STATE OF VERMONT
AGENCY OF TRANSPORTATION

Scoping Report

FOR

Killington BF 020-2(42)

US ROUTE 4, BRIDGE 33 over Ottauquechee River

March 9, 2015

I. Contents

I. Site Information

The bridge is located on US Route 4 in the Town of Killington, near a secondary access to the Killington Ski Area, approximately 1.0 mile west of the intersection of US Route 4 with VT Route 100S in the Town of Bridgewater. 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 Principal Arterial
Bridge Type	CIP Concrete Deck on Rolled Steel Beams
Bridge Span	67 feet
Year Built	1956
Ownership	State of Vermont

Need

The following is a list of the deficiencies of Killington Bridge 33 and US Route 4 in this location.

1. The deck is in poor condition with a deck rating of 4. There are concerns with full depth holes occurring in the near future. The bridge is considered "structurally deficient" overall.

2. The shoulder width is substandard in the roadway and on the bridge.

3. The project location has been identified as a High Crash Location. One fatality and 10 crashes have occurred from 2006 to 2012 in the project area encompassing mile markers (MM) 7.26 to 7.56. The bridge is located between MM 7.51 and 7.53. Causes of crashes are difficult to analyze in terms of roadway and bridge characteristics. Several crashes have occurred due to failure to stop for left-turning traffic. Stopping sight distances do not appear to be a problem and corner sight distances have been measured and found to meet standards.

Traffic

A traffic study of this site was performed by the Vermont Agency of Transportation. The traffic volumes are projected for the years 2017 and 2037.

TRAFFIC DATA	2017	2037
ADT	5,600	5,900
DHV	780	820
ADTT	670	1000
%T	10.6	15.4
%D	58	58

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 > 5000 and a design speed of 50 mph.

Design Criteria	Source	Existing Condition	Minimum Standard	Comment
Approach Lane and Shoulder Widths	VSS Table 3.3	12'/5.5' (35')	12'/10' (44')[1,2]	Substandard
Bridge Lane and Shoulder Widths	VSS Table 3.3	12'/2.9' (29.8')	12'/10' (44')[1,2]	Substandard
Clear Zone Distance	VSS Table 3.4	Unshielded utility pole at approx. sta. 40+30 rt	20' fill / 12' cut 1:3, 14' cut 1:4	Substandard
Banking	VSS Section 3.13	Varies - Some adverse slopes exist	8% (max), 6% (max) at side roads	Substandard
Speed	VSS Section 3.3	50 mph (Posted)	50 mph (Design)	
Horizontal Alignment	AASHTO Green Book Table 3-10b	R=2030' , Bridge located approximately 30 ft. beyond PT	A 5% bank is appropriate for a 2030ft. radius	
Vertical Grade	VSS Table 3.5	Bridge located on a 0.2268% grade	7% (max) for mountainous terrain	
K Values for Vertical Curves	VSS Table 3.1	Profile is straight	110 crest / 90 sag	
Vertical Clearance Issues	VSS Section 3.8	None noted	16'-3" (min)	
Stopping Sight Distance	VSS Table 3.1	Does not appear to be limited by bridge.	400'	
Bicycle/Pedestrian Criteria	VSS Table 3.7	2.9 ft.	5' Shoulder[3]	
Bridge Railing	Structures Manual Section 13	Two rail curbed mounted box beam	TL-4	
Hydraulics	VTrans Hydraulics Section	Passes Q_{50} storm event with 1.3 ft. freeboard	Pass Q_{50} storm event with 1.0' of freeboard	
Structural Capacity	SM, Ch. 3.4.1	Structurally Deficient	Design Live Load: HL-93	Substandard

[1] Table 3.3 lists 12'/8' as minimum lane and shoulder widths, but states that 11' may be used where alignment and safety records indicate a satisfactory condition. Since the project location is listed as a high crash location, the 1' lane reduction will not be taken.

[2] Table 3.3 requires two feet to be added to shoulder width in guard rail areas where DHV is over 400. This applies to bridge and approaches only for this project.

[3] Five feet includes an additional foot required for shoulders on bridges or where the percentage of trucks is > 10%. This is exceeded by the ten feet required by Table 3.3.

Inspection Report Summary

Deck Rating	4 Poor
Superstructure Rating	7 Good
Substructure Rating	7 Good
Channel Rating	6 Satisfactory

From the Structure Inspection, Inventory, and Appraisal Sheet:

"05/16/13 Deck is in poor condition & full depth hole is highly likely at mid span. Deck needs replacement soon. MJK SH

11/21/11 Irene damage along channel and rip rap needed. Channel dropped from 7 to 4. FRE,JDM

08/19/11 Deck soffit continues to deteriorate mainly at mid span with moderate to heavier spalling and delams in each bay. Structure is a good candidate for full deck replacement as full depth failures are possible. MK & NV

04/22/09 Structure's in satisfactory condition overall. However the concrete deck continues to deteriorate and soffit has areas of exposed rebar. Areas of large delams in localized spots. Full depth failures are possible. Structure would be a good candidate for deck replacement. MJK"

Hydraulics

From Preliminary Hydraulics Report (PHR):

"The structure is considered to be hydraulically adequate because there is 1.3' of freeboard at Q_{50}. In fact, all flows up to Q_{100} pass through the structure with no roadway overtopping". Hydraulic standards require a minimum of 1 foot of freeboard for the Q_{50} discharge for Principal Arterials.

The existing skew is approximately 0 degrees. In a separate memo, the bank full width (BFW) is identified as approximately 53 ft. The existing low beam elevation has been established to be 1155.4 ft., and recommended low beam elevation should not be lower than 1155 ft.

It was assumed in the PHR that any new bridge would be constructed on the current alignment and grade. Therefore no specific recommendations for spans and low beams were included, but it was stated in supporting data that the existing configuration was satisfactory if the existing substructures and river protection remain. The toe to toe distance and abutment clear span should not be reduced over the current dimensions.

Utilities

<u>Underground:</u> There is underground fiber optic telephone cable on the south side of US Route 4 on both ends of the bridge. This cable comes up out of the ground to cross the river over head south of the bridge.

There is an abandoned private sewer force main (Sunrise Homeowners Association) underneath and attached to the bridge. This can be removed during the project.

<u>Aerial:</u> There are overhead electric and communication utility lines passing by the project on the upstream side. Some of these utility lines cross the road just west of the project. If a temporary

bridge is used for this project, upstream or downstream, aerial utility relocation will be required. Otherwise, it is expected that no relocation of utilities will be required.

Right Of Way

The existing Right-of-Way is shown on the Layout sheet. The width is not constant, but seems to be a minimum of 8 rods (132 ft) west of the bridge, and 9 rods east of the bridge. The Town of Killington has indicated that 3 rods is appropriate for the nearby town highway Rights-of-Way.

Resources

Biological:

The resources present at this project are shown on the Existing Conditions Layout Sheet, and are as follows:

<u>Wetlands/Watercourses</u>

There are mapped Class II wetlands in three quadrants of the project area. These wetlands are emergent/scrub shrub/forested wetlands with dominant vegetation being Speckled Alder, Elm, Sensitive Fern, Meadowsweet, and White Pine. Some upstream wetlands appear to have been filled in over time.

The Ottauquechee River is an Essential Fish Habitat that supports a variety of aquatic organisms and fish species. The design of the new structure will need to accommodate aquatic organism passage in accordance with VT Fish and Wildlife AOP Guidelines. It would be beneficial as the project moves forward to receive feedback from the fisheries biologist. Incorporating a wildlife shelf should be considered in the design phase if the full bridge replacement alternative is chosen. The US Army Corps of Engineers and the State Agency of Natural Resource and Department of Environmental Conservation would regulate any activities below ordinary high water and adjacent wetlands. Efforts to minimize water quality impacts during construction will need to be evaluated as the project design moves forward.

The estimated extent of the wetlands is shown on a map contained in the Appendix.

<u>Wildlife Habitat</u>

The project corridor ranks in the range of 4 on the wildlife habitat regional linkage analysis. Consideration should be made toward providing a wildlife shelf within the existing crossing. Rip rap should not be the surface of the shelf.

<u>Rare, Threatened and Endangered Species</u>

There are no federal or state mapped threatened or endangered plants or animals within the project corridor and no impacts are anticipated.

<u>Agricultural</u>

There are no Prime Agricultural soils within the project area.

Archaeological:

Archaeological sensitivity was identified within all four quadrants of the project area. These areas can be seen in the Appendix.

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

Hazardous Materials:
There are no known hazardous materials in the project area.

Stormwater:
There are no stormwater concerns for this project.

II. Maintenance of Traffic

The Vermont Agency of Transportation reviews each new project to determine suitability for the Accelerated Bridge Program, which focuses on faster delivery of construction plans, permitting, and Right-of-Way, as well as faster construction of projects in the field. One practice that will help in this endeavor is closing bridges for portions of the construction period, rather than providing temporary bridges. In addition to saving money, the intention is to minimize the closure period with faster construction techniques and incentives to contractors to complete projects sooner. 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 provides enhanced safety for the workers and the travelling public while maintaining project quality.

Option 1: Off-Site Detour

This option would close the bridge and reroute traffic to an off-site detour. Utilizing State Routes, there are two similar routes that are suitable for truck traffic which are approximately the same distance. One is via VT 100 southward into the town of Ludlow, west and north on VT 103 to Clarendon, north on US 7 to Rutland, and east on US 4 back to the project area. The end-to-end distance around this State-signed detour would be approximately 47.4 miles. Another detour could be east from the project site on US 4 into the village of Woodstock, then north on VT 12 through Barnard, west on VT 107, south on VT 100, and back to US 4 in Killington. The distance on this detour is approximately 50.2 miles. The through route is estimated to be 6.0 miles.

There is essentially one local bypass if US Route 4 is closed to through traffic, and it still impacts the construction site due to its location near the work zone. Local bypass routes are not signed, or official, detour routes and are not appropriate for all traffic that needs to detour around a site. Because local bypass routes are comprised of public roads that circumvent the road closure in a shorter distance than the official detour, they may see an increase in traffic from passenger cars as locals use them during the closure.

The obvious local bypass route is Mission Farm Road, TH-38, a class 3 road. The Town has expressed concern over the impact of this road if it is overused as a bypass. A bypass route on this road would be approximately 1.6 miles end to end. Although it is paved, this Town road is narrow and it is assumed that it does not meet Vermont State Standards for several parameters. It is posted for 25 mph. This road would not be appropriate for trucks nor for the entire volume of traffic that typically travels through the project site.

Note that this area has been identified as a High Crash Location, but it is believed that the crashes are not due to the shoulder widths on the bridge and roadway.

Safety is a major consideration during the development and construction of a project. Not only is the safety of the travelling public and construction workers affected by the construction activities, but also the ability of fire and rescue personnel to reach all areas of a town during construction. Thus, any bypass routes are evaluated to determine if they may be used by service vehicles and first responders to respond to emergencies during a road closure. There are two fire stations in the Town of Killington. One is located at the intersection of TH-1 (River Road) and US Route 4, and the other is located on TH-2 (Killington Road). There is mutual aid coverage with the Town of Bridgewater. TH-38 would be appropriate for emergency use, but would increase response time slightly.

An analysis of the traffic impacts caused by this project was completed by the University of Vermont in February 2015, using what is referred to as the “Vermont Travel Model” or the “Statewide Model”. The model indicated that the closure and detour method of traffic maintenance, on average and considering all traffic statewide, would not increase delay times for regional traffic using this bridge. On the other hand, maintaining traffic through the work zone by phasing would increase delays. Obviously, those few whose points of origin and destination lie closer to the bridge will be most affected by a closure.

Option 2: Temporary Bridge

A one lane bridge with alternating one-way traffic would have stop bars approximately 600 ft. apart to include the two Town roads intersecting with US Route 4, Mission Farm Road (TH-38) and East Mountain Road (TH-15) and the driveway access to a parking lot owned by AMSC Killington, LLC. It is unlikely that an ADT of 5600 and a DHV of 780 would give a satisfactory level of service with this configuration. Therefore, only a two lane temporary bridge would be considered. Both upstream and downstream locations were considered for a temporary bridge. A temporary bridge on the south side of US Route 4 (downstream) would require additional temporary Right-of-Way acquisition. A temporary bridge on either side would impact an archaeologically sensitive area and Class II wetlands.

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

Temporary Bridge Layout Sheets can be seen in the Appendix.

Option 3: Phased Construction

Phased construction is the maintenance of one lane for traffic on the existing bridge while building one lane at a time of the proposed structure. This allows keeping the road open during construction, while having minimal impacts to resources and adjacent property owners.

While the time required to develop a phased construction project would remain the same, the time required to complete a phased construction project increases because some of the construction tasks have to be performed multiple times. In addition to the increased design and construction costs mentioned above, the costs also increase for phased construction because of the inconvenience of working around traffic and the effort involved in coordinating the joints between the phases. Another negative aspect of phased construction is the decreased safety of the workers and vehicular traffic, which is caused by increasing the proximity and extending the duration that workers and moving vehicles are operating in the same confined space. Phased construction is usually considered when the benefits include reduced impacts to resources and decreased costs and development time by not requiring the purchase of additional Right-of-Way.

A project done using phased construction will cause delays for all who transit through the work zone, more an entire construction season. The stop bars for a phased project could be considerably closer together than for a temporary bridge, which allows traffic to move through the work zone more quickly, increasing the capacity of the temporary lane. The level of service for those trying to exit Mission Farm Road or East Mountain Road would be lowered, but regular travelers on those routes would have the option of exiting at the other end of those respective roads.

Statewide Model Analysis

To analyze the traffic impacts from short term road closure as compared to phased construction, the "Vermont Travel Model" was applied by the University of Vermont's Transportation Research Center. A travel demand model includes elements such as roadway and transit network, and population and employment date to calculate the expected demand for transportation facilities. These models are used to estimate travel behavior and travel demand for a specific future time frame based on a number of assumptions. The following is a summary of the analysis:

"The analysis consisted of a series of Model runs with the link representing this bridge (1) completely closed, or (2) reduced to 50 of its full operating capacity, simulating the effects of either complete closure or lane reduction of the bridge during the upcoming construction project. In addition, a select-link analysis was performed with this link at full capacity to better understand the communities that make use of the bridge on a normal day in Vermont.

The indication of the select-link analysis is that the bridge is primarily used by regional traffic between Rutland, Killington, and the urban areas (UAs) of northern New England that are accessed via I-89 across Vermont's eastern border with New Hampshire. The second most common use of the bridge is for local traffic between Bridgewater, Killington, Woodstock, and Plymouth. Finally, traffic passing through Vermont between northern New England and Ticonderoga, NY also makes significant use of the bridge.

In the Bridge Active-Construction Scenario, the impacts of the construction will outweigh the benefits by 1.4 vehicle-hours of travel. In the Bridge Construction-Closure Scenario, the benefits will completely counteract the impacts on travel, resulting in no net effect. Therefore, the Bridge Construction-Closure Scenario is preferable.

However, it is important to note that both scenario Model runs assume that all travelers have perfect information about the status of the network. This means that the information about the closure must be communicated throughout the region, possibly even into New Hampshire, in order to alleviate the effects of the construction on individual users, and bring the new network structure into equilibrium.

The somewhat paradoxical finding of this application is due to the relatively highly-congested conditions normally found on the U.S. Route 4 corridor, where the average daily volume-capacity ratio is 0.73 (1.00 is completely congested). This congestion is being somewhat alleviated when the bridge is under construction and many of those travelers choose a totally different route. This shift creates less congestion on other parts of U.S. Route 4, so the travelers who are still using it (because they do not need to use the bridge) experience faster travel times, and the increases in VHTs from the regional re-routing is counteracted."

III. Alternatives Discussion

Bridge 33 is structurally deficient with a deck rating of 4, and is also substandard for lane and shoulder widths. The existing channel configuration is rated 6, satisfactory. The bridge meets the hydraulic standard. Minor horizontal geometry deficiencies exist. The alternatives presented here are based on improvement of the condition of the bridge.

No Action

This alternative leaves the bridge in its current condition. A good rule of thumb for the "No Action" alternative is to determine whether the existing bridge can stay in place without any work being performed on it during the next 10 years. Given the poor rating on the deck, this bridge will require work within the next 10 years. From the standpoint of safety, economics, and convenience, this alternative is not recommended and will not be considered further.

Rehabilitation

The deck is most in need of attention on this bridge. The first consideration of a rehabilitation alternative would be to rectify the deck issues.

Deck Patching

The existing deck is rated a 4 ("poor"). The superstructure, referring to the rolled steel beams, is rated a 7 ("good"), and the existing substructure is rated a 7 ("good"). Deck patching would include removal of loose and deteriorating concrete, cleaning and possibly supplementing reinforcing steel, application of patching material to cracks and areas of section loss, and paving on the bridge and for a short distance on each approach to the bridge. The Bridge Inspection Report (attached) indicates that the existing bridge rail meets the current standard, but the approach rail does not. It would be reasonable to consider replacement of the existing bridge and approach rail to provide a bridge and approach rail that meets the current standard. Some characteristics of Superstructure Patching are as follows:

- Patching tends to accelerate the deterioration of the existing concrete that is in contact with the patching material, and thus offers an additional service life of only 10 years or less.
- The attachment of new rail to the old, deteriorating deck would be challenging.

- Much of the work would take place underneath the bridge with efforts required to avoid contamination of the river.
- This alternative leaves several substandard conditions in place, including substandard lane and shoulder widths, and roadway banking.
- After approximately 10 years, major work would be required.

Disadvantages seem to outweigh the benefits to this short-term fix. Deck patching alone will not be considered further.

Alternative 1: Deck Replacement

Included in the Deck Replacement option are: deck replacement, cleaning and painting of the superstructure, new bridge and approach rail, abutment crack and surface defect repair, and possibly improved protection of the channel banks in the area of the bridge (bank protection should not encroach further out into the waterway area). The existing curb to curb width on the bridge deck is slightly less than 30 ft. which is 12 ft. narrower than the standard. In placing a new deck on the existing superstructure, the standard lane and shoulder width can be improved slightly, but not brought up to standard. By increasing the deck overhang, a typical section of 4.33-12-12-4.33 can be provided. New bridge and approach railing would be installed.

Placing a new deck on the existing superstructure and substructure makes good economic sense because the superstructure and substructure are rated as 7 and in good condition. It is estimated that they would have approximately 40 years of service life left. Substandard horizontal approach roadway geometry and banking will not be significantly improved. Sight distance and geometry would be unchanged, thus any features affecting crash frequency would be unchanged. Traffic could be maintained by phasing or by a temporary bridge.

New Right of Way is not anticipated for this alternative.

Alternative 2: Superstructure Replacement

Even though the superstructure is in good condition, beam cleaning and repainting is included as part of a superstructure replacement alternative. Partly because it is likely that lead paint abatement procedures will be required, and partly because these operations are much easier and cheaper when done in the shop, it has been found that it is quicker and easier, and therefore not much more expensive, to replace the entire superstructure.

Since maintaining the substructures does not allow the opportunity to widen the superstructure significantly, this alternative would have the same typical section as the deck replacement, 4.33-12-12-4.33, and would maintain the existing bridge length and alignment. Banking and shoulder width deficiencies would not be corrected. Substructure work would include abutment crack and surface defect repair, as well as any bridge seat modifications required to accommodate the new superstructure. Traffic could be maintained by either phasing or a temporary bridge.

New Right of Way is not anticipated for this alternative.

Alternative 3: New Structure, 70 ft. span

For a new structure, an integral abutment bridge was considered. Improvements to the alignment of the roadway were also considered. Variables include:

a. Roadway Width

The current curb to curb width is 29.8 feet. This does not meet the minimum standard for a Rural Principal Arterial. Since a new bridge with an 80+ year life is being proposed, consideration was given to meeting all bridge geometry standards. However, the lane and shoulder widths on US Route 4 in this area are consistently 8'-12'-12'-8'. It is proposed that this typical section be provided to maintain consistency.

b. Span and Skew

The current clear span between faces of abutments is 65 ft. with 0 degrees skew. This is the minimum span acceptable to the Hydraulics staff for a new structure, and meets the estimated bank full width as well. Using an assumed wall thickness for integral abutments of 3 ft, and some margin for error, the distance between centerlines of bearing would be approximately 73 ft. Skew would remain at 0 degrees.

c. Horizontal Alignment

The existing roadway on the west approach is a horizontal curve with a radius of 2030 ft. The bridge is on a tangent. The shape of the existing roadway cross section west of the bridge is generally banked, with cross slope that is highly variable and sometimes banked adversely. On the east side of the bridge, the road is on a tangent and returns generally to a normal crown shape, although banking is less than the typical 2%. A new bridge would be built on the current horizontal alignment, with minor revisions to portions of the approach roadway banking to meet the standard for a 2030 ft. radius curve at 50 mph.

d. Vertical Alignment

The existing vertical alignment is satisfactory geometrically, at a constant slope of 0.2268 in the project area, and meets the hydraulic standard. The preliminary hydraulics report indicates that the recommended low beam elevation for this bridge configuration is 1155 ft. It is believed that the current banking on the bridge is less than required by the Vermont State Standards. A new bridge would be constructed in compliance with the banking standard, requiring the roadway to be raised approximately 1.5 ft. This would require extending the length of project to allow matching back in to existing conditions at the project approaches and additional work to match in to the two town roads and parking lot near the bridge.

e. Superstructure Type

The most common superstructure types for comparable spans in Vermont are steel beams/girders with concrete decks, or precast concrete. Steel beams and cast-in-place decks might be an economical solution if rapid construction is not chosen. Precast NEXT-D beams or Prefabricated Bridge Units (PBUs) could be used if a rapid construction technique is desired. NEXT Beam F type is not approved for use on VTrans projects at this time. The superstructures will be designed in a later phase of project planning.

f. Substructure Type

There is no visible bedrock in the location of the project. The original plans for this bridge indicate that it is founded on timber piles at depths of roughly 30-50 ft. As can be seen in the preliminary geotechnical report in the Appendix, the project site is underlain by glaciofluvial kame terrace deposits on top of glacial till. Because it appears that it is probably feasible to install piles, integral abutment foundations would be the preferred substructure type.

g. Maintenance of Traffic

Either a temporary bridge, phasing, or closure and off-site detour could be used for traffic during construction, depending on the alternative chosen.

New Right of Way is not anticipated for this alternative.

IV. Alternatives Summary

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

- Alternative 1a: Deck Replacement with Traffic Maintained by Phasing
- Alternative 1b: Deck Replacement with Traffic Maintained on Temporary Bridge
- Alternative 2a: Superstructure Replacement with Traffic Maintained by Phasing
- Alternative 2b: Superstructure Replacement with Traffic Maintained on Temporary Bridge
- Alternative 3a: New 73 ft. Structure with Traffic Maintained by Phasing
- Alternative 3b: New 73 ft. Structure with Traffic Maintained on Temporary Bridge.
- Alternative 3c: New 73 ft. Structure with Traffic Maintained on Off-Site Detour

V. Cost Matrix[1]

Killington BF 020-2(42)		Do Nothing	Alt 1a	Alt 1b	Alt 2a	Alt 2b	Alt 3a	Alt 3b	Alt 3c
			Deck Replacement		Superstructure Replacement		Full Bridge Replacement		
			Phasing	Temporary Bridge	Phasing	Temporary Bridge	Phasing	Temporary Bridge	Off-site Detour
COST	Bridge Cost	$0	$253,000	$230,000	$297,000	$270,000	$649,000	$590,000	$679,000
	Removal of Structure	$0	$42,000	$35,000	$46,000	$38,000	$84,000	$70,000	$70,000
	Roadway	$0	$209,000	$190,000	$220,000	$200,000	$425,000	$375,000	$320,000
	Maintenance of Traffic	$0	$27,000	$250,000	$27,000	$250,000	$60,000	$250,000	$55,000
	Construction Costs	$0	$531,000	$705,000	$590,000	$758,000	$1,218,000	$1,285,000	$1,124,000
	Construction Engineering + Contingencies	$0	$160,000	$211,000	$171,000	$220,000	$353,000	$373,000	$326,000
	Total Construction Costs w CEC	**$0**	**$691,000**	**$916,000**	**$761,000**	**$978,000**	**$1,571,000**	**$1,658,000**	**$1,450,000**
	Preliminary Engineering[2]	**$0**	**$160,000**	**$211,000**	**$191,000**	**$245,000**	**$305,000**	**$321,000**	**$281,000**
	Right-of-Way	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
	Total Project Costs	$0	$851,000	$1,127,000	$952,000	$1,223,000	$1,876,000	$1,979,000	$1,731,000
SCHEDULING	Project Development Duration[3]	NA	2 years	2 years	2 Years	2 Years	2 years	2 years	2 Years
	Construction Duration	NA	6 months	18 months	6 months	18 months	6 months	18 months	6 Months
	Closure Duration (If Applicable)	NA	NA	N/A	NA	NA	NA	N/A	10 Days
ENGINEERING	Typical Section - Roadway (feet)	35'	35'	35'	35’	35’	40'	40’	40’
	Typical Section - Bridge (feet)	3.9-11-11-3.9	5.33-11-11-5.33	5.33-11-11-5.33	5.33-11-11-53.3	5.33-11-11-5.33	8-12-12-8	8-12-12-8	8-12-12-8
	Geometric Design Criteria	Substandard width and banking, western approach	Substandard width and banking, western approach	Substandard width and banking, western approach	Substandard width and banking, western approach	Substandard width and banking, western approach	Substandard Width	Substandard Width	Substandard Width
	Traffic Safety	No Change	Improved	Improved	Improved	Improved	Improved	Improved	Improved
	Alignment Change	No	No	No	No	No	Vertical Change (Roadway raised approximately 1.5 feet at the bridge)		
	Bicycle Access	No Change	Improved	Improved	Improved	Improved	Improved	Improved	Improved
	Hydraulic Performance	Meets Standard	Meets Standard	Meets Standard	Meets Standard	Meets Standard	Meets Standard	Meets Standard	Meets Standard
	Pedestrian Access	No Change	Improved	Improved	Improved	Improved	Meets Standard	Meets Standard	Meets Standard
	Utility	No Change	No Change	Relocated	No Change	Relocated	No Change	Relocated	No Change
OTHER	ROW Acquisition	No	No	No	No	No	No	No	No
	Road Closure	No	No	No	No	No	No	No	Yes
	Design Life	<10 years	40 years		50 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] Project Development Durations are starting from the end of the Project Definition Phase.

VI. Conclusion

We recommend **Alternative 3c**; complete bridge replacement on the existing alignment, using integral abutments, while maintaining traffic on an off-site detour. A 10 day closure is proposed.

<u>Structure:</u>

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

- US Route 4 and Bridge 33 are part of the National Highway System. It is desired that the project be constructed to provide the maximum service life and maintain geometric consistency in the corridor.
- A superstructure replacement was considered until it was realized that the existing abutments are quite small, and not much "7" rated material is being lost. It seems reasonable that replacement of the timber piles be part of the project. The VTrans geotechnical engineering section is in support of the replacement of the substructures.

The Vermont State Standard calls for lane and shoulder widths of 10'-11'-11'-10'. However, the corridor consistently offers an 8'-12'-12'-8'typical section. It is felt that a consistent width in this area of highway is desirable. Therefore, an 8'-12'-12'-8' width is proposed. A design exception request is recommended to document this condition. Based on additional input from the hydraulics staff, it is understood that bank-full width intent will be met.

It is expected that the other geometric standards, including banking, can be fully met within the project limits on this full replacement alternative.

Consideration for wildlife connectivity and Aquatic Organism Passage is recommended. Feedback during subsequent design phases should be solicited from the fisheries biologist and other environmental specialists.

<u>Traffic Control:</u>

The first choice for method of traffic control is a closure with an off-site detour. The State detours described above are in the neighborhood of 50 miles long end-to-end, which is long for an AADT of 5600. A 10 day closure is proposed to minimize traffic impacts. As described above in the Off-Site Detour section, this project was modeled for impacts due to a detour condition, and again for a phased condition. It was understood from the model that the lesser adverse impact would be associated with the detour option. Periodic lane closures will be used two weeks preceding and following the closure, in preparation for the main portion of the work.

This method of traffic maintenance allows for reduced impacts to neighboring properties and resources, including wetlands and archaeologically sensitive areas. Emergency responders would still have access to all points with minimal delays.

Crucial to the success of a closure is public outreach and information. Traffic originating from out-of-state to the south will rely on publicity and signage to divert them onto alternate routes on a regional basis, so that the work area can be avoided without backtracking or traveling far out of the their way. The minimization of traffic disruption and reopening the bridge on time will be key measures of success for this project.

VII. Appendices

- A: Site Pictures
- B: Town Map
- C: Bridge Inspection Report
- D: Preliminary Hydraulics Report
- E: Preliminary Geotechnical Information
- F: Natural Resources Memo
- G: Archaeology Memo
- H: Historic Memo
- I: Local Response and Input
- J: Traffic Safety Discussions
- K: Statewide Travel Model Report
- L: Plans
    - Detour Route
    - Existing Conditions
    - Proposed Conditions
        - Typical Sections
        - Layout
        - Profile
        - Temporary Bridge Layouts
        - Phasing

Appendix A: Site Pictures

Bridge 33 Looking West

Bridge 33 Looking East

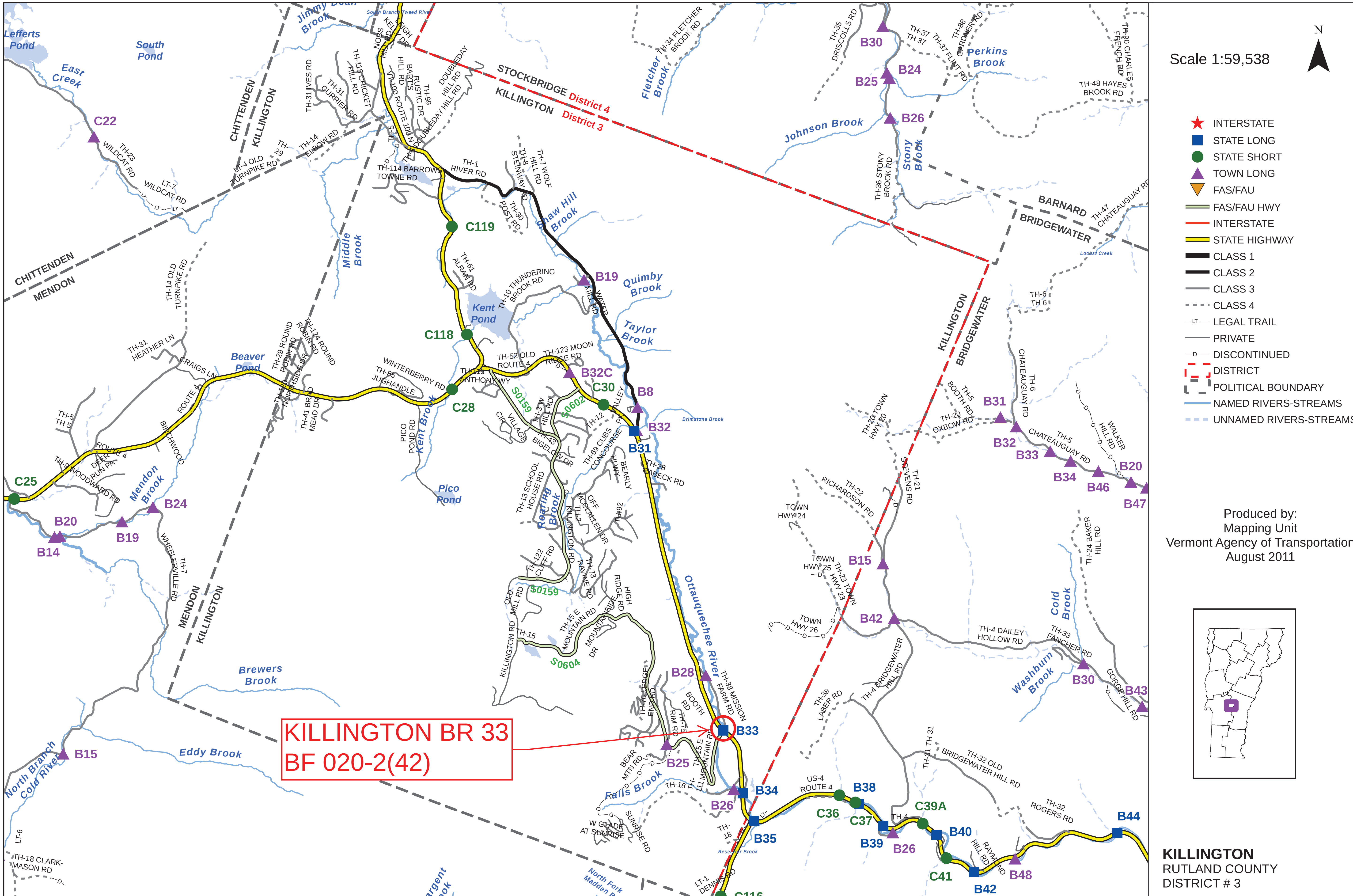
Ottauquechee River Looking Upstream

Ottauquechee River Looking Downstream

Deck Deterioration

Fascia Deterioration

Appendix B: Town Map



KILLINGTON BR 33
BF 020-2(42)
Scale 1:59,538
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
KILLINGTON
RUTLAND COUNTY
DISTRICT # 3
STOCKBRIDGE District 4
KILLINGTON District 3
CHITTENDEN
MENDON
KILLINGTON
BARNARD
BRIDGEWATER
Ottauquechee River
Kent Pond
Lefferts Pond
South Pond
Beaver Pond
Pico Pond
East Creek
Middle Brook
Shaw Hill Brook
Quimby Brook
Taylor Brook
Kent Brook
Roaring Brook
Mendon Brook
Brewers Brook
Eddy Brook
Falls Brook
North Branch Cold River
Johnson Brook
Perkins Brook
Stony Brook
Fletcher Brook
Cold Brook
Washburn Brook
C22
C25
C28
C30
C36
C37
C39A
C41
C116
C118
C119
B8
B14
B15
B19
B20
B24
B25
B26
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B31
B32
B32C
B33
B34
B35
B38
B39
B40
B42
B43
B44
B46
B47
B48
S0159
S0602
S0604
TH-38 MISSION FARM RD
US-4 ROUTE 4
ROUTE 100 N
TH-4 BRIDGEWATER HILL RD
TH-32 OLD BRIDGEWATER HILL RD
TH-32 ROGERS RD
TH-5 CHATEAUGUAY RD
TH-4 DAILEY HOLLOW RD
TH-33 FANCHER RD
TH-1 RIVER RD
TH-114 BARROWS TOWNE RD
TH-10 THUNDERING BROOK RD
TH-123 MOON RIDGE RD
TH-52 OLD ROUTE 4
WINTERBERRY RD
TH-23 WILDCAT RD
TH-14 OLD TURNPIKE RD
TH-31 HEATHER LN
TH-13 SCHOOL HOUSE RD
TH-15 E MOUNTAIN RD
TH-18 CLARK-MASON RD

Appendix C: Bridge Inspection Report

STRUCTURE INSPECTION, INVENTORY and APPRAISAL SHEET

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

Inspection Report for KILLINGTON **bridge no.:** 00033 **District:** 3

Located on: US 00004 ML **over** OTTAUQUECHEE RIV **approximately** 0.9 MI W JCT. VT.100 S **Owner:** 01 STATE-OWNED

CONDITION

Deck Rating: 4 POOR

Superstructure Rating: 7 GOOD

Substructure Rating: 7 GOOD

Channel Rating: 6 SATISFACTORY

Culvert Rating: N NOT APPLICABLE

Federal Str. Number: 200020003311212

Federal Sufficiency Rating: 056.5

Deficiency Status of Structure: SD

AGE and SERVICE

Year Built: 1956 Year Reconstructed: 0000

Service On: 1 HIGHWAY

Service Under: 5 WATERWAY

Lanes On the Structure: 02

Lanes Under the Structure: 00

Bypass, Detour Length (miles): 42

ADT: 005900 % Truck ADT: 09

Year of ADT: 1998

GEOMETRIC DATA

Length of Maximum Span (ft): 0067

Structure Length (ft): 000069

Lt Curb/Sidewalk Width (ft): 0.4

Rt Curb/Sidewalk Width (ft): 0.4

Bridge Rdwy Width Curb-to-Curb (ft): 29.8

Deck Width Out-to-Out (ft): 35.4

Appr. Roadway Width (ft): 035

Skew: 00

Bridge Median: 0 NO MEDIAN

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

Feature Under: FEATURE NOT A HIGHWAY OR RAILROAD

Min Vertical Underclr (ft): 00 FT 00 IN

STRUCTURE TYPE and MATERIALS

Bridge Type: ROLLED BEAM

Number of Approach Spans 0000 Number of Main Spans: 001

Kind of Material and/or Design: 3 STEEL

Deck Structure Type: 1 CONCRETE CIP

Type of Wearing Surface: 6 BITUMINOUS

Type of Membrane 2 PREFORMED FABRIC

Deck Protection: 0 NONE

APPRAISAL *AS COMPARED TO FEDERAL STANDARDS

Bridge Railings: 1 MEETS CURRENT STANDARD

Transitions: 1 MEETS CURRENT STANDARD

Approach Guardrail 1 MEETS CURRENT STANDARD

Approach Guardrail Ends: 1 MEETS CURRENT STANDARD

Structural Evaluation: 6 EQUAL TO MINIMUM CRITERIA

Deck Geometry: 2 INTOLERABLE, REPLACEMENT NEEDED

Underclearances Vertical and Horizontal N NOT APPLICABLE

Waterway Adequacy: 8 SLIGHT CHANCE OF OVERTOPPING 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): 1 LOAD FACTOR (LF)

Posting Status: A OPEN, NO RESTRICTION

Bridge Posting: 5 NO POSTING REQUIRED

Load Posting: 10 NO LOAD POSTING SIGNS ARE NEEDED

Posted Vehicle: POSTING NOT REQUIRED

Posted Weight (tons):

Design Load: 4 H 20

INSPECTION and CROSS REFERENCE

X-Ref. Route:

Insp. Date: 052013 Insp. Freq. (months) 12 X-Ref. BrNum:

INSPECTION SUMMARY and NEEDS

05/16/13 Deck is in poor condition & full depth hole is highly likely at mid span. deck needs replacement soon. MJK SH

11/21/11 Irene damage along channel and rip rap needed. Channel dropped from 7 to 4. FRE, JDM

08/19/11 Deck soffit continue to deteriorate mainly at mid span with moderate to heavier spalling and delams in each bay. Structure is a good candidate for full deck replacement as full depth failures are possible. MK & NV

04/22/09 Structure's in satisfactory condition overall. However the concrete deck continues to deteriorate and soffit has areas of exposed rusted rebar. Areas of large delams in localize spots. Full depth failures are possible. Structure would be a good candidate for deck replacement. ~MJK

Appendix D: Hydraulics memo

VT AGENCY OF TRANSPORTATION PROGRAM DEVELOPMENT DIVISION

HYDRAULICS UNIT

TO: Chris Williams, Structures Project Manager

FROM: Leslie Russell, P.E., Hydraulics Project Supervisor

DATE: 11 February 2014

SUBJECT: Killington BF 020-2(42) – US 4 BR 33 over the Ottauquechee River

---

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

Existing Conditions

The existing bridge is a rolled beam bridge that was built in 1956. It is approximately 69' along the roadway. It has a clear span of about 65' with a low beam elevation of approximately 1155.4'. This structure provides about 560 sq. ft. of waterway area. The existing abutments are concrete with stone fill in front of them. There is a slight bend in the river into and out of the bridge, but the river goes straight through the bridge. The bridge is aligned well with the channel and the roadway. It appears that the bridge is stable for scour.

The structure is considered to be hydraulically adequate because there is 1.3' of freeboard at Q50. In fact, all flows up to Q100 pass through the structure with no roadway overtopping.

Recommendations

Since there is an intersection with a town road on both the west and east sides of the bridge, we have assumed the new bridge will be on the same horizontal and vertical alignments. Any proposed structure and stone fill should not decrease the existing waterway area. Therefore, the clear span should be 65' and the low beam elevation can be at a minimum of 1155.0'.

Footings for this bridge should be placed at least 6' below channel bottom, or to ledge, to prevent undermining. If integral abutments are used, piles should be designed to be freestanding to 6' below channel bottom.

The existing abutments can be reused if it is decided that only the deck should be replaced. In this case, bottom of beam elevations should be no lower than 1155.0'. The bridge will remain hydraulically adequate providing approximately 1.3' of freeboard at Q50. This will allow the Q100 water surface elevation to remain the same with no roadway overtopping. No additional stone fill should be placed that would decrease the existing waterway area.

Stone Fill Type III should be used on this project. Stone fill placed in front of the abutments should match into the upstream and downstream channel banks and should not constrict the channel.

It is always desirable for a new structure of this size to have flared wingwalls at the inlet and outlet, to smoothly transition flow through the structure, and to protect the structure and roadway approaches from erosion. The wingwalls should match into the channel banks.

Temporary Bridge
No temporary bridge was analyzed at this time. If Structures decides to use a temporary bridge, we will analyze it at that time.

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

LGR

cc: Hydraulics Project File via NJW
Hydraulics Chrono File

Appendix E: Preliminary Geotechnical Information

AGENCY OF TRANSPORTATION **OFFICE MEMORANDUM**

To: Chris Williams, P.E., Structures Project Manager

END CCB

From: Eric Denardo, Geotechnical Engineer, via Christopher C. Benda P. E., Soils and Foundations Engineer

Date: March 21, 2014

Subject: Killington BF 020-2(42) Preliminary Geotechnical Information

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 33 on US Route 4 in Killington, which travels over the Ottauquechee River. This review included observations made during a site visit, the examination of historical in-house bridge boring files, as-built record plans, USDA Natural Resources Conservation soil survey records, published surficial and bedrock geologic maps and water well logs on-file at the Agency of Natural Resources.

Previous Projects

The record plans found for the project show the bridge abutments are supported on wooden timber piles. Four boring logs were noted in the plans. A boring was completed to "refusal" at each of the four corners of the bridge in the roadway. Borehole depths ranged from 36.5' to 47.5'. The overlying soil was reported as sand with fine gravel and some clay.

A search of historical records of subsurface investigations maintained by the Soils and Foundations Unit revealed no nearby borings in Killington. These records are GIS based, and contain electronic logs for the majority of borings completed in the past 10 years.

Water Well Logs

The Agency of Natural Resources (ANR) publishes logs for all water wells drilled for residential and commercial purposes. The logs can be used to determine general characteristics of soil strata in the area. The logs contain soil descriptions completed in the field, by unknown personnel, and therefore, should only be used as an approximation. Depths to bedrock and soil strata were taken from four well logs in close proximity to the project.

Figure 1 shows the project and the locations of surrounding wells. The wells used for information on the subsurface conditions are highlighted by red boxes.

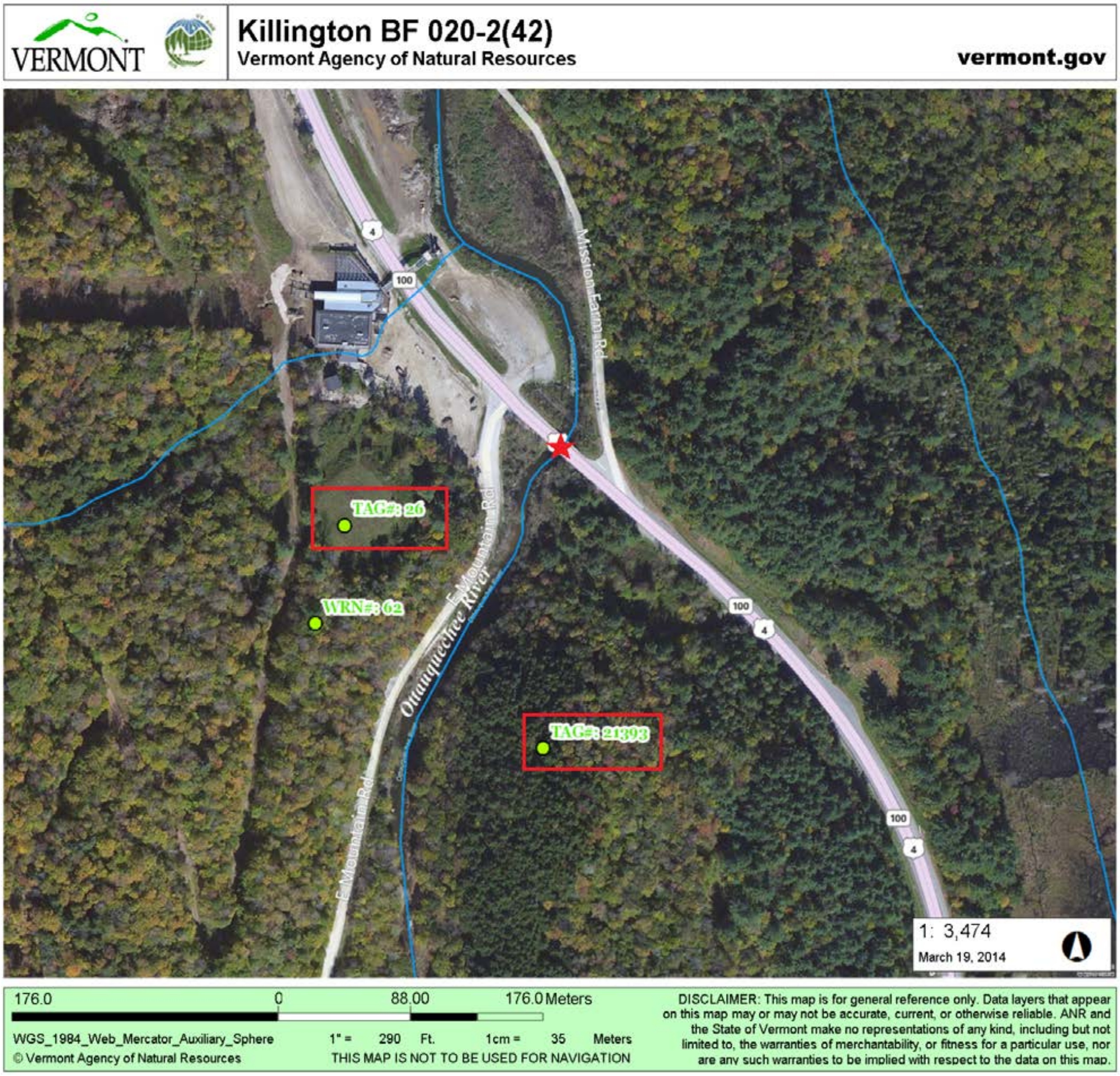


Figure 1. Highlighted well locations near subject project

Table 1 lists the wells used for gathering the surrounding information. Wells are listed with the distance from the bridge project, depth to bedrock, and overlying soils encountered. Only two wells within a 1000' radius of the project site had information about the depth to bedrock.

Table 1. Depths to bedrock of surrounding wells

Well ID	Distance From Project (feet)	Depth To Bedrock (feet)	Overlying Strata
26	500	45	Clay/ Gravel
21393	700	6	Not Specified

USDA Soil Survey

The United States Department of Agriculture Natural Resources Conservation Service maintains an online surficial geology map of the United States. According to the Web Soil Survey, the strata directly underlying the project site consists of Udorthents loamy soil deep to bedrock. The drainage of the soil in the project area is not known.

Geologic Maps of Vermont

Mapping conducted in 1970 for the Surficial Geologic map of Vermont shows that the project area is underlain by glaciofluvial kame terrace deposits on top of glacial till.

According to the 2011 Bedrock Map of Vermont, the project site is underlain with feldspathic quartzite.

A site visit was conducted on March 18, 2014, to assess potential issues with boring operations, and to make any other pertinent observations about the project.

Figure 2. View of Bridge, Looking Southeast

Overhead utilities run along either side of the bridge, Figure 2, but should not conflict with boring operations. A utility conduit also crosses under the bridge on the northwest side as shown in Figure 3.

Figure 3. Utility Conduit below Northwest end of Bridge

According to record plans for the existing bridge, the abutments are founded on timber piles. From the record plans, pile lengths are estimated to be 35’. No visible bedrock was seen during the site visit.

The surrounding surficial soils are within the floodplain. Large amounts of snow and ice present during a visit to the project site made it difficult to see the streambed or any erosion of the banks of the river. From what was observed, the minimal presence of cobbles and boulders in the river suggests borings and piles could be advanced with limited difficulty. Figure 4 shows an exposed part of the streambed south of the bridge.

Figure 4. Streambed Downstream of the Bridge

Based on this information, possible foundation options for a bridge replacement include the following:

- Reinforced concrete abutments on spread footings
- Pile caps on a single row of H-Piles
- Spread footings supported on micropiles

We recommend advancing two additional borings, one at each new abutment location at opposite corners of the bridge, to confirm the depth to bedrock, characterize the overburden soils and groundwater conditions.

When a preliminary alignment has been chosen, the Soils and Foundations Unit should be contacted to help determine a subsurface investigation that efficiently gathers the most information.

If you have any questions or would like to discuss this report, please contact us by phone at (802) 828-6910, or via email at chris.benda@state.vt.us.

cc: Project File/CCB
END

G:\Soils and Foundations\Projects\Killington BF 020-2(42)\SCOPING & BACKGROUND\Killington BF 020-2(42) Preliminary Geotechnical Information

Appendix F: Natural Resources Memo

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

Agency of Transportation

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

To: James Brady, VTrans Environmental Specialist

From: Glenn Gingras, VTrans Environmental Biologist

Date: 4/18/2014

Subject: Killington BF 020-2(42) - Natural Resource ID

I have completed my natural resource scoping review 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 information in the project file. I also conducted a field visit.

Wetlands/Watercourses
There are wetlands within the project area. Wetlands are located on both the downstream and upstream side of the crossing. There are mapped class II Wetlands upstream of the crossing and would be contiguous to the downstream side. The wetlands are emergent/scrub shrub/forested wetlands. Dominant vegetation included Speckled Alder, Elm, Sensitive Fern, Meadowsweet, and White Pine. Main functions and values of wetlands present on site would be flood storage, erosion control, and some wildlife habitat. It appears that some of the upstream wetlands have been filled in over time. The wetlands on the upstream side are limited to a wet ditch adjacent to US4/100.

The Ottauquechee River flows through the project area. This brook supports a variety of aquatic organisms including a variety of fish species. The Ottauquechee River is an Essential Fish Habitat (EFH) waterway which is broadly defined to include “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.” Efforts to minimize water quality impacts during construction will need to be evaluated as the project design moves forward.

Alternatives to avoid wetlands/waterways will need to be examined during scoping. If wetlands/waterways cannot be avoided, minimization/mitigation measures will be evaluated and further information may need to be collected in the field. I have downloaded a line feature for approximate wetland boundaries and loaded the data into the geodatabase so that a (dgn.) can be created.

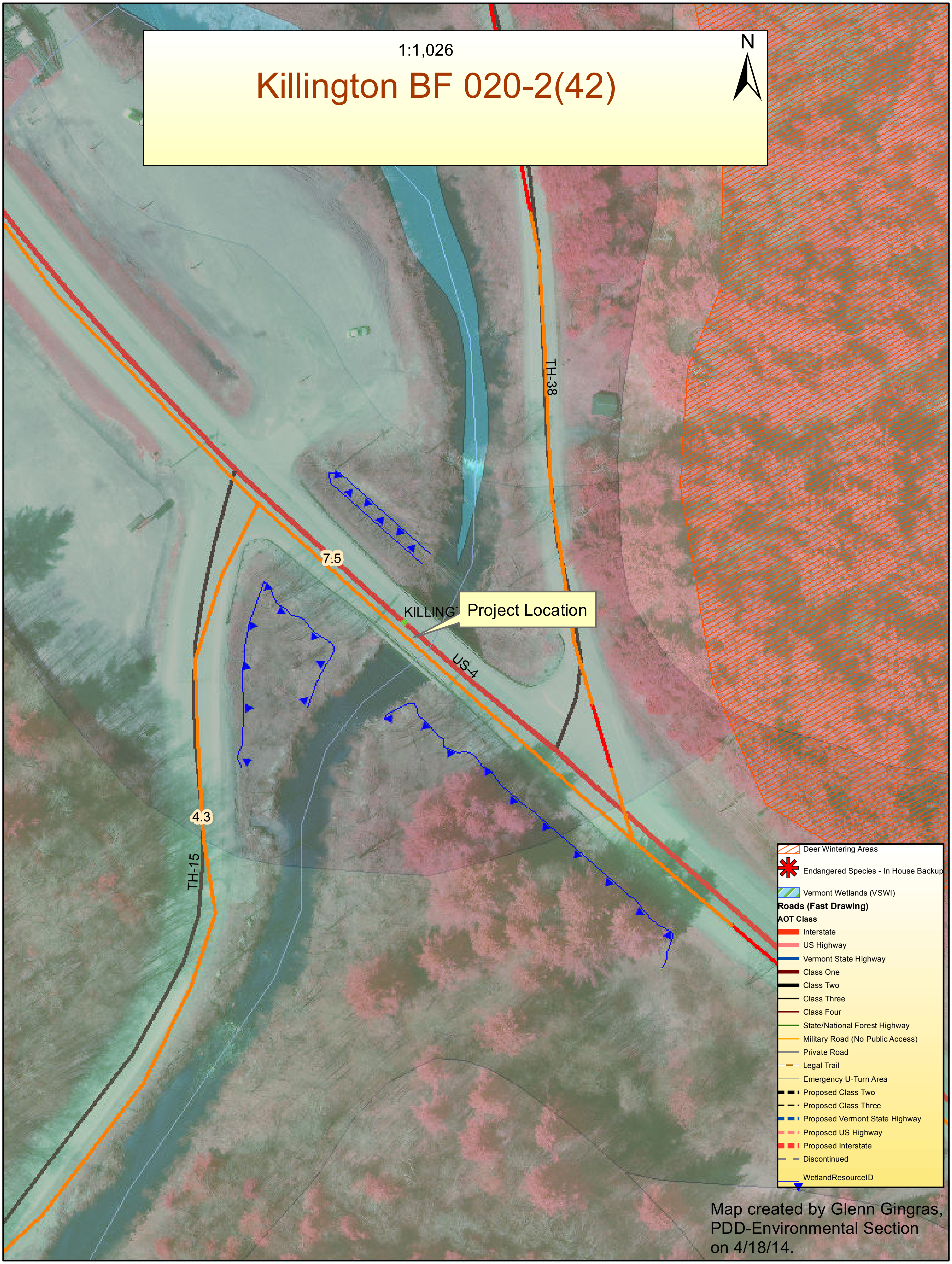
The US Corps of Engineers and the Agency of Natural Resources- Department of Environmental Conservation would regulate all activities below ordinary high water and adjacent wetlands.

Wildlife Habitat
The project corridor ranks as in the range of 4 on the wildlife habitat regional linkage analysis. This indicates that the area is of moderate to high importance to wildlife movement. Traffic in this area is high. The riparian zone along Ottauquechee River would serve as a corridor for a variety of wildlife species. Consideration should be made to provide some sort of wildlife shelf within the existing crossing. This would consist of having a minor shelf that does not have riprap on the surface. This shelf can be overtopped during higher flows and could be incorporated into the design fairly easily.

Ottauquechee River supports a variety of aquatic organisms including wild brook trout as well as other fish species. The design of the new structure will need to accommodate aquatic organism passage (AOP) in accordance to the VT Fish and Wildlife AOP guidelines. As the design moves forward it would be beneficial to receive feedback from the fisheries biologist.

Rare, Threatened and Endangered Species
According to the VT Fish and Wildlife – Wildlife Diversity mapping there are no mapped State listed rare, threatened or endangered species within the project area according to latest GIS information available. According to the USFWS IPac mapping there are no occurrences of federally listed species.

Agricultural Soils
There are no prime agricultural soils within the project area.


1:1,026
Killington BF 020-2(42)
N
TH-38
7.5
KILLING
Project Location
US-4
4.3
TH-15
Deer Wintering Areas
Endangered Species - In House Backup
Vermont Wetlands (VSWI)
Roads (Fast Drawing)
AOT Class
Interstate
US Highway
Vermont State Highway
Class One
Class Two
Class Three
Class Four
State/National Forest Highway
Military Road (No Public Access)
Private Road
Legal Trail
Emergency U-Turn Area
Proposed Class Two
Proposed Class Three
Proposed Vermont State Highway
Proposed US Highway
Proposed Interstate
Discontinued
WetlandResourceID
Map created by Glenn Gingras,
PDD-Environmental Section
on 4/18/14.

Appendix G: Archaeology Memo

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

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

Agency of Transportation

To: James Brady, Environmental Specialist

From: Jeannine Russell, VTrans Archaeology Officer

Date: February 3, 2014

Subject: Killington BF 020-2(42) – Archaeological Resource ID

The scope of this project has not yet been determined but includes the areas surrounding Bridge 33 on VT RT 100/US 4 over the Ottaquechee River in Killington.

The VTrans Archaeology Officer has completed an Archaeological Resources Assessment for the above project. Background research, ArcMap review and photographs of the site were included in the assessment review. A site visit was conducted on January, 30, 2014 and was sufficient to determine that there are no archaeological resources or sensitive areas present within the proposed project area.

A review of conceptual plans will be necessary prior to issuing a formal clearance. Please contact me if you have any questions.

Thank you,
Jen Russell
VTrans Archaeology Officer

Appendix H: Historic Memo

Brady, James

From: Newman, Scott
Sent: Wednesday, January 22, 2014 1:12 PM
To: Brady, James
Cc: O'Shea, Kaitlin; Williams, Chris
Subject: Killington Bridge 33
Attachments: photo.JPG; ATT00001.txt

Hi James,

Resource ID for this bridge project has concluded with a finding of no Section 106 or 4(f) properties in the project area.

Thanks,
Scott

Appendix I: Local Response and Input

Local & Regional Input Questionnaire

Project Name:/Project Number: KILLINGTON BF 020-2(42) US 4, Bridge 33 over Ottauquechee River

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.

   The following events will cross the bridge directly and will generate increased traffic there. Skier traffic/season (Nov-April/May) and Foliage (Sept-Oct) are also important to factor.

   Killington Stage Race, Saturday, May 24 – Monday, May 26
   Long Trail Century Ride, Saturday, June 21
   Vermont Challenge, Saturday, August 16 – Sunday, August 17
   Killington Classic, Thursday, August 29 – Sunday, August 31
   Spartan Race, Friday, September 19 – Sunday, September 21

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

   May – June except for Killington Stage Race, Saturday, May 24 – Monday, May 26 is likely the slowest.

   July-Aug. second slowest.

3. Please describe the location of emergency responders (fire, police, ambulance) and emergency response routes.

   All use the bridge to provide services to Eastern Killington and Mutual Aid to Plymouth and W. Bridgewater

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

   Killington Elementary and Woodstock High School (our high school) from Aug – June
   Killington Mountain School and Green Mountain College – same

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

   The only significant Bike and Ped Traffic would be from the Skier parking lot to Skyship Gondola, but that traffic does not cross the bridge.

6. Are there any businesses (including agricultural operations) that would be adversely impacted either by a detour or due to work zone proximity?

   Mission Farm Rd, Mission Farm Church, and Killington Resort (Primary access to Skyship Gondola, and Bear Mountain Base Area)

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?

   Town Office, Rec Fields, Library, Transfer Station, Pool and Tennis Courts are located approx 4 miles away on River Rd. off Rt. 4

8. Are there any town highways that might be adversely impacted by traffic bypassing the construction on another local road?

   Concern is impact to Mission Farm Road (Class 3) during construction if used as a bypass.

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

   Fire, Police mentioned before. Road Maintenance to E. Killington. Also the Town is concerned what the impact to Mission Farm Road (class 3) would be if it is used as a bypass during construction.

   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.

   Newspapers: Rutland Herald, Mountain Times, VT Standard
   Rutland Radio
   Town Email List
   Town Website
   PEG TV

   Please let us know your plans and timing and we will help inform the community, especially those impacted.

10. Is there a local business association, chamber of commerce or other downtown group that we should be working with?

    Killington Chamber of Commerce 802-773-4181

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?

   Not that we're aware of. It's part of the intersection of E. Mountain Rd. which is highly trafficked with Winter Skiing.

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

   No

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

   Limited, but Route 4 is a popular cycling route

4. If a sidewalk or wide shoulder is present on the existing bridge, should the new structure have one? Are there existing bicycle and/or pedestrian facilities on the approaches to the bridge?

   None/currently

5. Does the Town have plans to construct either bicycle or pedestrian facilities leading up to the bridge? Please provide a copy of the planning document that demonstrates this (e.g. scoping study, master plan, corridor study) Please explain and provide documentation.

   No

6. Does the bridge provide an important link in the town or statewide bicycle or pedestrian network such that you feel that bicycle and pedestrian traffic should be accommodated during construction?

   No

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

   No

8. Are there any traffic, pedestrian or bicycle safety concerns associated with the current bridge? If yes, please explain.

   No

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

   Irene only.

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?

    Mission Farm Church and Cemetery

12. Are there any other comments you feel are important for us to consider that we have not mentioned yet?

    No

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.

   This bridge is not referenced in the Town Plan.

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

   Copies are attached to this email.

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

   There are no existing or planned development proposals that that would impact future transportation patterns near the bridge.

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

   There are no planned expansions of public transit service that would impact this bridge.

Appendix J: Traffic Safety Discussions

Traffic Safety Discussion

Gary, just to follow up, Dan Newhall went to measure the corner sight distance at the two intersections looking towards the bridge from the side roads. At Mission Farm Rd, when looking to the right, he measured the corner sight distance to be 578 ft. At East Mountain Rd, looking towards Mission Farm Rd, he measured it to be 625 ft. At 50 mph, AASHTO says it should be 555 ft.

Mario Dupigny-Giroux, P.E.
Traffic Safety Engineer
Vermont Agency of Transportation
1 National Life Building
Montpelier, VT 05633
Phone: 802 828-0169
Fax: 802 828-2437
Email: mario.dupigny-giroux@state.vt.us

From: Sweeny, Gary
Sent: Friday, September 05, 2014 8:09 AM
To: Dupigny-Giroux Mario
Cc: Williams, Chris
Subject: RE: Killington BF 020-2 (42) crash location

Mario, thanks for looking at this. What I will say in the scoping report is that we took a preliminary look at the crash data and believe that the bridge is not a factor in the majority of crashes and don't feel the need to modify the characteristics of the bridge or something to that effect. Thanks again.

Gary

From: Dupigny-Giroux Mario
Sent: Tuesday, September 02, 2014 2:52 PM
To: Sweeny, Gary
Subject: RE: Killington BF 020-2 (42) crash location

Gary,

I reviewed the crashes that took place in this section of road from 2010 and up. Historically, most of the crashes have been taking place at the East Mountain Road intersection. Very few have taken place at the Mission Rd intersection. I do not see the bridge as being a factor in these crashes. The crashes are mostly rear-end crashes. Broadside crashes are not currently an issue.

If there were a need for a left turn lane at the East Mountain Road intersection, the bridge would be a limiting factor.

I am going to have Dan Newhall check the corner sight distance at the tow intersections.

Mario Dupigny-Giroux, P.E.
Traffic Safety Engineer
Vermont Agency of Transportation
1 National Life Building
Montpelier, VT 05633

Phone: 802 828-0169
Fax: 802 828-2437
Email: mario.dupigny-giroux@state.vt.us

From: Sweeny, Gary
Sent: Wednesday, August 27, 2014 11:17 AM
To: Dupigny-Giroux Mario
Cc: Williams, Chris
Subject: Killington BF 020-2 (42) crash location

Mario:

We are doing a scoping report on Bridge 33 on US 4 in Killington. It has been identified as a High Crash Location. Below are links to a location map and some crash data from our website. By my observation, the bridge is from mile marker 7.5085 to 7.5280. There are two Town roads and a ski area parking lot within the approaches. There is a curve to the west of the bridge, but the bridge and the roadway to the east are on a tangent. I would be interested to know if anything about this jumps out at you in terms of anything that we should be doing differently. I had not planned on changing the alignment. The shoulder widths are substandard, but the rest of the geometry features look pretty good. I am not sure about corner sight distance. If this is something that you think you need some time to review, let me know. Thanks for looking.

Gary

Z:\Projects-Engineering\KillingtonBF020-2(42)13b260\Structures\Memos\2013\Killington Town Map Br 33.pdf

Z:\Projects-Engineering\KillingtonBF020-2(42)13b260\Structures\Memos\2013\13b260_Crash Data.pdf

Z:\Projects-Engineering\KillingtonBF020-2(42)13b260\Structures\Memos\2013\13b260_HCL.pdf

Gary Sweeny, PE, Project Engineer

Vermont Agency of Transportation
Project Delivery Bureau/Structures
One National Life Dr.
Montpelier, Vermont 05633-5001
802-828-0049 gary.sweeny@state.vt.us

Appendix K: Statewide Travel Model Report

Statewide Travel Model Report

TECHNICAL MEMO

To: Jennifer Fitch, VTrans

From: Jim Sullivan, UVM TRC

cc: Joe Segale, VTrans

Date: February 5, 2015

Re: Statewide Model Analysis to Support Scoping for Killington BF 020-2(42)

This memo documents the results of an application of the Vermont Travel Model ("the Model") to support a scoping effort for construction planned for Killington BF 020-2(42), also known as Bridge 33, spanning U.S. Route 4 over the Ottauquechee River in Killington, Vermont. This work was performed under the "Operation of the Model" task of the Improvement and Operation of the Vermont Travel Model: Year 7 contract. The analysis consisted of a series of Model runs with the link representing this bridge (1) completely closed, or (2) reduced to 50 of its full operating capacity, simulating the effects of either complete closure or lane reduction of the bridge during the upcoming construction project. In addition, a select-link analysis was performed on the with this link at full capacity to better understand the communities that make use of the bridge on a normal day in Vermont.

Specific direction for the scope of this Model application was received through a series of emails between Jim Sullivan of the UVM TRC and Jennifer Fitch of VTrans between January 6th and 9th, 2015, included as Attachment A.

Relating the Bridge to the Model

The link in the Model road network representing the bridge is link ID 12849 (see Figure 1).

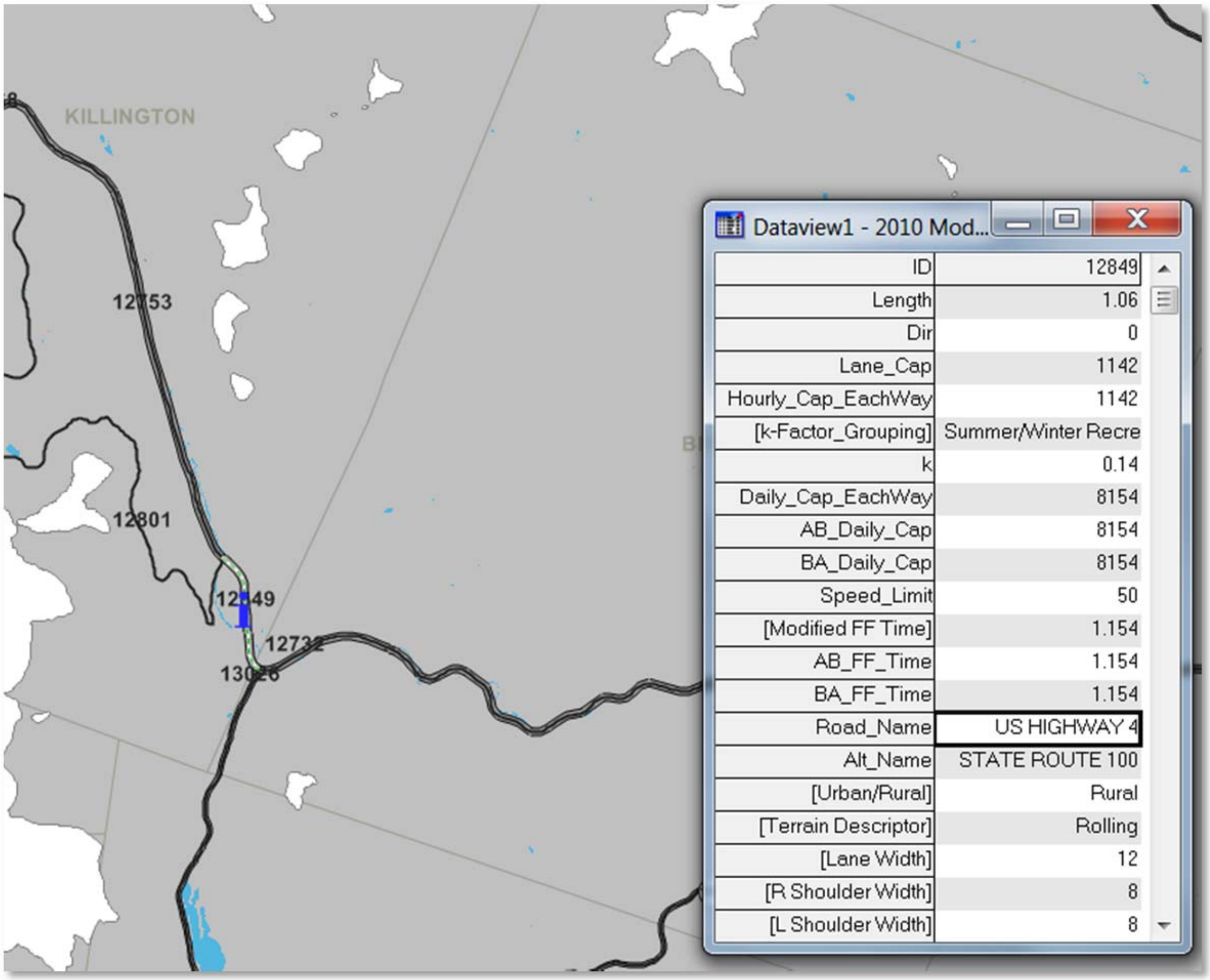


Figure 1 The Model road network a Bridge 33 in Killington, Vermont

The daily capacity of this link each way is estimated in the Model at 8,154 vehicles/day, and the speed limit is 50 mph. Free-flow travel speeds on this link are estimated to be approximately 5 mph above the speed limit. Under normal ("Base") conditions, representing an annualized average day of travel in Vermont, the Model estimates 4,642 vehicles using the link. Since the AADT for the Model's base-year (2010) is 4,650 vehicles per day, the Model appears to simulate real-world travel on this link effectively.

Communities that Use the Bridge on a Typical Day

A select-link analysis was performed on the link 12849 with the Model network intact, representing the current roadway conditions. The purpose of this analysis was to better understand the communities that use the link on a typical day in Vermont. Specific information about TAZ-based origins and destinations from the analysis was aggregated to represent towns in Vermont and regions in New England outside of Vermont. Table 1 shows the most common aggregated origins and destinations found to be using the bridge, as a % of the daily traffic total.

Table 1 Most Common Origins and Destinations Using Bridge 33

Description of Traffic Stream	% of Total Daily

Description of Traffic Stream				% of Total Daily
Regional traffic between	Northern New England UAs	&	Rutland	10.6%
Regional traffic between	Bridgewater	&	Rutland	8.7%
Regional traffic between	Woodstock	&	Rutland	6.1%
Local traffic between	Bridgewater	&	Killington	5.2%
Regional traffic between	Plymouth	&	Rutland	4.0%
Local traffic between	Woodstock	&	Killington	2.7%
Local traffic between	Plymouth	&	Killington	2.4%
Regional traffic between	Lebanon--Hanover, NH—VT UA	&	Rutland	2.4%
Through traffic between	Northern New England UAs	&	Ticonderoga, NY UA	2.1%
Regional traffic between	Hartford	&	Rutland	1.8%
Regional traffic between	Northern New England UAs	&	Killington	1.6%
Regional traffic between	Ludlow	&	Killington	1.1%

"Northern New England UAs" include Boston, MA--NH--RI; Nashua, NH--MA; Lebanon--Hanover, NH--VT; Manchester, NH; Concord, NH
"Rutland" includes Rutland city and the larger town of Rutland

The indication of the select-link analysis is that the bridge is primarily used by regional traffic between Rutland, Killington, and the urban areas (UAs) of northern New England that are accessed via I-89 across Vermont's eastern border with New Hampshire. The second most common use of the bridge is for local traffic between Bridgewater, Killington, Woodstock, and Plymouth. Finally, traffic passing through Vermont between northern New England and Ticonderoga, NY also makes significant use of the bridge.

Impact of Bridge Construction Closure

In order to better understand the effects of closure of the bridge on traffic, the Model was run a second time with link 12849 disabled to represent a Bridge Construction-Closure Scenario. Figure 2 illustrates the changes in traffic volumes from the Base Scenario that occurred when the bridge was closed.

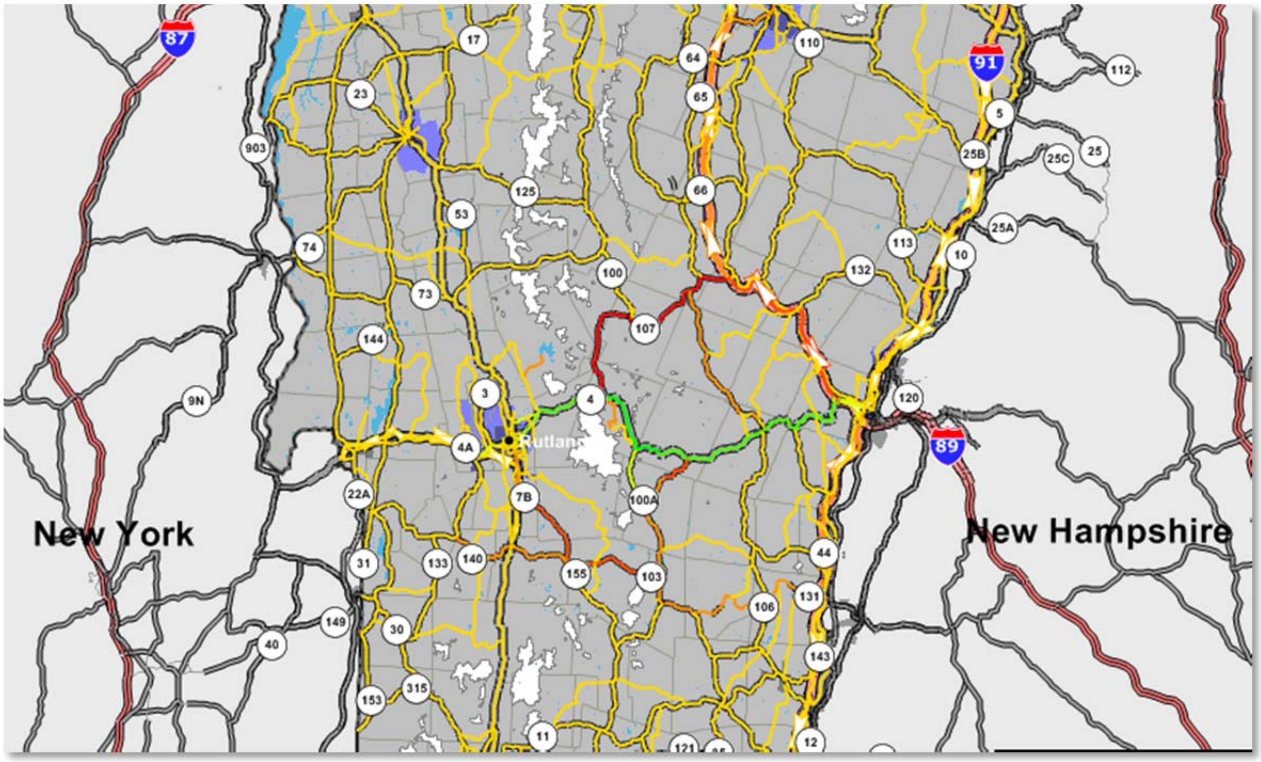
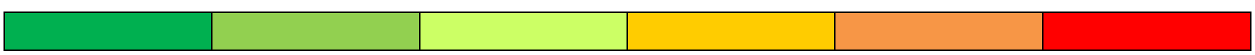


Figure 2 Changes in Traffic Volumes Between the Base Scenario and the Bridge Construction-Closure Scenario

In Figure 2, the more red links had the greatest increases in traffic volumes, while the more green links had the greatest decreases in traffic volumes. Most of the links experienced no change in volume, indicated by the most common yellowish-orange color:



The standard deviation of the shifts in traffic volumes was relatively high (224 vehicles per day) across all roadways statewide, indicating large shifts in route choice and travel behavior when the bridge is closed. These shifts are precipitated by the assumptions in the Model that users have perfect knowledge of the network, and the closure, allowing them to plan accordingly. Based on this assumption the effect of the closure on vehicle-hours of travel looks slightly different (see Figure 3).

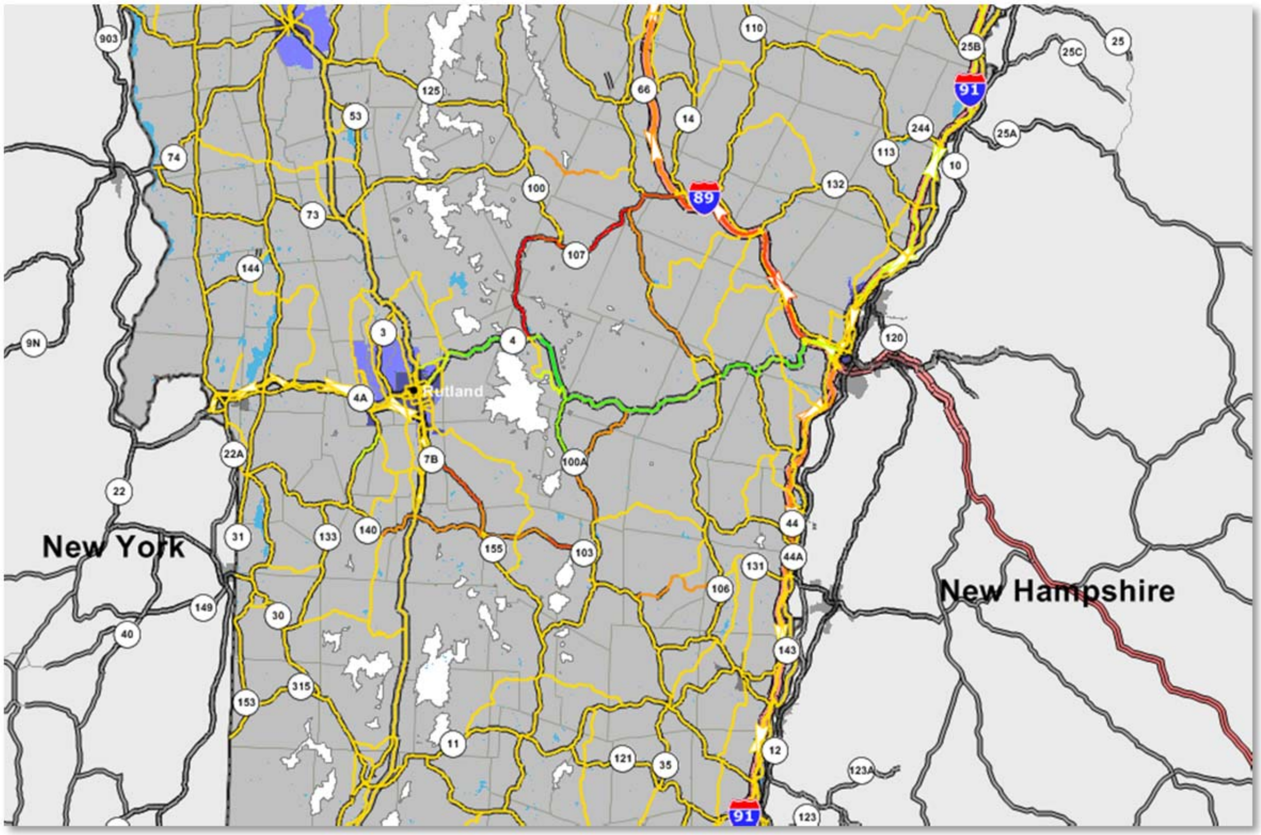


Figure 3 Changes in Vehicle-Hours of Travel Between the Base Scenario and the Bridge Construction-Closure Scenario

With fewer vehicles using U.S. Route 4 to cross between Rutland and White River Junction, the VHTs on that corridor go down, while the number of travelers and the delay they experience on State Routes 107, 100A, and 103 and I-89 increase. Overall, these effects counteract to create no overall net increase in daily VHTs statewide.

Impact of Capacity Reduction for Bridge Active-Construction

In order to simulate the effects of a lane-closure approach to bridge construction on traffic in Vermont, the Model was run a third time with the capacity of link 12849 reduced 50% to represent a Bridge Active-Construction Scenario. Figure 4 illustrates the effect of reducing the capacity of link 12849 by 50% on traffic volumes.

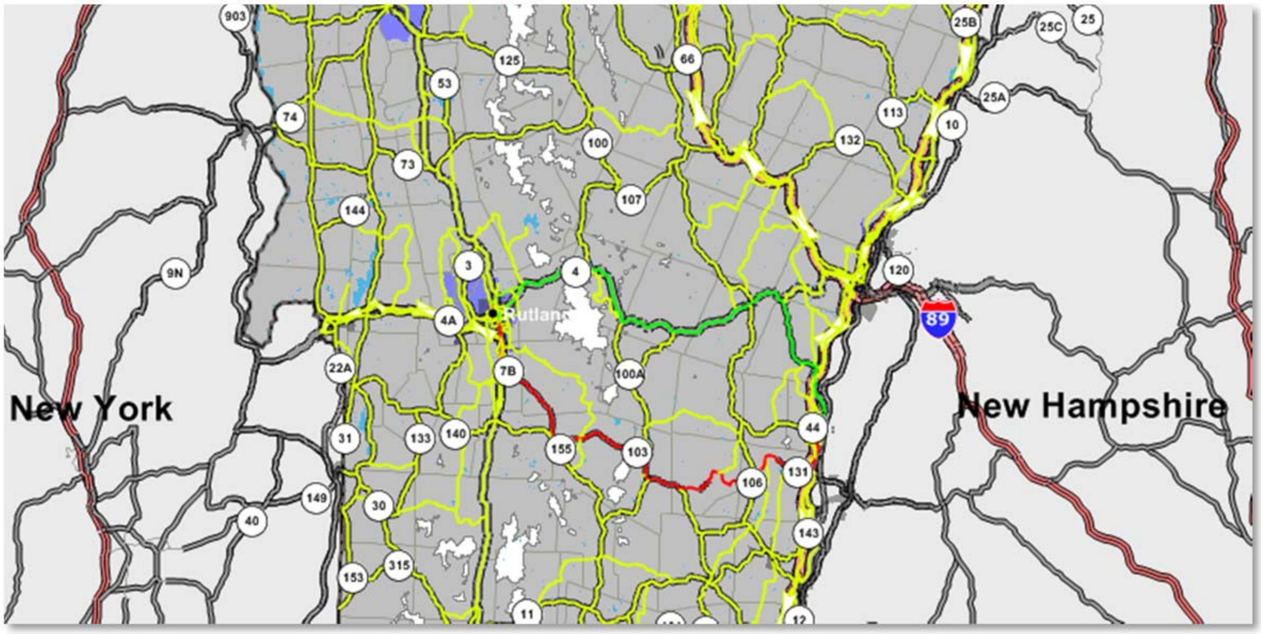


Figure 4 Changes in Traffic Volumes Between the Base Scenario and the Bridge Active-Construction Scenario

In this scenario, the shifts in traffic volumes were much more focused around the U.S. Route 4 corridor, with a portion of the normal corridor traffic re-routing to State Routes 103 & 131. This time the standard deviation of the shifts in daily traffic volumes are less than 1 vehicle per day across all roadways statewide, indicating very few shifts in route choice and travel behavior. The impacts of this scenario on VHTs are also more localized, with the U.S. Route 4 corridor experiencing reduced aggregate travel times (except at the bridge itself, where delays are present) and the State Routes 103 & 131 corridor experiencing a significant increase, as shown in Figure 5.

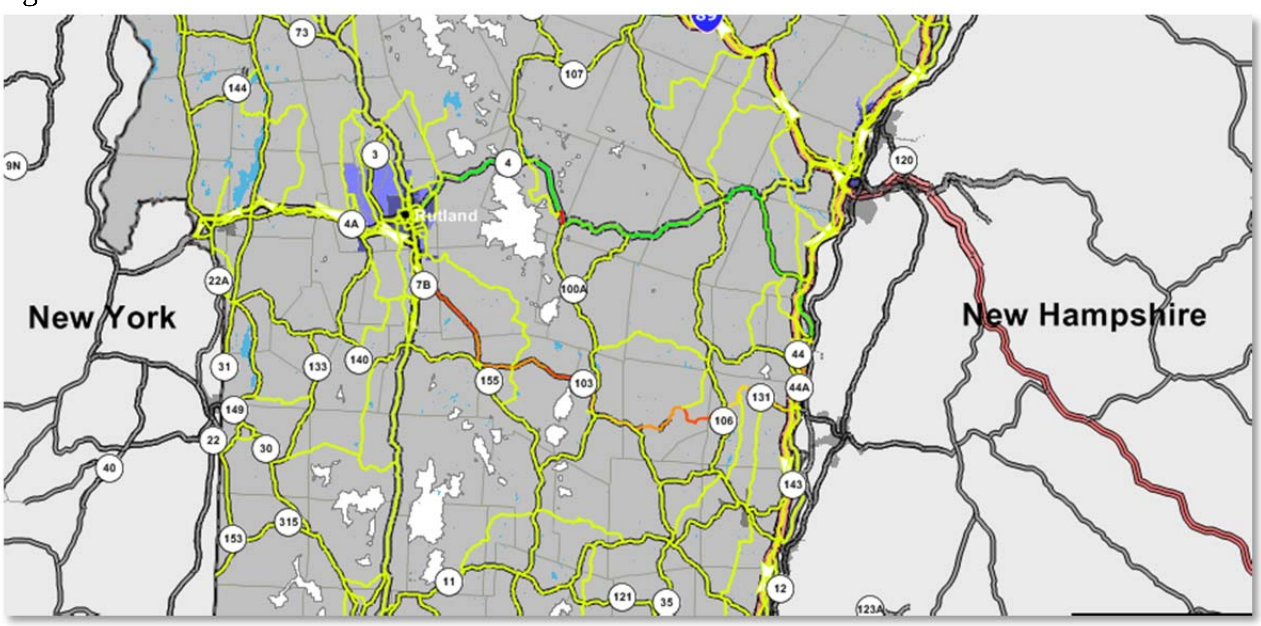


Figure 5 Changes in Vehicle-Hours of Travel Between the Base Scenario and the Bridge Active-Construction Scenario

The overall net effect statewide of the Active-Construction Scenario was an increase of 1.4 vehicle-hours per day.

General Impacts on Travelers and the Vermont Economy

Due to the low or non-existent net effects of the bridge construction scenarios on aggregate travel times statewide, there is not expected to be an adverse impact on the Vermont economy from travel delays. Individual impacts on travelers in the U.S Route 4 corridor will be varied. Regional travelers and through-traffic between New York and New Hampshire will be delayed considerably, while other more local travelers on the U.S. Route 4 corridor who don't normally use the bridge will actually see improved travel times, as normal congestion is alleviated by the re-routing of regional and through-traffic. The adverse impacts on some travelers are expected to be counteracted by benefits to other travelers.

Conclusions

In the Bridge Active-Construction Scenario, the impacts of the construction will outweigh the benefits by 1.4 vehicle-hours of travel. In the Bridge Construction-Closure Scenario, the benefits will completely counteract the impacts on travel, resulting in no net effect. **Therefore, the Bridge Construction-Closure Scenario is preferable.**

However, it is important to note that both scenario Model runs assume that all travelers have **perfect information about the status of the network**. **This means that the information about the closure must be communicated throughout the region, possibly even into New Hampshire, in order to alleviate the effects of the construction on individual users, and bring the new network structure into equilibrium.**

The somewhat paradoxical finding of this application is due to the relatively highly-congested conditions normally found on the U.S. Route 4 corridor, where the average daily volume-capacity ratio is 0.73 (1.00 is completely congested). This congestion is being somewhat alleviated when the bridge is under construction and many of those travelers choose a totally different route. This shift creates less congestion on other parts of U.S. Route 4, so the travelers who are still using it (because they do not need to use the bridge) experience faster travel times, and the increases in VHTs from the regional re-routing is counteracted.

Attachment A

Jim-

Consider this my approval and please work directly with Jennifer.

Joe Segale, PE/PTP, Director
Policy, Planning and Research Bureau
Vermont Agency of Transportation
One National Life Drive - 5th Floor
Montpelier, VT 05633-5001
Cell phone: 802.477.2365
Fax: 802.828.3983
joe.segale@state.vt.us

From: Jim Sullivan [mailto:jlsulliv@uvm.edu]
Sent: Friday, January 09, 2015 1:29 PM
To: Segale, Joe
Cc: Fitch, Jennifer
Subject: Re: Killington Statewide Model Analysis Request

Joe,

Jennifer and I spoke about this effort in detail on the phone, and I am confident that we can use the Model to give her some very valuable information in the decision of whether or not to pursue a short-term bridge closure. I intend to:

1. Do a Select Link Analysis to get an idea of the communities that would be impacted by the closure
2. Do a scenario run with the bridge closed to get an idea of where the biggest increases in traffic volume will take place
3. Do an NRI run with monetary values per hour for re-routing of trips by purposes due to the bridge closure to assess the cost of closing the bridge (I will also do a run with the bridge 50-70% reduced to get a number to compare the cost of closing to).

I am thinking this will take about 20-24 hours of effort, including write-up, and I think I can have it done by the end of the month (I am away all next week at the TRB Annual Meeting).

Do I have your OK to proceed?

Jim
Senior Research Analyst
UVM Transportation Research Center
802-656-9679

On 1/6/2015 9:54 AM, Fitch, Jennifer wrote:

Good Morning Jim,

Thanks for taking the time to discuss the Statewide Model and how this may be used during the scoping phase to look at the impact of bridge closures. Killington BF 020-2(42) is a good project to start with. Bridge 33 over the Ottauquechee River is located along US 4 in the Town of Killington. The AADT is 5,600 with 10% trucks. The current scope calls for full bridge replacement using phased construction (alternating one way traffic for an entire construction season). I am interested in pursuing a short term bridge closure.

The draft Killington scoping report has been uploaded to the Sharepoint Site. Can you please:

1. Evaluate the communities that would be impacted by a bridge closure,
2. Determine the routes that appear to be affected with higher traffic volumes,
3. Determine the user cost for a short term long weekend closure (Friday at 6PM through 6AM the following Monday).

ftp://www.aot.state.vt.us/outgoing/Killington/
Username: External
Password: receive!2002
(Password is case-sensitive)

I may have missed something as I was a little distracted yesterday with the Live Load Test in Stowe.

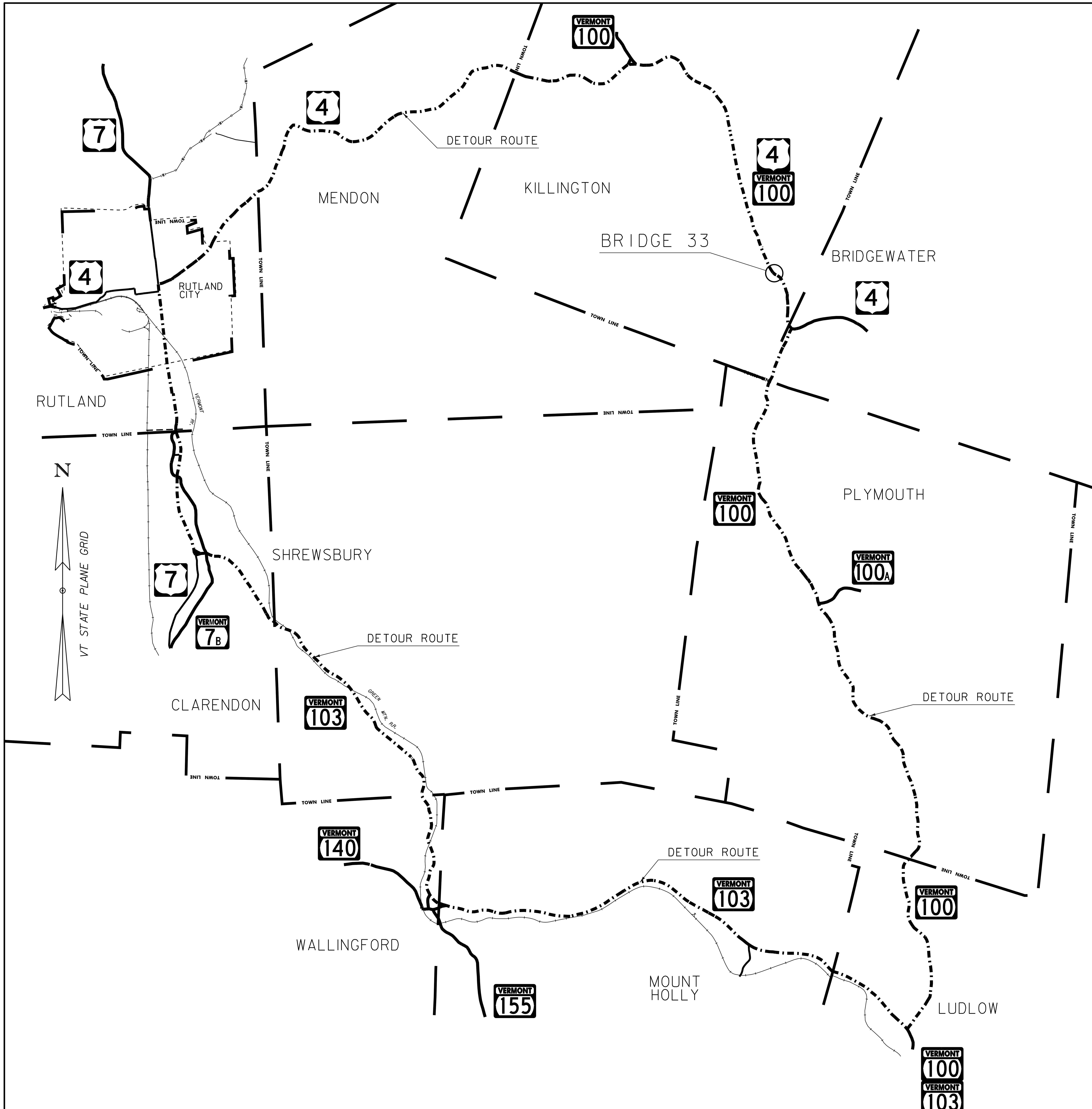
Please let me know when you think you can provide the analysis,

Thanks,

Jennifer

Jennifer M. V. Fitch, P.E.
Project Manager

Appendix L: Detours



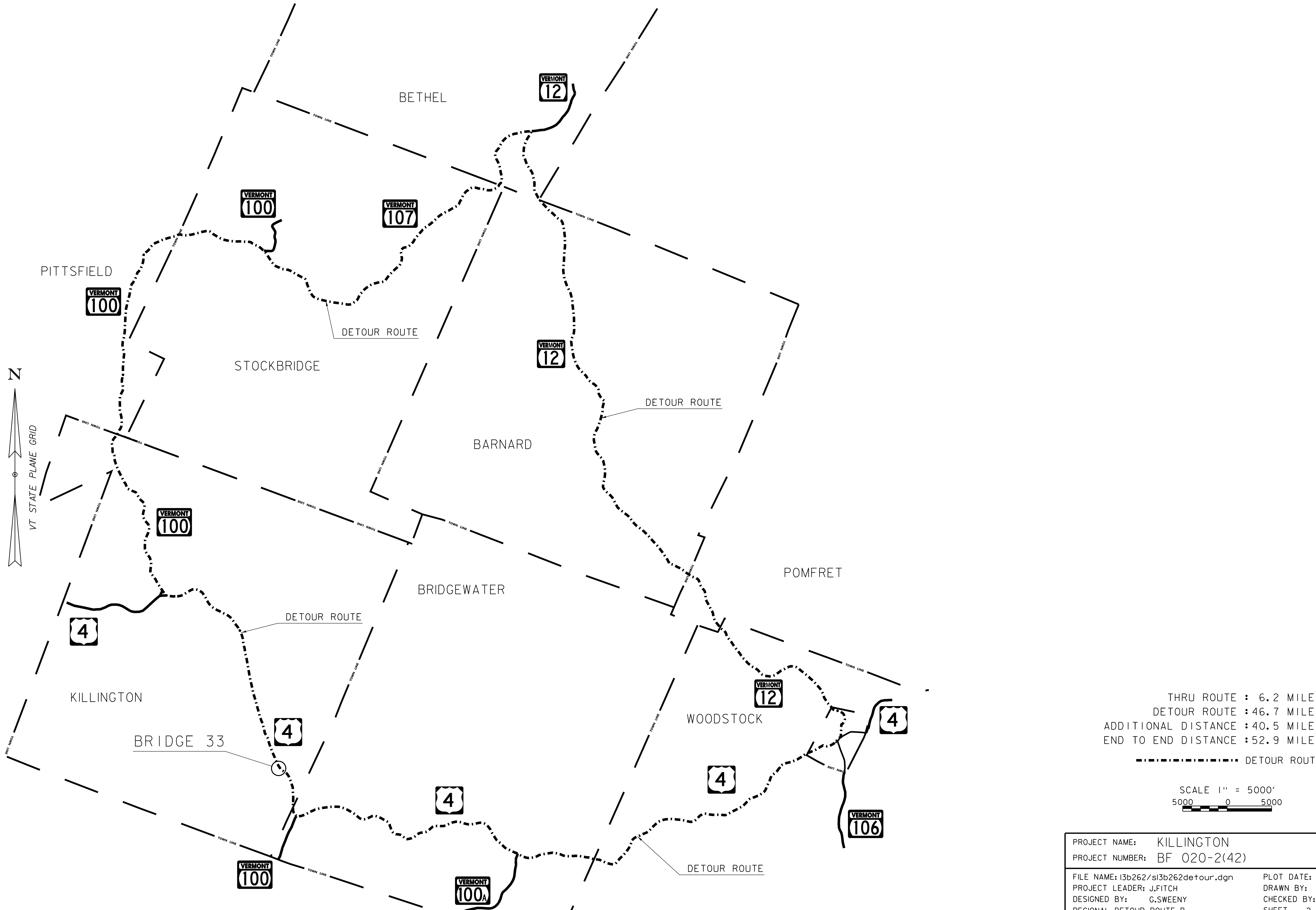
THRU ROUTE : 6.2 MILES
DETOUR ROUTE : 47.4 MILES
ADDITIONAL DISTANCE : 41.2 MILES
END TO END DISTANCE : 53.6 MILES

-·-·-·-·-·- DETOUR ROUTE

SCALE 1" = 5000'
5000 0 5000

PROJECT NAME:	KILLINGTON
PROJECT NUMBER:	BF 020-2(42)

FILE NAME: 13b262/sl3b262detour.dgn	PLOT DATE: 09-FEB-2015
PROJECT LEADER: J.FITCH	DRAWN BY: D.D.BEARD
DESIGNED BY: G.SWEENY	CHECKED BY: G.SWEENY
REGIONAL DETOUR ROUTE A	SHEET 1 OF 15



PROJECT NAME: KILLINGTON	
PROJECT NUMBER: BF 020-2(42)	
FILE NAME: 13b262/sl3b262detour.dgn	PLOT DATE: 09-FEB-2015
PROJECT LEADER: J.FITCH	DRAWN BY: D.D.BEARD
DESIGNED BY: G.SWEENY	CHECKED BY: G.SWEENY
REGIONAL DETOUR ROUTE B	SHEET 2 OF 15

Appendix M: Plans

EXISTING CONDITIONS

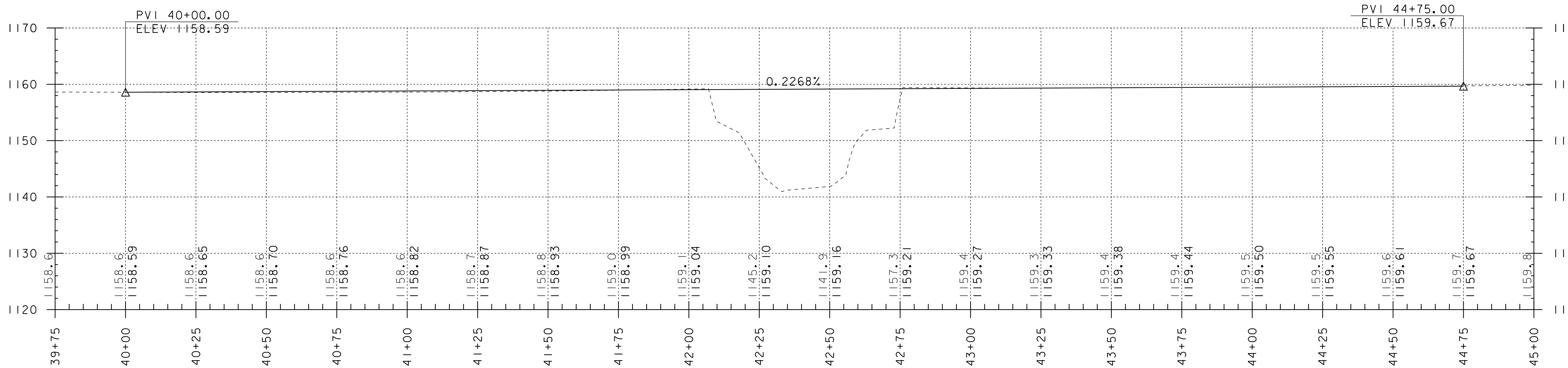
SCALE 1" = 20′-0"

20 0 20

PROJECT NAME: KILLINGTON
PROJECT NUMBER: BF 020-2(42)

FILE NAME: 13b260/sl3b260border.dgn
PROJECT LEADER: C.P.WILLIAMS
DESIGNED BY: ------
EXISTING CONDITIONS LAYOUT

PLOT DATE: 09-FEB-2015
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 3 OF 15



US ROUTE 4 EXISTING / ALTERNATIVES 1 & 2 PROFILE

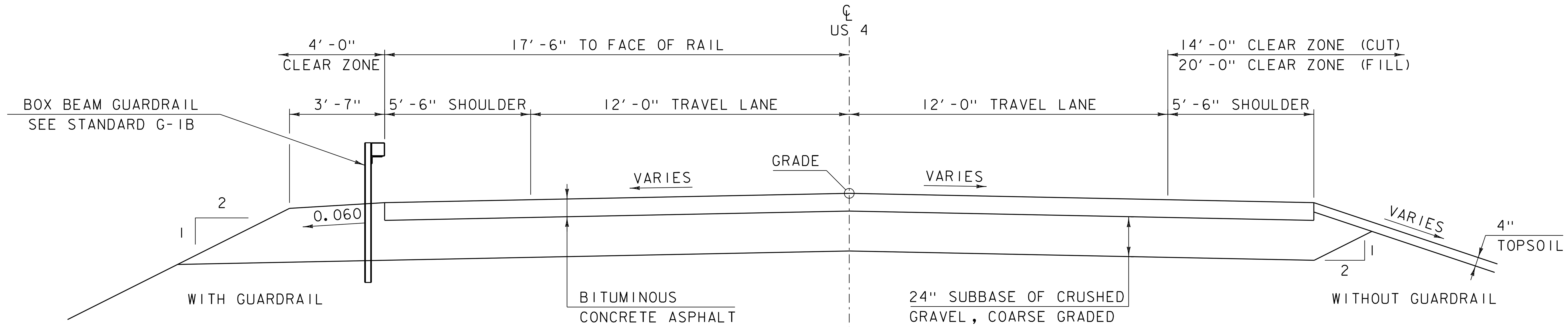
SCALE: HORIZONTAL 1"=20'
VERTICAL 1"=10'

NOTE:

GRADES SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG ℄

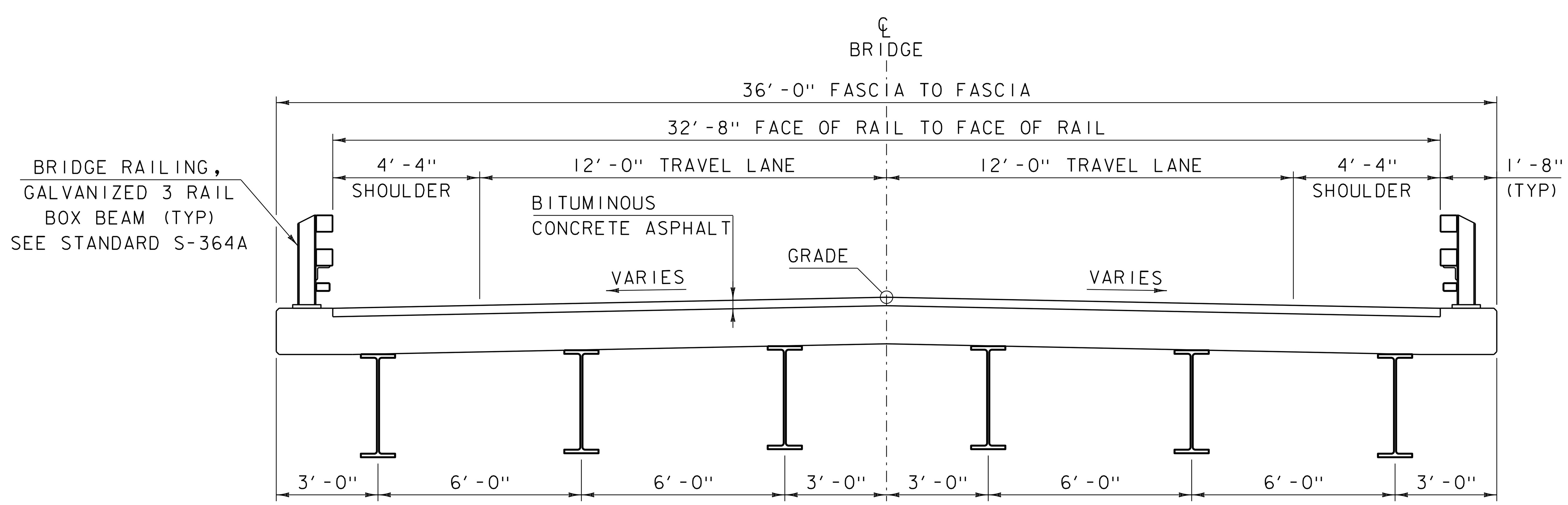
GRADES SHOWN TO THE NEAREST HUNDREDTH ARE FINISH GRADE ALONG ℄

PROJECT NAME: KILLINGTON	
PROJECT NUMBER: BF 020-2(42)	
FILE NAME: 13b260/s13b260profile.dgn	PLOT DATE: 09-FEB-2015
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: G.SWEENY	CHECKED BY: ------
ALTERNATIVES 1& 2 PROFILE SHEET	SHEET 4 OF 15



PROPOSED US 4 TYPICAL SECTION - ALTERNATIVE 1 & 2

SCALE ⅜" = 1'-0"



FLOW

PROPOSED BRIDGE TYPICAL SECTION - ALTERNATIVE 1 & 2

SCALE ⅜" = 1'-0"

NOTE: SUPERSTRUCTURE FOR ALTERNATIVE #1 WILL REMAIN IN PLACE. SUPERSTRUCTURE FOR ALTERNATIVE #2 IS NOT YET DESIGNED.

MATERIAL TOLERANCES
(IF USED ON PROJECT)

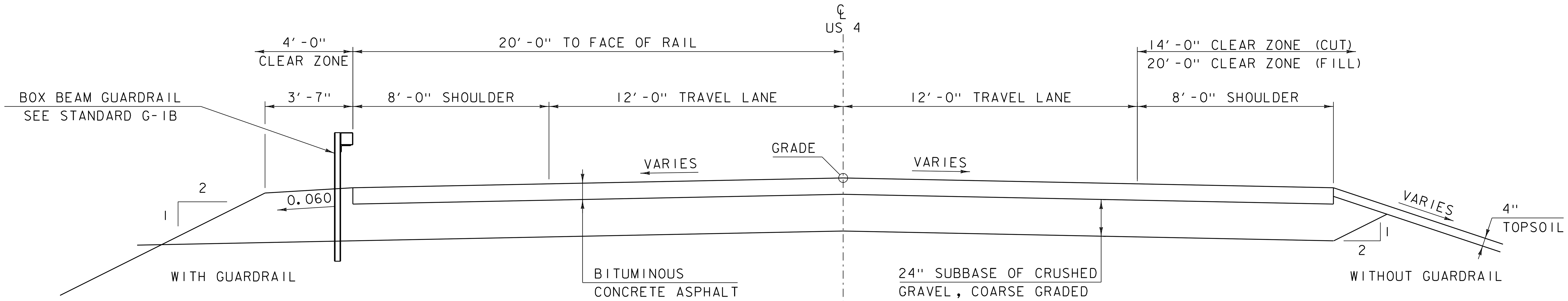
SURFACE	
- PAVEMENT (TOTAL THICKNESS)	+/- ¼"
- AGGREGATE SURFACE COURSE	+/- ½"
SUBBASE	+/- 1"
SAND BORROW	+/- 1"

PROJECT NAME: KILLINGTON	
PROJECT NUMBER: BF 020-2(42)	
FILE NAME: 13b260\s13b260typical.dgn	PLOT DATE: 09-FEB-2015
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: G.SWEENY	CHECKED BY: G.SWEENY
ALTERNATIVE 1& 2 TYPICAL SECTIONS	SHEET 5 OF 15

ALTERNATIVE 1 & 2 LAYOUT

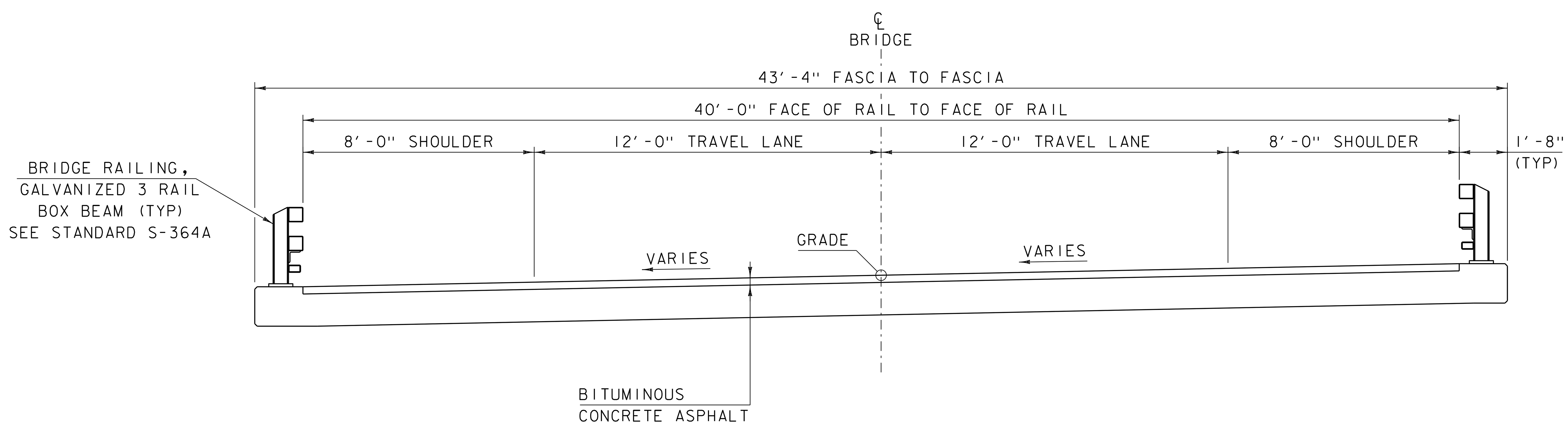
SCALE 1" = 20′-0"
20 0 20

PROJECT NAME: KILLINGTON	
PROJECT NUMBER: BF 020-2(42)	
FILE NAME: 13b260/s13b260border.dgn	PLOT DATE: 09-FEB-2015
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: G.SWEENY	CHECKED BY: ------
ALTERNATIVE 1 & 2 LAYOUT SHEET	SHEET 6 OF 15



PROPOSED US 4 TYPICAL SECTION - ALTERNATIVE 3

SCALE 3/8" = 1'-0"



FLOW

PROPOSED BRIDGE TYPICAL SECTION - ALTERNATIVE 3

SCALE 3/8" = 1'-0"

NOTE: SUPERSTRUCTURE NOT YET DESIGNED.

MATERIAL TOLERANCES
(IF USED ON PROJECT)

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

PROJECT NAME: KILLINGTON	
PROJECT NUMBER: BF 020-2(42)	
FILE NAME: 13b260\s13b260typical.dgn	PLOT DATE: 09-FEB-2015
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: G.SWEENY	CHECKED BY: G.SWEENY
ALTERNATIVE 3 TYPICAL SECTIONS	SHEET 7 OF 15

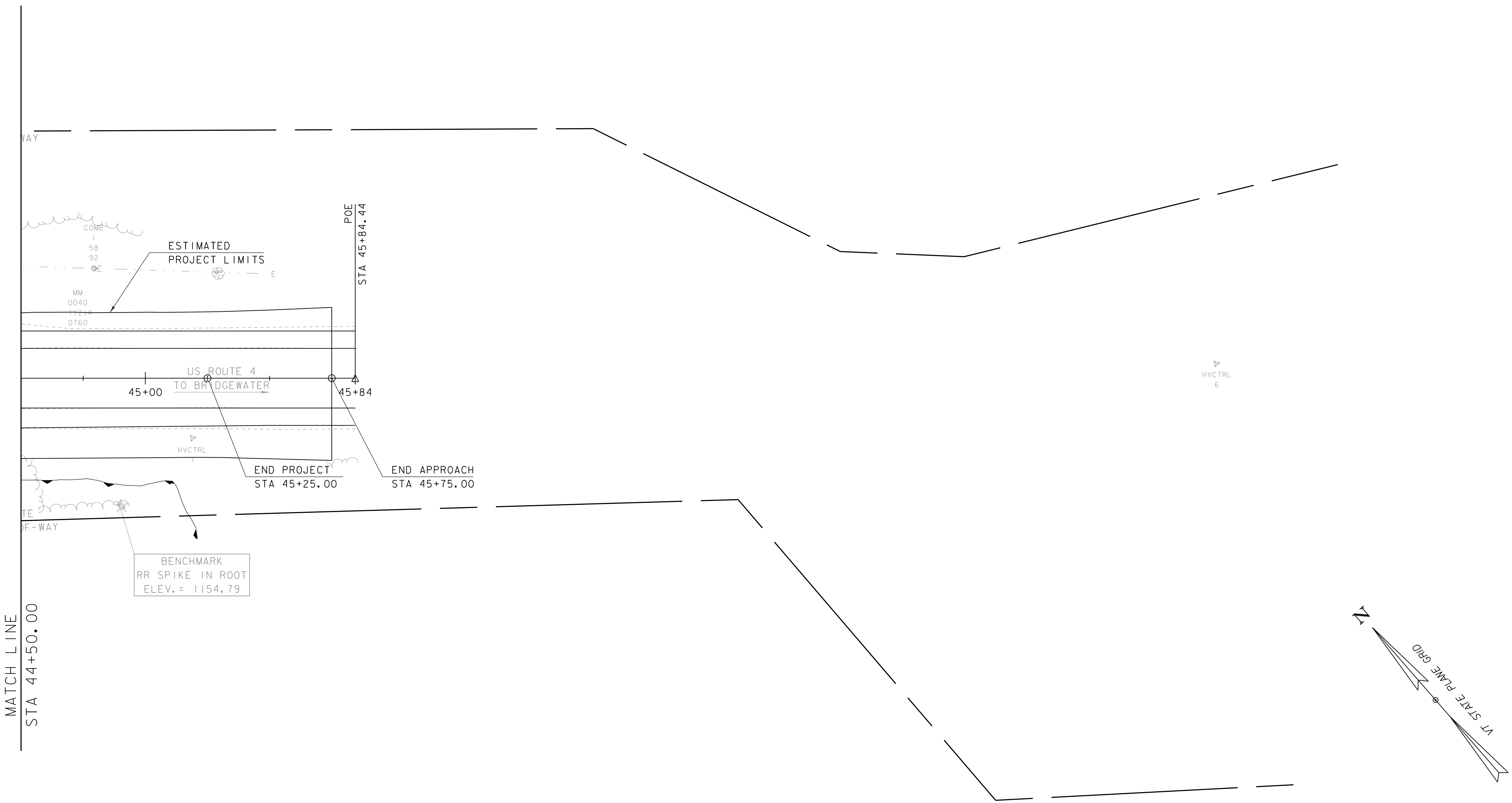
ALTERNATIVE 3 LAYOUT 1

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

PROJECT NAME: KILLINGTON
PROJECT NUMBER: BF 020-2(42)

FILE NAME: l3b260/sl3b260border.dgn
PROJECT LEADER: C.P.WILLIAMS
DESIGNED BY: G.SWEENY
ALTERNATIVE 3 LAYOUT SHEET 1

PLOT DATE: 09-FEB-2015
DRAWN BY: D.D.BEARD
CHECKED BY: G.SWEENY
SHEET 8 OF 15



ALTERNATIVE 3 LAYOUT 2

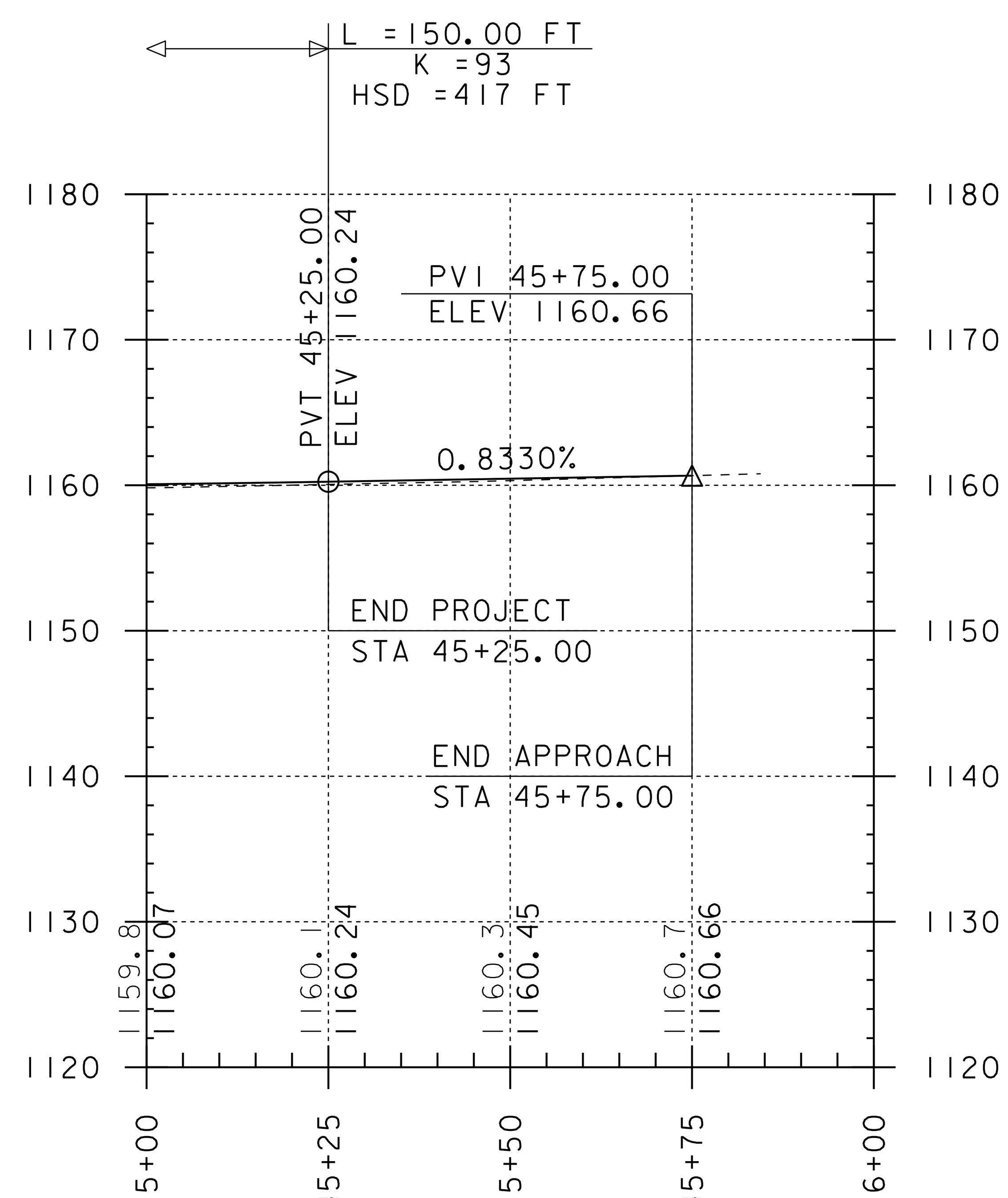
SCALE 1" = 20'-0"

20 0 20

PROJECT NAME: KILLINGTON	
PROJECT NUMBER: BF 020-2(42)	
FILE NAME: l3b260/sl3b260border.dgn	PLOT DATE: 09-FEB-2015
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: G.SWEENY	CHECKED BY: ------
ALTERNATIVE 3 LAYOUT SHEET 2	SHEET 9 OF 15

US ROUTE 4 ALTERNATIVE 3 PROFILE

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



US ROUTE 4 ALTERNATIVE 3 PROFILE

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

NOTE:

GRADES SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG ℄

GRADES SHOWN TO THE NEAREST HUNDREDTH ARE FINISH GRADE ALONG ℄

PROJECT NAME: KILLINGTON	
PROJECT NUMBER: BF 020-2(42)	
FILE NAME: 13b260/s13b260profile.dgn	PLOT DATE: 09-FEB-2015
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: G.SWEENY	CHECKED BY: ------
ALTERNATIVE 3 PROFILE SHEET	SHEET 10 OF 15

UPSTREAM TEMPORARY BRIDGE

SCALE 1" = 20′-0"
20 0 20

PROJECT NAME:	KILLINGTON
PROJECT NUMBER:	BF 020-2(42)

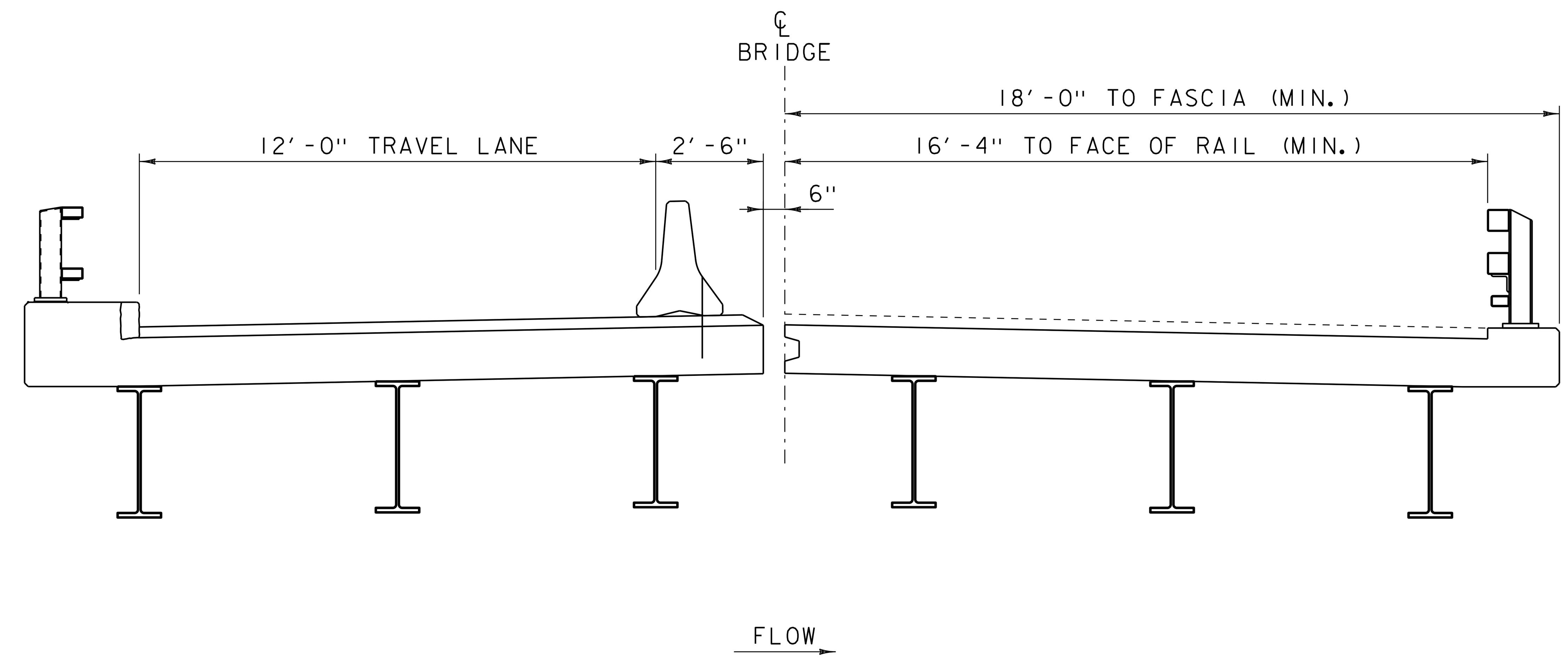
FILE NAME: 13b260/s13b260tempbridge.dgn	PLOT DATE: 09-FEB-2015
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
UPSTREAM TEMPORARY BRIDGE	SHEET 11 OF 15

DOWNSTREAM TEMPORARY BRIDGE

SCALE 1" = 20′-0"

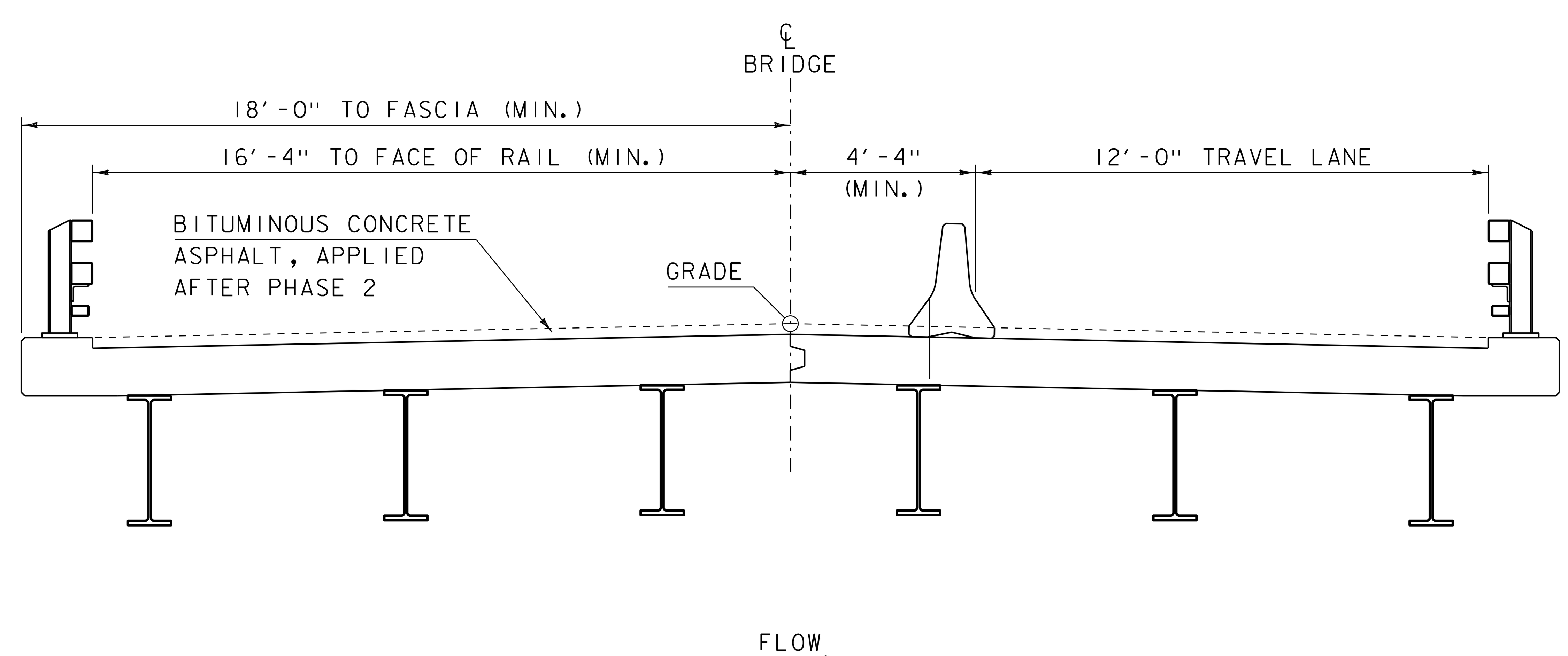
20 0 20

PROJECT NAME: KILLINGTON	
PROJECT NUMBER: BF 020-2(42)	
FILE NAME: l3b260/sl3b260tempbridge.dgn	PLOT DATE: 09-FEB-2015
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
DOWNSTREAM TEMPORARY BRIDGE	SHEET 12 OF 15



PHASE #1 TYPICAL SECTION

SCALE ⅜" = 1'-0"



PHASE #2 TYPICAL SECTION

SCALE ⅜" = 1'-0"

PROJECT NAME: KILLINGTON	
PROJECT NUMBER: BF 020-2(42)	
FILE NAME: 13b260\s13b260phasing.dgn	PLOT DATE: 09-FEB-2015
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: G.SWEENY	CHECKED BY: G.SWEENY
PHASING TYPICAL SECTIONS	SHEET 13 OF 15

PHASE I LAYOUT

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME: KILLINGTON	
PROJECT NUMBER: BF 020-2(42)	
FILE NAME: l3b260/sl3b260border.dgn	PLOT DATE: 09-FEB-2015
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
PHASE I LAYOUT SHEET	SHEET 14 OF 15

PHASE 2 LAYOUT

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME: KILLINGTON	
PROJECT NUMBER: BF 020-2(42)	
FILE NAME: 13b260/s13b260border.dgn	PLOT DATE: 09-FEB-2015
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
PHASE 2 LAYOUT SHEET	SHEET 15 OF 15