 78 is classified as a High Density Residential area. Thus, not only are the current traffic volumes and vehicle classifications exceeding the capacity of the current bridge, but the quantity of traffic traveling this corridor is expected to increase in the near future because the Town Plan is encouraging growth in East Highgate around Hanna Road and Durkee Road. While the area west of the bridge is only classified as Medium Density Residential, it is anticipated that some of the existing farm land will be converted to more residential housing as has been done previously in this area between VT 78, VT 105 and VT 207.

There has been a coordinated effort with Canada to actively support traveling by bicycle in Highgate, and there is already a reasonably large contingent of bicycle enthusiasts who travel Highgate's roads. The current configuration of Bridge 25 is not very accommodating to bicycle traffic.

Sight Distance

The horizontal and vertical alignments are substandard in this stretch of Machia Road. This creates poor sight distance for people travelling over the bridge. A representation of the poor sight distance can be seen from the west and the east in the images below.

Given the poor sight distance, relatively high traffic volumes and 35 mph speed, there is a safety issue with people queuing on the east side of the bridge waiting to cross. There is only about 140' between the end of the bridge and the intersection of Machia Road and VT 78. The stopping sight distance is 225' for 35 mph and the corner sight distance is 385' for this same speed. Neither of these distances is available at this location.

No Action

This alternative would involve leaving the bridge in its current condition. A memorandum was issued from the VTrans Structures Section on February 24, 2012 indicating that Bridge 25 should be repaired in the immediate future or closure may be warranted. Based on this condition rating, it is not reasonable to leave the bridge in its current condition; it should either be repaired, replaced or closed. Thus, the No Action alternative will not be considered further in this report.

Alternative 1: Rehabilitation

Alternative 1a: Rehabilitation – 20 year fix

DuBois & King was procured to analyze the various rehabilitation alternatives for the east abutment of Bridge 25 at this site. Some of the deficiencies of this abutment include the following: the concrete cap has a full depth crack, the stone masonry has settled and bowed towards the river, the soft shale stones have deteriorated causing significant voids, much of the mortar between the stones is lost and saturated with water. The recommendation was to completely replace the abutment with a brand new substructure.

The services of DuBois & King were obtained again to compare the costs of rehabilitating and replacing Bridge 25. In addition to replacing the east abutment, the following recommendations were made to rehabilitate the structure for continued use. It is believed that the western abutment could be rehabilitated by repairing cracks, spalled concrete and deteriorated masonry. The recommendations for the pier range from injecting epoxy in the cracks and lubricating the bearings to completely replacing the pier. The recommendations for the deck include patching the deteriorated areas, various types of overlays, partial depth repairs, and complete replacement. The truss contains several significantly deteriorated or damaged steel members. It was assumed that those members would either be replaced in-kind or the connections replaced. In addition to repairing or replacing the damaged steel members, it was assumed that the entire truss superstructures would be repainted to prevent further corrosion.

The options chosen in the DuBois & King report resulted in a 20 year extension in the service life of the structure at a construction cost around $1.8 million dollars.

Alternative 1b: Rehabilitation – 40 year fix

In order to more fully flesh out the feasible options between a 20 year extension of the useful life of the structure and a complete replacement, an alternative will be considered which provides a 40 year design life for the structure between the 20 year and 80 year options. This would entail more extensive repairs to the west abutment, pier and deck replacement, and more extensive truss member replacement or repair, in addition to the east abutment replacement and painting.

Alternative 1c: Rehabilitation – Widened truss

While the other rehabilitation options address the structural deficiencies of the bridge, they do not address the narrow lane and shoulder widths or the substandard horizontal and vertical curves. There have been several examples of historic trusses being widened in the last several years, so it is feasible to consider widening Bridge 25 to meet the lane and shoulder widths required along Machia Road.

This option would be similar to the 40 year fix in that the east abutment and pier would need to be replaced with wider substructure units. The deck would need to be replaced and the truss painted. The west abutment would need to be extended with a new concrete abutment to support the wider truss. Additional truss members would need to be strengthened or replaced to support the legal loads on this widened superstructure.

One of the disadvantages of this option, in addition to the extra cost, time and impacts, is that modifying the historic bridge in this manner is still considered an adverse impact. The Historic Preservation Officer for the State of Vermont has indicated that imposing the adverse impacts necessary to widen Bridge 25 in this location is not warranted in order to preserve the historic significance of the structure. This would make the justification required to procure a permit for this option more difficult, time-consuming and expensive than justifying some of the other options which include less extensive adverse impacts to the historic resource.

Alternative 1d: Rehabilitation with Second Bridge

Another method of providing a wider typical section without adversely impacting the existing historic bridge is providing a second bridge adjacent to the first to handle the traffic traveling in the other direction.

This option would include the 40 year fix for the existing structure and include the cost of a new structure adjacent to the existing structure.

Traffic could be maintained over the existing bridge while the new structure is being constructed and on the new structure while existing truss is being rehabilitated.

The advantages of this option are that the structural deficiencies would be addressed, the lane and shoulder widths could be brought up to standards and there would be the minimal amount of adverse impact to the historic structure. The disadvantages would lie in the cost, time and resource impacts for constructing two adjacent, permanent structures at this river crossing.

Alternative 2: Complete Replacement

The rehabilitation options are able to rectify the structurally deficient components and substandard guardrail, while some of the options are also able to address the substandard widths. However, this still leaves the substandard horizontal and vertical curves at this location. So in order to provide an equivalent comparison, one replacement option will utilize the existing substandard horizontal alignment and one option will consider a revised alignment brought up to current design standards. It should be possible to rectify the deficiencies with the vertical alignment for both the existing and revised alignment. Some of the other considerations which may affect the scope of the project include the bridge width, length, structure type and skew.

Alternative 2a: Complete Replacement on Existing Alignment

The hydraulics report indicates that the current bridge length with the existing pier provides adequate hydraulic capacity at this location. In addition, the hydraulic clearance between the structure and the flood level water surface is approximately 10’ suggesting that a typical girder superstructure could be adequately sized to fit in this location without impacting flood water depths. In order to not increase flood water depths and constrict the existing bank full width at Bridge 25, it is recommended that a new bridge have a span between 290 and 300’ as well. The bridge width should be sized to meet the current design standards with 9’ lanes and 2’ shoulders for a fascia to fascia width around 25’. The existing structure and any new structure on the existing alignment should be perpendicular to the Missisquoi River and have no skew.

Alternative 2b: Complete Replacement on Revised Alignment with State Standard Typical Section

The intent of this alternative is to address all of the substandard aspects of Machia Road at its crossing with the Missisquoi River in addition to the structural deficiencies and the lane and shoulder widths. The horizontal alignment will be modified to increase the corner sight distance before and after the bridge. In addition, the horizontal curves on each side of the bridge will be flattened to allow proper superelevation for the design speed and road classification. The vertical curves will be flattened as well to increase the K values and provide adequate headlight and stopping sight distance over the bridge as well.

A similar bridge type, length and width will be proposed for both replacement alternates. It will include a multiple span plate girder superstructure with a total span between 290 and 300 feet. The same 9' lanes and 2' shoulders are appropriate for this option for a fascia to fascia width of 25'. The crossing will remain relatively perpendicular to the river with no skew of the substructure units relative to the centerline of the road.

Alternative 2c: Complete Replacement on Revised Alignment with Town Standard Typical Section

According to the Highgate Road Acceptance Policy[2], the minimum traveled way width of a road shall be 22 feet, not including the shoulders. This would result in two 11' lanes. The policy further requests that the shoulders be 5' wide for the road classification and traffic volumes found on Machia Road. This roadway width is over twice as wide as the current 15.9' curb to curb width listed for Bridge 25. It is believed that this typical section will appropriately accommodate the type of traffic including passenger vehicles, farm equipment, trucks and bicyclists and the volumes of these types of traffic which are present on Machia Road.

This alternative will be essentially the same as Alternative 2b, except that it will provide a lane and shoulder width that meets the criteria of the Highgate Town Plan and Road Acceptance Policy.

[2] Highgate Road Acceptance Policy, http://highgate.weebly.com/uploads/2/4/6/0/2460358/hg_road_acceptance_policy.pdf.

IV. Alternatives Summary

Based on the existing site conditions, bridge condition, and recommendations from hydraulics, the alternatives being considered are:

Alternative 1a: Rehabilitation – 20 year fix with Traffic Maintained on an Offsite Detour
Alternative 1b: Rehabilitation – 40 year fix with Traffic Maintained on an Offsite Detour
Alternative 1c-1: Rehabilitation – Widened truss with Traffic Maintained on an Offsite Detour
Alternative 1c-2: Rehabilitation – Widened truss with Traffic Maintained on a Temporary Bridge
Alternative 1d: Rehabilitation with Second Bridge with Traffic Maintained by Phasing
Alternative 2a-1: Complete Replacement on Existing Alignment with Traffic Maintained on an Offsite Detour
Alternative 2a-2: Complete Replacement on Existing Alignment with Traffic Maintained on a Temporary Bridge
Alternative 2b-1: Complete Replacement on Revised Alignment with State Standard Typical Section and Traffic Maintained on an Offsite Detour
Alternative 2b-2: Complete Replacement on Revised Alignment with State Standard Typical Section and Traffic Maintained on a Temporary Bridge
Alternative 2c-1: Complete Replacement on Revised Alignment with Town Standard Typical Section and Traffic Maintained on an Offsite Detour
Alternative 2c-2: Complete Replacement on Revised Alignment with Town Standard Typical Section and Traffic Maintained on a Temporary Bridge

V. Cost Matrix

Highgate BO 1448(43)		Do Nothing	Alt 1a	Alt 1b	Alt 1c-1	Alt 1c-2	Alt 1d	Alt 2a-1	Alt 2a-2	Alt 2b-1	Alt 2b-2	Alt 2c-1	Alt 2c-2
			Rehab - 20 yr	Rehab - 40 yr	Widen Truss		Rehab w/ 2nd Bridge	Replace On Alignment (State Typical)		Replace New Alignment (State Typical)		Replace New Alignment (Town Typical)	
			Offsite Detour	Offsite Detour	Offsite Detour	Temp Bridge	Phased	Offsite Detour	Temp Bridge	Offsite Detour	Temp Bridge	Offsite Detour	Temp Bridge
COST[1]	Bridge Cost	$0	$1,622,000	$2,398,000	$3,691,000	$3,691,000	$3,898,000	$2,145,000	$2,145,000	$2,252,000	$2,252,000	$2,700,000	$2,700,000
	Removal of Structure	$0	$0	$0	$0	$0	$0	$199,000	$199,000	$199,000	$199,000	$199,000	$199,000
	Roadway	$0	$413,000	$491,000	$703,000	$778,000	$1,053,000	$898,000	$973,000	$909,000	$984,000	$1,019,000	$1,094,000
	Maintenance of Traffic	$0	$30,000	$30,000	$30,000	$780,000	$30,000	$30,000	$780,000	$30,000	$780,000	$30,000	$780,000
	Construction Costs	$0	$2,065,000	$2,919,000	$4,424,000	$5,249,000	$4,981,000	$3,272,000	$4,097,000	$3,390,000	$4,215,000	$3,948,000	$4,773,000
	Construction Engineering + Contingencies	$0	$619,500	$875,700	$1,327,200	$1,574,700	$1,494,300	$981,600	$1,229,100	$1,017,000	$1,264,500	$1,184,400	$1,431,900
	Total Construction Costs w/ CEC	$0	$2,684,500	$3,794,700	$5,751,200	$6,823,700	$6,475,300	$4,253,600	$5,326,100	$4,407,000	$5,479,500	$5,132,400	$6,204,900
	Preliminary Engineering[2]	$0	$516,300	$729,800	$1,106,000	$1,312,300	$1,245,300	$818,000	$1,024,300	$847,500	$1,053,800	$987,000	$1,193,300
	Right of Way	$0	$0	$30,000	$40,000	$60,000	$80,000	$30,000	$60,000	$30,000	$60,000	$30,000	$60,000
	Total Project Costs	$0	$3,200,800	$4,554,500	$6,897,200	$8,196,000	$7,800,600	$5,101,600	$6,410,400	$5,284,500	$6,593,300	$6,149,400	$7,458,200
	Town Share[3]	$0 (0.0%)	$0 (0.0%)[4]	$0 (0.0%)[4]	$0 (0.0%)[4]	$0 (0.0%)[4]	$97,508 (1.25%)[4]	$255,080 (5.0%)	$641,040 (10.0%)	$264,225 (5.0%)	$659,330 (10.0%)	$307,470 (5.0%)	$745,820 (10.0%)
SCHEDULING	Project Development Duration[5]	N/A	2 years	4 years	4 years	4 years	4 years	4 years	4 years	4 years	4 years	4 years	4 years
	Construction Duration	N/A	12 months	18 months	18 months	24 months	24 months	12 months	24 months	12 months	24 months	12 months	24 months
	Closure Duration (If Applicable)	N/A	2 weeks	2 weeks	24 weeks	N/A	N/A	12 weeks	N/A	12 weeks	N/A	12 weeks	N/A
ENGINEERING	Typical Section - Roadway (feet)	1-9-9-1	1-9-9-1	1-9-9-1	2-9-9-2	2-9-9-2	2-9-9-2	2-9-9-2	2-9-9-2	2-9-9-2	2-9-9-2	5-11-11-5	5-11-11-5
	Typical Section - Bridge (feet)	0.25-8-8-0.25	0.25-8-8-0.25	0.25-8-8-0.25	2-9-9-2	2-9-9-2	2.5-9-2.5 & 2-9-2	2-9-9-2	2-9-9-2	2-9-9-2	2-9-9-2	5-11-11-5	5-11-11-5
	Geometric Design Criteria	No Change	No Change	No Change	Improved	Improved	Improved	Improved	Improved	Improved	Improved	Improved	Improved
	Traffic Safety	No Change	No Change	No Change	Improved	Improved	Improved	Improved	Improved	Improved	Improved	Improved	Improved
	Alignment Change	No	No	No	No	No	Yes	Vertical	Vertical	Yes	Yes	Yes	Yes
	Bicycle Access	No Change	No Change	No Change	Improved	Improved	Improved	Improved	Improved	Improved	Improved	Improved	Improved
	Hydraulic Performance	Meets Criteria	Meets Criteria	Meets Criteria	Meets Criteria	Meets Criteria	Meets Criteria	Meets Criteria	Meets Criteria	Meets Criteria	Meets Criteria	Meets Criteria	Meets Criteria
	Pedestrian Access	No Change	No Change	No Change	Improved	Improved	Improved	Improved	Improved	Improved	Improved	Improved	Improved
	Utility	No Change	No Change	Relocation	Relocation	Relocation	Relocation	Relocation	Relocation	Relocation	Relocation	Relocation	Relocation
	Structural Capacity	5 Tons	HS-15	HS-15	HS-15	HS-15	HS-15	HL-93	HL-93	HL-93	HL-93	HL-93	HL-93
OTHER	ROW Acquisition	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Road Closure	No	Yes	Yes	Yes	No	No	Yes	No	Yes	No	Yes	No
	Design Life	<10 years	20 years	40 years	40 years	40 years	40 years	80 years	80 years	80 years	80 years	80 years	80 years

[1] Costs are estimates only, used for comparison purposes.

[2] Preliminary Engineering Costs are estimated starting from the end of the Project Definition Phase.

[3] See 19 V.S.A Chapter 3 Section 3 (http://www.leg.state.vt.us/statutes/fullsection.cfm?Title=19&Chapter=003&Section=00309a).

[4] Costs reflecting a Town Share of 0% of the cost of rehabilitation are dependent on an historic easement being signed by both the State and the Town (http://historicbridges.vermont.gov/bridge-easements).

[5] Project Development Durations start from the end of the Project Definition Phase.

VI. Conclusion

The recommendation is to proceed with Alternative 2b-1: Complete Replacement on Revised Alignment with State Standard Typical Section and Traffic Maintained on an Offsite Detour.

Structure:
Of all of the options considered, only alternative 2b and 2c meet all of the Vermont State Standards. Since Alternative 2b meets these standards and is approximately $900,000 less expensive than alternative 2c, it was chosen as the baseline alternative to move forward. It may seem short sighted to construct a new 5 million dollar bridge that is intended to last for at least 80 years without making it as wide as the Town Plan recommends. When the current bridge was built in 1928, the 16 foot passable width was probably all that was required at that time. Yet, by today's standards, it is considered functionally obsolete and not able to be effectively rehabilitated to meet the current standards. However, the addition of one or two more girders on the exterior of the proposed bridge in 40 years when a wider structure may be required would cost a similar amount in current year dollars as the $900,000 that it would cost today.

While the Town would like to encourage the construction of sidewalks and amend its bylaws to require them to be included in high density residential zones, it has been recognized that the construction of sidewalks along Machia Road is very unlikely with the current fiscal constraints in the near future. And while the Town recommends 11' lanes and 5' shoulders on reconstruction efforts of the roadway classification and traffic volumes found on Machia Road, it is also highly unlikely that the remainder of Machia Road will be widened from the existing 9' lanes and 1' shoulders to the proposed 11' lanes and 5' shoulders to match those found in alternative 2c. The 22' typical section proposed in alternative 2b is 6' wider than the current bridge and 2' wider than the existing roadway and would better fit within the existing Right of Way.

The horizontal alignment needs to be revised slightly to meet the standards for curvature on and off the bridge. This revision would add approximately $180,000 in engineering and construction costs over the existing alignment proposed in alternative 2a. It is believed that this small increase in cost is justified to meet the sight and curve standards in this location. In addition, the Town mentioned that Bridge 25 is the brake failure escape route for semi-trucks coming down the East Highgate Hill. In the event of a brake failure, a truck would be unable to navigate the corner on VT 78 and would head to the bridge as a straight shot to slow down. If a truck were to utilize the escape route with the existing alignment, the truck and driver would not be able to safely maneuver the sharp curve on the east side of Bridge 25. By bringing the alignment up to standards, a runaway truck would be able to navigate the curve along the bridge.

Because Bridge 25 is a historic structure, 4 rehabilitation alternatives were considered to attempt at varying degrees to preserve the historic integrity of the structure while meeting the transportation needs of the site.

Alternative 1a would have the least adverse impact on the historic integrity of the bridge. It would maintain most of the laid up stone in the western abutment and pier and maintain most of the structural steel in the trusses except the floor system. But, it would be the least effective alternative in meeting the transportation needs of the site. This alternative would also require that more construction and the decision about what scope of construction is required would occur within 20 years.

Alternative 1b would have the second least adverse impact on the historic integrity of the structure, but would not be any better at meeting the transportation needs at the site rather than extending the life of the structure out to a reasonable timeframe. Even though this alternative has the second least adverse impact on the historic integrity of the structure, whether or not one could justify that alternative 1b is actually a rehabilitation and preserving the historic integrity is questionable. All of the laid up stone in the substructures would need to be replaced or encased in concrete and much of the structural steel would be replaced to allow the remaining 85 year old steel to last another 40 years.

The historic preservation requirements stipulate that an alternative is to be investigated to determine whether one can construct a bridge at a new location or parallel to the old bridge, allowing for a one-way couplet. This is alternative 1d which provides the benefit of preserving the historic integrity of the structure as much as alternative 1b while providing improved strength, geometry and access to meet the transportation needs at the site. This is the most expensive alternative which does not include a temporary bridge and has much larger impacts to the environment, adjacent properties and the archaeologically sensitive land than all of the other alternatives which do not include a temporary bridge.

While alternative 1c would preserve a truss bridge in this location, essentially no historic components would be kept. The substructures would have to be replaced to handle the larger and wider loads. The floor system and upper lateral bracing components would need to be replaced with longer members and the truss components would need to be strengthened or replaced to resist the larger loads. No one has yet expressed the opinion that they would like to see a truss in this location even if it were not the original. And if someone did express that opinion, it would be easier and less expensive and more durable to construct a completely new truss at this location. New trusses at this location would cost around $750,000 a piece, or around $1,500,000 for installation of the superstructure steel with a protective coating already in place.

While the Town is sensitive to its historic centers and structures and does not take the decision lightly about whether to eliminate historic structures from their view shed, it seems imprudent to expend the amount of money required to keep, rehabilitate and maintain the existing bridge. This is based on the location, route classification and traffic volumes for this structure and the realization that any minimal adverse impact to the historic integrity of the structure would leave a number of substandard features including the structural capacity, geometric configuration and sight distance.

Traffic Control:

There are several reasonable detour routes to get from East Highgate to points west without utilizing Bridge 25 on Machia Road. The end-to-end distance is 8.1 miles requiring approximately 16 minutes and essentially no one would be doing this except the farmer mentioned previously who has to do this now because of the weight restrictions on the current bridge.

For the minimal inconvenience that would be experienced for the duration of the closure period, a safer, faster and cheaper project will be able to be constructed that minimizes the impacts to adjacent properties and archaeological resources by detouring traffic during construction rather than building a temporary bridge.

VII. Appendices

- Site Pictures
- Town Map
- Bridge Inspection Report
- Critical Maintenance Notification
- Hydraulics Memo
- Preliminary Geotechnical Information
- Natural Resources Memo
- Hazardous Waste Sites
- Archaeology Memo
- Historic Memo
- Utility Information
- Local Input
    - Land Use Maps
    - Traffic Counts
- Crash Data
- Potential Detour Route
- Plans
    - Existing Conditions
    - Proposals
        - Typical Sections
        - Layouts
        - Profiles
    - Temporary Bridge Layout

Eastern Abutment Slide and Settlement Failure

Western Abutment showing undermining

Pier Crack Before Patching

Pier Crack After Patching

Additional Pier Cracks Continuing to form

Cracked Stringer Connection Angle

Example of Deteriorated Truss Member (Connection between Vertical member and Bottom Chord)

Example of Vehicle Impact Damage (End Portal Member)

Looking East – showing narrow width and poor sight distance

Looking West – showing narrow width and poor sight distance

Looking West Across Bridge – Poor Condition of Deck and Pavement, Impact Damage, Narrow Bridge, Overhead Restrictions and Poor Sight Distance

Looking Downstream – showing remains of old river control structures

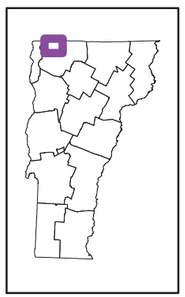
HIGHGATE, TH-4, BR 25

Scale 1:65,700

N

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

Produced by:
Mapping Unit
Vermont Agency of Transportation
August 2011



HIGHGATE
FRANKLIN COUNTY
DISTRICT # 8

STRUCTURE INSPECTION, INVENTORY and APPRAISAL SHEET

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

Inspection Report for HIGHGATE **bridge no.:** 00025 **District:** 8

Located on: C2004 **ove** MISSISQUOI RIVER **approximately** 0.02 MI TO JCT W VT78 **Owner:** 03 TOWN-OWNED

CONDITION

Deck Rating: 5 FAIR

Superstructure Rating: 4 POOR

Substructure Rating: 4 POOR

Channel Rating: 8 VERY GOOD

Culvert Rating: N NOT APPLICABLE

Federal Str. Number: 100609002506091

Federal Sufficiency Rating: 029.8

Deficiency Status of Structure: SD

AGE and SERVICE

Year Built: 1928 **Year Reconstructed:** 0000

Service On: 1 HIGHWAY

Service Under: 5 WATERWAY

Lanes On the Structure: 01

Lanes Under the Structure: 00

Bypass, Detour Length (miles): 08

ADT: 001200 **% Truck ADT:** 02

Year of ADT: 2007

GEOMETRIC DATA

Length of Maximum Span (ft): 0143

Structure Length (ft): 000292

Lt Curb/Sidewalk Width (ft): 0.3

Rt Curb/Sidewalk Width (ft): 0.3

Bridge Rdwy Width Curb-to-Curb (ft): 15.9

Deck Width Out-to-Out (ft): 17

Appr. Roadway Width (ft): 020

Skew: 00

Bridge Median: 0 NO MEDIAN

Min Vertical Clr Over (ft): 15 FT 04 IN

Feature Under: FEATURE NOT A HIGHWAY OR RAILROAD

Min Vertical Underclr (ft): 00 FT 00 IN

STRUCTURE TYPE and MATERIALS

Bridge Type: TWO SPAN THRU TRUSS

Number of Approach Spans 0000 **Number of Main Spans:** 002

Kind of Material and/or Design: 3 STEEL

Deck Structure Type: 1 CONCRETE CIP

Type of Wearing Surface: 0 NOT APPLICABLE

Type of Membrane 0 NONE

Deck Protection: 0 NONE

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: 4 MEETS MINIMUM TOLERABLE CRITERIA

Deck Geometry: 3 INTOLERABLE, CORRECTIVE ACTION NEEDED

Underclearances Vertical and Horizontal: N NOT APPLICABLE

Waterway Adequacy: 7 SLIGHT CHANCE OF OVERTOPPING BRIDGE & ROADWAY

Approach Roadway Alignment: 8 EQUAL TO DESIRABLE CRITERIA

Scour Critical Bridges: 8 STABLE FOR SCOUR

DESIGN VEHICLE, RATING, and POSTING

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

Posting Status: P POSTED FOR LOAD

Bridge Posting: 5 NO POSTING REQUIRED

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

Posted Vehicle: 6 GROSS LOAD ONLY

Posted Weight (tons): 05

Design Load: 0 OTHER OR UNKNOWN

INSPECTION and CROSS REFERENCE

X-Ref. Route:

Insp. Date: 092013 **Insp. Freq. (months)** 12 **X-Ref. BrNum:**

INSPECTION SUMMARY and NEEDS

9/9/2013 This structure is in need of a full deck replacement. Steel repairs/replacement of floorbeam 1 and multiple stringers are necessary. More steel repairs may be found necessary after any cleaning before a paint project. The portal over abutment 1 has been bent and torn heavily on the upstream side due to collision damage. JWW/JDM

12/03/2012 No change found on the substructure since last inspection of 2011. East portal has received new heavy collision damage along the entire lower portion area. PLB

10/11/2011 This structure remains in serious to critical condition due to the seating area settlement on the upstream corner area of abutment No.1 and heavy cracking on the downstream end area of the pier. The deck soffit area continues to slowly deteriorate. Scattered steel members forming the under carriage remains weak due to holes, heavy section loss or rust scaling. The upstream corner area of the abutment No.1 stemwall can experience sudden collapse or failure at anytime without notice. The downstream end area of the pier cap and granite blocks are slightly flexing with horizontal movement when the trusses experience heavy loading. This structure is in need of full rehab. PLB

VERMONT

State of Vermont
Program Development - Structures Section
One National Life Drive [phone] 802-828-2621
Montpelier, VT 05633-5001 [fax] 802-828-3566
www.aot.state.vt.us [ttd] 800-253-0191

Agency of Transportation

February 24, 2012

Mr. Jeff Towle, Selectboard Chair
Town of Highgate
c/o Ms. Wendi Dusablon, Town Clerk
P.O. Box 189
Highgate, VT 05459

RE: Highgate, bridge #25 on TH #4 (Class 2) over Missisquoi River

Dear Mr. Towle:

The Federal National Bridge Inspection Standards require inspection of all publicly owned bridges over 20 feet in length on a 24 month cycle. A two-member team performs the inspection, with at least one member specially trained for this work. The Agency of Transportation provides this inspection in the interest of public safety and as a service to the municipalities with the cost shared between the Federal government and the State.

The above referenced structure is a (2) span steel truss bridge spanning over Missisquoi River. During a recent inspection the following problems were noted which are in need of attention.

The downstream end area of the abutment no.1 stemwall continues to deteriorate. The lost of mortar is evident at the right side of the large cut stone (lower) in the photo of 2011. The area, one foot above this same large stone, consists of flat shale like stone that is pulverized and is easily removed with a hammer. Heavy moisture and saturation occurs within this same general area. The concrete cap area has a full depth diagonal crack that extends to the backwall and lies to the right of the uppermost large cut stone 4 to 5 feet from the corner. This cracked off corner area is slowly settling downwards. The cracked off section lies under the downstream bearing of truss no.1. The entire area is showing signs of structural weakness.

- The downstream stemwall area of abutment no.1 is need of repairs or additional support.

Photo 2009 – abutment no.1

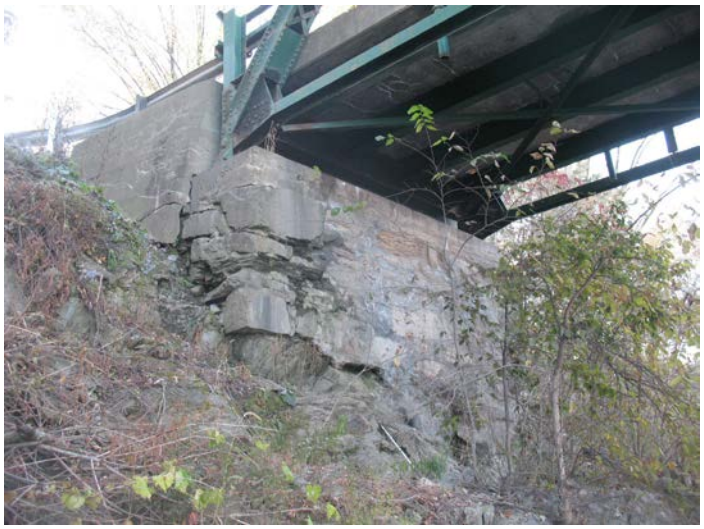


Photo 2011 – abutment no.1

VERMONT

To: Town of Highgate
RE: Highgate, bridge #25 on TH #4 (Class 2) over Missisquoi River
Date: February 24, 2012

- The downstream end of the concrete pier cap has a 5/16" longitudinal crack running full depth of the cap and extends at least ½ half the distance of the pier length. The crack is situated adjacent to the base plate of the right downstream fix bearing of truss no.1. One anchor bolt on this bearing in pinching upwards due to a flexing movement. This crack flexes back and forth especially under heavy vehicular loading.

To: Town of Highgate
RE: Highgate, bridge #25 on TH #4 (Class 2) over Missisquoi River
Date: February 24, 2012

This structure's substructure has been rated in serious condition due to the unstableness of abutment no.1 which consists predominantly of deteriorated shale stones with scattered granite stones intermixed. If the previous noted items of concern aren't addressed, future closure may be warranted.

Based on these findings, we recommend reconstruction of the downstream end area of the abutment no.1 stemwall or place an additional support beneath the downstream truss. We recommend that the pier cap receive work to prevent the flexing of the wide longitudinal crack along the downstream end. The full height wide vertical crack on the downstream nosing of the pier especially within the granite block area needs repair to prevent instability or further widening. It is recommended that light vehicle traffic be allowed until repairs can be made. **Failure to comply with the recommendations may compromise public safety, result in additional damage, and/or substantially reduce the service life of the structure**.

Even though a bridge is recommended for repairs due to deterioration or unstable conditions by the State, the decision to properly respond to the recommendations is the responsibility of municipal officials. However, it is in the best interest of the municipality to address these recommendations. A failure to address potential bridge hazards may result in tort liability claims.

Please send WRITTEN notification of your intent to comply with, your compliance with, or reasons for non-compliance with these recommendations within 60 days from receipt of this letter. We are required by the Federal Highway Administration to report to them when the recommended safety repairs have been implemented. A response form has been provided for your use.

If you have any questions concerning the matter, please contact your local District Transportation Administrator, DTA David Blackmore at 527-5500 or VTrans' Bridge Management and Inspection Engineer, Pamela M. Thurber at 828-0041. A representative from the Bridge Management and Inspection Unit would be willing to meet with you at the site to discuss the contents of this letter.

Sincerely,

Wm. Michael Hedges, P.E.
Structures Program Manager

WMH: PMT: *plb*
cc: David Blackmore, DTA District #8
NBIS Inspection Files via PLB
FHWA Design and Structures Engineer

VT AGENCY OF TRANSPORTATION PROGRAM DEVELOPMENT DIVISION

HYDRAULICS UNIT

TO: Chris Williams, Structures Project Manager

FROM: Ryan Lizewski, Hydraulics Project Engineer (VHB)
via Nick Wark, VTrans Hydraulic Engineer

DATE: September 26, 2013

SUBJECT: HIGHGATE – BO 1448(43),
TH4 BR25 over the MISSISQUOI RIVER

We have completed our preliminary hydraulic study for the above referenced site, and offer the following information for your use:

Existing Bridge Information

The site is located on Machia Road, 0.02 miles west of the VT78 junction, in the Town of Highgate, approximately 19 miles feet upstream of Lake Champlain. There are no record plans available. The original date of construction for the original bridge appears to be 1928 based on the Structure Inspection Inventory. The existing TH4 BR25 bridge is a two span thru truss structure. The existing abutments are stone with a concrete seat supporting the structure. Other properties of the bridge include:

Number of Lanes	2	
Number of Spans	2	
Max. Span	143	ft
Structure Length	292	ft
Bridge Skew Angle	0	deg
Width: Out to Out	17	ft
Approach Width	20	ft
Superstructure Depth	2.8	ft
Low Chord Elevation	217.97	ft (NAVD)
Opening Height	24	ft

The existing bridge meets the hydraulic standard. The bridge passes the Q_{25} storm (with 9.7 feet of freeboard). The standard requires a minimum of 1 foot of freeboard for the Q_{25} discharge for town routes.

Recommendations

The bridge replacement option selection criteria should at a minimum meet the hydraulic standard and to the extent practicable provide a bridge opening that does not restrict the bank full width, nor provide an unrealistic widening of the existing channel, nor create any worse backwater flooding conditions than the existing conditions.

The Vermont Agency of Natural Resources (VANR) Bank Full Width (BFW) Equation estimates the BFW of the Missisquoi River to be approximately 250 feet. The estimated natural bank full stream width based on actual field conditions supports the VANR BFW of 250 feet. The current span is approximately 275 feet between the abutments and adequately spans the BFW.

It has been assumed that if the existing bridge is replaced, a replacement structure will be located in the existing roadway alignment having the same basic surface geometry based on the site constraints.

- The first option analyzed maintains the existing two span bridge with a maximum span of 143 feet, an overall structure length of 292 feet, and vertical abutments with no stone fill above the existing ground; as shown in Figure 1. This option maintains the existing pier dimensions and location. The structure was widened from 17 feet to 20 feet to match the approach roadway width. This option meets the VTrans hydraulic requirement to pass the Q_{25} flow with 1 foot of freeboard. The model predicts 9.7 feet of freeboard with a low chord elevation of 217.96 feet. The low chord elevation may be as low as 209.70 and meet the hydraulic standard without impacting the Q_{100} water surface elevation. This option spans the BFW of 250 feet. The modeling predicts no change in the water surface elevations for the Q_{100} event under Option 1.

- A second option assumes integral abutments with stone fill at a 1.5(h):1(v) slope; as shown in Figure 2. The integral abutments result in widening of the existing two span bridge to an overall structure length of 332 feet, maximum span of 163 feet. This option maintains the existing pier dimensions and location. A structure width of 20 foot was assumed to match the approach roadway width. This option meets the VTrans hydraulic requirement to pass the Q_{25} flow with 1 foot of freeboard. The model predicts 8.6 feet of freeboard with a low chord elevation of 216.89 feet. The low chord elevation may be as low as 211.00 and meet the hydraulic standard without impacting the Q_{100} water surface elevation. This option spans the BFW of 250 feet.

The field survey did not extend far enough downstream to include the remnants of an old hydro dam utilized by an ax factory up until the early 1900's. The dam was included into the model based on estimates from on a field visit conducted on 9/20/13 and aerial imagery.

Scour was not reviewed during the preliminary design. However based on the velocities from the analyses, it is anticipated that a minimum of Type III Stone Fill will be necessary for armoring the abutments and disturbed channel banks near the replacement structure. Stone fill sizing will be verified during final hydraulic design.

Temporary Bridge

As part of this analysis we did not size a temporary bridge. If a temporary bridge is determined to be necessary let us know and we will work with you to size one.

Please contact us if you have any questions or if we may be of further assistance.

cc: Hydraulics Project File via NJW
Hydraulics Chrono File

FIGURE 1

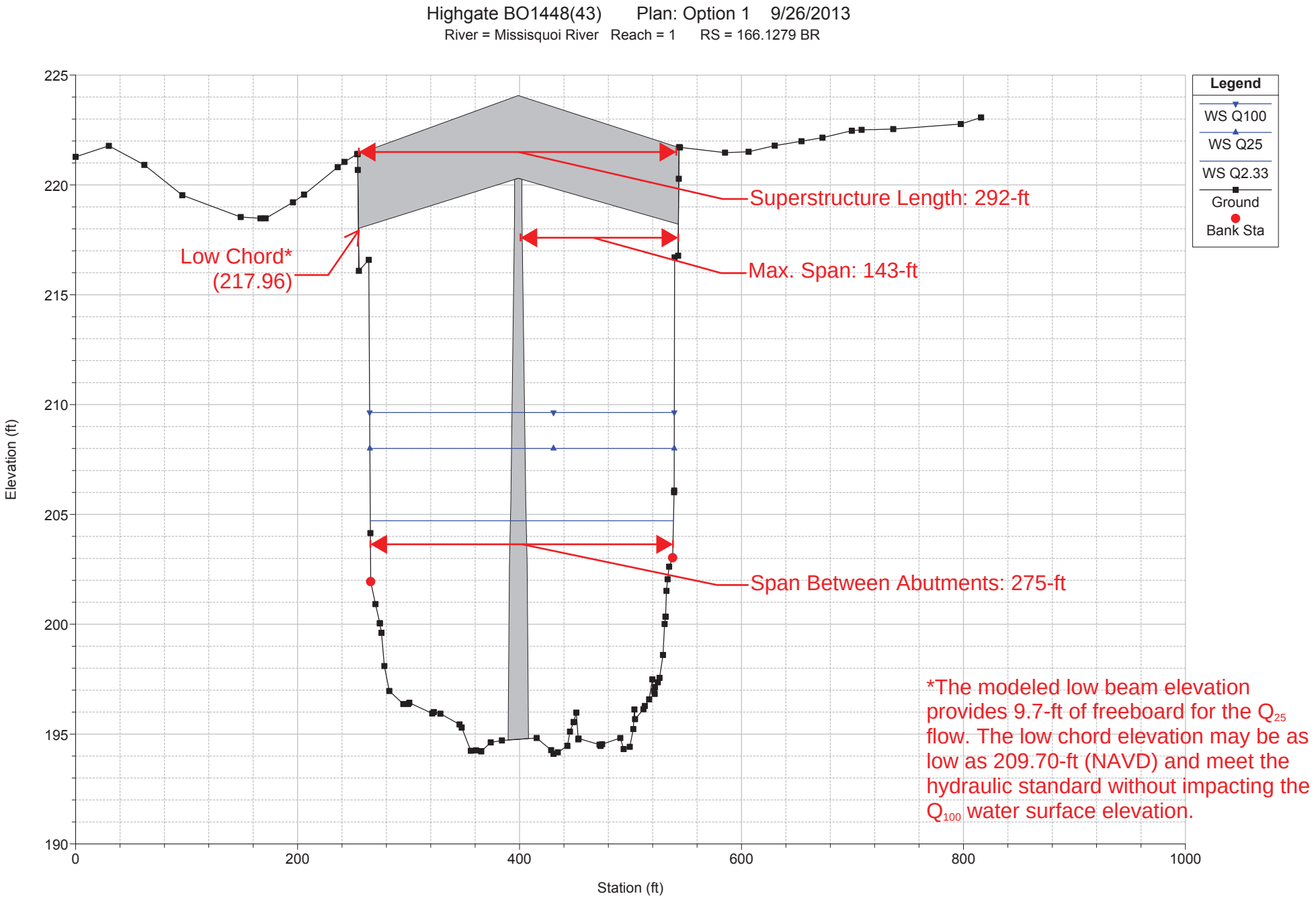
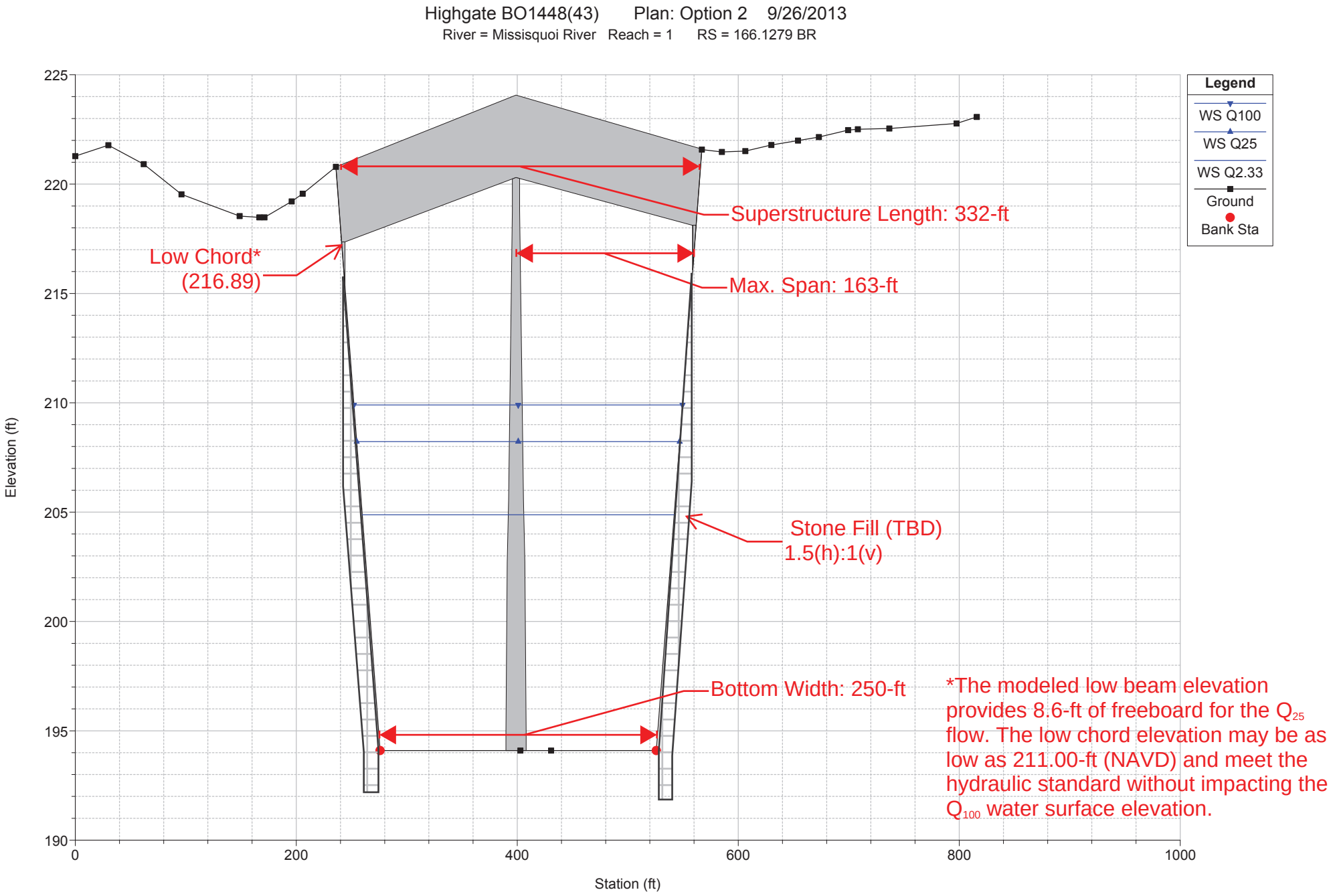

Highgate BO1448(43) Plan: Option 1 9/26/2013
River = Missisquoi River Reach = 1 RS = 166.1279 BR
Legend
WS Q100
WS Q25
WS Q2.33
Ground
Bank Sta
Superstructure Length: 292-ft
Max. Span: 143-ft
Low Chord*
(217.96)
Span Between Abutments: 275-ft
*The modeled low beam elevation provides 9.7-ft of freeboard for the Q_{25} flow. The low chord elevation may be as low as 209.70-ft (NAVD) and meet the hydraulic standard without impacting the Q_{100} water surface elevation.
Elevation (ft)
Station (ft)
225
220
215
210
205
200
195
190
0
200
400
600
800
1000

FIGURE 2


Highgate BO1448(43) Plan: Option 2 9/26/2013
River = Missisquoi River Reach = 1 RS = 166.1279 BR
Legend
WS Q100
WS Q25
WS Q2.33
Ground
Bank Sta
Superstructure Length: 332-ft
Low Chord*
(216.89)
Max. Span: 163-ft
Stone Fill (TBD)
1.5(h):1(v)
Bottom Width: 250-ft
*The modeled low beam elevation provides 8.6-ft of freeboard for the Q_{25} flow. The low chord elevation may be as low as 211.00-ft (NAVD) and meet the hydraulic standard without impacting the Q_{100} water surface elevation.
Elevation (ft)
Station (ft)
225
220
215
210
205
200
195
190
0
200
400
600
800
1000

AGENCY OF TRANSPORTATION **OFFICE MEMORANDUM**

To: Chris Williams, Project Manager, Structures

From: Chad A. Allen, Geotechnical Engineer via Christopher C. Benda, Soils and Foundations Engineer

Date: August 28, 2013

Subject: Highgate BO 1448(43) - TH4 BR 25 Geotechnical Scoping Report

1.0 Introduction

In an effort to assist the Structures Section with their bridge type study, the Soils and Foundations Unit within the Materials and Research Section has completed a review of available geological data for Bridge 25 on TH4 (Machia Rd). The existing structure is a two span thru truss structure that crosses over Missisquoi River in East Highgate, VT and is depicted below in Figure 1. The bridge is located in a low speed rural village setting and is approximately 200 ft from the intersection of TH4 and VT 78. This scoping report includes a review of VTrans record plans, USDA Natural Resources Conservation soil survey records, and surficial geology and bedrock maps.

Figure 1: Highgate TH 4 BR 25 - 2 Span Thru Truss

2.0 Surficial and Bedrock Geology

The Agency of Natural Resources (ANR) documents and publishes all water wells that are drilled for residential or commercial purposes. Published online, the logs can be used to

determine general characteristics of the bedrock and soil strata in the area. The soil description given on the water well logs is provided by field personnel with unknown qualifications, and as such, should only be used as an approximation of the soil strata. Well locations in the ANR database are shown below in Figure 2 and a summary of the specific wells used to gain information on the subsurface conditions are presented in Table 1. The three closest wells, wells No. 26974, 26955 and 18780, are located between and 250 and 750 ft from the project location.

Figure 2: ANR Well Locations near Bridge 25 on TH 4 in Highgate, VT

Well Tag ID	Overburden Description	Overburden Thickness, ft
18780	sand and clay	43
26974	glacial till: mixture of sand, clay and gravel	8
26955	clay and gravel	4

Table 1: Summary of ANR Well Data & Well Driller Soil Stratigraphy Notes

The 1920 plan set for Bridge 25 did not indicate the soil stratigraphy beneath the existing bridge. The *Soil Survey of Franklin County, Vermont* published by the Soil Conservation Service in 1979 indicated that the soils in the vicinity of the western abutment is likely a Colton gravelly loamy sand (CoB), 2 to 8% slopes while the eastern abutment is likely to be Windsor loamy fine sand (WsA), 0 to 3% slopes.

Based on a site inspection performed on August 15, 2013 the bedrock is shallow on both ends of the bridge as well as up and downstream of the structure. Bedrock is exposed under the eastern abutment and it is also presumed that the remaining bridge foundations are lying on top of existing bedrock. The 2012 Vermont Geological Survey Bedrock Map of the area indicates that the existing bedrock deposit is a Morses Line Slate (Cambrian to Middle Ordovician rocks of the St. Albans area) and is described as medium-gray to black calcareous slate.

3.0 Utility & Construction Considerations

There are power and telephone lines that run along the northern side of the bridge and cross at either end roughly 50 to 75 feet from either entrance. Based on the location of the existing aerial utilities, and a homestead located in the northeast quadrant of the east abutment the best location for a temporary structure would be on the south side of the existing structure. However, considering the population impacts, length of temporary bridge required, proximity to the VT 78 intersection and detour routes available (the nearest bridge to cross the Missisquoi to access VT 78 is approximately 3.5 miles northwest of the existing structure) there would be a reduction in overall impacts and a significant cost savings if a road closure could be coordinated with the town instead of constructing a temporary structure.

4.0 Recommendations

In summary, the existing bridge is a 292 ft two span thru truss. Bedrock is visible under the east abutment but its depth under the western abutment is currently undetermined although bedrock is visible in the stream. The alignment is straight and the current grade difference between the abutments is negligible. The existing bridge length places this structure near our limits for a single span integral abutment structure. I recommend that the Agency explore the design of a semi-integral abutment bridge with one or more (pending depth of bedrock at west abutment) spread footings.

It is recommended that the Project Manager complete a Geotechnical Services Request Form which can be accessed at the following link:

http://vtransengineering.vermont.gov/sites/aot_program_development/files/documents/materialsandresearch/MandRSoilGeotechnical_RequestR3Finale41.pdf

The Project Manager should request that prior to any subsurface investigation the Agency's Geologist assess the stability of the bedrock under the East Abutment and provide recommendations on whether or not the foundation for the eastern abutment should be moved back and if so how far. It is recognized that the Geologist's recommendations could impact the substructure location(s) and subsequent subsurface investigation program.

The subsurface investigation should include, but not be limited to, a determination of the soil and bedrock properties (strength, material composition, RQD, etc), ground water conditions and the depth of bedrock. Four relatively shallow geotechnical borings are anticipated to adequately assess the subsurface conditions at this site. [Additional borings may be necessary if abrupt changes in bedrock elevation are encountered at the foundation locations.] Conceptually, two borings are recommended to be drilled at each abutment, preferably at the intersection of the back wall and wing wall location. These borings should be positioned a minimum of 10 feet away from any overhead power lines and far enough from the abutment to avoid drilling through the abutment footings - although this may not be avoidable. From a subsurface investigation perspective it would be best to lengthen the bridge and drill behind the existing abutments than to drill for a replacement structure at the existing locations. Final recommendations for boring locations can be provided once an alignment and preliminary structure type have been selected.

If a 2 span structure is desired consideration of a drilled shaft at the pier location would eliminate the need for a cofferdam and perhaps the drilled shaft could be constructed by working off of the existing bridge although given its current condition this is highly unlikely without significant structural modifications. The environmental permitting of an access road to the pier location seems feasible given the currently large channel width. This permit could identify the use of the access road during the subsurface investigation and during construction of the pier.

Access limitations include the following;

- relatively steep side slopes with limited drilling access in front of the abutment and adjacent to the wingwalls, and
- drilling for a pier structure would require an access road at low flow (preferable) or the use of a raft. The result is increased subsurface investigation costs, and
- guard rail may need to be temporarily removed during drilling to facilitate boring placement, and
- temporary traffic control, including flaggers, may be necessary at this site to facillitate a safe work zone.

Based on the information in this scoping report, possible foundation options for this bridge replacement project include the following:

- two span concrete structure supported by shallow spread footing substructures on bedrock, or
- single span semi-integral abutment bridge supported by shallow spread footing substructures on bedrock, or
- single span integral abutment bridge on steel H-piles socketed into bedrock.

If you have any questions regarding the information or recommendations in this report, please feel free to contact the Soils & Foundations Engineer at (802) 828-6910.

cc: WEA/Read File
CCB/Project File

VERMONT

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

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

Agency of Transportation

To: Jeff Ramsey, VTrans Environmental Specialist

From: Glenn Gingras, VTrans Environmental Biologist

Date: 5/29/2013

Subject: Highgate BO 1448(43) - Natural Resource ID

I have completed my natural resource ID for the above referenced project. My evaluation has included the following resources: wetlands, wildlife habitat, agricultural soils, and rare, threatened and endangered species. I have reviewed all existing mapped information and completed a field visit. I have evaluated 100 feet of the approaches and 50 feet upstream and downstream.

Wetlands/Watercourses
There are no wetlands within the immediate area of the project.

The Missisiquoi River flows northerly through the project area. The river provides for recreational activities such as boating, fishing and swimming within this reach. The Missisiquoi has been officially designated by Congress as a "study river" under the National Wild and Scenic River System. Activities that have the potential to alter flows of these nationally recognized rivers are required to be processed under CAT 2 of the US Corps of Engineers permitting process. Impacts to this waterway will need to be avoided and minimized to the maximum extent practicably.

Immediately adjacent to the southeastern side of the existing bridge there is an outlet of an existing piping system that was conveying water of some origin from the east. The existing concrete pipe (roughly 4') is in serious disrepair (multiple sections apart) and I was not able to find where the water was coming from. This is either a stream conveyance or storm water feature.

Wildlife Habitat
According to VT Fish and Wildlife linkage rating "3", moderate wildlife habitat exists on both sides of TH 4 within this corridor. This area does not support large blocks of forested habitat on each side of the bridge. It would be expected that most wildlife would use the existing forested riparian zone for a travel corridor and foraging. No improvements to wildlife movement are warranted at this location.

There are numerous aquatic species that would be present within the Missisiquoi River. Timing restrictions will be likely within this watercourse if in-stream work is anticipated on existing abutments or piers.

Rare, Threatened and Endangered Species (R/T/E)
According to the VT Fish and Wildlife Natural Heritage Database there are state listed mapped threatened or endangered plants or animals within the project corridor:

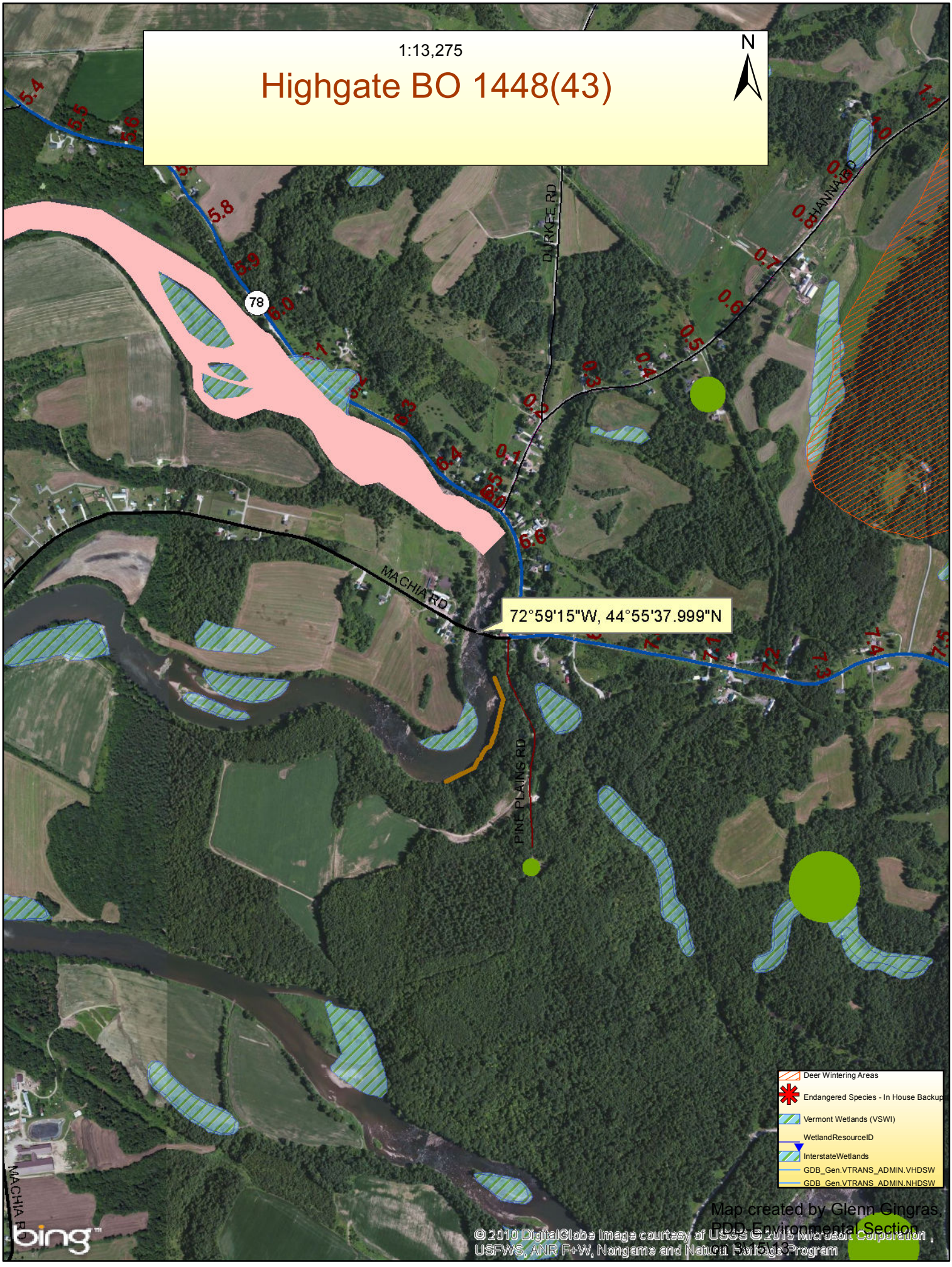
Lathyrus palustris, Marsh Vetchling; State Threatened; upstream side of project
Rivershore Grassland; State rare species; upstream side of project

Anodontoides ferussacianus, Cylindrical Papershell; State listed Endangered; downstream and potentially upstream.

Depending on the nature of the project, additional review may be required by specialists in plants and fresh water mussels.

There are no federally listed species within this project corridor.

Agricultural Soils
Soils within the project area are mapped as Windsor fine sandy loam and Colton gravelly loamy sand, which are considered Statewide important soils in the VT NRCS Vermont Important Farmland Rating. No prime agricultural soils are present.

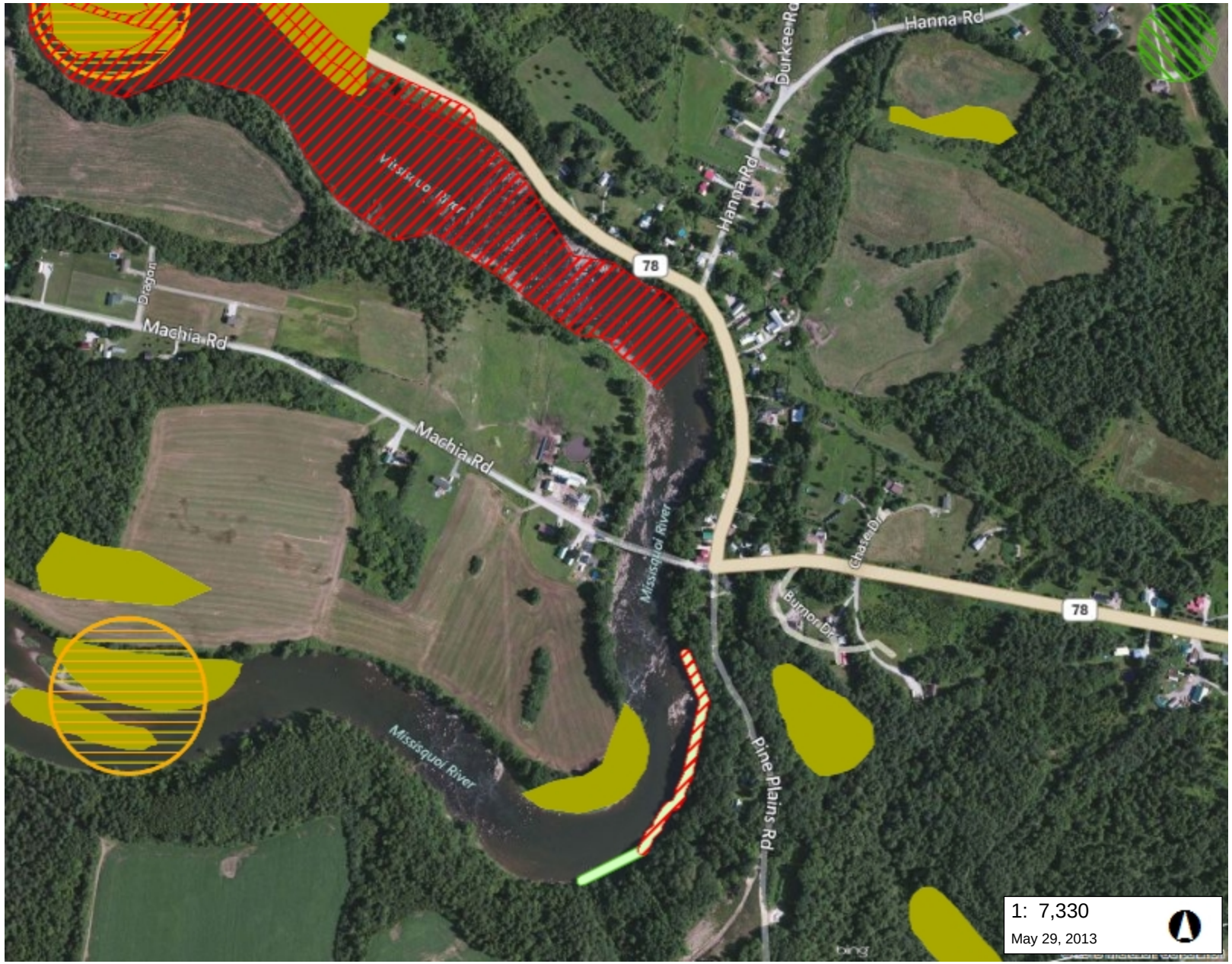

1:13,275
Highgate BO 1448(43)
N
78
DURKEE RD
HANNAH RD
MACHIA RD
PINE PLAINS RD
72°59'15"W, 44°55'37.999"N
Deer Wintering Areas
Endangered Species - In House Backup
Vermont Wetlands (VSWI)
WetlandResourceID
InterstateWetlands
GDB_Gen.VTRANS_ADMIN.VHDSW
GDB_Gen.VTRANS_ADMIN.NHDSW
Map created by Glenn Gingras,
RDD Environmental Section
© 2010 DigitalGlobe Image courtesy of USGS © 2010 Microsoft Corporation ,
USFWS, ANR F+W, Nongame and Natural Heritage Program
bing

VERMONT

Highgate BO 1448(43)

Vermont Agency of Natural Resources

vermont.gov



LEGEND

- Invasive Plant Atlas
  - Acer platanoides
  - Berberis thunbergii
  - Euonymus alatus
- Rare Threatened Endangered
  - Threatened or Endangered
  - Rare
- Significant Natural Community
- Uncommon Species and Other
  - Animal
  - Plant
  - Natural Community
- Indiana Bat Hibernacula
- Wetlands - VSWI
  - Class 1 Wetland
  - Class 2 Wetland
- Wetlands - VSWI Advisory Lay
- Town Boundary

NOTES

Map created using ANR's Natural Resources Atlas

372.0 0 186.00 372.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 611 Ft. 1cm = 73 Meters

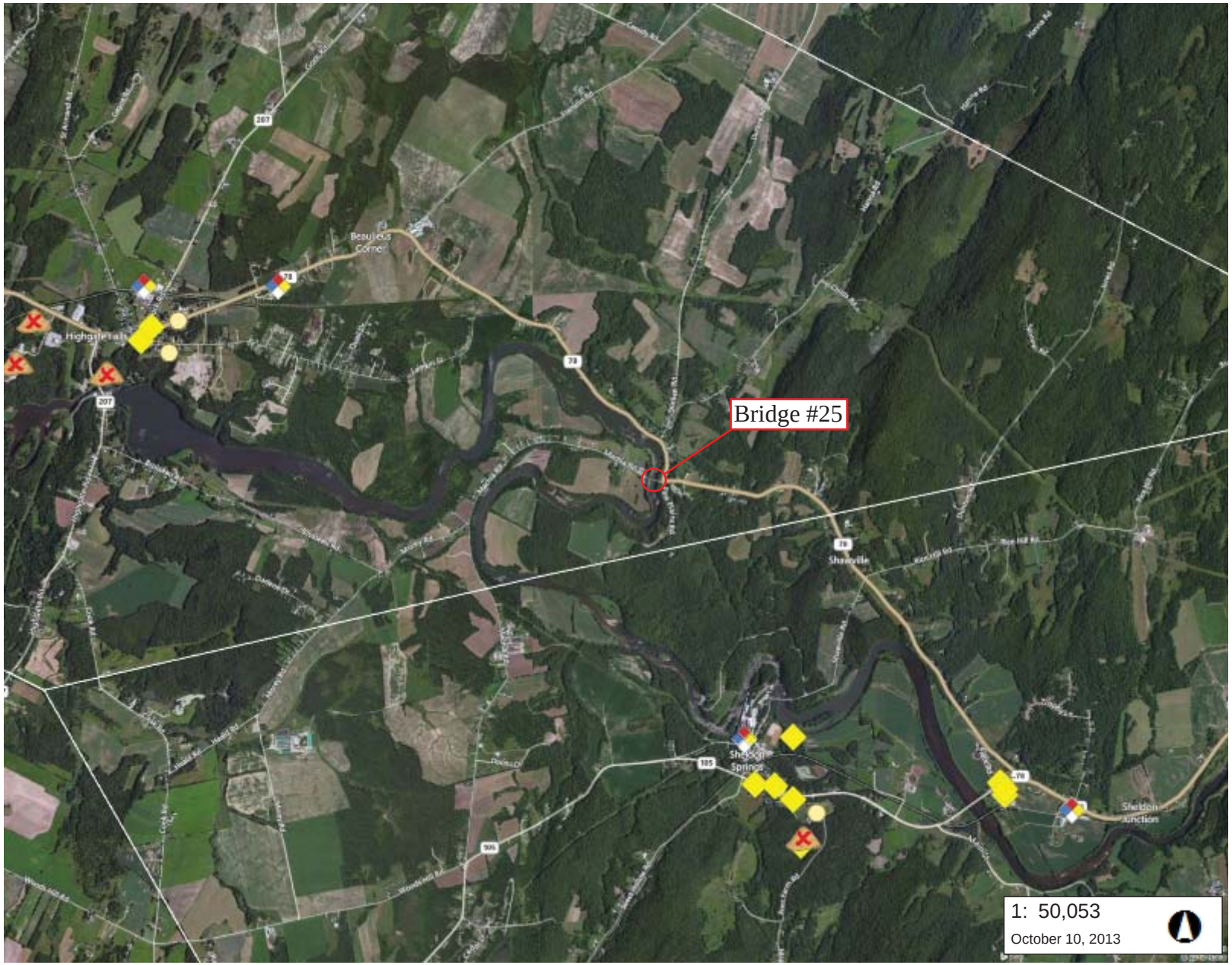
THIS MAP IS NOT TO BE USED FOR NAVIGATION

VERMONT

Hazardous Waste Sites

Vermont Agency of Natural Resources

vermont.gov



LEGEND

- Landfills
  - OPERATING
  - CLOSED
- Hazardous Waste Site
- Hazardous Waste Generators
- Brownfields
- Underground Storage Tank (w
- Town Boundary

NOTES

Map created using ANR's Natural Resources Atlas

2,543.0 0 1,272.00 2,543.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 4171 Ft. 1cm = 501 Meters

THIS MAP IS NOT TO BE USED FOR NAVIGATION

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, VTrans Environmental Specialist

From: Jeannine Russell, VTrans Archaeology Officer
via Brennan Gauthier, VTrans Assistant Archaeologist

Date: 6/3/2013

Subject: Highgate BO 1448(43) – Archaeological Resource ID

Jeff,

A field visit was conducted on 5/29/2013 in order to assess archaeological sensitivity in the general area around Bridge 25 in East Highgate, Franklin County, Vermont. Archaeological deposits related to Native American habitation in the area are highly likely given the high concentration of known precontact sites in the area. In addition, historic maps show a number of structures in the general area in the mid-late 1800s. One structural foundation was located during field reconnaissance in the SE quadrant. This structure may predate the 1850s historic map judging by construction techniques and general size.

A cursory field review was conducted on all four quadrants to identify obvious disturbance. Both the SW and SE quadrants appear to be relatively undisturbed and are considered archeologically sensitive. The aforementioned foundation remain is contained within the SE quadrant. Both areas have been mapped into the archaeological geodatabase for inclusion in future plans. Feel free to contact me with any questions or concerns.

Sincerely,

Brennan

Brennan Gauthier
VTrans Archaeologist
Vermont Agency of Transportation
Program Development Division
Environmental Section
1 National Life Drive
Montpelier, VT 05633
tel. 802-828-3965
fax. 802-828-2334
Brennan.Gauthier@state.vt.us

VTrans Working to Get You There
Vermont Agency of Transportation


Highgate BO 1448(43)
Resource ID
0 5 10 20 30 40
Meters
1:1,148
N
Arch Sensitive
Arch Sensitive
Map created by BCG,
PDD-Environmental Section
on 6/3/2013.
bing
© 2010 Dig

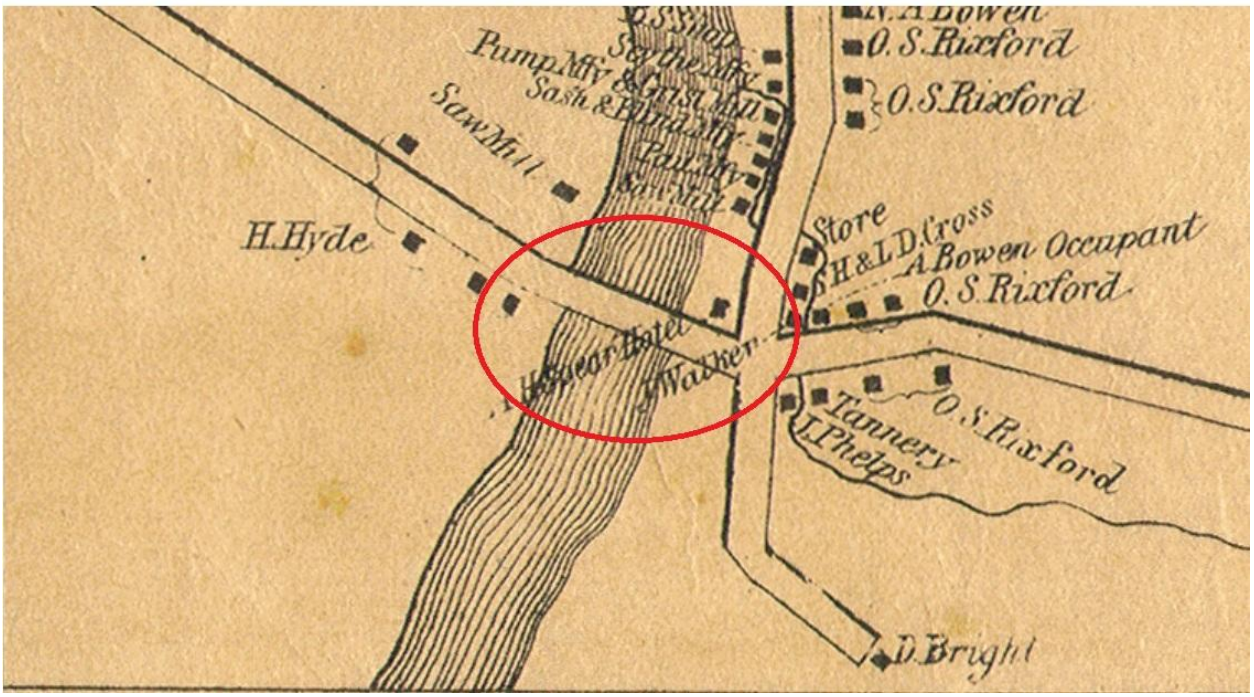


Figure 1: 1850s Map

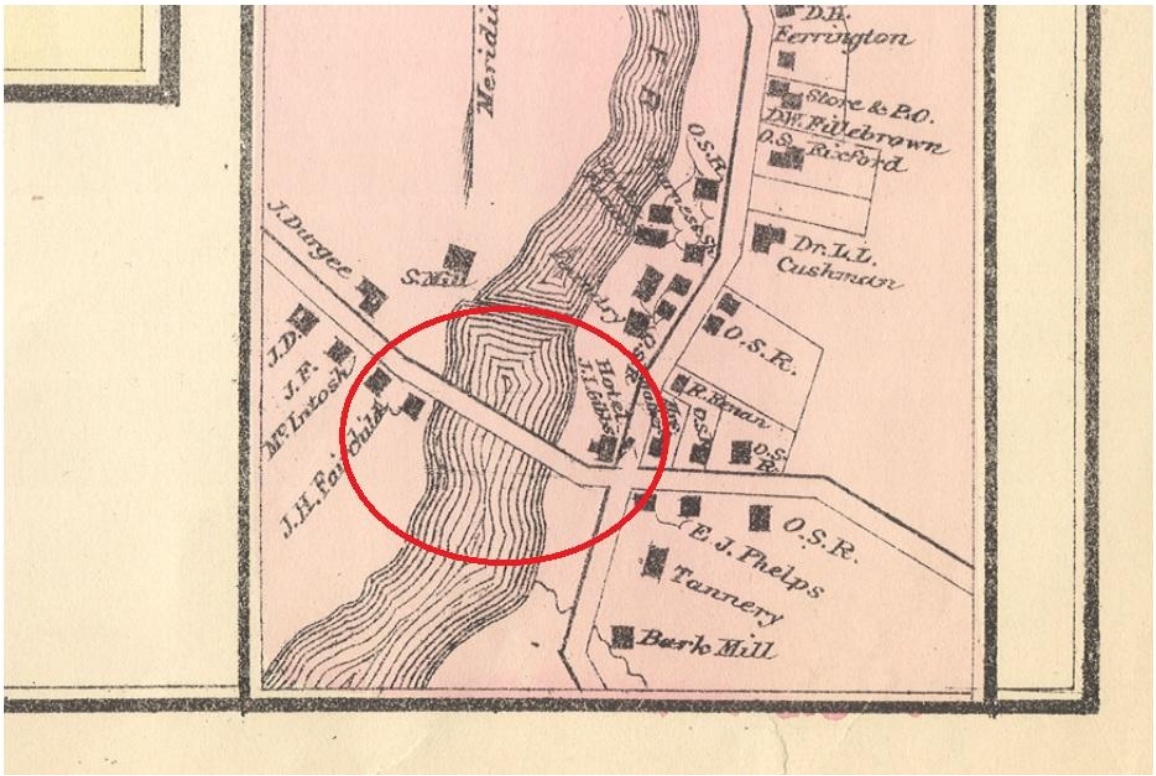


Figure 2: 1860s Map

Highgate BO 1448(43) Historic / 4(f) Resource ID

Newman, Scott

Sent: Tuesday, May 14, 2013 8:49 PM

To: Ramsey, Jeff

Cc: Williams, Chris; O'Shea, Kaitlin; Newman, Scott

Jeff,

I've concluded the resource ID for the above subject project. The only historic/4(f) resource in the project area is the 2-span metal truss. Any adverse effects to the span will trigger reviews under both laws. The resource ID has been entered into ArcMap and bookmarked under the project number.

Note that this bridge was the subject of a proposed Town Highway grant in 2012 and as a result there was some discussion and preliminary engineering regarding its disposition - nothing conclusive at this point.

Thanks

D. Scott Newman M.Sc.
Historic Preservation Officer
Vermont Agency of Transportation
1 National Life Drive
Montpelier, VT 05633

Cell: 802-595-5119
Fax: 802-828-2334

Fillbach, Tim

From: Wheeler, Lawrence
Sent: Tuesday, July 09, 2013 10:20 AM
To: Williams, Chris
Cc: Hall, Robert; Symonds, Wayne
Subject: Highgate BO 1448(43) - Request for Utility Information
Attachments: highgate utility sketch_0001.pdf

On 7/1/13 I conducted an on-site investigation of the existing utility locations within the referenced project area. While in Highgate I stopped at the Municipal Offices to gather information. Since that date I have been in touch with numerous utility companies and private individuals. The following summarizes my observations and discussions:

Vermont Gas Systems, Inc.

- Although Vermont Gas has facilities along VT Route 78 in Highgate, these facilities do not extend into East Highgate Village. They end approximately 2 miles to the west on VT Route 78.

Municipal Utilities

- There are no municipal water or sewer facililities within the project area.

- At one time there was a municipally owned water company in East Highgate (the East Highgate Water System) which had facilities in the location of the existing bridge. A number of years ago this company drilled private wells for each and every one of its customers and the water company was discontinued. There remains one water line which crosses the end of Machia Road, adjacent to VT 78 which provides service to the old store (now an apartment house) in the intersection. The water supply for this apartment house is a short distance up TH # 48 Pine Plains Road. This privately owned water main should not be impacted by the bridge project. The original owner of the East Highgate Water System has passed away. But I was able to get in touch with his son who provided much needed information.

Public Utilities

Underground:

- There are several poles along Machia Road which have risers for both electric and telephone. These underground facilities are service lines to the first three or four houses along Machia Road.

Aerial:

- There are aerial electric (single phase) and communication cables which run along the northerly side of of the existing bridge on Machia Road; these aerial facilities are owned by Vermont Electric Cooperative, FairPoint and Comcast.

- There are aerial electric and telephone service lines which cross Machia Road between the existing bridge and VT Route 78, approximately 75 feet from the end of the bridge (see attached sketch).

- There are aerial electric and telephone service lines which cross Machia Road at the far end of the bridge as well; these aerial crossinging are approximately 10 feet and 75 feet from the end of the bridge (see attached sketch).

Following is a list of the contacts for this project:

Former East Highgate Water System
Peter Rixford (son of previous owner)

Telephone: (802) 868-4266

Address: 6507 VT Route 78 East Highgate, VT 05459

(This information is provided just in case you need more information on the former water system).

Evan Mercy
Vermont Electric Cooperative

Telephone: (802) 730-1124

emercy@vermontelectric.coop

Address: 42 Wescom Street Johnson, VT 05656

Laura Szabelski
FairPoint Communications

Telephone: (802) 863-0703

lszabelski@fairpoint.com

Address: 800 Hinesburg Road South Burlington, VT 05403

Conrad Ritchie
Comcast Project Coordinator

Telephone: (802) 846-2414

conrad_ritchie@cable.comcast.com

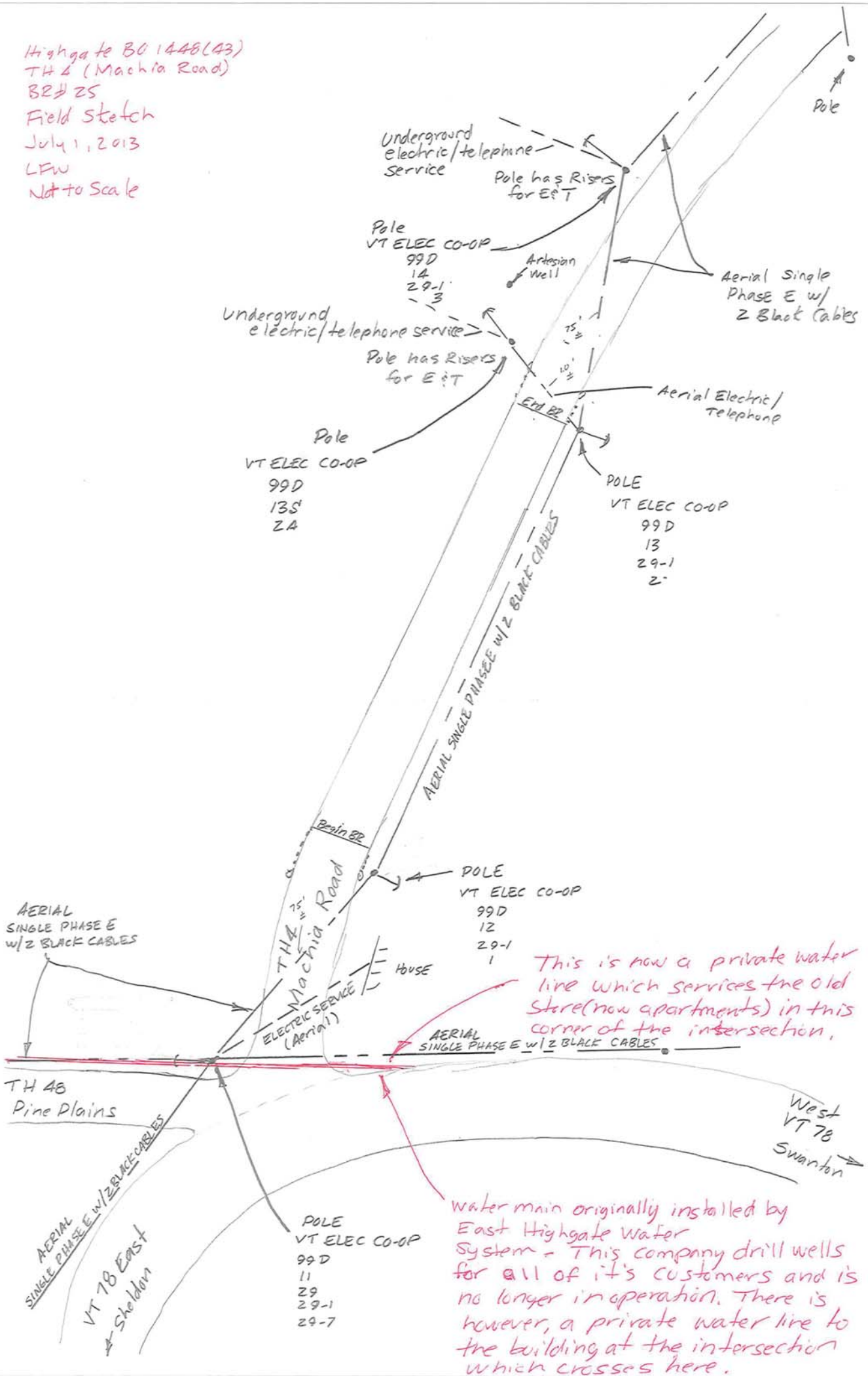
Address: 96 Avenue B Williston, VT 05495

Lawrence Wheeler, Senior Technician

Greenman-Pedersen, Inc.
Engineering and Construction Services

Vermont Agency of Transportation
Structures Section
One National Life Drive
Montpelier, VT 05633-5001

Office (802) 828-1450
Cell (802) 498-8418
lwheeler@gpinet.com
lawrence.wheeler@state.vt.us


Highgate BO 1448(43)
TH 4 (Machia Road)
BR# 25
Field Sketch
July 1, 2013
LFW
Not to Scale
Pole
Underground electric/telephone service
Pole has Risers for E&T
Pole
VT ELEC CO-OP
99D
14
29-1
3
Artesian Well
Aerial Single Phase E w/ 2 Black Cables
Underground electric/telephone service
Pole has Risers for E&T
End BR
Aerial Electric/ Telephone
Pole
VT ELEC CO-OP
99D
13S
24
POLE
VT ELEC CO-OP
99D
13
29-1
2
AERIAL SINGLE PHASE E w/ 2 BLACK CABLES
Begin BR
TH 4 Machia Road
POLE
VT ELEC CO-OP
99D
12
29-1
1
AERIAL
SINGLE PHASE E
w/ 2 BLACK CABLES
House
ELECTRIC SERVICE (Aerial)
This is now a private water line which services the old Store (now apartments) in this corner of the intersection.
AERIAL
SINGLE PHASE E w/ 2 BLACK CABLES
TH 48
Pine Plains
West
VT 78
Swanton
AERIAL
SINGLE PHASE E w/ 2 BLACK CABLES
VT 78 East
Sheldon
POLE
VT ELEC CO-OP
99D
11
29
29-1
29-7
Water main originally installed by East Highgate Water System - This company drill wells for all of it's customers and is no longer in operation. There is however, a private water line to the building at the intersection which crosses here.

Community Considerations

1. Are there any 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: a bike race, festivals, cultural events, farmers market, concerts, etc. that could be impacted? If yes, please provide date, location and event organizers' contact info.
   B-25 is located in East Highate which is away from the center of Highgate where the majority of the events would be located. It does not appear that the closure of the bridge would dramatically interfere with any scheduled events however, during the spring of the year, ice jams or during intense rain events the alternate route of Route 78 would be closed due to flooding in East Highgate. This may present a problem.

2. Is there a "slow season" or period of time from May through October where traffic is less?

   There is no known slower period for traffic on the bridge. If the bridge did not have a 5 ton posted weight restriction, there would be more farm equipment using the bridge during the spreading, planting and harvesting periods.

3. Please describe the location of emergency responders (fire, police, ambulance) and emergency response routes.
   Emergency responders are already taking alternate routes due to the bridge posted weight restriction of 5 tons.

   The town has a fire station location at the town offices on VT 78. Ambulance service is provided by Missisquoi Valley Rescue located in Swanton. The town contracts with the Franklin County Sheriff's Department in St. Albans.

4. Where are the schools in your community and what are their schedules?
   Highgate is served by an elementary in Highgate Center and a middle and High School located on near the border with Swanton on Route 78. School buses are already taking alternate routes due to the bridge posted weight restriction of 5 tons.

5. Is the proposed project on an established or planned school bus or public transit route(s)?
   School buses are already taking alternate routes due to the bridge posted weight restriction of 5 tons. The project is not on a public transit route.

6. Are there any businesses (including agricultural operations) that would be adversely impacted either by a detour or due to work zone proximity?
   Farms and delivery trucks are already impacted due to the 5 ton weight restriction. Multiple farms have already suffered an impact from alternative routes and the added expense and time to manage fields.

7. Are there any important public buildings (town hall or community center) or community facilities (recreational fields or library) in close proximity to the proposed project?
   There are no public buildings in the immediate area of the bridge.

8. Are there any town highways that might be adversely impacted by traffic bypassing the construction on another local road?
   Route 78 is the alternative route and it is congested and paving is scheduled for the fall of this year. (Note: PE and Construction funds programed in FY 14)

9. Are there any other municipal operations that could be adversely impacted if the bridge is closed during construction? If yes, please explain.

   None known.

10. Please identify any local communication channels that are available—e.g. weekly or daily newspapers, blogs, radio, public access TV, Front Porch Forum, etc. Also include any unconventional means such as local low-power FM.
    Highgate does not subscribe to Front Porch Forum however, we record our public meetings on the local access network, Channel 15-16.

    We also list our meeting notices and agendas in the St. Albans Messenger. We run items of impact in the County Courier Newspaper.

    The Town has a website and a facebook page to distribute information. We post flyers at 5 public locations in town. Current website is highgate.weebly.com but will be moving to www.highgatevt.org

11. Is there a local business association, chamber of commerce or other downtown group that we should be working with?
    The Franklin County Regional Chamber of Commerce is the largest association in our area. The neighboring Town of Swanton has a Chamber of Commerce but it is more focused on Swanton businesses.

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?

   There are no known issues with the alignment of the existing bridge. However, the bridge is located just off from a very sharp angle in VT Route 78.

2. Are there any concerns with the width of the existing bridge?
   the current bridge is a one lane bridge. The width and height of the existing bridge does not accommodate large vehicles such as agricultural apparatus or large delivery trucks.

3. What is the current level of bicycle and pedestrian use on the bridge?
   the current level of bicycle or pedestrian traffic is unknown.

4. If a sidewalk or wide shoulder is present on the existing bridge, should the new structure have one?
   a sidewalk or wide shoulder is not present on the current bridge but it would be an asset to the community as we strive to improve pedestrian and bicycle infrastructure.

5. Is there a need for a sidewalk or widened shoulder if one does not currently exist? Please explain.
   a sidewalk or wide shoulder is not present on the current bridge but it would be an asset to the community as we strive to improve pedestrian and bicycle infrastructure.

6. Does the bridge provide an important link in the town or statewide bicycle or pedestrian network such that bicycle and pedestrian traffic should be accommodated during construction?
   The Lamoille Valley Rail Trail runs through Highgate near the B-25 bridge and continues into Swanton. This links up with the segment that runs from St. Albans to Richford at the junction of Route 78 and route 105. It is unclear how much bicycle traffic uses the bridge each day.

7. Are there any special aesthetic considerations we should be aware of?
   B-25 is a historic iron bridge that was erected after the flood of 1927. It replaced a wooden covered bridge that washed away during the flood.

8. Are there any traffic, pedestrian or bicycle safety concerns associated with the current bridge? If yes, please explain.
   the bridge is currently one lane and does not allow cross traffic or vehicular traffic with bicycle traffic.

9. Does the location have a history of flooding? If yes, please explain.
   the bridge has not flooded since 1927 however high water may have contributed to the erosion of the abutment and pier of the bridge.

10. Are you aware of any nearby Hazardous Material Sites?
    No

11. Are you aware of any historic, archeological and/or other environmental resource issues?
    The East Highgate dam was the site of a hydro powered ax factory. Part of the dam remains but it is a boating hazard with an undercurrent that has threatened to pull small boats under.

12. Are there any other comments you feel are important for us to consider that we have not mentioned yet?
    The bridge should be capable to accommodating agricultural vehicles that are wide and extremely heavy.

Land Use & Public Transit Considerations – to be filled out by the municipality or RPC.

1. Does your municipal land use plan reference the bridge in question? If so please provide a copy of the applicable section or sections of the plan.
   The current town plan references the bridge. It also describes the flooding situation on VT Route 78. Machia Road is the only detour when this section of state highway is closed.

   In January of 2010 Bridge #25 over the Missisquoi River in East Highgate was inspected evaluated by two highway engineers from VT AOT along with Selectboard members. The steel bridge which was originally built in 1929 is in need of repairs. The Town will develop a strategic plan to pay for the replacement of necessary parts of the bridge. Grants, loans and additional funding will be sought to help pay for the costs. Until the repairs are completed, the bridge will be open to only one-lane of traffic with a weight restriction. (Highgate, Vermont Town Plan, 2010, Page 33)

   The area of VT 78 just west of East Highgate Village has suffered from annual flooding for several years. Ice usually jams in the Missisqoi River behind the Orman E. Croft Generating facility and causes water and ice to overflow onto the road. (Highgate, Vermont Town Plan, 2010, Page 33)

2. Please provide a copy of your existing and future land use map, if applicable.
   See attached.

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

   Based on the current zoning, it is anticipated that the bridge will see an increase in traffic in future years. The bridge is located in the Medium Density Residential Zoning District and adjacent to the High Density Residential District. According to the town's 2009 zoning bylaws, the High Density Residential "consists of the locations within the town where it is desired that development occur which can accommodate the majority of the population growth in Highgate" (Page 4). The intent of the Medium Density Residential District is to have "less intensity of use than the high density zone" (Page 4) but still allows Planned Unit Developments as a conditional use.

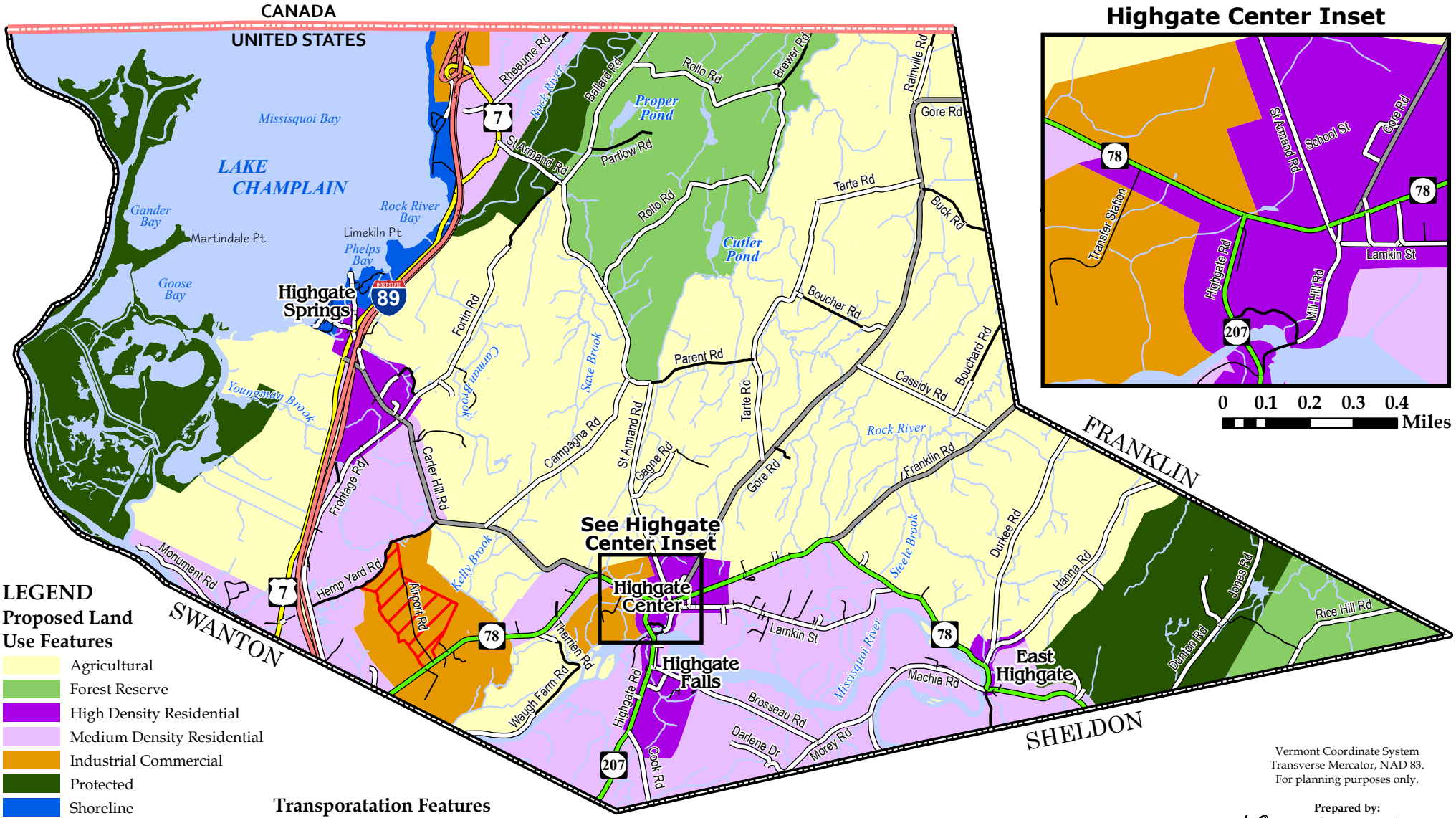
4. Is there any planned expansion of public transit service in the project area? If not known please contact your Regional Public Transit Provider.

   No public transit routes are planned for the project area**.**

Attachments:

1. **Existing and Future Land Use Maps**
2. **2012 Traffic Count Results Summary**

TOWN OF HIGHGATE
Proposed Land Use



Highgate Center Inset

0 0.1 0.2 0.3 0.4 Miles

LEGEND

Proposed Land Use Features
- Agricultural
- Forest Reserve
- High Density Residential
- Medium Density Residential
- Industrial Commercial
- Protected
- Shoreline
- Airport Overlay

Surface Water Features
- River, Stream or Brook
- Lake, River or Pond

Boundary Features
- International Boundary
- Town Boundary

Transporatation Features
- Interstate Highway
- Federal Highway
- State Highway
- Class 2 Town Highway
- Class 3 Town Highway
- Class 4 Town Highway
- Private Road

N W E S

0 0.5 1 1.5 2 Miles

0 4,000 8,000 12,000 16,000 Feet

Vermont Coordinate System
Transverse Mercator, NAD 83.
For planning purposes only.

Prepared by:
Northwest Regional
Planning Commission
155 Lake Street
St. Albans, VT 05478
802.524.5958
www.nrpcvt.com
February, 2010.

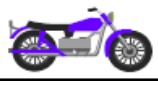
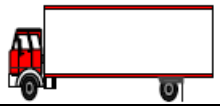
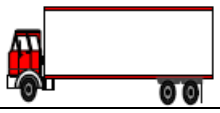
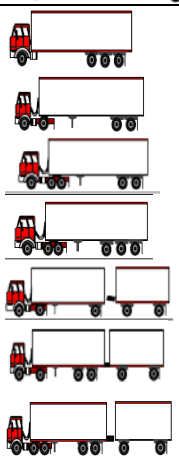
Data Sources: All map features derived from VGIS digital coverages. North arrow on map refers to Grid North.

Location: z:\gis\projects\county\franklin\highgate\townplan2010

Town of Highgate: Machia Road Traffic Count Results
7/11- 7/20/2012

Station ID: 07
Road Name: Machia Road
Town: Highgate
Description: Counter installed at west-end of Machia Bridge, bridge weight limit posted at 5 tons.
Date Start: 7/11/2012 3:00 PM
Date End: 7/20/2012 2:59 PM

AADT*: (Seasonal correction factor .93 applied- MADT to AADT)	**700**

Axle Classifications- *see attached classification chart*			# of vehicles 7/11-7/20
Class 1- Motorcycles: % of Total Volume		**1.0%**	**70**
Class 2- Cars and Trailers: % of Total Volume		**66.6%**	**4578**
Class 3- 2 Axle, Four Tire, Single Unit		**23.7%**	**1631**
Class 4- Busses: % of Total Volume		**0.1%**	**10**
Class 5- Two Axle, Six Tire: % of Total Volume		**2.9%**	**200**
Class 6- Three Axle, Single: % of Total Volume		**0.8%**	**55**
Class 7-13: % of Total Volume		**0.2%**	**17**
Class 14**- Not Classified: % of Total Volume	**?**	**4.6%**	**315**

***AADT:** The average number of vehicles traveling the road on any given day.

**Note on axle classification:

The accuracy of axle sensor based counters is a function of several factors, including (but not limited to) the following:

- the accuracy of the distance measurement between the two axle sensors
- the need for constant vehicle speed over the two sensors (changing vehicle speeds cause errors in the axle spacing computation)
- the need for a vehicle to stay in a single lane until it has passed completely over both sensors
- the speed with which the axle sensor can respond to axles crossing the sensor,
- the accuracy of the axle sensors themselves (that is how often they either report non-existent axles (ghost axles) and/or miss axles that pass over them)
- the presence of different types of vehicles with similar axle spacing
- the care with which the classification algorithm was developed that converts the number and spacing of axles into vehicle

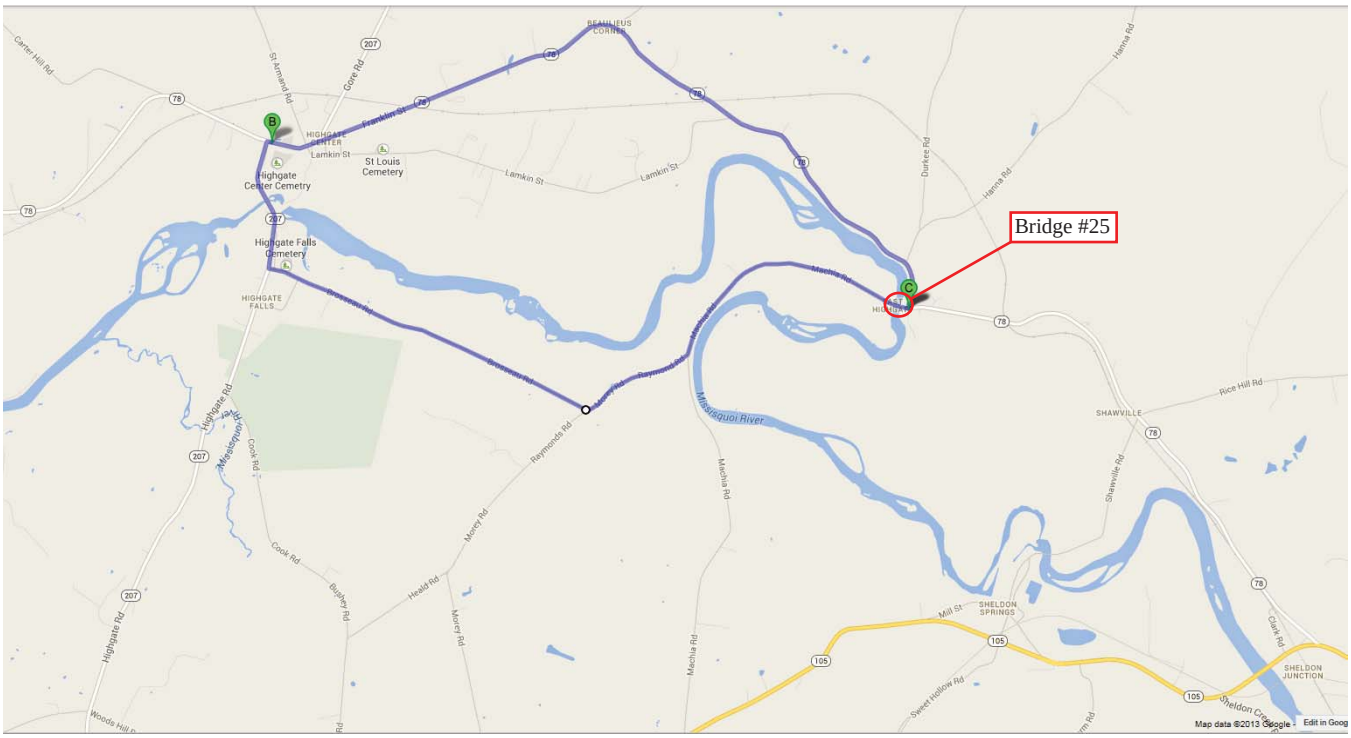
Vermont Agency of Transportation

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

From 01/01/07 To 12/31/11 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	Location
0613/3884-07	Franklin	Georgia	T0040	02/11/2007	08:38	Clear	Failure to keep in proper lane	Single Vehicle Crash	0	0	TH 40 (Sand Hill Connector) at TH 43 (Stone Bridge Rd)
VTVSP0700/08 A202267	Franklin	Georgia	T0043	05/09/2008	15:14	Cloudy	Failed to yield right of way, Swerving or avoiding due to wind, slippery surface, vehicle, object, non-motorist in roadway etc	Left Turn and Thru, Same Direction Sideswipe/Angle Crash vv--	1	0	TH-43 (Stonebridge Rd)
VTVSP0700/09 A204431	Franklin	Georgia	T0043	09/22/2009	06:15	Rain	Driving too fast for conditions	Single Vehicle Crash	0	0	TH-43 Stonebridge Road at 1343 Residence
VTVSP0700/08 A204254	Franklin	Georgia	T0054	08/17/2008	15:45	Clear		Single Vehicle Crash	1	0	TH-54 (604 Fontaine Drive) at Residence #604
VTVSP0700/11 A204023	Franklin	Georgia	T0067	08/29/2011	20:27	Clear	Driving too fast for conditions, Operating vehicle in erratic, reckless, careless, negligent, or aggressive manner	Single Vehicle Crash	0	0	TH-67 (550 Nottingham Drive)
0613/1262-07	Franklin	Georgia	T0072	01/15/2007	16:32	Sleet, Hail (Freezing Rain or Drizzle)	Driving too fast for conditions	Single Vehicle Crash	0	0	TH 72 at Old Quarry Rd.
VT0060000/08 FRC1096	Franklin	Highgate	0000	05/11/2008	19:37	Clear	Operating vehicle in erratic, reckless, careless, negligent, or aggressive manner, Under the influence of medication/drugs/alcohol	Other - Explain in Narrative	1	0	23 Virginia Lane at Frontage Road
VT0060000/09 FRC1768	Franklin	Highgate	0000	06/07/2009	19:01	Clear	Inattention, No improper driving	Left Turn and Thru, Head On ^v--	0	0	Lampkin St - Cross St. at Cross St.
0612/2790-07	Franklin	Highgate	T0004	02/05/2007	21:09	Blowing Sand, Soil, Dirt, Snow	Swerving or avoiding due to wind, slippery surface, vehicle, object, non-motorist in roadway etc, Wrong side or wrong way	Other - Explain in Narrative	0	0	TH-4 (2451 Machia Rd) at Driveway 2451 Machia Rd
0613/9637-07	Franklin	Highgate	T0004	07/11/2007	10:12	Cloudy	Exceeded authorized speed limit, Other improper action	Single Vehicle Crash	0	0	TH 4 (2567 Machia Rd) at William Rd
VTVSP0700/08 A206358	Franklin	Highgate	T0004	12/07/2008	11:59	Cloudy	Driving too fast for conditions, Failure to keep in proper lane	Single Vehicle Crash	0	0	TH-4 (1905 Machia Road) at Morey Road
VT0060000/10 FRC0123	Franklin	Highgate	T0004	01/10/2010	17:53	Clear	Driving too fast for conditions, No improper driving	Opp Direction Sideswipe	0	0	TH-4 Machia Rd at Rte 78
0612/6216-07	Franklin	Highgate	T0005	04/22/2007	17:41	Clear	Inattention	Rear End	0	0	TH 5 (1814 Lamkin St) at in driveway
0612/6361-07	Franklin	Highgate	T0005	05/06/2007	00:47	Clear	Operating vehicle in erratic, reckless, careless, negligent, or aggressive manner, Driving too fast for conditions	Single Vehicle Crash	0	0	TH 5 (Frontage Rd) at FAS 300 (Carter Hill Rd)
0613/12363-07	Franklin	Highgate	T0005	07/14/2007	09:28	Clear	No improper driving	Single Vehicle Crash	0	0	TH 5 (2991 Lamkin Rd)
0613/11775-07	Franklin	Highgate	T0005	09/13/2007	12:29	Clear	Exceeded authorized speed limit, Inattention, Made an improper turn	Left Turn and Thru, Angle Broadside -->v--	0	0	TH-5 (Frontage Road) at Carter Hill Road
VTVSP0700/08 A201171	Franklin	Highgate	T0005	03/02/2008	08:53	Clear	No improper driving, Driving too fast for conditions	Rear End	0	0	TH-5(1625 Lamkin Street) at Beverly Street
VT0060000/08 FRC0591	Franklin	Highgate	T0005	03/20/2008	22:18	Clear	Driving too fast for conditions, Operating defective equipment	Single Vehicle Crash	1	0	TH-5 (Frontage Road) at Carter Hill Road
VTVSP0700/08 A205427	Franklin	Highgate	T0005	10/21/2008	15:51	Rain	Inattention, No improper driving	Rear End	0	0	Th-5 (2169 Frontage Road) at VT Route 78
VTVSP0700/10 A202283	Franklin	Highgate	T0005	06/01/2010	16:52	Clear	No improper driving	Single Vehicle Crash	0	0	TH-5 Frontage Road at Carter Hill Road
VT0060000/11 FRC1377	Franklin	Highgate	T0005	04/22/2011	18:13	Clear	Under the influence of medication/drugs/alcohol	No Turns, Thru moves only, Broadside ^<	1	0	TH-5 (760 Lampkin St.)
0613/4602-07	Franklin	Highgate	T0006	03/10/2007	09:59	Clear	Failed to yield right of way, No improper driving	Head On	0	0	TH-6 St. Armand Rd at RT 78
0613/13037-07	Franklin	Highgate	T0006	10/11/2007	16:13	Cloudy	Failure to keep in proper lane, Inattention	Single Vehicle Crash	2	0	TH-6 (2415 St. Armond Rd) at Lampagna Rd
0612/13922-07	Franklin	Highgate	T0006	10/20/2007	23:55	Clear	Failure to keep in proper lane, Under the influence of medication/drugs/alcohol	Other - Explain in Narrative	2	0	TH 6 (617 Brosseau Rd) at Whitetail Rd
VTVSP0700/08 A201980	Franklin	Highgate	T0006	04/21/2008	14:27	Clear	Failure to keep in proper lane	Single Vehicle Crash	0	0	TH-6 (Brosseau Rd) at Morey Road
VT0060000/08 FRC1143	Franklin	Highgate	T0006	05/17/2008	20:39	Clear	Operating vehicle in erratic, reckless, careless, negligent, or aggressive manner, Under the influence of medication/drugs/alcohol	Single Vehicle Crash	2	0	TH-6 (St. Armand Road) at Parent Road
VTVSP0700/08 A206493	Franklin	Highgate	T0006	12/13/2008	10:50	Clear	Swerving or avoiding due to wind, slippery surface, vehicle, object, non-motorist in roadway etc, Other improper action	No Turns, Thru moves only, Broadside ^<	0	0	TH-6 (St Armand Road) at Gagne Road
VTVSP0700/09 A205595	Franklin	Highgate	T0006	12/08/2009	07:28	Snow	Driving too fast for conditions, Failure to keep in proper lane	Single Vehicle Crash	0	0	TH-6 (St. Armand Road) at Residence 2415
VTVSP0700/11 A200296	Franklin	Highgate	T0006	01/19/2011	12:27	Clear	Failed to yield right of way, No improper driving	Head On	1	0	Machia Road
VT0060000/11 FRC2438	Franklin	Highgate	T0006	07/03/2011	00:24	Clear	Failure to keep in proper lane, Under the influence of medication/drugs/alcohol	Single Vehicle Crash	0	0	TH-6 (851 St. Armand Rd.) at 851 St. Armand Rd.
VTVSP0700/10 A200768	Franklin	Highgate	T0007	02/25/2010	06:32	Cloudy	Swerving or avoiding due to wind, slippery surface, vehicle, object, non-motorist in roadway etc, Failure to keep in proper lane	Single Vehicle Crash	0	0	TH-7 St. Armand Road at Rollo Road
0613/14146-07	Franklin	Highgate	T0009	11/03/2007	14:08	Cloudy	Driving too fast for conditions	Single Vehicle Crash	1	0	TH-9 (Rice Hill Rd) at Town Line
VTVSP0700/08 A204545	Franklin	Highgate	T0010	09/01/2008	11:25	Clear	Driving too fast for conditions, Failure to keep in proper lane	Single Vehicle Crash	0	0	TH-10 at Ballard Road
0613/13089-07	Franklin	Highgate	T0016	10/15/2007	16:29	Cloudy	Fatigued, asleep	Single Vehicle Crash	1	0	TH-16 (288 Frontage Rd) at Carter Hill Rd

Source: SQL Server VCSG



Detour Route – Machia Road to VT 78 to VT 207 to Brosseau Rd to Morey Rd and back to Machia Rd

End to End Distance: 8.1 Miles (about 16 minutes)

PC STA 41+18.99

PT STA 42+01.39

PC STA 44+83.65

PC STA 46+48.35

PI STA 41+60.38

PI STA 45+64.70

S 58°27'17" E

S 71°56'34" E

N 18°03'26" E

TH 4 TO SHELDON

VT 78 TO HUNTINGTON

VT 78 TO SHELDON

TH 48

TH 4

41+00

42+00

43+00

44+00

45+00

46+00

46+45

50+00

51+00

52+00

BENCH MARK
USGS DISK
5 LLB 1962
ELEV. = 221.48

EXISTING CURVE 1
DELTA = 13°29'16"
D = 16°22'13"
R = 350.00'
T = 41.39'
L = 82.39'
E = 2.44'

EXISTING CURVE 2
DELTA = 20°52'25"
D = 13°01'18"
R = 440.00'
T = 81.05'
L = 160.30'
E = 7.40'

GRAVEL DRIVE

GRAVEL PARKING LOT

HISTORIC

ARTESIAN WELL

RAIL FENCE

CHAIN LINK FENCE

WOVEN WIRE FENCE

SIGN "5 TON WEIGHT LIMIT STRICTLY ENFORCED (SIGN FINES EXCEED 7500"

SIGN "15 TON WEIGHT LIMIT STRICTLY ENFORCED (SIGN FINES EXCEED 7500"

SIGN W1-6 R12-1 (TRUCKS)

SIGN W14-1

SIGN R3-1 (PINE PLAINS RD)

SIGN R3-1 (MECHIA RD)

MILE MARKER 0780 0809 6780

24" RCP SEPARATED FLOW

4" PVC UNDERDRAIN

MISSISQUOI RIVER FLOW

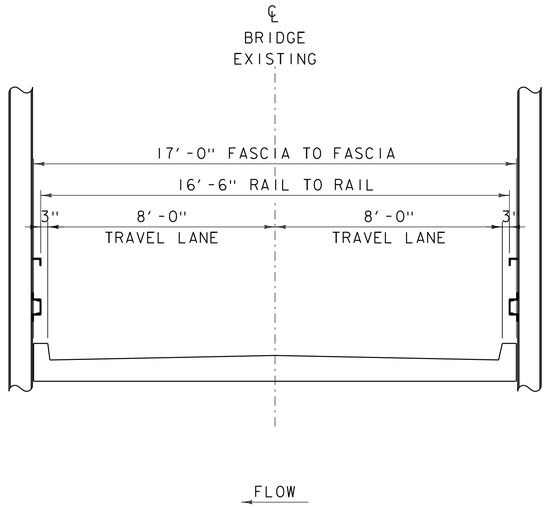
N

VT STATE PLANE GRID

EXISTING CONDITIONS

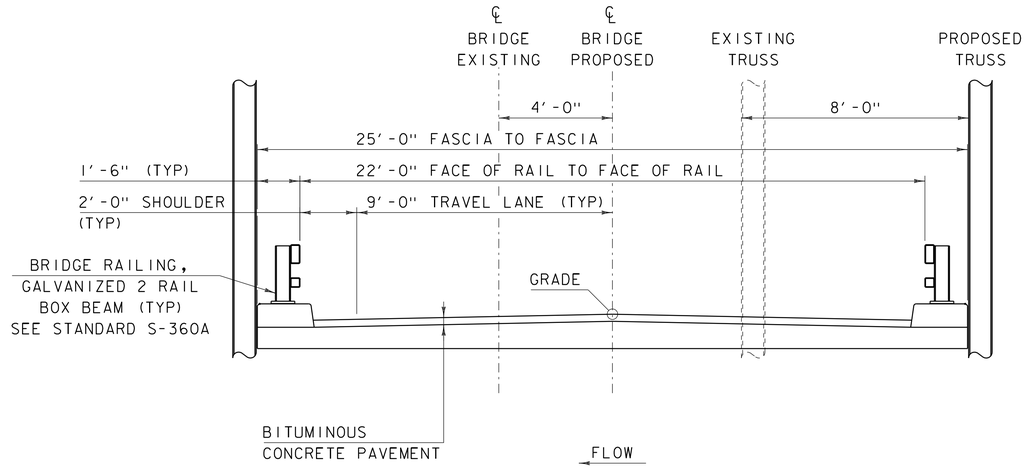
SCALE 1" = 20'-0"
20 0 20

PROJECT NAME:	HIGHGATE
PROJECT NUMBER:	BO 1448(43)
FILE NAME: 98j378/s98j378border.dgn	PLOT DATE: 14-NOV-2013
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
EXISTING CONDITIONS	SHEET 1 OF 13



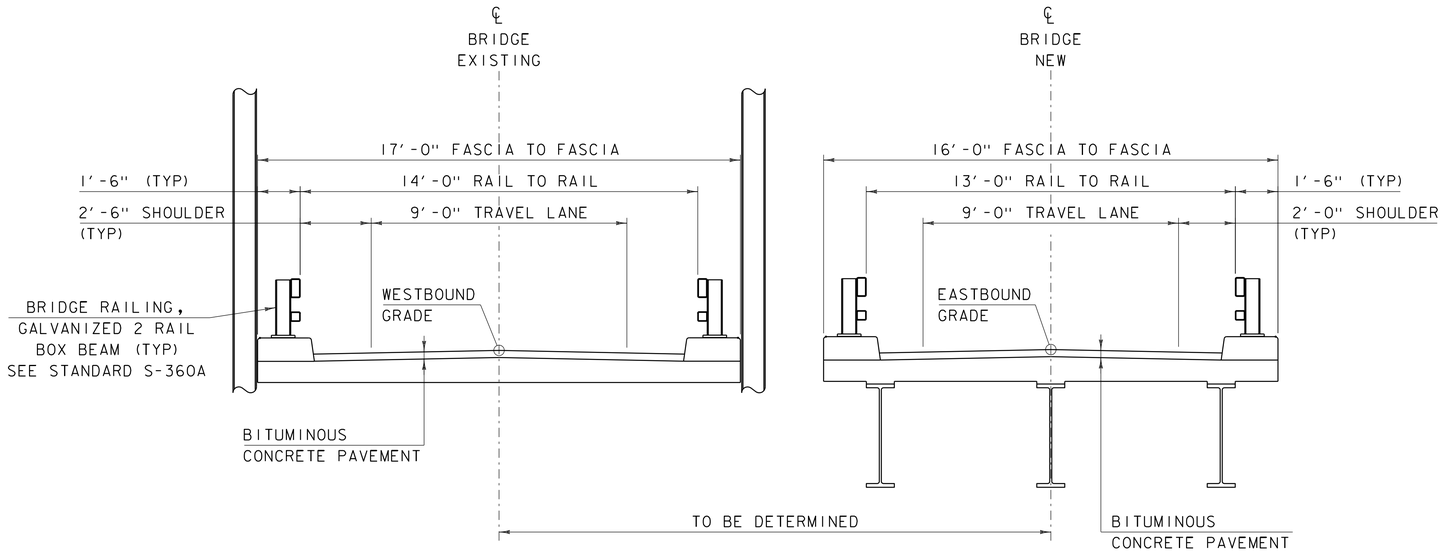
EXISTING BRIDGE TYPICAL SECTION (ALT IA & IB)

SCALE 3/8" = 1'-0"



PROPOSED BRIDGE TYPICAL SECTION (ALT IC)

SCALE 3/8" = 1'-0"



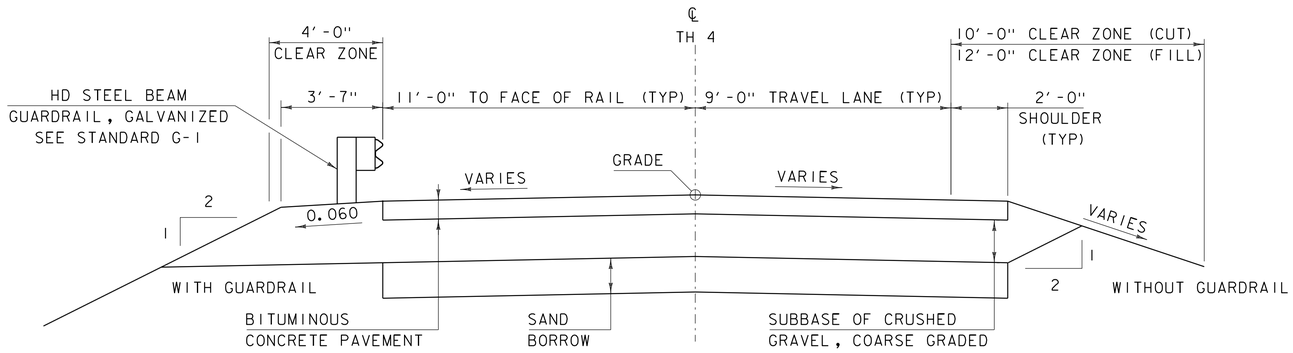
PROPOSED BRIDGE TYPICAL SECTION (ALT ID)

SCALE 3/8" = 1'-0"

PROJECT NAME: HIGHGATE
PROJECT NUMBER: BO 1448(43)

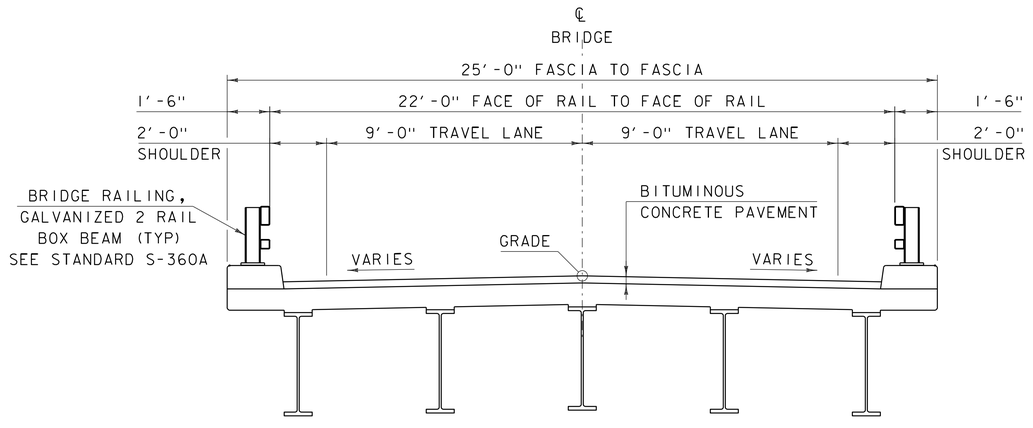
FILE NAME: 98j378/s98j378typ.dgn
PROJECT LEADER: C.P.WILLIAMS
DESIGNED BY: T.FILLBACH
TYPICAL SECTIONS

PLOT DATE: 14-NOV-2013
DRAWN BY: D.D.BEARD
CHECKED BY: ------



PROPOSED TH 4 TYPICAL SECTION (ALT 2A & 2B)

SCALE 3/8" = 1'-0"



PROPOSED BRIDGE TYPICAL SECTION (ALT 2A & 2B)

SCALE 3/8" = 1'-0"

MATERIAL TOLERANCES

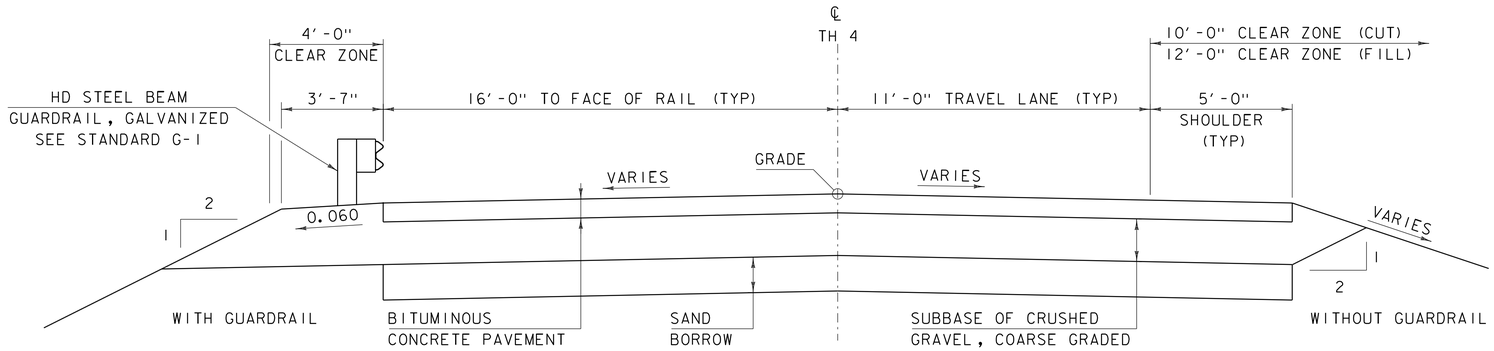
(IF USED ON PROJECT)

SURFACE	
- PAVEMENT (TOTAL THICKNESS)	+/- 1/4"
- AGGREGATE SURFACE COURSE	+/- 1/2"
SUBBASE	+/- 1"
SAND BORROW	+/- 1"

PROJECT NAME: HIGHGATE
PROJECT NUMBER: BO 1448(43)

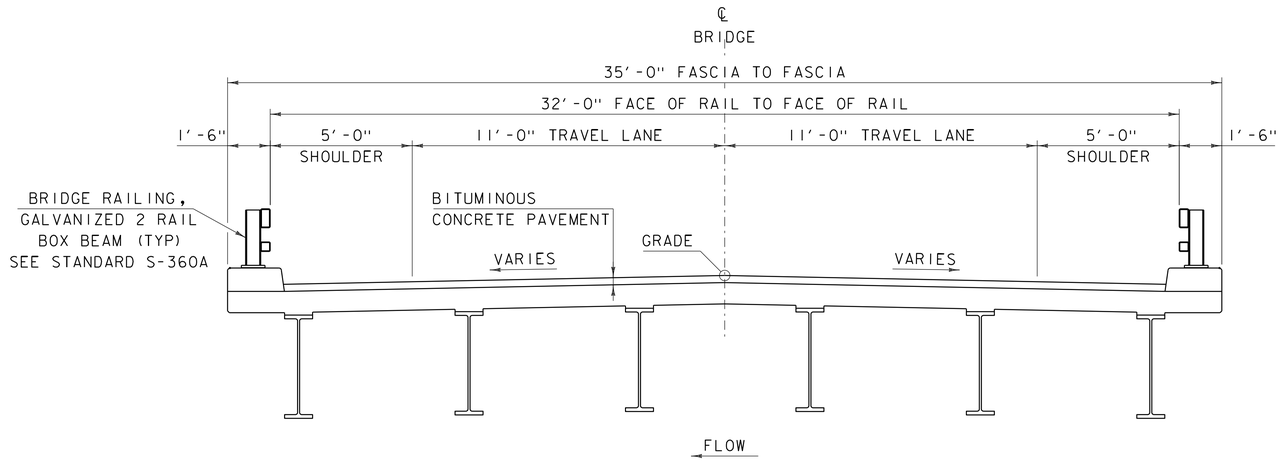
FILE NAME: 98j378/s98j378typ.dgn
PROJECT LEADER: C.P.WILLIAMS
DESIGNED BY: T.FILLBACH
TYPICAL SECTIONS

PLOT DATE: 14-NOV-2013
DRAWN BY: D.D.BEARD
CHECKED BY: ------



TOWN PROPOSED TH 4 TYPICAL SECTION (ALT 2C)

SCALE 3/8" = 1'-0"



TOWN PROPOSED BRIDGE TYPICAL SECTION (ALT 2C)

SCALE 3/8" = 1'-0"

MATERIAL TOLERANCES

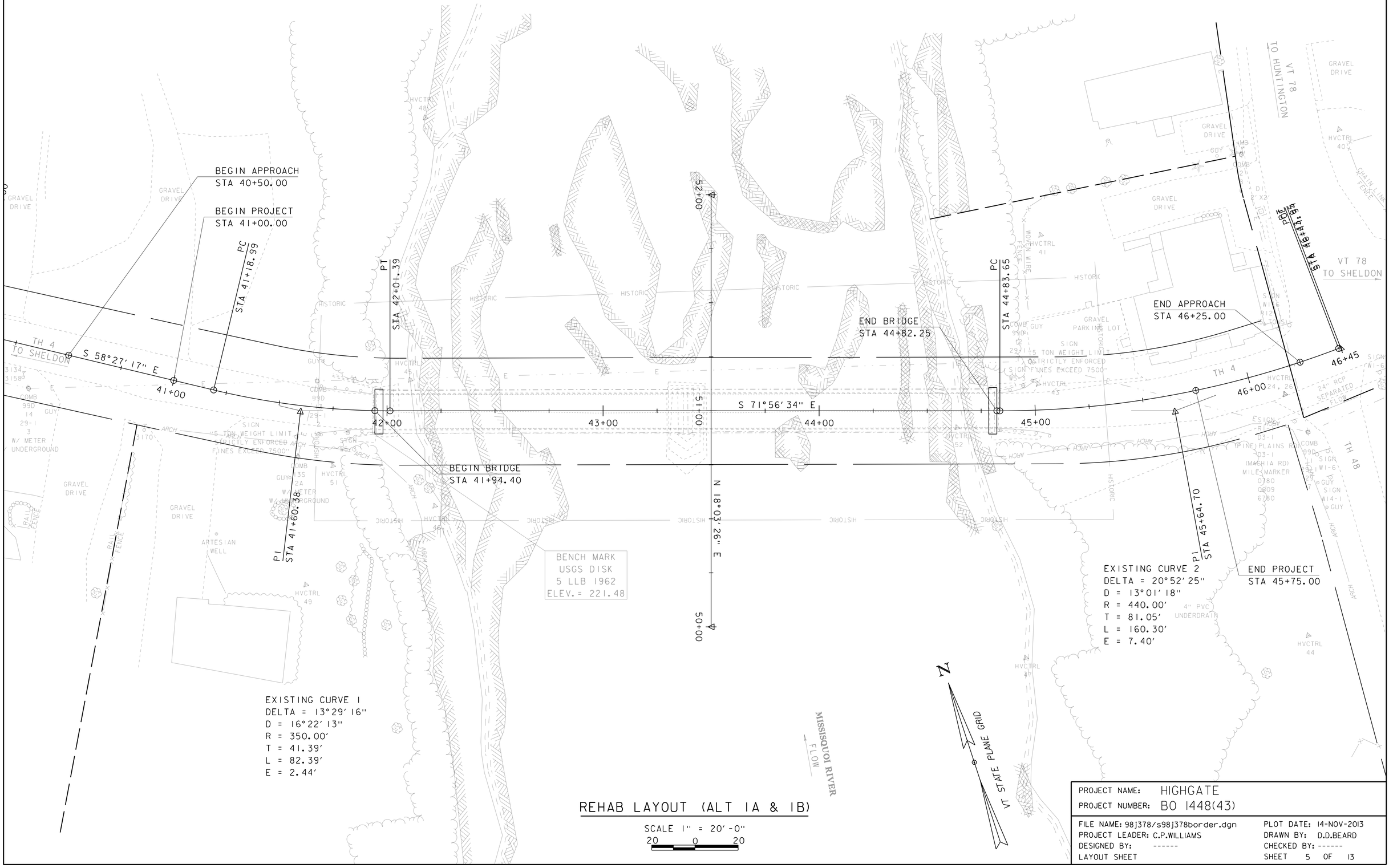
(IF USED ON PROJECT)

SURFACE	
- PAVEMENT (TOTAL THICKNESS)	+/- 1/4"
- AGGREGATE SURFACE COURSE	+/- 1/2"
SUBBASE	+/- 1"
SAND BORROW	+/- 1"

PROJECT NAME: HIGHGATE
PROJECT NUMBER: BO 1448(43)

FILE NAME: 98j378/s98j378typ.dgn
PROJECT LEADER: C.P.WILLIAMS
DESIGNED BY: T.FILLBACH
TYPICAL SECTIONS

PLOT DATE: 14-NOV-2013
DRAWN BY: D.D.BEARD
CHECKED BY: ------

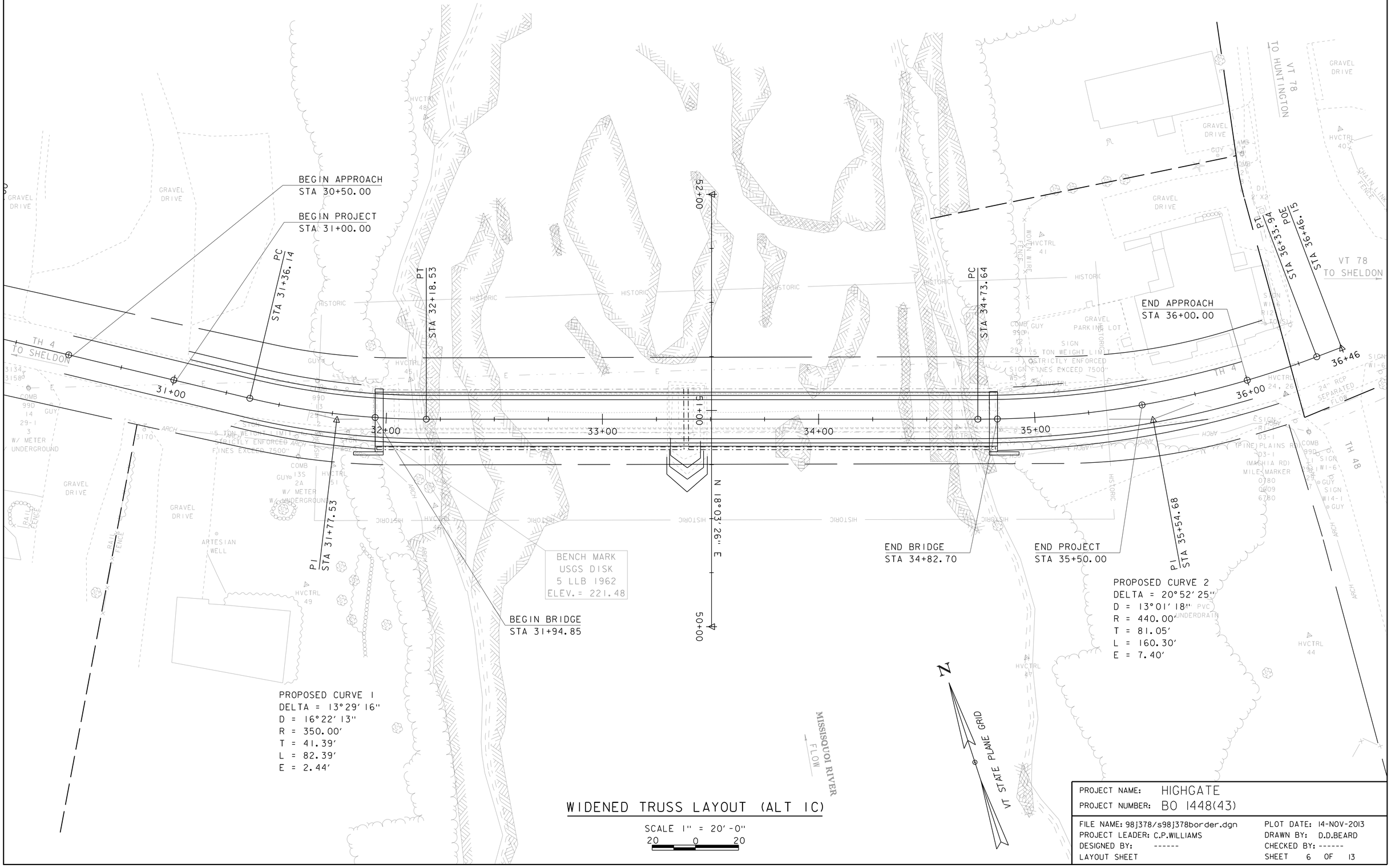


REHAB LAYOUT (ALT 1A & 1B)

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME:	HIGHGATE
PROJECT NUMBER:	BO 1448(43)
FILE NAME: 98j378/s98j378border.dgn	PLOT DATE: 14-NOV-2013
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
LAYOUT SHEET	SHEET 5 OF 13



WIDENED TRUSS LAYOUT (ALT IC)

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

PROJECT NAME:	HIGHGATE
PROJECT NUMBER:	BO 1448(43)
FILE NAME: 98j378/s98j378border.dgn	PLOT DATE: 14-NOV-2013
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
LAYOUT SHEET	SHEET 6 OF 13

BEGIN APPROACH
STA 20+25.00=
STA 70+25.00

BEGIN PROJECT
STA 20+50.00=
STA 70+50.00

PROPOSED WB CURVE 1
DELTA = 13°13'36"
D = 16°22'13"
R = 350.00'
T = 40.58'
L = 80.80'
E = 2.34'

PROPOSED WB CURVE 2
DELTA = 20°52'25"
D = 16°22'13"
R = 350.00'
T = 64.47'
L = 127.51'
E = 5.89'

BEGIN BRIDGE
STA 22+00.80=
STA 71+94.50

END BRIDGE
STA 24+87.00=
STA 74+80.60

PROPOSED EB CURVE 1
DELTA = 14°28'09"
D = 28°38'52"
R = 200.00'
T = 25.39'
L = 50.51'
E = 1.60'

PROPOSED EB CURVE 2
DELTA = 27°57'25"
D = 28°38'52"
R = 200.00'
T = 49.79'
L = 97.59'
E = 6.10'

PROPOSED EB CURVE 3
DELTA = 20°52'25"
D = 28°38'52"
R = 200.00'
T = 36.84'
L = 72.86'
E = 3.36'

BENCH MARK
USGS DISK
5 LLB 1962
ELEV. = 221.48

END PROJECT
STA 26+12.22=
STA 76+00.00

END APPROACH
STA 26+37.32=
STA 76+25.00

REHAB W/ SECOND BRIDGE LAYOUT (ALT ID)

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

PROJECT NAME:	HIGHGATE
PROJECT NUMBER:	BO 1448(43)
FILE NAME: 98j378/s98j378border.dgn	PLOT DATE: 14-NOV-2013
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
LAYOUT SHEET	SHEET 7 OF 13

BEGIN APPROACH
STA 10+50.00

BEGIN PROJECT
STA 11+00.00

PC
STA 11+18.99

PT
STA 12+01.39

BEGIN BRIDGE
STA 12+00.00

℄ PIER
STA 13+41.25

END BRIDGE
STA 14+82.50

PC
STA 14+83.65

PT
STA 16+43.95

VT 78
TO HUNTINGTON

VT 78
TO SHELDON

TH 4
TO SHELDON

TH 4

TH 4B

11+00

12+00

13+00

14+00

15+00

16+00

16+45

52+00

50+00

N 18°03'26" E

PI
STA 11+60.38

PI
STA 15+64.70

END PROJECT
STA 15+75.00

END APPROACH
STA 16+25.00

BENCH MARK
USGS DISK
5 LLB 1962
ELEV. = 221.48

PROPOSED CURVE 1
DELTA = 13°29'16"
D = 16°22'13"
R = 350.00'
T = 41.39'
L = 82.39'
E = 2.44'

PROPOSED CURVE 2
DELTA = 20°52'25"
D = 13°01'18"
R = 440.00'
T = 81.05'
L = 160.30'
E = 7.40'

MISSISQUOI RIVER
FLOW

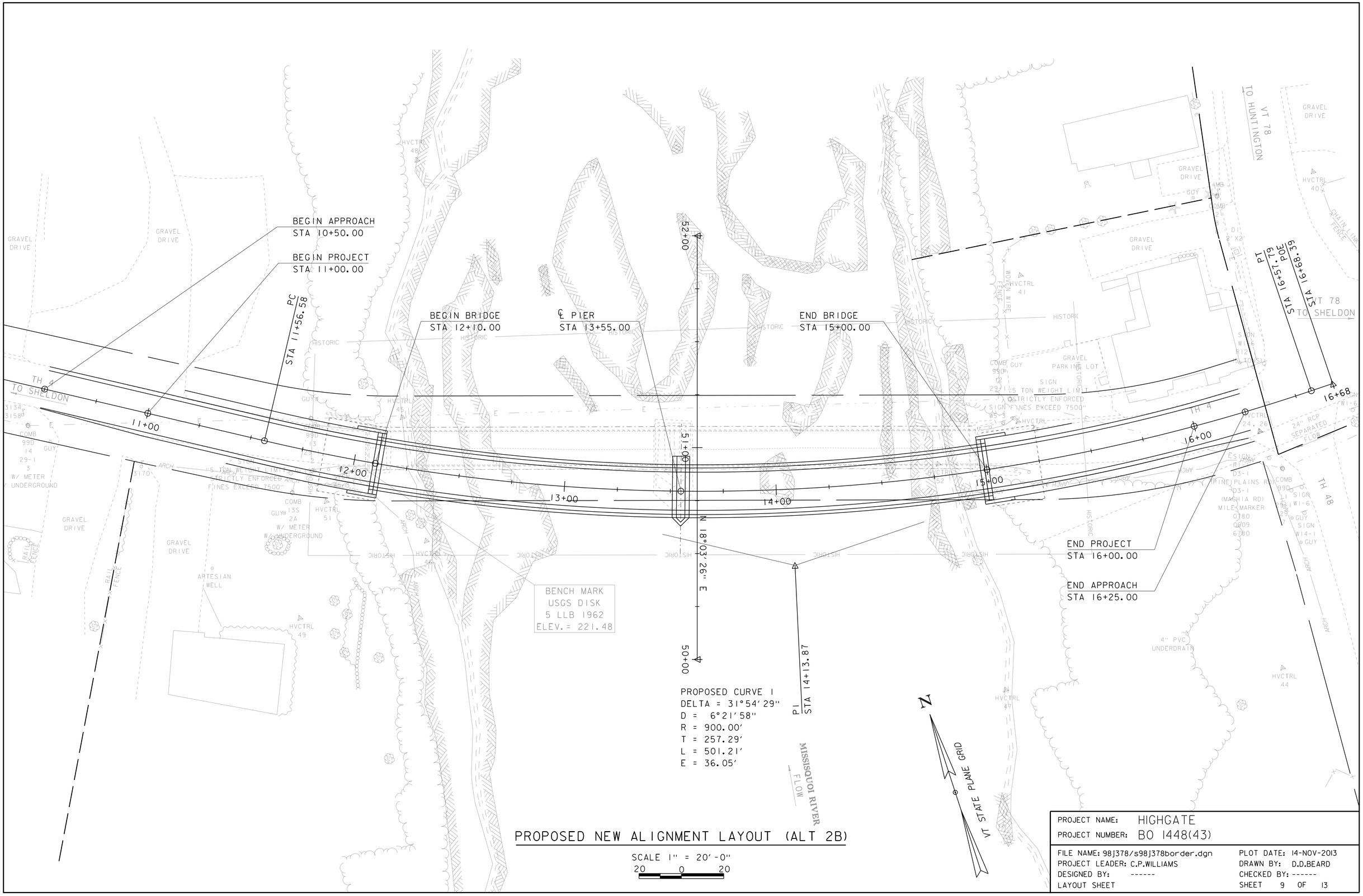
N

VT STATE PLANE GRID

PROPOSED NEW BRIDGE LAYOUT (ALT 2A)

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

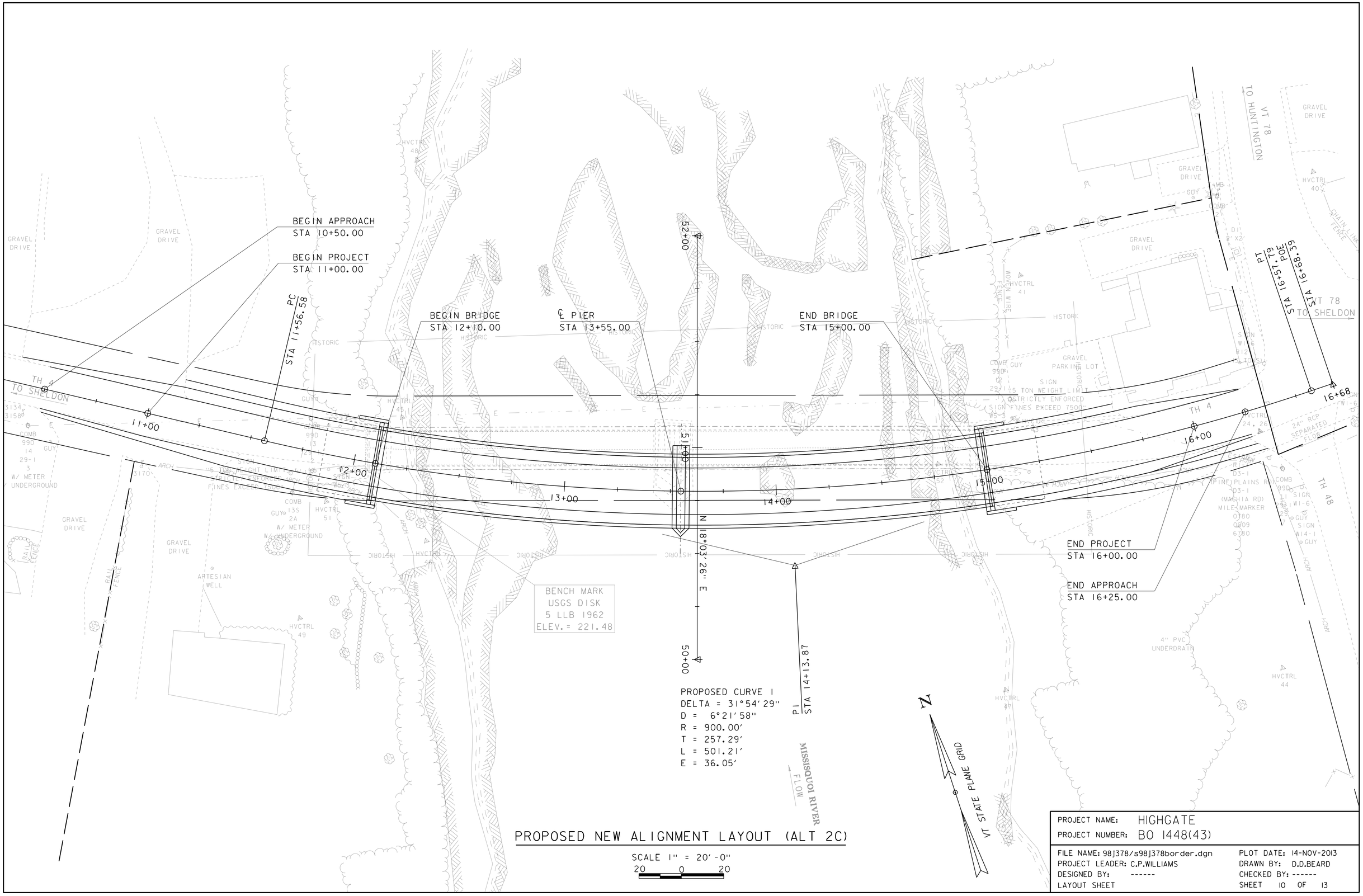
PROJECT NAME:	HIGHGATE
PROJECT NUMBER:	BO 1448(43)
FILE NAME: 98j378/s98j378border.dgn	PLOT DATE: 14-NOV-2013
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
LAYOUT SHEET	SHEET 8 OF 13



PROPOSED NEW ALIGNMENT LAYOUT (ALT 2B)

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

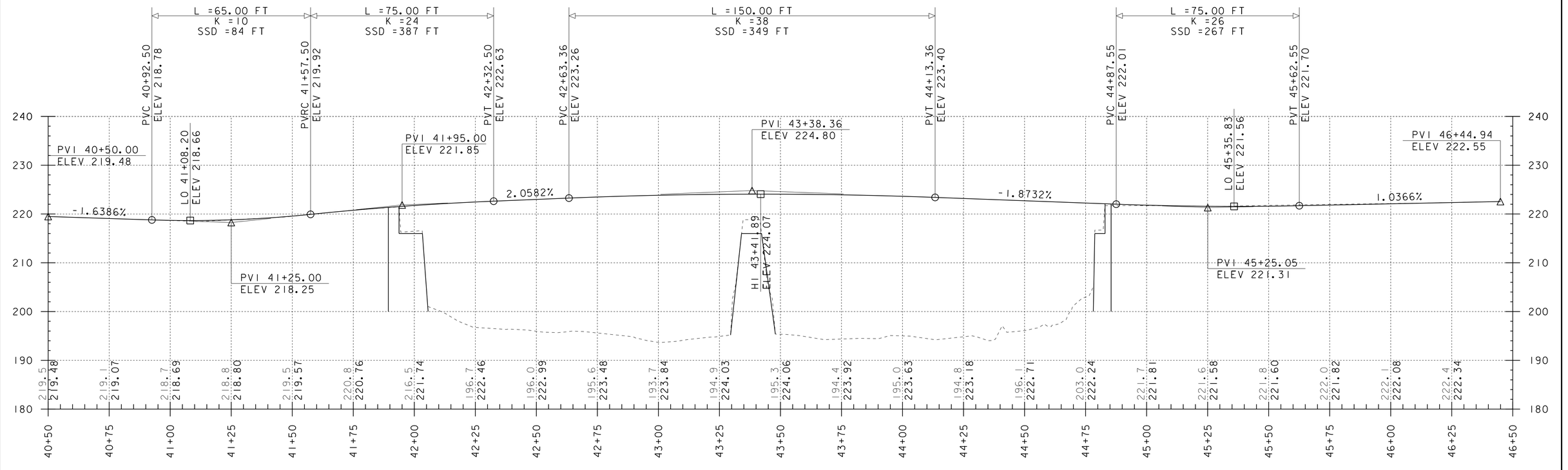
PROJECT NAME:	HIGHGATE
PROJECT NUMBER:	BO 1448(43)
FILE NAME: 98j378/s98j378border.dgn	PLOT DATE: 14-NOV-2013
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
LAYOUT SHEET	SHEET 9 OF 13



PROPOSED NEW ALIGNMENT LAYOUT (ALT 2C)

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

PROJECT NAME:	HIGHGATE
PROJECT NUMBER:	BO 1448(43)
FILE NAME: 98j378/s98j378border.dgn	PLOT DATE: 14-NOV-2013
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
LAYOUT SHEET	SHEET 10 OF 13



TH 4 EXISTING PROFILE (ALT IA, IB, IC & ID)

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

NOTE:

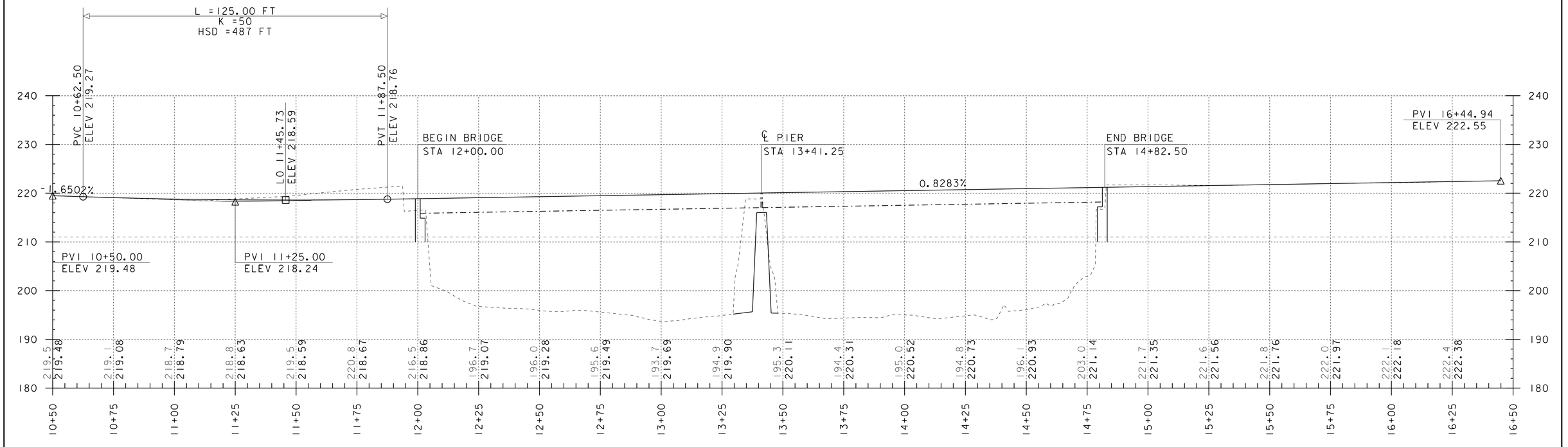
GRADES SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG ℄

GRADES SHOWN TO THE NEAREST HUNDREDTH ARE FINISH GRADE ALONG ℄

PROJECT NAME: HIGHGATE
PROJECT NUMBER: BO 1448(43)

FILE NAME: 98j378/s98j378profile.dgn
PROJECT LEADER: C.P.WILLIAMS
DESIGNED BY: ------
PROFILE SHEET

PLOT DATE: 27-NOV-2013
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 11 OF 23



TH 4 PROPOSED PROFILE (ALT 2A)

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

NOTE:

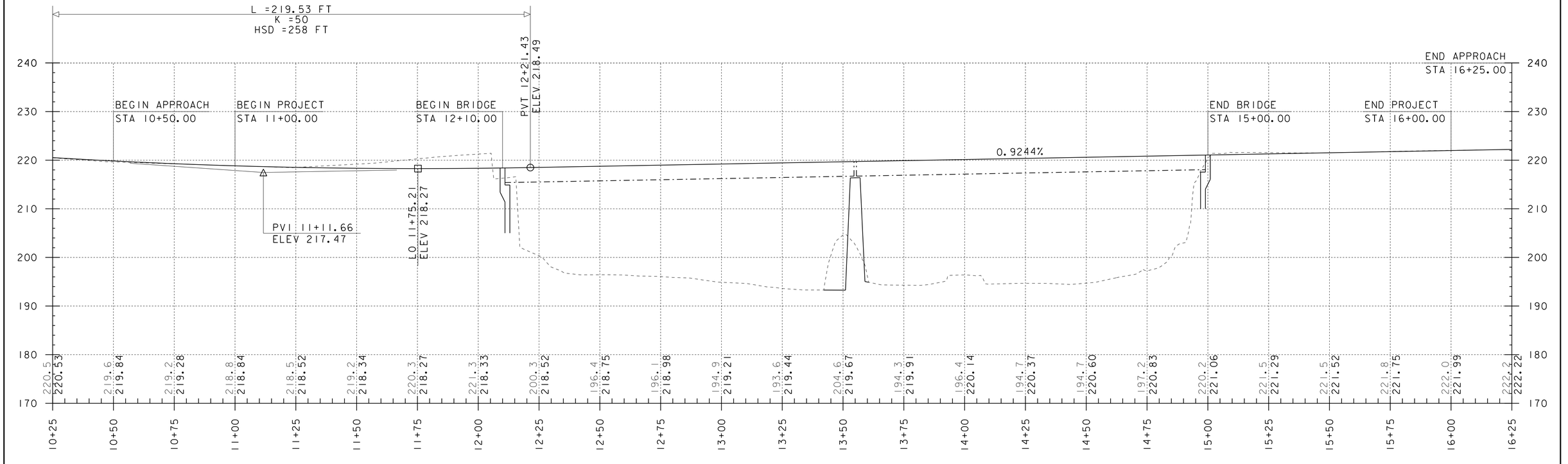
GRADES SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG ℄

GRADES SHOWN TO THE NEAREST HUNDREDTH ARE FINISH GRADE ALONG ℄

PROJECT NAME: HIGHGATE
PROJECT NUMBER: BO 1448(43)

FILE NAME: 98j378/s98j378profile.dgn
PROJECT LEADER: C.P.WILLIAMS
DESIGNED BY: ------
PROFILE SHEET

PLOT DATE: 27-NOV-2013
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 12 OF 23



TH 4 NEW ALIGNMENT PROFILE (ALT 2B & 2C)

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: HIGHGATE
PROJECT NUMBER: BO 1448(43)

FILE NAME: 98j378/s98j378profile.dgn
PROJECT LEADER: C.P.WILLIAMS
DESIGNED BY: ------
PROFILE SHEET

PLOT DATE: 14-NOV-2013
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 12 OF 13

DRAGON, DAVID M. & JACQUELINE

MACHIA, DUSTIN & CHAD

MACHIA, RONALD & CHERYL

LAPLANT, NANCY

BOUSQUET, ARTHUR & LEMNAH, LEORA

SWEENEY, MARCIA MAE

VT 78 TO HUNTINGTON

VT 78 TO SHELDON

TH 4 TO SHELDON

TH 4

TH 48

11+00 12+00 13+00 14+00 15+00 16+00

51+00 52+00 50+00

N 18°03' 26" E

325'-0"

BENCH MARK
USGS DISK
5 LLB 1962
ELEV. = 221.48

TEMPORARY BRIDGE CONCEPTUAL LIMIT

TEMPORARY BRIDGE CONCEPTUAL LIMIT

MISSISQUOI RIVER FLOW

VT STATE PLANE GRID

N

GRAVEL DRIVE

GRAVEL PARKING LOT

HISTORIC

HVCTRL 45 46 47 48 49 51 52

COMB 99D 14 29-1 3 W/ METER UNDERGROUND

COMB 99D 13 12 2 W/ METER UNDERGROUND

COMB 99D 13S 2A W/ METER UNDERGROUND

COMB GUY 99D 12 29-15 TON WEIGHT LIMIT STRICTLY ENFORCED SIGN FINES EXCEED 7500

SIGN W5-4 W13-1P

SIGN W13-1P 15 TON WEIGHT LIMIT STRICTLY ENFORCED SIGN FINES EXCEED 7500

SIGN W13-1P 15 TON WEIGHT LIMIT STRICTLY ENFORCED SIGN FINES EXCEED 7500

SIGN W3-3 W7-1P MACHIA RD MILE MARKER 0.80 0.09 6780

SIGN W14-1 GUY

GUY

WOVEN WIRE FENCE

CHAIN LINK FENCE

RAIL FENCE

ARTESIAN WELL

4" PVC UNDERDRAIN

24" RCP SEPARATED FLOW

DI 2' X2'

UPSTREAM TEMPORARY BRIDGE LAYOUT

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME:	HIGHGATE
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FILE NAME: 98j378/s98j378border.dgn	PLOT DATE: 14-NOV-2013
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
UPSTREAM TEMPORARY BRIDGE LAYOUT SHEET	SHEET 13 OF 13