STATE OF VERMONT
AGENCY OF TRANSPORTATION

Scoping Report

FOR

Dover BF 013-1(20)

VT ROUTE 100, BRIDGE 59 OVER THE NORTH BRANCH OF THE DEERFIELD RIVER

December 6, 2013

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I. Site Information

Bridge 59 is a State owned bridge located on VT Route 100 near a light residential neighborhood with some small commercial businesses nearby. The bridge is approximately 280 feet northwest of the intersection of VT 100 and Country Club Road (TH 9). Blue Brook Road (TH 8) is approximately 125 feet northwest of the bridge. The bridge is a straight structure located on a curve in the roadway, and is near the crest of a slight vertical curve. The approaches are both curving, but have good sight distance. 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 Minor Arterial (State Highway)
Bridge Type	Single span, cast-in-place concrete deck. Original span is on CIP tee-beams, added width is a slab section.
Bridge Length	35 feet
Year Built	1926, widened in 1978.
Ownership	State of Vermont

Need

Bridge 59 carries VT Route 100 across the North Branch of the Deerfield River. The following is a list of deficiencies of Bridge 59 and VT Route 100 in this location:

1. The deck is in poor condition. There are areas of heavy spalling on the original deck soffit, exposing the steel reinforcement. The bridge is considered structurally deficient.

2. The existing bridge does not meet the hydraulic standard. The channel is in fair condition, but is stable for scour.

3. The bridge railing does not meet crash standards.

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	4900	5200
DHV	890	950
ADTT	390	630
%T	6.0	9.1
%D	55	55

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 of 5,200, a DHV of 950, and a design speed of 40 mph for a Rural Minor Arterial.

Design Criteria	Source	Existing Condition	Minimum Standard	Comment
Approach Lane and Shoulder Widths	VSS Table 4.3	12'/5' (34')	11'/5' (32')	
Bridge Lane and Shoulder Widths	VSS Section 4.7	12'/5' (34')	11'/5' (32')	
Clear Zone Distance	VSS Table 4.4		14' fill / 12' cut	
Banking	VSS Section 4.13	Varies	8% (max)	
Speed		40 mph	40 mph (Design)	
Horizontal Alignment	AASHTO Green Book Table 3-10b	R = 1,450' (Bridge is on tangent within curve)	R_{min} = 1,390' @ e=4.8%	
Vertical Grade	VSS Table 4.6	0.2% on bridge 3.0% (east approach) 1.7% (west approach)	7% (max) for level terrain, village	
K Values for Vertical Curves	VSS Table 4.1	East approach located on a crest (K = 58), West approach located on a sag (K = 123)	60 crest / 60 sag	Acceptable
Vertical Clearance	VSS Section 4.8	No Issues Noted	14'-3" (min)	
Stopping Sight Distance	VSS Table 4.1	473' on east approach 524' on west approach	275'	
Bicycle/Pedestrian Criteria	VSS Table 4.7	6' shoulder	4' Shoulder	
Bridge Railing	Structures Design Manual Section 13	Fascia mounted W Beam R6 Rail	TL-2	Substandard
Hydraulics	VTrans Hydraulics Section	Does not pass Q_{25} storm event	Pass Q_{50} storm event with 1.0' of freeboard	Substandard
Structural Capacity	SM, Ch. 3.4.1	Structurally Deficient	Design Live Load: HL-93	Substandard

Inspection Report Summary

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

6/19/2013 – This structure is going to need a deck rehab project of the older section in the near future due to the extensive deterioration. The spalling in the soffit between the tee beams penetrated up to the 4th layer of rebar in some areas. The downstream wingwall will have to be replaced as well as it is cracked through and separated from the stemwall, tipping towards the channel 3" @ 4'. ~JWW/JDM

04/11/2011 – The deck soffit area has several large spalls and delaminated areas predominantly in bays 1 and 2. Local failures are eminent (sic) in the near future and may occur at anytime and anywhere. ~PLB

03/31/2009 – Original deck portion is in poor condition with advanced deterioration of the underside. Consider installing a rigid overlay. The slab and downstream portions of the abutments could use concrete repair but this damage does not effect (sic) carrying capacity and is secondary to the poor deck state. ~MJ/DS

Hydraulics

The existing bridge currently does not pass a 25 year storm event. This does not meet the hydraulic standard of passing the 50 year storm event (Q_{50}) with one foot of freeboard below the low beam elevation of the bridge. If a total bridge replacement is considered, there are several combinations of span and low beam elevations that would meet the hydraulic standard. All of the combinations considered would require raising the bridge. These options are outlined in the preliminary hydraulics report in the Appendix.

Utilities

The existing utilities are shown on the Existing Conditions Layout Sheet, and are as follows:

Municipal Utilities

- There are no municipal water facilities within the project area. However, most of the residences/businesses in the project area have a private water supply, such as an artesian well.

- There is an existing sewer main, owned by North Branch District # 1, which parallels VT Route 100 on the westerly side thru the entire project area. This sewer main crosses the river just upstream from the existing bridge. There is also an existing sewer main which crosses VT Route 100 approximately 200 feet north of the existing bridge.

- There are no water or sewer mains attached to the existing bridge.

Public Utilities

Underground:

- FairPoint has a buried fiber optic cable which approaches the bridge from the south, on the west side of VT Route 100. This buried cable changes to aerial 50 feet south of the bridge (Pole #1/4) and continues north along the upstream side of the bridge.

Aerial:

- There are aerial electric and communication cables which parallel VT Route 100 on the downstream side of the bridge; these cables continue to just north of the existing bridge; at that point they extend up and along Blue Brook Road and cross to the upstream side of VT Route 100. This aerial crossing is approximately 120 north of the existing bridge.

- There are aerial communication lines which cross VT Route 100 approximately 145 feet south of the existing bridge.

- There is an existing aerial fiber optic cable which runs along the upstream side of VT Route 100.

It is anticipated that overhead utilities will have to be relocated for construction.

Right Of Way

The existing Right-of-Way is 4 Rods and is plotted on the Existing Conditions Layout Sheet. This Right-Of-Way is not centered on the centerline of VT Route 100, and the existing upstream wingwalls are located outside the Right-Of-Way. Depending on the alternative selected, additional rights may be necessary.

Resources

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

Biological:

There are no wetlands identified within the project area. The US Army Corps of Engineers and the Agency of Natural Resources would regulate any activities below ordinary high water. The river would support a variety of aquatic organism including brook trout. Efforts to minimize water quality impacts during construction will need to be evaluated as the project design moves forward.

Wildlife Habitat

There are no wildlife corridor issues within the project area.

Rare, Threatened and Endangered Species

There are no mapped rare, threatened or endangered species within the project area.

Agricultural

There are no prime agricultural lands within the project area.

Hazardous Materials:

According to the Vermont Agency of Natural Resources (VANR) Vermont Hazardous Sites List, there are several hazardous waste site located along VT Route 100 in the vicinity of the project. The closest site is located approximately 0.2 miles south of the bridge. It is anticipated that the bridge project will not impact these sites.

Historic:

Bridge 59 is not historic and there are no historic or Section 4(f) resources in the project area.

Archeological:

There is one area of low-moderate archeological sensitivity present in the SW quadrant. The sensitive area is shown in the appendix.

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 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

From a constructability standpoint, a temporary bridge could be placed on either the upstream or downstream side of the existing bridge. A downstream temporary bridge would have temporary impacts to the intersection with Blue Brook Road, and to the drive located before the bridge. The intersection would need to be temporarily reconfigured during construction. An upstream temporary bridge would have impacts to the archeologically sensitive area located in the southwest quadrant of the project, and would require an archeological assessment. Additionally, an upstream temporary bridge would have impacts to the municipal underground sewer line. Both an upstream and downstream temporary bridge would require additional rights from adjacent property owners, and would require a temporary relocation of overhead utilities.

A two-way temporary bridge would be required based on the daily traffic volumes and sight distance. See the Temporary Bridge Layout Sheets in the appendix.

Advantages: Traffic flow can be maintained through the project corridor during construction.

Disadvantages: This option would require additional Right-of-Way acquisition for placement of the temporary bridge. This option would have adverse impacts to adjacent properties and resources. There would be decreased safety to the workers and to vehicular traffic, because of cars driving near the construction site, and construction vehicles entering and exiting the construction site. This traffic control option would be costly, and time consuming, as construction activities would take a second construction season, in order to set up the temporary bridge.

Option 2: Phased Construction

Phased construction is the maintenance of one way alternating 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 adjacent property owners and environmental resources.

Phased construction is a feasible method for traffic maintenance at this site, from a construction standpoint. The existing width of the bridge would allow for phased construction without shifting the horizontal alignment of the proposed bridge, widening the proposed bridge, or using a temporary bridge for one of the phases.

The main concern for phased construction at this site is the high volume of traffic. Based on the current daily traffic volumes, if VT Route 100 was reduced to one way alternating traffic with a traffic signal, the average traffic queue lengths would exceed capacity. There would be delays and traffic congestion beyond what is considered acceptable. Therefore, phased construction will not be considered further.

Option 3: Off-Site Detour

This option would close the bridge and reroute traffic onto VT Route 30, to VT Route 9, back to VT Route 100. This regional detour has an end-to-end distance of 64.7 miles. This detour adds approximately 19.3 miles to travel distance.

The detour on state roads is quite long but there are local roads that could accommodate the volume of detoured traffic. The detour using local roads would be:

1. VT Route 100, to Tannery Road, Handle Road, Coldbrook Road, back to VT Route 100 (10.4 miles end-to-end)

From a geometric standpoint, the Local Roads could be considered an acceptable signed detour. Since these roads are locally owned, permission would be needed from the towns involved in order to sign these as official detour routes.

A map of the detour route and a possible local detour route, which could see an increase in traffic, can be found in the Appendix.

Advantages: This option would eliminate the need for a temporary bridge, which would significantly decrease cost and time of construction. This option would have the least impact to adjacent properties and archeological resources.

Disadvantages: Traffic flow would not be maintained through the project corridor during construction.

III. Alternatives Discussion

No Action

This alternative is not recommended. The deck is in poor condition and will continue to deteriorate. Additionally, full depth holes in the deck are increasingly likely with time. Something will have to be done to improve this bridge in the near future. Although the bridge does not appear to be in imminent danger of collapse, it will eventually be posted for lower traffic loads. In the interest of safety to the traveling public, the No Action alternative is not recommended. No cost estimate has been provided for this alternative since there are no immediate costs.

Superstructure Replacement

A superstructure replacement option for this bridge would include a new precast superstructure, and substructure repair as follows:

- There is no evidence of Alkali Silica Reaction taking place at the substructures. Damage appears to be from chloride attack. Therefore, details for adequate drainage are recommended to keep deicing salts off the wingwall joints.

- Wingwall 2 is cracked through and separated from the stemwall. It is tipping in towards the channel 3" @ 4'. This wingwall should either be fully replaced, or soil nailed for stabilization and then concrete patched. Due to the amount of concrete patching and need for extra equipment to soil nail, it is recommended that wingwall 2 is replaced.

- Wingwall 4 has some spalling at the joint, but has not separated from the stemwall, and is not showing signs of displacement. It is recommended that spalled concrete is removed and patched (possibly with the addition of anodes).

- There is chloride attack along the abutment as evident by efflorescence. This is due to leaky bridge joints. This can be mitigated with minimal type concrete repair, and new bridge joints.

The existing substructure is in satisfactory condition, and it is reasonable to assume that the existing substructure can safely carry anticipated traffic loads for an additional 20 years. Since the existing T-beams are integral with the deck, replacement of the deck only is not feasible.

The existing lane widths and shoulders on the bridge are 12 feet wide and 5 feet wide respectively. The Town of Dover has indicated that VT Route 100 through this area has heavy bicycle and pedestrian usage. It is proposed that the current 12 foot lanes are reduced to 11 feet; this is an effective traffic calming measure that can be used in high bicycle/pedestrian traffic areas. Additionally, 5 foot shoulders are proposed for a shared use lane, in order to match the existing fascia to fascia distance and meet the Vermont State Standards. For pedestrian safety, a flush mounted galvanized 3-rail box beam is the recommended bridge railing, instead of the current fascia mounted railing. Including a flush mounted box beam railing, this new configuration would result in a fascia to fascia distance of 35'-4".

The existing bridge has a skew of 35 degrees, which is within the restricted range for new bridge construction as set forth by SEI 08-003. Consequently, the bridge joints would be delineated with guidance from the VTrans Operations Division to avoid damage to the bridge joints and snow maintenance equipment while plowing.

Advantages: This alternative would address the structural deficiencies of the existing bridge, with minimum upfront costs. This option would not require Right-of-Way acquisition, and would have minimal impacts to adjacent properties and resources.

Disadvantages: The current bridge does not meet the hydraulic standards, which this option does not improve.

Maintenance of Traffic: The possible options here would be either an offsite detour or a temporary bridge.

Full Bridge Replacement

The current alignment meets current standards, so any new structure will be placed on the existing horizontal alignment in order to minimize project limits and impacts.

This alternative would replace the existing bridge with a new superstructure as well as a new substructure at the existing location. The various considerations under this option include: the bridge width and length, skew, superstructure type and substructure type.

a. Bridge Width

A typical section meeting the minimum State Standards will be proposed for a brand new 80+ year bridge. The Town of Dover has indicated that VT Route 100 through this area has heavy bicycle and pedestrian usage. It is proposed that the current 12 foot lanes are reduced to 11 feet for traffic calming. Additionally, 6 foot shoulders are proposed for a shared use lane, to match the existing rail to rail width. This exceeds the Vermont State Standards by one foot on each side of the bridge. Including a flush mounted box beam railing, this configuration results in a fascia to fascia distance of 37'-4".

b. Bridge Length and Skew

The existing bridge is 35 feet long and with a skew of 35 degrees.

The Hydraulics section has recommended two options that will meet hydraulics standards: a 45 foot clear span (55' span along the roadway) option with a vertical raise in finished grade of 1'-2" (28D NEXT Beams assumed), and a 55 foot clear span (65' span along the roadway) option matching the existing vertical grade (32D NEXT Beams assumed). From a constructability standpoint, either option is acceptable. The cost comparison of the two options can be found below in the Cost Matrix section.

Eliminating the skew would result in a structure with a minimum length of 85 feet. Increasing the span by this magnitude would require a deeper superstructure type and would not be economical. Therefore, the skew should closely match the natural channel skew of 35 degrees. Skews between 32 degrees and 42 degrees are restricted in order to avoid damage to bridge joints and to snow maintenance equipment while plowing. Therefore, a skew of 30 degrees will be chosen.

c. Superstructure Type

A prefabricated structure will be the preferred choice, due to decreased construction time. The possible 55' to 65' span length bridge types that are most commonly used in Vermont, are steel beams with a composite concrete deck and NEXT beams. Utilizing concrete with a strength of 8,000 psi, NEXT beams yield a shallower superstructure depth. For either bridge type, straight beams can be utilized for simplicity, and the fascia and bridge railing can be cast on a curve to account for the roadway curve.

d. Substructure Type

There is no visible bedrock in the location of the project; however, based on available information on nearby water wells, the site may contain bedrock at a depth that would not be conducive to integral abutments. As such, stub abutments on spread footings placed six feet below stream bed would be the likely substructure choice for this bridge. In order to reduce construction time, precast abutments and footings may be used.

Maintenance of Traffic:

Either a temporary bridge or an offsite detour could be utilized for traffic control at this site.

IV. Alternatives Summary

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

Alternative 1a: Superstructure Replacement with Traffic Maintained on Off-Site Detour
Alternative 1b: Superstructure Replacement with Traffic Maintained on Temporary Bridge
Alternative 2a: 55’ Span Full Bridge Replacement with Traffic Maintained on Off-Site Detour
Alternative 2b: 55’ Span Full Bridge Replacement with Traffic Maintained on Temporary Bridge
Alternative 3a: 65’ Span Full Bridge Replacement with Traffic Maintained on Off-Site Detour
Alternative 3b: 65’ Span Full Bridge Replacement with Traffic Maintained on Temporary Bridge

V. Cost Matrix[1]

Dover BF 013-1(20)		Do Nothing	Alt 1a	Alt 1b	Alt 2a	Alt 2b	Alt 3a	Alt 3b
			Superstructure Replacement		55' Span Bridge Replacement		65' Span Bridge Replacement	
			Offsite Detour	Temp Bridge	Offsite Detour	Temp Bridge	Offsite Detour	Temp Bridge
COST	Bridge Cost	$0	$183,000	$183,000	$504,000	$504,000	$586,000	$586,000
	Removal of Structure	$0	$25,000	$25,000	$80,000	$80,000	$80,000	$80,000
	Roadway	$0	$225,000	$308,000	$381,000	$437,000	$316,000	$373,000
	Maintenance of Traffic	$0	$60,000	$200,000	$80,000	$200,000	$80,000	$200,000
	Construction Costs	$0	$493,000	$716,000	$1,045,000	$1,221,000	$1,062,000	$1,239,000
	Construction Engineering + Contingencies	$0	$147,900	$214,800	$313,500	$366,300	$318,600	$371,700
	Total Construction Costs w CEC	**$0**	**$640,900**	**$930,800**	**$1,358,500**	**$1,587,300**	**$1,380,600**	**$1,610,700**
	Preliminary Engineering[2]	**$0**	**$172,550**	**$250,600**	**$313,500**	**$366,300**	**$318,600**	**$371,700**
	Right of Way	**$0**	**$0**	**$64,440**	**$94,050**	**$109,890**	**$95,580**	**$111,510**
	Total Project Costs	$0	$813,000	$1,246,000	$1,766,000	$2,063,000	$1,795,000	$2,094,000
	Annualized Costs	$0	$40,700	$62,300	$22,100	$25,800	$22,400	$26,200
SCHEDULING	Project Development Duration[3]		2 years	4 years	4 years	4 years	4 years	4 years
	Construction Duration		3 months	18 months	6 months	18 months	6 months	18 months
	Closure Duration (If Applicable)		2 weeks	N/A	4 weeks	N/A	4 weeks	N/A
ENGINEERING	Typical Section - Roadway (feet)	34'	32'	32'	34'	34'	34'	34'
	Typical Section - Bridge (feet)	5-12-12-5	5-11-11-5	5-11-11-5	6-11-11-6	6-11-11-6	6-11-11-6	6-11-11-6
	Geometric Design Criteria	No Change	Meets Criteria	Meets Criteria	Meets Criteria	Meets Criteria	Meets Criteria	Meets Criteria
	Traffic Safety	No Change	Improved	Improved	Improved	Improved	Improved	Improved
	Alignment Change	No	No	No	Vertical Raise	Vertical Raise	No	No
	Bicycle Access	No Change	No Change	No Change	Improved	Improved	Improved	Improved
	Hydraulic Performance	No Change	No Change	No Change	Improved	Improved	Improved	Improved
	Pedestrian Access	No Change	No Change	No Change	Improved	Improved	Improved	Improved
	Utility	No Change	Relocation	Relocation	Relocation	Relocation	Relocation	Relocation
OTHER	ROW Acquisition	No	No	Yes	Yes	Yes	Yes	Yes
	Road Closure	No	Yes	No	Yes	No	Yes	No
	Design Life	<10 years	20 years	20 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] Project Development Durations are starting from the end of the Project Definition Phase.

VI. Conclusion

Our **conditional** recommendation is to pursue alternative 3a; to build a new 65 foot span bridge with a four week closure while maintaining traffic on an offsite detour, on locally owned roads. This alternative will be able to be constructed in the shortest possible time with minimal impacts to adjacent property owners and archeological resources. Since the proposed detour route is on locally owned roads, this recommendation is conditional on receiving the approval from the Towns of Dover and Wilmington, who own the roads that traffic could be detoured onto.

If the Towns are not willing to give approval to use their roads as the detour route, our recommendation will be to pursue alternative 3b, to build a new bridge on existing alignment, while maintaining traffic on a temporary bridge.

Structure:

The bridge will have a single span of 65 feet and a skew of 30 degrees to match the channel. The existing bridge has a width of 34 feet, which exceeds Vermont State Standards by two feet; this travel width will be maintained. Additionally, by choosing the 65 foot span bridge option, the vertical grade can remain the same, reducing permanent impacts. While the rehabilitation option has the lowest upfront costs, a bridge replacement has a lower per year cost based on an 80 year design life compared to a 20 year design life. Additionally, not only does a full bridge replacement address structural deficiencies of the existing bridge, but it also addresses the hydraulic deficiencies.

Traffic Maintenance:

The official state detour route has an end-to-end distance of 69.7 miles, which is relatively long for the amount of traffic that would be detoured at this site. The Average Daily Traffic volume is 4,900 vehicles per day. It does not seem reasonable to send that volume of traffic around a detour of that length. However, Local Bypass Route 1, as described in the appendix could be appropriate for a signed detour route, if the Towns give their permission to do so.

Local Bypass Route 1 is as follows: VT Route 100, to Tannery Road, Handle Road, Coldbrook Road, back to VT Route 100. This local bypass route does not add any distance to the through route. It has an end-to-end distance of 10.4 miles, and could be appropriate for a signed detour route. The option to close the road will have smaller impacts to adjacent properties compared to other traffic maintenance options. Additionally the option to close the road is the least expensive and the safest option.

If the Towns of Dover and Wilmington do not wish to have the Local Bypass Route signed, than a temporary bridge will be recommended. A two-way temporary bridge could be constructed on either the upstream or downstream side of the existing bridge.

Additional Considerations:

Since the Town of Dover requested a sidewalk on the bridge, the VTrans Bicycle and Pedestrian Program Manager has been consulted as part of this scope. The Town has developed a shared use path on the west side of VT Route 100 that terminates at a shopping plaza a short distance south of the bridge. The path is on its own alignment separate from VT Route 100 and there are no sidewalks or shared use paths along 100 at the project location. The land use north of the bridge is relatively low density with some sporadic retail uses. Given the scope of the project, the absence of sidewalks or paths leading up to the bridge, and the provision of 6 foot shoulders on both sides of the bridge for bicycle traffic and pedestrians, the recommended alternative provides an appropriate typical section. This would not preclude the town from pursuing a northern extension of their existing path with its own independent crossing of the river.

VII. Appendices

- Site Pictures
- Town Map
- Bridge Inspection Report
- Hydraulics Memo
- Preliminary Geotechnical Information
- Natural Resources Memo
- Archeology Memo
- Historic Memo
- Local Input
- Detour and Local Bypass Maps
- Plans
    - Existing Conditions
    - Alternative 1 Proposed Typical Sections
    - Alternative 1 Layout and Profile
    - Alternative 2 & 3 Proposed Typical Sections
    - Alternative 2 Layout and Profile
    - Alternative 3 Layout and Profile
    - Upstream and Downstream Temporary Bridge Layouts

Approach – Looking north over bridge

Approach – Looking South over bridge

Looking Downstream

Looking Upstream

Deck Soffit Deterioration

Downstream Wingwall

DOVER,
VT 100, BR 59

Scale 1:42,762

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

DOVER
WINDHAM COUNTY
DISTRICT # 1

STRUCTURE INSPECTION, INVENTORY and APPRAISAL SHEET

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

Inspection Report for DOVER **bridge no.:** 00059 **District:** 1

Located on: VT 00100 ML **over** N. BR. DEERFIELD RI **approximately** 7.1 MI N JCT. VT.9 W **Owner:** 01 STATE-OWNED

CONDITION

Deck Rating: 4 POOR

Superstructure Rating: 6 SATISFACTORY

Substructure Rating: 6 SATISFACTORY

Channel Rating: 6 SATISFACTORY

Culvert Rating: N NOT APPLICABLE

Federal Str. Number: 200013005913042

Federal Sufficiency Rating: 074.5

Deficiency Status of Structure: SD

AGE and SERVICE

Year Built: 1926 **Year Reconstructed:** 1978

Service On: 1 HIGHWAY

Service Under: 5 WATERWAY

Lanes On the Structure: 02

Lanes Under the Structure: 00

Bypass, Detour Length (miles): 18

ADT: 006500 **% Truck ADT:** 09

Year of ADT: 1998

GEOMETRIC DATA

Length of Maximum Span (ft): 0030

Structure Length (ft): 000035

Lt Curb/Sidewalk Width (ft): 0

Rt Curb/Sidewalk Width (ft): 0

Bridge Rdwy Width Curb-to-Curb (ft): 34.2

Deck Width Out-to-Out (ft): 35

Appr. Roadway Width (ft): 034

Skew: 33

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: CONC TBM WID W SLAB

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

Kind of Material and/or Design: 1 CONCRETE

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: 5 BETTER THAN MINIMUM TOLERABLE CRITERIA

Deck Geometry: 4 MEETS MINIMUM TOLERABLE CRITERIA

Underclearances Vertical and Horizontal: N NOT APPLICABLE

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

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: 2 H 15

INSPECTION and CROSS REFERENCE

X-Ref. Route:

Insp. Date: 062013 **Insp. Freq. (months)** 12 **X-Ref. BrNum:**

INSPECTION SUMMARY and NEEDS

6/19/2013 This structure is going to need a deck rehab project of the older section in the near future due to the extensive deterioration. The spalling in the soffit between the tee beams penetrates up to the 4th layer of rebar in some areas. The downstream wingwall will have to be replaced as well as it is cracked through and separated from the stemwall, tipping towards the channel 3" @ 4'. JWW/JDM

04/11/2011 The deck soffit area has several large spalls and delaminated areas predominantly in bays 1 and 2. Local failures are eminent in the near future and may occur at anytime anywhere. PLB

03/31/2009 - Original deck portion is in poor condition with advanced deterioration of the underside. Consider installing a rigid overlay. The slab and downstream portions of the abutments could use concrete repair but this damage does not effect carrying capacity and is secondary to the poor deck state. - MJ/DS

VT AGENCY OF TRANSPORTATION PROGRAM DEVELOPMENT DIVISION

HYDRAULICS UNIT

TO: Chris Williams, Structures Project Manager

FROM: Melanie Haskins, Hydraulics Engineer (McFarland Johnson)
Brian Bennett, Hydraulic Engineer (McFarland Johnson)
via Nick Wark, VTrans Hydraulic Engineer

DATE: July 26, 2013

SUBJECT: Dover – BF-013-1(20) – VT 100 BR 59 over N. Branch of Deerfield River

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

Existing Bridge Information

The original bridge was constructed in 1926 and widened in 1978 based on the bridge inspection reports and record information. The bridge is owned by the State, based on the bridge inspection reports, located on VT 100 approximately 7.1 miles north of the junction with VT 9. The original structure was a single span narrow 2-lane concrete T-beam construction with an asphalt pavement surface. During the 1978 project, the bridge was widened in the upstream direction using a concrete slab deck with an asphalt pavement surface. Also as part of the 1978 construction, the roadway on the existing bridge and the new concrete slab deck created a superelevation sloping towards the upstream side of the bridge due to the bridge being located on a horizontal curve. Also, the bridge superstructure is askew to the stream at approximately 33°. The abutments appear to be normal to the stream. The total width of bridge is approximately 35.67 feet normal to the roadway, but approximately 43.67 feet along the stream. The total clear span along the roadway is approximately 29.25 feet (abutment face to abutment face), but the clear span normal to the stream is approximately 24.75 feet. The superstructure depth for the spans is approximately 2.55 feet on the upstream end for the concrete slab and 3.55 feet on the downstream end with the concrete T-beam. The approximate height to the bottom of the superstructure to the streambed varies, but the maximum height is approximately 8 feet.

The existing bridge does not meet the hydraulic standard for the Q_{50} design storm event. In fact, the Q_{25} storm event doesn't pass through the structure. The bridge is located on the North Branch of the Deerfield River just upstream of the confluence with Blue Brook. The structure is located on a section of the river having a well-defined channel having an underlying sandy-gravelly streambed having many stones. We did not evaluate the scour for the existing conditions or any proposed bridge configurations as part of the preliminary design. Scour calculations will be performed during final hydraulics since the foundations have not been fully evaluated or selected at this time.

Recommendations

The bridge option selection criteria should be to provide a bridge opening that does not restrict the bank full width, nor provide an unrealistic widening of the existing channel, or create any worse backwater flooding conditions than the existing conditions. The VANR Bank Full Width (BFW) Equation estimates the width to be approximately 27 feet, but the actual field conditions have varying natural bank full stream widths within the study reach between 25 to 30 feet upstream of the bridge and between 30 to 35 feet downstream of the bridge from site observation and survey.

It has been assumed a replacement structure will be located in the existing horizontal roadway alignment. For a replacement structure, we have anticipated that the proposed abutments will be vertical face concrete abutments placed normal to the river with 3H:2V sloped stone fill placed to provide scour protection in front of the abutments.

Based on our analysis, we have reviewed a couple of viable replacement bridges. A 45-foot clear span normal to the stream channel between the abutment faces (which is equivalent to approximately 53.6 feet along the roadway) with low beam elevation of 1740.2 feet. The other option is a 55-foot normal clear span (or approximately 65.6 feet along the roadway) with low beam elevation of 1738.7 feet. Both of these viable options pass the Q_{50} design storm event through the structure and meet the VTrans hydraulic standards. However, each of the potential options will also require a low beam elevation adjustment (i.e. 1.25 feet for the 45-foot structure and 0.75 feet for the 55-foot structure) since the existing structure is significantly undersized. Conversely creating too long a replacement span to limit the roadway elevation adjustment will not be desirable given the bridges location with regard to the existing river characteristics and other roadways.

As anticipated and based on the modeling, the longer span will have lower velocities in the area of the bridge than the existing conditions. The magnitudes of the velocities (i.e. 4.5 to 5 feet per second) for the Q_{50} design event are similar in both options. Both of the options are also recommended to have approximately 4' height of 3H:2V sloped stone fill for scour protection in front of both abutments. It is anticipated that this stone fill will be blended back to the existing banks along wing walls. If additional stone fill height is determined to be necessary during further bridge design, the low beam elevation will need to be evaluated further and possibly raised slightly. Refer to the attached sketches showing the limits of the stone fill slopes and bridge opening cross section configuration.

It is noted with the stone fill scour protection for the 45-foot option provides width through the structure of approximately 29 feet of channel width at the toe which is closer to the existing conditions and closer to the estimated VANR BFW. This 45-foot option also appears to be able to blend into the site better given some of the site constraints. The proposed opening width at the toe of the 55-foot option is approximately 39 feet. Therefore, the 45-foot clear span structure is the preferred option hydraulically since it appears to fit the site better, but the 55-foot clear span structure also is also considered to be viable option and will most likely require less roadway elevation adjustments.

<u>Temporary Bridge/Phasing</u>
Based on pre-scoping information from the Structures Group, it has not been determined whether a detour or a temporary bridge will be used for this location.

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

MAH/BMB
cc: Hydraulics Project File via NJW
Hydraulics Chrono File

AGENCY OF TRANSPORTATION **OFFICE MEMORANDUM**

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

NSM CCB

From: Nicholas S. Meltzer, P.E., Geotechnical Engineer, via Christopher C. Benda P. E., Soils and Foundations Engineer

Date: July 9, 2013

Subject: Dover BF 013-1(20) 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 59 on Vermont 100 in Dover, which flows over The North Branch of the Deerfield River. This review included our in-house bridge boring files, record plans, USDA Natural Resources Conservation soil survey records, surficial geology and bedrock maps of the State and the Agency of Natural Resources Well logs.

Previous Projects

Record plans were found for the project, which show the bridge supported on spread footings placed 6 feet below the bottom of streambed. No soil information was available. The Soils and Foundations Unit maintains a GIS based historical record of subsurface investigations, which contains electronic records for the majority of borings completed in the past 10 years. An exploration of this map revealed no previous borings in the town of Dover

Water Well Logs

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 soil strata in the area. The soil description given on the logs is done in the field, by unknown personnel, and as such, should only be used as an approximation. Five surrounding well logs were examined for depths to bedrock and soil strata.

Figure 1 contains the project and surrounding well locations. The specific wells used to gain information on the subsurface conditions are highlighted by red boxes.

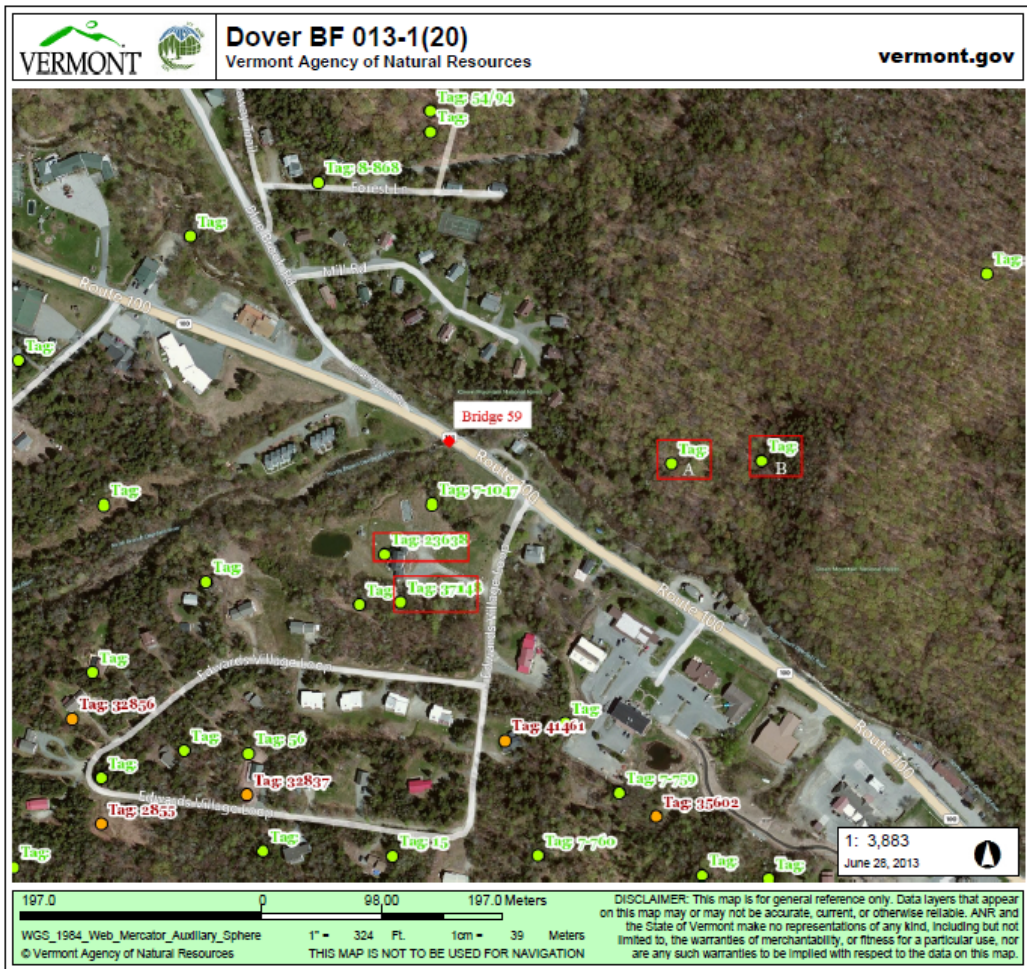


Figure 1. Highlighted well locations near subject project

Table 1 lists the well sites used in gathering the surrounding information. Wells are listed with the distance from the bridge project, depth to bedrock, and type of soils encountered.

Table 1. Depths to bedrock and subsurface strata of surrounding sites

Well Number	Distance From Project (feet)	Depth To Bedrock (feet)	Overburden Material
"A"	600	32	Clay
"B"	850	32	Gravel
23638	350	25	Gravel
37148	450	50	Sand

USDA Soil Survey

The United States Department of Agriculture Natural Resources Conservation Service maintains a surficial geology map of the United States, which is available online.

According to the Web Soil Survey, the strata directly underlying the project site consists of Sheepscot sandy loam, which is well draining and has a seasonally high water table.

A site visit was conducted to determine potential issues with boring operations, and to make any other pertinent observations about the project. Figure 2 was taken on June 18, 2013

Figure 2. View of bridge, looking upstream (west)

Overhead power exists on both sides of the road, which may conflict with boring operations. With the available site distance, borings could easily be located in the roadway.

With a relatively short span, it is anticipated the structure may be replaced with a precast arch or stub abutment, which would both be founded on spread footings. If this is the case, two borings could be completed in the roadway, to relatively shallow depths, in a short timeframe. If integral abutments are the preferred alternative, borings should be advanced to bedrock, in which case we recommend two borings on opposite corners. Numerous cobbles were prevalent in the streambed and along the banks, which may impede boring and construction operations. The shallow depths to bedrock seen in private wells could make integral abutments unfeasible.

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

- A precast arch supported on spread footings
- Reinforced concrete abutments on spread footings
- Pile caps on a single row of H-Piles

If spread footings are the favored alternative, two borings in the roadway to a depth of 40 feet should be completed. If piles are the chosen foundation preference, we recommend a minimum of two borings be taken at opposite corners of the proposed bridge, in order to more fully assess the subsurface conditions at the site including, but not limited to, the soil properties, ground water conditions and depth to bedrock.

If you have any questions or would like to discuss this report, please contact us by phone at (802) 828-6911, or via email at Nick.Meltzer@state.vt.us.

cc: Project File/CCB
NSM

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: 4/26/2012

Subject: Dover BF 013-1 (20) - 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 performed a site review of the project area.

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

The North Branch of the Deerfield River flows westerly through the project area. This river would support a variety of aquatic organisms including wild brook trout. Efforts to minimize water quality impacts during construction will need to be evaluated as the project design moves forward. The Blue Brook also flows in close proximity of the project area although there will likely be no impacts associated with this water course.

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

Wildlife Habitat
There is no wildlife corridor issues within the project area. As this is a bridge project aquatic organism passage will be provided.

Rare, Threatened and Endangered Species
There are no mapped rare, threatened or endangered species within the project area.

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

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: James Brady, VTrans Environmental Specialist

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

Date: 05/21/2013

Subject: Dover BF 013-1(20) – Archaeological Resource ID

James,

A field visit was conducted in April of 2013 in order to assess the archaeological sensitivity of the general area around Bridge 59 along US 100 in Dover over the North Branch of the Deerfield River. I've identified one area of low-moderate sensitivity based on visual observation and the environmental predictive model. This area is located in the scrub brush in the SW quadrant and has been mapped into the archaeological geodatabase for inclusion in future plans. Please 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
Brennan.Gauthier@state.vt.us

VTrans Working to Get You There
Vermont Agency of Transportation


Dover BF013-1(20)
Arch Resouce ID
0 510 20 30 40
Feet
1:546
N
Arch Sensitive Area
Map created by BCG,
PDD-Environmental Section
on 5/21/2013.
bing

Brady, James

From: Newman, Scott
Sent: Friday, May 10, 2013 6:14 PM
To: Brady, James
Cc: O'Shea, Kaitlin
Subject: Dover BF 013-1(20)
Attachments: photo.JPG

Afternoon James,

There are no historic or Section 4(f) properties in the project area for this bridge.

Have a great weekend,
Scott

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 Town of Dover is the home of Mount Snow. The busiest time of year is during the winter months, but there other seasons when there are parades, benefit motorcycle rides, etc.

   Please contact the three entities listed below to get a current schedule of the area's events.

   Mount Snow Ltd
   www.mountsnow.com
   Mount Snow Road
   West Dover, Vermont, 05356
   (802) 464-3333

   Town of Dover
   www.doververmont.com
   P.O. Box 428
   102 Route 100
   West Dover, VT 05356
   (802) 464-8000 x:4 for Economic Development

   Mount Snow Chamber of Commerce
   www.visitvermont.com
   21 West Main Street
   Wilmington, VT 05363
   (802) 464-8092

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

   The slowest time of year in Dover is during the months of April and November.

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

   Police Station is located north of the bridge at 246 Route 100.

The West Dover Firehouse is located across from the Police Station at 253 Route 100.

The Town does not have a rescue service, but Deerfield Valley Rescue houses an ambulance at the West Dove Firehouse.

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

   Dover Elementary School is located at 1 Schoolhouse Road in East Dover (off Dover Hill Road). The school operates September through June.

   Also, there is a daycare facility and a library located on Dover Commons in East Dover.

5. Is the proposed project on an established or planned school bus or public transit route(s)?

   Yes. The school bus route and the MooVer (free public transit bus) travel along Route 100.

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

   No agricultural operations will be impacted, but there are restaurants and Inns north and south of the project.

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?

   Dover Town Office is located south of the project at 102 Route 100.

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

   No, because sometimes Handle Road is used as an alternate route to homes and businesses along Route 100.

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 and rescue will be cut off from reaching the southern end of West Dover and to all of East Dover if the bridge is closed to thru traffic.

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.

    Weekly Publication: Deerfield Valley News
    www.deerfieldvalleynews.com

P.O. Box 310
West Dover, VT 05356
(802) 464-3388

Daily Publication: **The Brattleboro Reformer**
www.reformer.com
P.O. Box 802
Brattleboro, VT 05302
(802) 254-2311

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

Mount Snow Chamber of Commerce
www.visitvermont.com
21 West Main Street
Wilmington, VT 05363
(802) 464-8092

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?

   No

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

   The Town recognizes a need to provide safe passage for pedestrians and bicyclists along Route 100. Two years ago the Town built a pedestrian path that runs along and off Route 100, and is currently in the planning phase for a sidewalk south of the bridge.

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

   Very high usage.

4. If a sidewalk or wide shoulder is present on the existing bridge, should the new structure have one?

   No sidewalk or wide shoulder presently exists on the bridge, but there is a need for a sidewalk.

5. Is there a need for a sidewalk or widened shoulder if one does not currently exist? Please explain.

   Yes there is a need for a sidewalk (or a cantilevered footpath) in order to provide safe passage for pedestrians and bicyclists.

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?

   Yes. The Town is trying to connect our trail system that runs south of the bridge project to north of the bridge project. The only impediment is costs associated with trying to provide safe passage over the bridge.

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.

   The present bridge is too narrow; therefore, pedestrians and bicyclists have an unsafe means of crossing the river.

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

   During Irene that area flooded.

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?

    No.

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

We would like to add consideration for the bridge replacement to include a 5 foot wide pedestrian and bicycle path. There is currently no such feature on the existing bridge and hence no safe mechanism for foot travel across the Deerfield River at that point. Currently foot traffic crosses in the traffic lane as close to the railing as possible. This creates a clear safety hazard within the town. A model for the bridge could be similar to the bridge in South Newfane that spans the Rock River along Dover Road.

The town of Dover will be pursuing the expansion of the "Valley Trail", which currently terminates at Mountain Park Plaza, to continue north along Route 100 to Stugger Road. We intend to begin a feasibility and engineering study for the path expansion in the fall, 2013 timeframe. The town's short range plans are to increase business presence along Route 100. This increases the likelihood that pedestrians and bicyclists will cross the river at that point thereby causing an increased hazard probability to those individuals.

We hope that you will consider adding the pedestrian and bicycle pathway in your design of the bridge replacement. We would be happy to answer any further questions in order to facilitate this request.

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

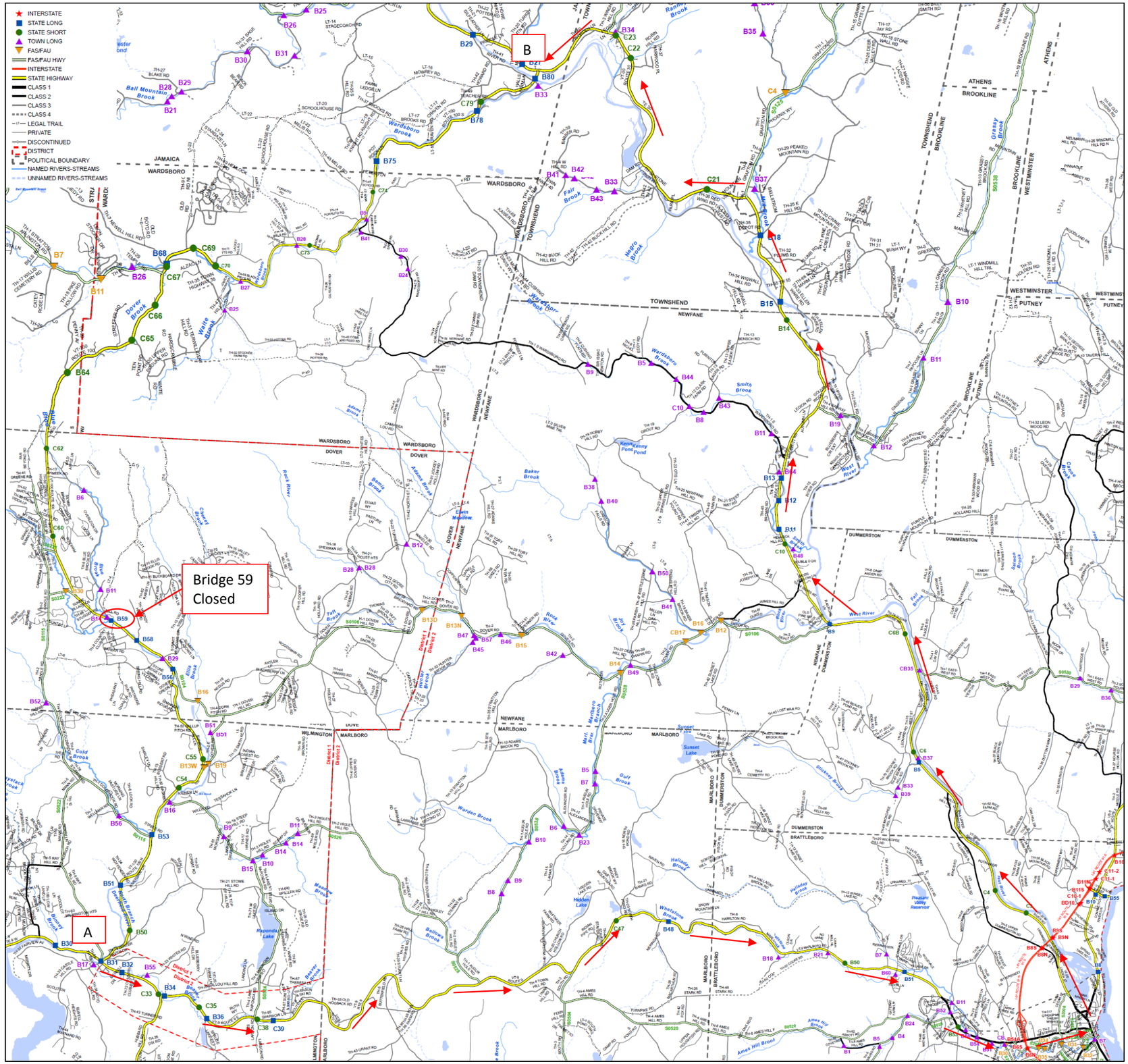
1. Does your municipal land use plan reference the bridge in question? If so please provide a copy of the applicable section or sections of the plan.
   The bridge is not specifically referenced in the plan, but based on its' location it plays a key role in accommodating for safe bike/ped activity along Route 100. Improved bike/ped accommodations on the bridge will greatly enhance the safety along this section of the Route 100 corridor.

2. Please provide a copy of your existing and future land use map, if applicable.
   Existing Land Use Map -
   file:///U:/GIS/Maps/Towns/Dover/2008%20Town%20Plan/TP_ELU.pdf
   Future Land use Map –
   file:///U:/GIS/Maps/Towns/Dover/2008%20Town%20Plan/TP_PLU.pdf
3. Are there any existing, pending or planned development proposal that would impact future transportation patterns near the bridge? If so please explain.

   Mount Snow Master Plan
   Haystack Mountain Master Plan

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

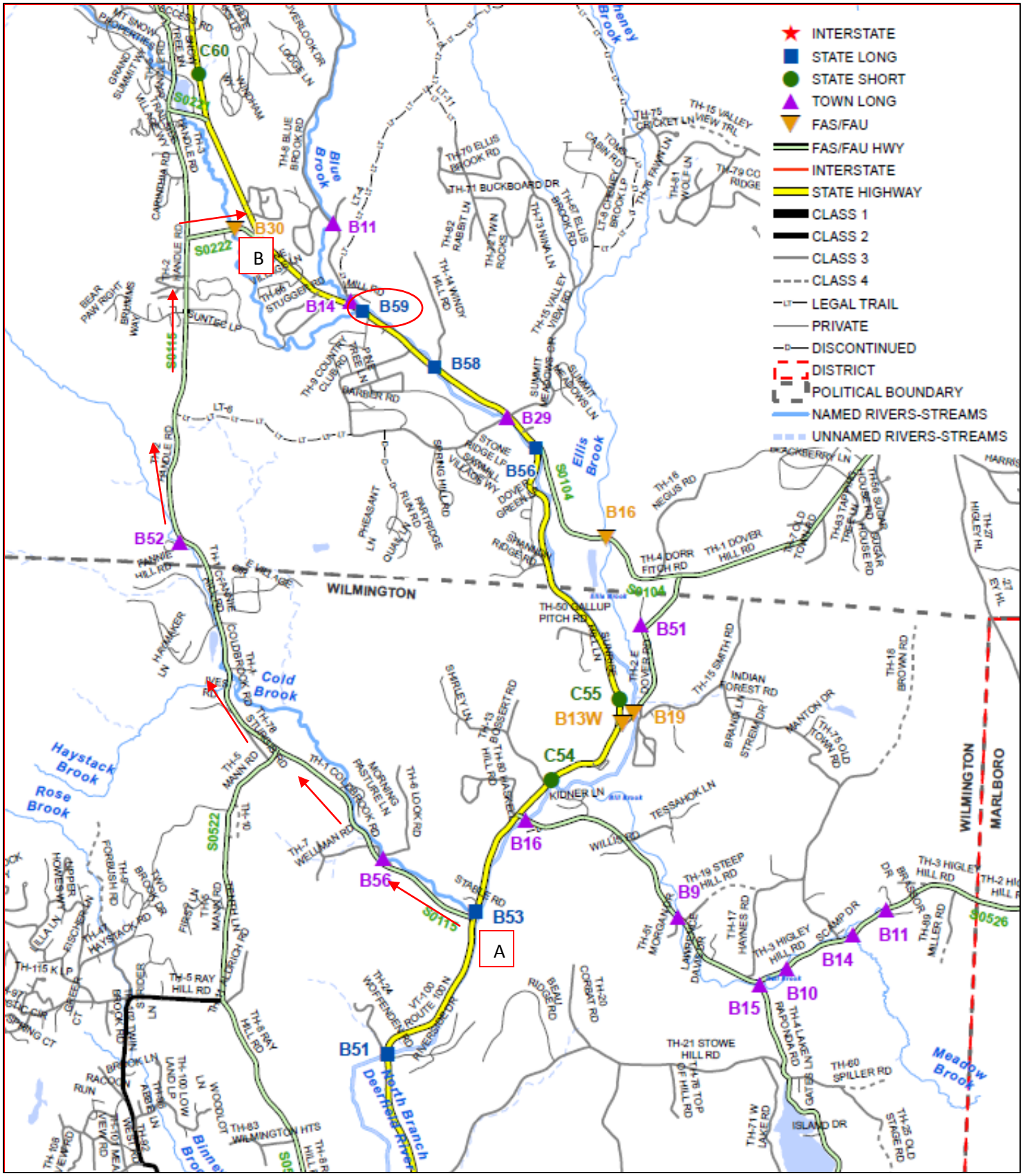
   No, but please note that the Town of Dover has taken part in the State's Byway program.



Detour Route

VT Route 100, to VT Route 9, VT Route 30, back to VT Route 100

A to B on Through Route: 22.7 Miles
A to B on Detour Route: 42.0 Miles
Added Miles: 19.3 Miles
End to End Distance: 64.7 Miles



Local Bypass Route

VT Route 100, to Coldbrook Road, Handle Road, Tannery Road, back to VT Route 100

A to B on Through Route: 5.2 Miles
A to B on Detour Route: 5.2 Miles
Added Miles: 0 Miles
End to End Distance: 10.4 Miles

EXISTING CURVE DATA
DELTA = 16°26'19"
D = 3°57'05"
R = 1450.00'
T = 209.45'
L = 416.02'
E = 15.05'

VT STATE PLANE GRID
N

NORTH BRANCH OF THE DEERFIELD RIVER
FLOW

BLUE BROOK
FLOW

VT 100
TO WILMINGTON

VT 100
TO STRATTON

TH 9
COUNTRY CLUB ROAD

TH 8
BLUE BROOK ROAD

PC
STA 39+55.26

STA 50+00.00
POB

STA 43+99.48
POE

STA 43+71.28

STA 52+00.00
POE

41+64.68
PT

SIGN
"VILLAGE OF
THE DEERFIELD"

SIGN
RI-1

SIGN
XX-X
(40)

SIGN
XX-X
(BLUE BROOK RD)

SIGN
XX-X
(VT 100)

SEWER
MANHOLE

SEWER
MANHOLE
COMB
1/2/1
UNDERGROUND

TEL
1/4
UNDERGROUND

TEL
1/3

UNDERGROUND
SEWER MAIN

4"X4" CONCRETE
BOUNDARY POST
3.5' ABOVE GROUND
LEANING

USGS HIGH
WATER MARK

ARCH

STONE FILL

GUY

DI

COMB
59.5
70

COMB
8
60
71

COMB
8 5
8
71.5

COMB
72
64

PAVED
DRIVE

GRAVEL
DRIVE

GRAVEL
DRIVE

RAIL
FENCE

18" COMP
GOOD CONDITION
FLOW

18" COMP
FLOW

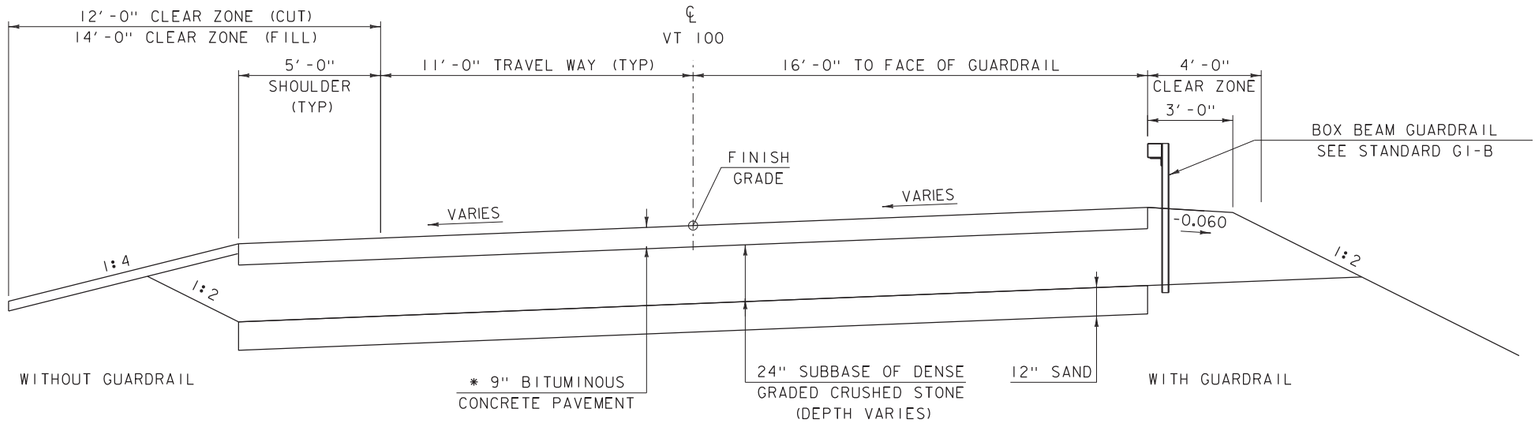
ARTESIAN
WELL

BENCHMARK
RAILROAD SPIKE
IN MEDIUM ASH
ELEV. = 1741.60

EXISTING CONDITIONS

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

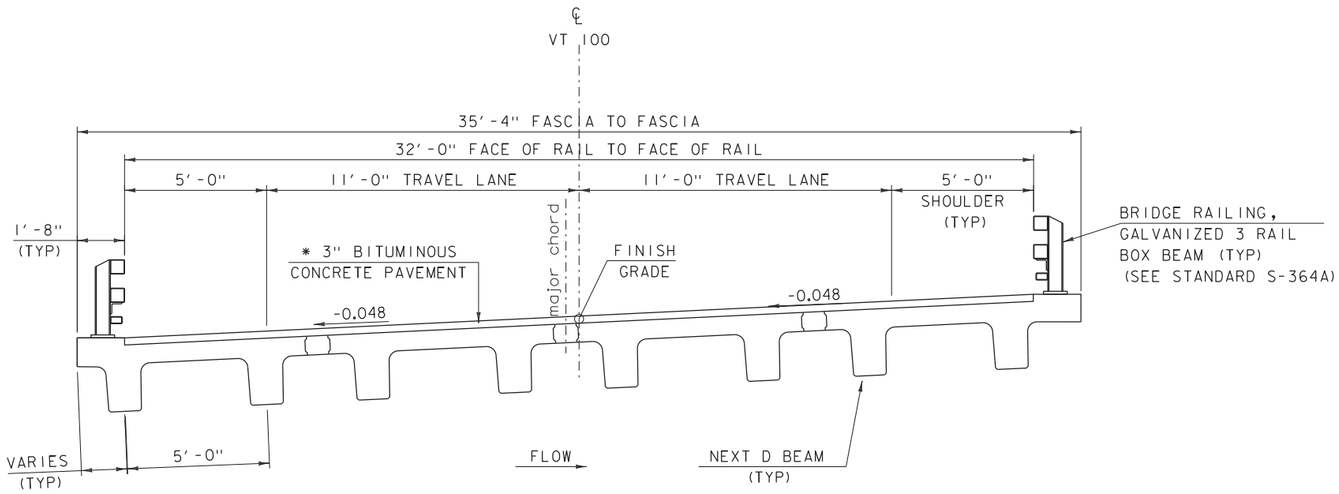
PROJECT NAME:	DOVER
PROJECT NUMBER:	BF 013-1(20)
FILE NAME: l3b058/sl3b058border.dgn	PLOT DATE: 06-DEC-2013
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
EXISTING CONDITIONS LAYOUT SHEET	SHEET I OF II



VT ROUTE 100 ROADWAY TYPICAL SECTION - ALTERNATIVE I

SCALE: 3/8" = 1'-0"

*1½" TYPE IVS OVER
1½" TYPE IVS OVER
3" TYPE IIS OVER
3" TYPE IIS



BRIDGE TYPICAL SECTION - ALTERNATIVE I

SCALE: 3/8" = 1'-0"
ALL DIMENSIONS ARE RADIAL

*1½" TYPE IVS OVER
1½" TYPE IVS

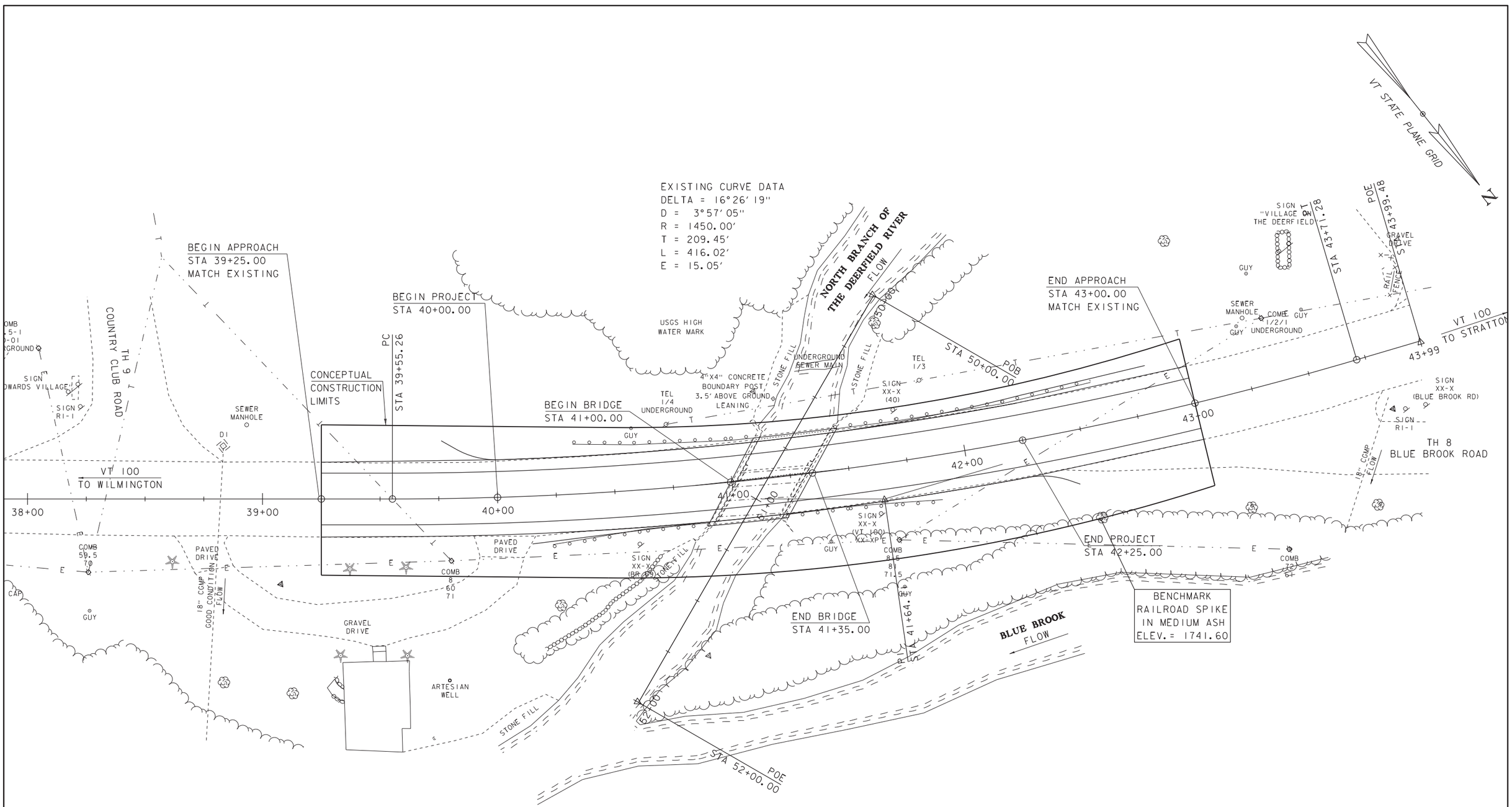
MATERIAL TOLERANCES
(IF USED ON PROJECT)

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

PROJECT NAME: DOVER
PROJECT NUMBER: BF 013-1(20)

FILE NAME: sl3b058_typ.dgn
PROJECT LEADER: C.P.WILLIAMS
DESIGNED BY: L.J.STONE
TYPICAL SECTIONS ALT I

PLOT DATE: 06-DEC-2013
DRAWN BY: L.J.STONE
CHECKED BY:
SHEET 2 OF 11

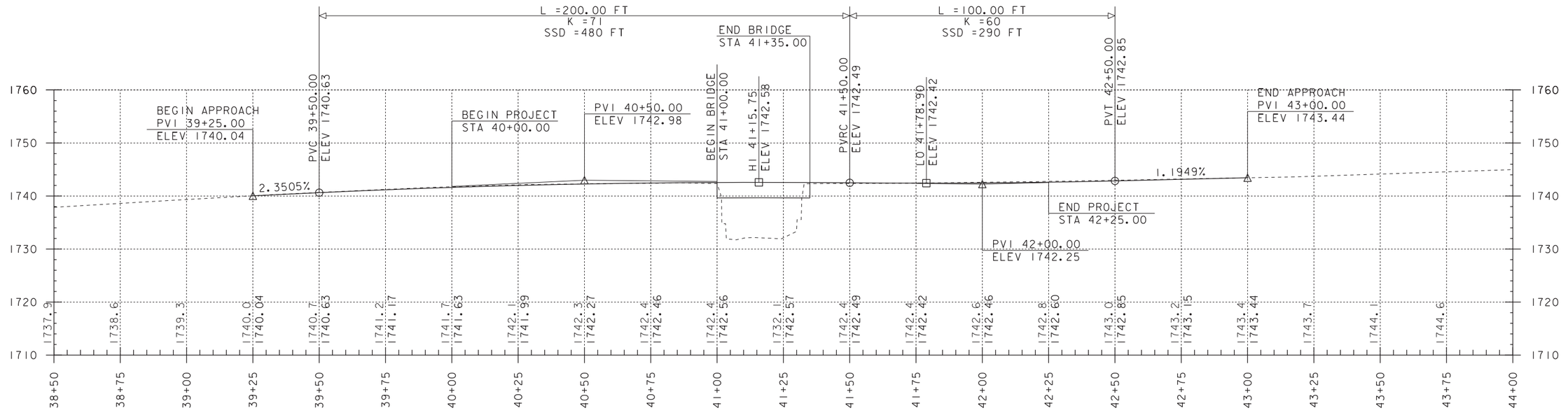


ALTERNATIVE 1 LAYOUT

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME:	DOVER
PROJECT NUMBER:	BF 013-1(20)
FILE NAME: sl3b058nul_Rehab.dgn	PLOT DATE: 06-DEC-2013
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: L.J.STONE
DESIGNED BY: ------	CHECKED BY: ------
ALTERNATIVE 1LAYOUT	SHEET 3 OF 11



LINE	SURFACE	OFFSET
--------	x13b058og	0.00
Scaled	2.0000	Times Ver.
Scaled	1.0000	Times Hor.

VT 100 PROFILE - ALTERNATIVE 1

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

NOTE:

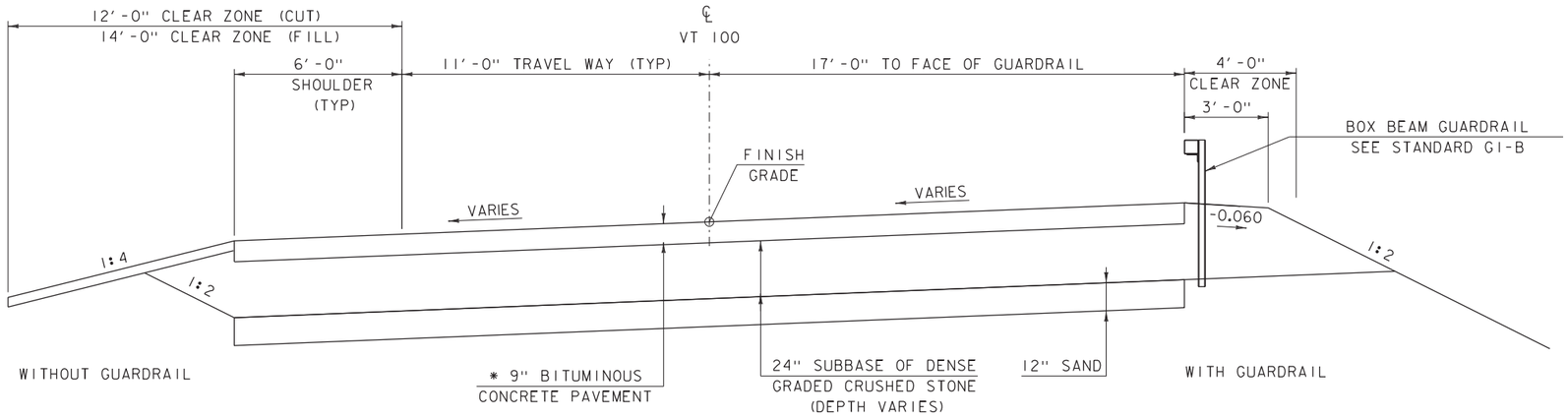
ELEVATIONS SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG PROPOSED CENTERLINE.

ELEVATIONS SHOWN TO THE NEAREST HUNDREDTH ARE FINISH GRADES ALONG PROPOSED CENTERLINE.

PROJECT NAME: DOVER
PROJECT NUMBER: BF 013-1(20)

FILE NAME: 13b058/sl3b058profile.dgn
PROJECT LEADER: C.P.WILLIAMS
DESIGNED BY: ------
ALTERNATIVE 1PROFILE SHEET

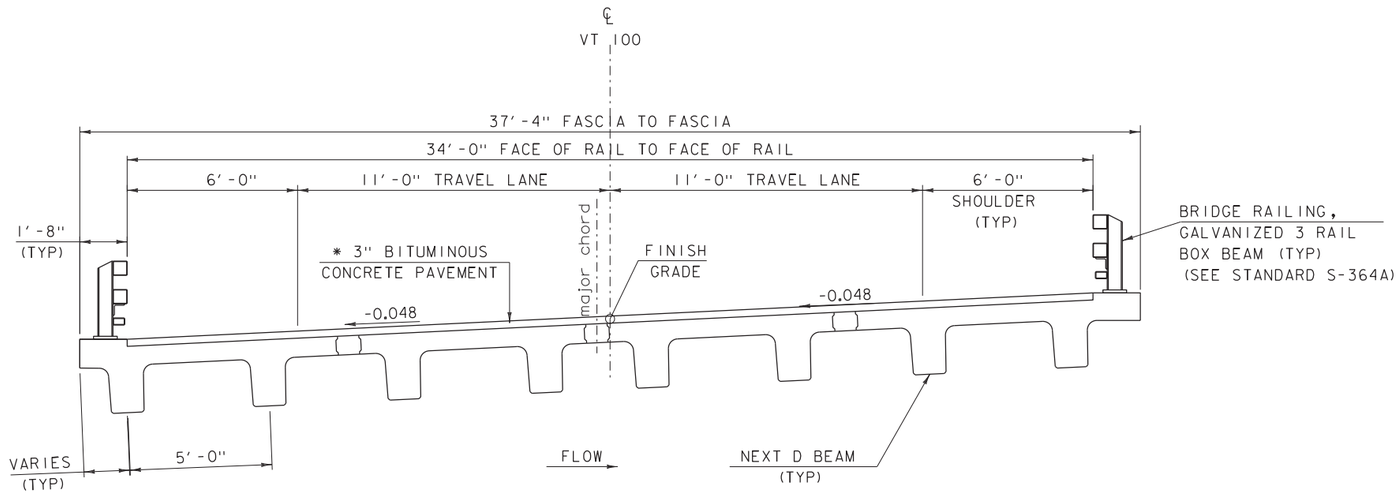
PLOT DATE: 06-DEC-2013
DRAWN BY: L.J.STONE
CHECKED BY: ------
SHEET 4 OF 11



VT ROUTE 100 ROADWAY TYPICAL SECTION - ALTERNATIVE 2 & 3

SCALE: 3/8" = 1'-0"

*1½" TYPE IVS OVER
1½" TYPE IVS OVER
3" TYPE IIS OVER
3" TYPE IIS



BRIDGE TYPICAL SECTION - ALTERNATIVE 2 & 3

SCALE: 3/8" = 1'-0"
ALL DIMENSIONS ARE RADIAL

*1½" TYPE IVS OVER
1½" TYPE IVS

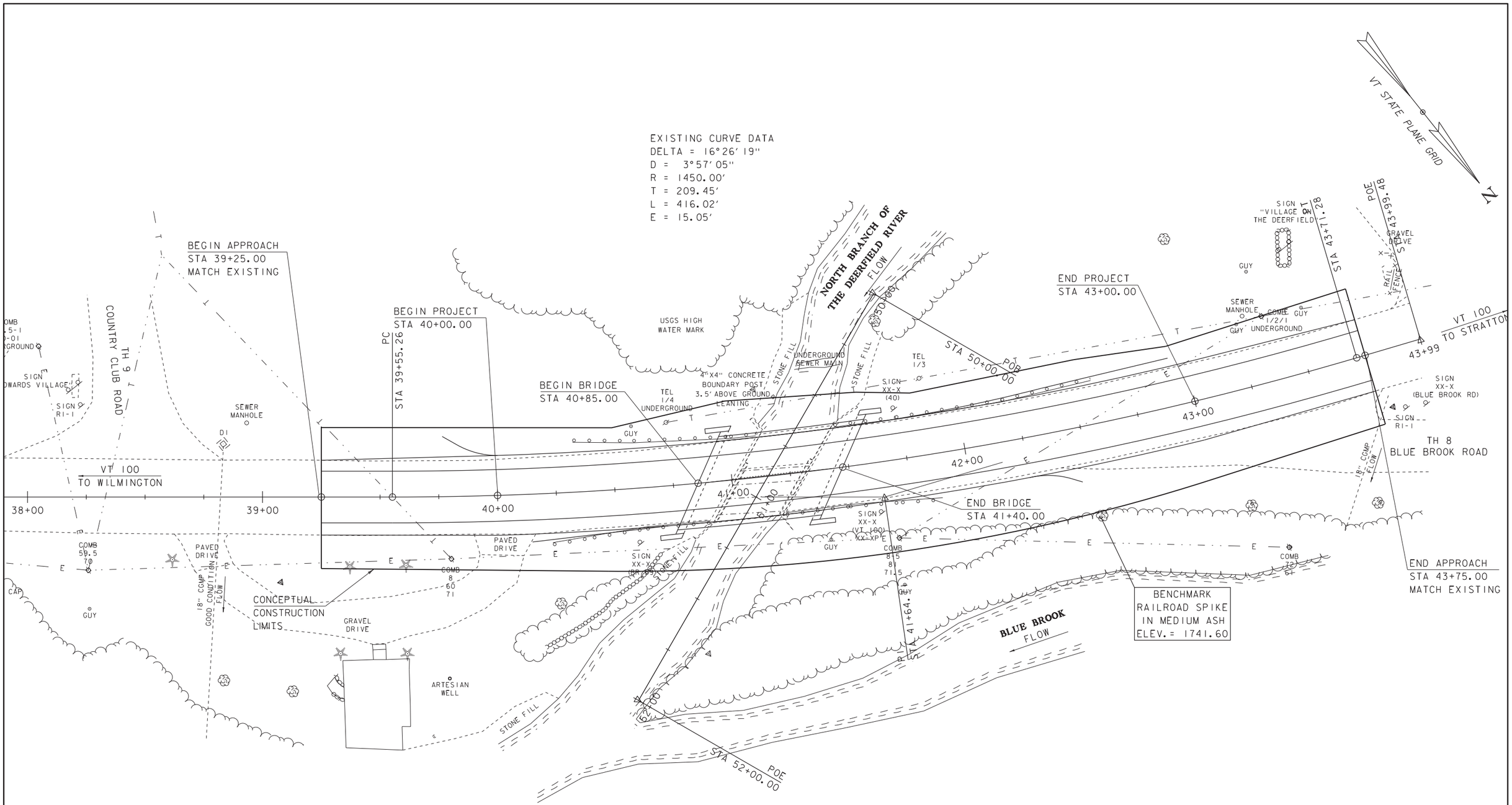
MATERIAL TOLERANCES
(IF USED ON PROJECT)

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

PROJECT NAME: DOVER
PROJECT NUMBER: BF 013-1(20)

FILE NAME: sl3b058_typ.dgn
PROJECT LEADER: C.P.WILLIAMS
DESIGNED BY: L.J.STONE
TYPICAL SECTIONS ALT 2 & 3

PLOT DATE: 06-DEC-2013
DRAWN BY: L.J.STONE
CHECKED BY:
SHEET 5 OF 11

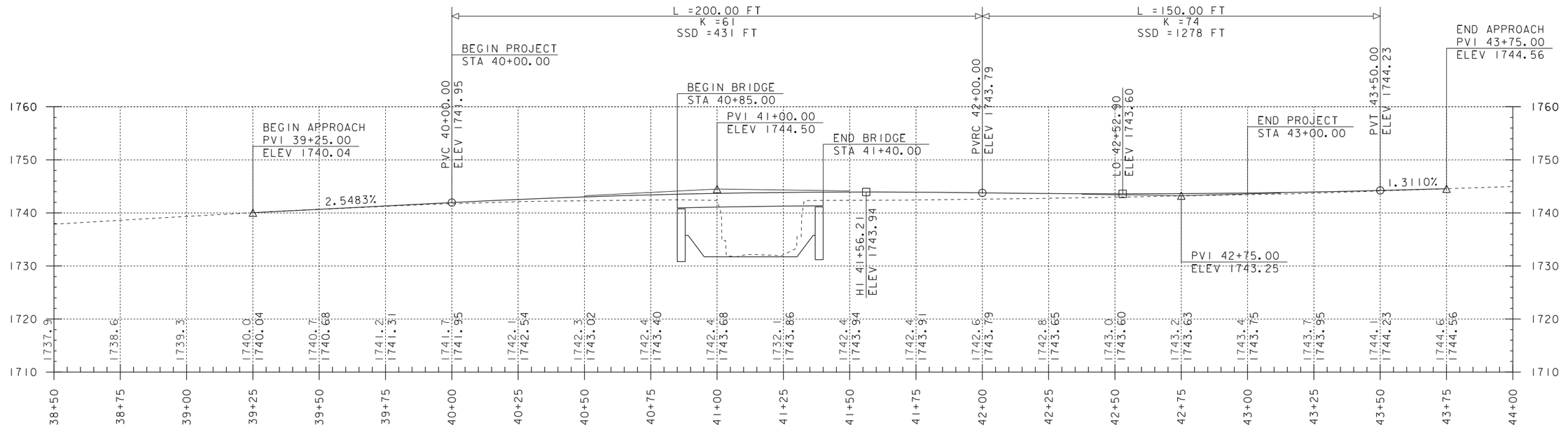


ALTERNATIVE 2 LAYOUT

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME:	DOVER
PROJECT NUMBER:	BF 013-1(20)
FILE NAME: sl3b058nul_Full.dgn	PLOT DATE: 06-DEC-2013
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: L.J.STONE
DESIGNED BY: ------	CHECKED BY: ------
ALTERNATIVE 2 LAYOUT	SHEET 6 OF 11



LINE	SURFACE	OFFSET
--------	x13b058og	0.00
Scaled	2.0000	Times Ver.
Scaled	1.0000	Times Hor.

VT 100 PROFILE - ALTERNATIVE 2

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

NOTE:

ELEVATIONS SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG PROPOSED CENTERLINE.

ELEVATIONS SHOWN TO THE NEAREST HUNDREDTH ARE FINISH GRADES ALONG PROPOSED CENTERLINE.

PROJECT NAME: DOVER
PROJECT NUMBER: BF 013-1(20)

FILE NAME: 13b058/sl3b058profile.dgn
PROJECT LEADER: C.P.WILLIAMS
DESIGNED BY: ------
ALTERNATIVE 2 PROFILE SHEET

PLOT DATE: 06-DEC-2013
DRAWN BY: L.J.STONE
CHECKED BY: ------
SHEET 7 OF 11

EXISTING CURVE DATA
DELTA = 16°26'19"
D = 3°57'05"
R = 1450.00'
T = 209.45'
L = 416.02'
E = 15.05'

BEGIN APPROACH
STA 39+25.00
MATCH EXISTING

BEGIN PROJECT
STA 40+00.00

PC
STA 39+55.26

BEGIN BRIDGE
STA 40+80.00

END APPROACH
STA 43+00.00
MATCH EXISTING

END PROJECT
STA 42+25.00

END BRIDGE
STA 41+45.00

POE
STA 43+69.48

STA 43+71.28

STA 50+00.00 POT

STA 52+00.00 POE

STA 41+64.

VT 100
TO WILMINGTON

VT 100
TO STRATTON

TH 9
COUNTRY CLUB ROAD

TH 8
BLUE BROOK ROAD

NORTH BRANCH OF
THE DEERFIELD RIVER
FLOW

BLUE BROOK
FLOW

USGS HIGH
WATER MARK

4"X4" CONCRETE
BOUNDARY POST,
3.5' ABOVE GROUND,
LEANING

UNDERGROUND
SEWER MAIN

SEWER
MANHOLE

SEWER
MANHOLE
1/2/1
UNDERGROUND

TEL
1/4
UNDERGROUND

TEL
1/3

SIGN
"VILLAGE OF
THE DEERFIELD"

SIGN
XX-X
(40)

SIGN
XX-X
(VT 100)

SIGN
XX-X
(BLUE BROOK RD)

SIGN
RI-1

GUY

COMB
59.5
70

COMB
8
60
71

COMB
8.5
8
71.5

PAVED
DRIVE

GRAVEL
DRIVE

GRAVEL
DRIVE

CONCEPTUAL
CONSTRUCTION
LIMITS

ARTESIAN
WELL

STONE FILL

18" CONC.
GOOD CONDITION
FLOW

12" CONC.
FLOW

RAIL
X FENCE

CAP

BENCHMARK
RAILROAD SPIKE
IN MEDIUM ASH
ELEV. = 1741.60

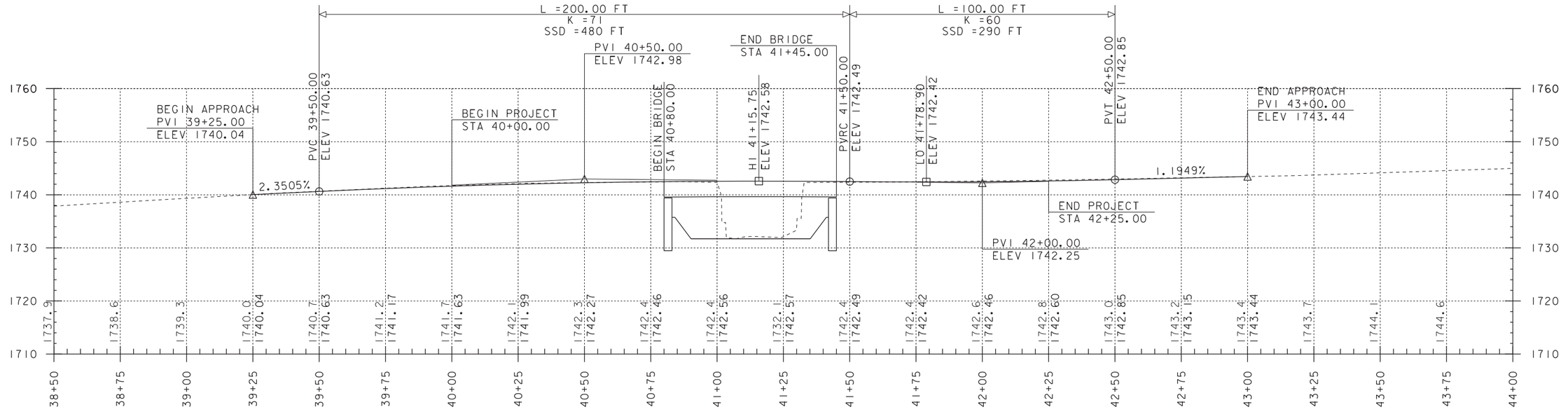
ALTERNATIVE 3 LAYOUT

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

PROJECT NAME: DOVER
PROJECT NUMBER: BF 013-1(20)

FILE NAME: sl3b058nul_Full.dgn
PROJECT LEADER: C.P.WILLIAMS
DESIGNED BY: ------
ALTERNATIVE 3 LAYOUT

PLOT DATE: 06-DEC-2013
DRAWN BY: L.J.STONE
CHECKED BY: ------
SHEET 8 OF 11



LINE	SURFACE	OFFSET
--------	x13b058og	0.00
Scaled	2.0000	Times Ver.
Scaled	1.0000	Times Hor.

VT 100 PROFILE - ALTERNATIVE 3

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

NOTE:

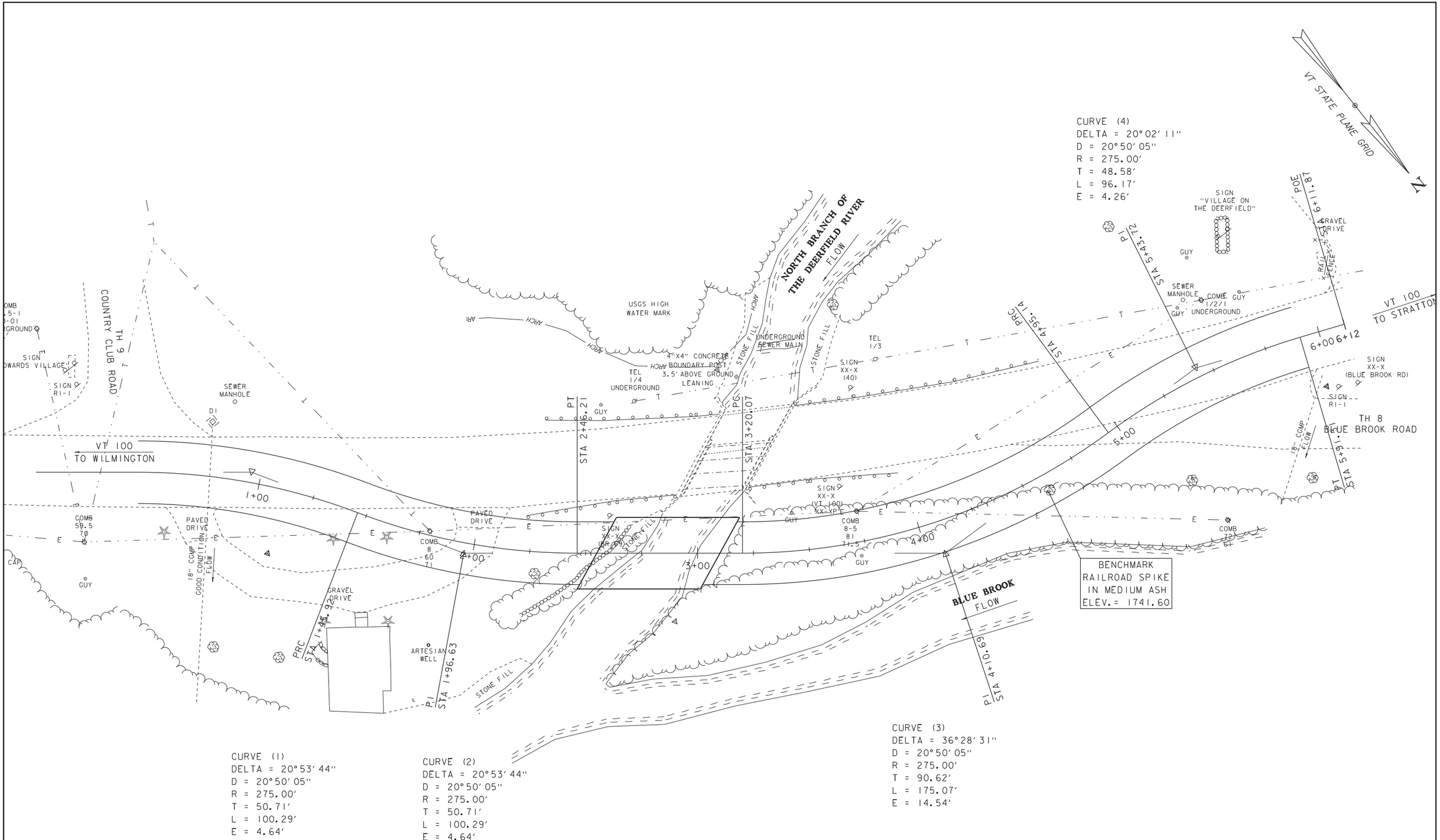
ELEVATIONS SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG PROPOSED CENTERLINE.

ELEVATIONS SHOWN TO THE NEAREST HUNDREDTH ARE FINISH GRADES ALONG PROPOSED CENTERLINE.

PROJECT NAME: DOVER
PROJECT NUMBER: BF 013-1(20)

FILE NAME: 13b058/sl3b058profile.dgn
PROJECT LEADER: C.P.WILLIAMS
DESIGNED BY: ------
ALTERNATIVE 3 PROFILE SHEET

PLOT DATE: 06-DEC-2013
DRAWN BY: L.J.STONE
CHECKED BY: ------
SHEET 9 OF 11



CURVE (1)
DELTA = 20°53'44"
D = 20°50'05"
R = 275.00'
T = 50.71'
L = 100.29'
E = 4.64'

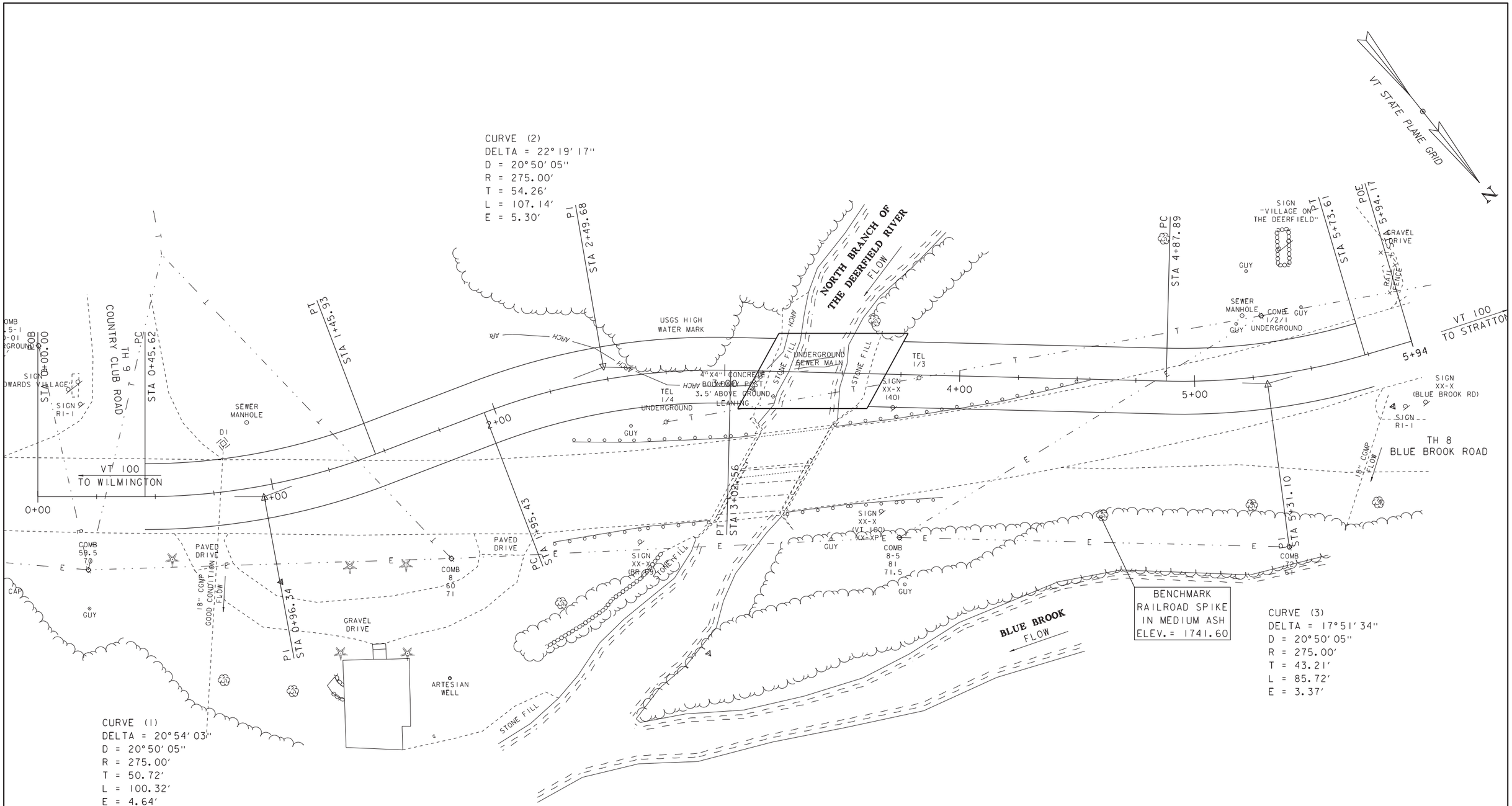
CURVE (2)
DELTA = 20°53'44"
D = 20°50'05"
R = 275.00'
T = 50.71'
L = 100.29'
E = 4.64'

CURVE (3)
DELTA = 36°28'31"
D = 20°50'05"
R = 275.00'
T = 90.62'
L = 175.07'
E = 14.54'

DOWNSTREAM TEMPORARY BRIDGE

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

PROJECT NAME:	DOVER
PROJECT NUMBER:	BF 013-1(20)
FILE NAME: sl3b058_TempBridge.dgn	PLOT DATE: 06-DEC-2013
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: L.J.STONE
DESIGNED BY: ------	CHECKED BY: ------
DOWNSTREAM TEMPORARY BRIDGE LAYOUT	SHEET 10 OF 11



UPSTREAM TEMPORARY BRIDGE

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME:	DOVER
PROJECT NUMBER:	BF 013-1(20)
FILE NAME: sl3b058_TempBridge.dgn	PLOT DATE: 06-DEC-2013
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: L.J.STONE
DESIGNED BY: ------	CHECKED BY: ------
UPSTREAM TEMPORARY BRIDGE LAYOUT	SHEET II OF II