STATE OF VERMONT
AGENCY OF TRANPORTATION

Scoping Report

FOR

Andover BHF 016-1(29)

VT ROUTE 11, BRIDGE 41 OVER MIDDLE BRANCH OF WILLIAMS RIVER

December 18, 2012

Table of Contents

I. Site Information

Bridge 41 is located in a rural area along VT Route 11 approximately 4.0 miles east of the junction with VT 121. The bridge and eastern approach are located on a curved segment of VT 11 and the western approach is located on a straight segment. There are residences in three quadrants of the bridge. The northwest quadrant is wooded area owned by the Vermont Agency of Transportation. 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 Concrete T-Beam Bridge, widened with Steel Beams
Bridge Span	44 feet long
Year Built	1927, widened in 1963
Ownership	State of Vermont

Need

Bridge 41 is considered structurally deficient with a Federal Sufficiency Rating of 69 (of a possible 100). The following is a list of the deficiencies of Bridge 41 and VT 11 in this location.

1. The deck slab is in poor condition, and at risk for full depth holes.

2. There is a scour issue along the eastern abutment's upstream wingwall. Also, the east abutment's stem has a significant amount of undermining.

Traffic

A traffic study of this site was performed by the Vermont Agency of Transportation. The traffic volumes are projected for the years 2015 and 2035.

TRAFFIC DATA	2015	2035
ADT	2,700	2,900
DHV	320	340
ADTT	440	670
%T	13.7	19.2
%D	53	53

Design Criteria

The design standards for this bridge project are the Vermont State Standards, dated October 22, 1997. Minimum standards are based on ADT of 2,900 and a design speed of 50 mph.

Design Criteria	Source	Existing Condition	Minimum Standard	Comment
Approach Lane and Shoulder Widths	VSS Table 4.3	11'/3' (28')	11'/5' (32')	Substandard
Bridge Lane and Shoulder Widths	VSS Section 4.7	11'/4' (30')	11'/5' (32')[1]	Substandard
Clear Zone Distance	VSS Table 4.4		20' fill / 12' (1:3) cut 14' (1:4) cut	
Banking		4.6%	8% (max)	
Speed		50 mph	50 mph (Design)	
Horizontal Alignment	AASHTO Green Book Table 3-10b	R = 625'	R_{min} = 760' @ e=8.0% R_{min} = 2280' @ e=4.6%	Substandard
Vertical Grade	VSS Table 4.5	(-)1.22%	4% (max) for level terrain	
K Values for Vertical Curves	VSS Table 4.1	Bridge located on sag (K = 794)	110 crest / 90 sag	
Vertical Clearance Issues	VSS Section 4.8	None noted	14'-3" (min)	
Stopping Sight Distance	VSS Table 4.1	2887'	400'	
Bicycle/Pedestrian Criteria	VSS Table 4.7	4' Shoulder	5' Shoulder (%T > 10%)	Substandard
Bridge Railing	Structures Design Manual Section 13	2 Rail – curb Mounted	TL-4	Substandard

Inspection Report Summary

Deck Rating	4 Poor
Superstructure Rating	5 Fair
Substructure Rating	6 Satisfactory
Channel Rating	5 Fair

10/26/2011 – Approach embankment filled in and behind the wings and in front of the abutment. ~DCP/FRE

09/13/2011 – Irene note: Heavy erosion along upstream side approaches has been filled in by the district. Original stem portion of the east abutment has significant undermining. Loss of material support is deceiving as the area is filled with loose sentiments. The voiding is roughly 6 inches to a foot deep and extends in up to 4 to 6 feet and is approximately 14 feet long. The void basically extends between the footings of the widened portions. There is scour to the clay streambed along the upstream wing at the east abutment but no undermining. The undermining along the east abutment stem needs to be filled in creating a shallow knee wall and the abutment protected with jagged riprap and the channel also needs alterations to improve alignment. ~MJ/DK

04/07/2011 – Deck continues to deteriorate and full depth holes could occur at any time. Tee beams 4 & 5 continue to deteriorate. Abutments are in satisfactory condition. There is some scour along abutment 1 exposing the footing. ~DCP/FRE

[1] 5 foot shoulder required for bicycle and pedestrian criteria.

Hydraulics

From preliminary hydraulics report, 10/12/2012:

The Q_{50} design event flow does pass through the existing structure. For a replacement bridge, the recommendation is to provide a structure having a 55-foot clear span normal to the stream channel (between the abutment faces) with a low beam elevation at or above 1064.7 feet with stone fill protection in front of the abutments. This condition will provide just over 1 foot of freeboard for the Q_{50} event.

Utilities

There are overhead utility lines that pass over the bridge on the upstream side. The existing utilities are shown on the Layout Sheet.

Right Of Way

The existing Right-of-Way is plotted on the Layout Sheet. Depending on the alternate chosen, additional rights may need to be obtained. Right-of-Way is not necessary to remove the existing structure, since the northwest quadrant is owned by the State of Vermont Agency of Transportation.

Resources

There are no environmental resources present at this project, as shown on the Existing Conditions Layout Sheet.

Biological:

Wetlands

There are no wetlands within the project area.

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 agricultural lands within the project area.

Hazardous Materials:

According to the Vermont Agency of Natural Resources (VANR) Vermont Hazardous Sites List, there are no hazardous waste sites in the project vicinity.

Historic:

Bridge 41 is not historic and there are no historic resources within the project area.

Archeological:

There are no areas of archeological sensitivity present in the general area around Bridge 41.

Stormwater:

There are no stormwater concerns for this project.

II. Maintenance of Traffic

The Vermont Agency of Transportation is in the process of finalizing an Accelerated Bridge Program, which focuses on faster delivery of construction plans, permitting, and Right of Way, as well as faster construction of projects in the field. One practice that will help in this endeavor is closing bridges for portions of the construction period, rather than providing temporary bridges. In addition to saving money, the intention is to minimize the closure period with faster construction techniques and incentives to contractors to complete projects early. The Agency will consider the closure option on most projects where rapid reconstruction or rehabilitation is feasible. The use of precast 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

A temporary bridge could be placed on either the upstream or downstream side of the bridge from a constructability standpoint. However, the downstream side of the bridge would require more clearing than the upstream side. Additionally, there is a landscaped hedgerow on the downstream side of the bridge that would be adversely affected by a temporary bridge. An upstream temporary bridge would require movement of the overhead utilities. Both an upstream and downstream temporary bridge alignment would require acquiring temporary rights from adjacent property owners, and would have temporary impacts to adjacent driveways.

A one-way temporary bridge, with traffic signals, would be appropriate based on the daily traffic volumes. See the Temporary Bridge Layout Sheet in the appendix.

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

Disadvantages: This option would require some Right-of-Way acquisition, which would lengthen the project development phase by a minimum of two years. This option would have adverse impacts to adjacent properties. 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.

Phased construction is a feasible method for traffic maintenance at this site. The existing bridge width is adequate to allow this method of construction. Additionally, based on the traffic volumes, it is acceptable to close one lane of traffic, and maintain one lane of traffic, both ways, with a traffic signal.

Advantages: Traffic flow would be maintained through the project corridor during construction. Also, this option would have minimal impacts to adjacent properties. Right-of-Way would not need to be obtained for this option.

Disadvantages: Phased construction generally involves higher costs and complexity of construction. Costs are usually higher and construction duration is longer, since many construction activities have to be performed two times. Additionally, since cars are traveling near construction activity, there is decreased safety. There would be some delays and disruption to traffic, since the road would be reduced to one-way traffic.

Option 3: Off-Site Detour

This option would close the bridge and reroute traffic onto VT RT 103, and VT RT 100 back to VT RT 11. This regional detour has an end-to-end distance of 42.7 miles. This detour adds approximately 13.9 miles to travel distance.

There are several local bypass routes that may see an increase in traffic from local passenger cars. Local bypass routes are not signed detours, but may experience higher traffic volumes if VT 11 is closed during construction. Two of the most likely local bypass routes are as follows:

1. VT 11, to Hill Top Road (Class 3 – Paved), Weston – Andover Road (Class 2 – Paved), Andover Road (Class 2 – Paved), back to VT 11 (6.4 mi end-to-end)

2. VT 11, to VT 121 (Class 2 – Paved/Unpaved), VT 35 (Class 2 – Paved), back to VT 11 (27.1 mi end-to-end)

A map of the detour route and possible local bypass routes, 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 not require the need to obtain rights from adjacent property owners for a temporary bridge. This option reduces the time and cost of the project both at the development stage and construction.

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. Additionally, the bridge has a scour issue and the channel has erosion issues. Something will have to be done to improve this bridge in the near future. Although the bridge is not in imminent danger of collapse, it is at risk for full depth deck holes, and 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 some minor substructure repair; there is some minor spalling along the water line, which should be repaired. Additionally, there is significant undermining of the eastern abutment, which would be addressed. 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 40 years. Since the existing T-beams are integral with the deck, replacement of the deck only is not feasible.

The existing shoulders on the bridge are substandard by one foot for bicycles and pedestrians. The existing shoulders are 4 feet wide. According to the Vermont State Standards, the shoulders should be 5 feet wide for shared use. Current railing details would add 10 inches to each shoulder on the bridge, while matching the existing fascia to fascia width. Therefore, it is proposed that the new fascia to fascia distance is widened by 4 inches, to meet current standards.

There is undermining of the eastern abutment, which should be mitigated. There are several methods that can be used to fill in the voids, and to protect from future undermining. One method is to pump grout under the footings, and then line the abutment with stone for protection.

Advantages: This alternative would address the structural deficiencies of the existing bridge, with minimum upfront costs. This alternative would address the substandard width on the bridge. This option would not require Right-of-Way acquisition.

Disadvantages: There is a slight constriction of the channel through the existing bridge, which this option does not improve.

Maintenance of Traffic: The preferred option here would be either phased construction or an offsite detour.

Full Bridge Replacement

Any new structure will be placed on the existing alignment. Realigning the current roadway would extend the project limits by hundreds of feet and have adverse impacts to adjacent properties, and as such will not be considered at this time.

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.

If a new structure is constructed, the bridge span can be lengthened to match the existing channel width. Hydraulics has recommended a span of 55 feet, which is 11 feet longer than the existing structure. Additionally, by choosing to replace the bridge, the width of the bridge can be widened one foot on each side to accommodate bicycle traffic, with 5 foot shoulders as per the Vermont State Standards.

a. Bridge Width

The current rail to rail width is 30 feet. This does not meet the minimum standard of 32 feet. Since a new 80+ year bridge is being proposed, the bridge geometry should meet the minimum standards. A 32 foot width bridge will be proposed.

b. Bridge Length and Skew

The existing bridge is 44 feet long with no skew. This does not match the existing channel, which was significantly widened during Tropical Storm Irene. The preferred substructure type is an integral abutment for scour protection. Based on the layout procedures for integral abutments, the appropriate span for this location is 60 feet. This is in accordance with hydraulics recommendation of a minimum 55 foot span. The bridge will have no skew to match the natural skew of the channel.

c. Superstructure Type

A precast structure will be the preferred choice, due to decreased construction time. The possible 60' span length bridge types that are most commonly used in Vermont, are steel and composite concrete deck and NEXT beams. The superstructure depth is not critical for meeting hydraulic standards, so the superstructure type shall be determined at a later time. The superstructure should have straight beams, with a varying overhang near the eastern approach to account for the curved roadway.

d. Substructure Type

There is no visible bedrock in the location of the project. Available information on nearby water wells indicates that the site may be comprised of a mixture of sand and gravel, with the possibility of boulders. Borings should be taken at the project site, to determine if the subsurface is conducive for an integral abutment at this location. This type of substructure would provide the best scour protection for this scour critical bridge location. If it is determined that driving piles will be difficult, then the substructure should be reinforced concrete abutments on spread footings. Any rapid construction alternative should have sufficient subsurface information to verify the in-situ conditions.

e. Maintenance of Traffic

Either a temporary bridge or an off-site detour would be appropriate measures for traffic control at this site.

Advantages: This alternative would be a new structure with an estimated life span of 80 years. The increased road width would meet Vermont State Standards, and would also make the bridge crossing safer for bikes and pedestrians.

Disadvantages: This alternative would have the highest upfront costs.

IV. Alternatives Summary

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

Alternative 1a: Superstructure Replacement with Traffic Maintained on Offsite Detour
Alternative 1b: Superstructure Replacement with Traffic Maintained with Phased Construction
Alternative 2a: Full Bridge Replacement with Traffic Maintained on Offsite Detour
Alternative 2b: Full Bridge Replacement with Traffic Maintained on Temporary Bridge

V. Cost Matrix[2]

Andover BHF 016-1(29)		Do Nothing	Alt 1a	Alt 1b	Alt 2a	Alt 2b
			Superstructure Replacement		Full Bridge Replacement	
			Offsite Detour	Phased	Offsite Detour	Temporary Bridge
COST	Bridge Cost	$0	$271,580	$307,250	$779,625	$779,625
	Removal of Structure	$0	$25,000	$25,000	$80,000	$80,000
	Roadway	$0	$146,095	$163,288	$237,734	$285,931
	Maintenance of Traffic	$0	$47,250	$61,000	$68,750	$168,750
	Construction Costs	$0	$489,925	$556,538	$1,166,109	$1,314,306
	Construction Engineering + Contingencies	$0	$146,977	$166,961	$349,833	$394,292
	Total Construction Costs w CEC	**$0**	**$636,902**	**$723,499**	**$1,515,942**	**$1,708,598**
	Preliminary Engineering[3]	**$0**	**$171,474**	**$194,788**	**$233,222**	**$262,861**
	Right of Way	**$0**	**$0**	**$0**	**$0**	**$118,288**
	Total Project Costs	$0	$808,376	$918,288	$1,749,164	$2,089,747
	Annualized Costs	$0	$20,209	$22,957	$21,865	$26,122
SCHEDULING	Project Development Duration[4]		2 years	2 years	2 years	>4 years
	Construction Duration		3 months	8 months	4 months	18 months
	Closure Duration (If Applicable)		2 weeks	N/A	4 weeks	N/A
ENGINEERING	Typical Section - Roadway (feet)	28'	28'	28'	32'	32'
	Typical Section - Bridge (feet)	4-11-11-4	5-11-11-5	5-11-11-5	5-11-11-5	5-11-11-5
	Geometric Design Criteria	No Change	Substandard Radius	Substandard Radius	Substandard Radius	Substandard Radius
	Traffic Safety	No Change	Improved	Improved	Improved	Improved
	Alignment Change	No	No	No	No	No
	Bicycle Access	No Change	Improved	Improved	Improved	Improved
	Hydraulic Performance	No Change	No Change	No Change	Improved	Improved
	Pedestrian Access	No Change	Improved	Improved	Improved	Improved
	Utility	No Change	Relocation	Relocation	Relocation	Relocation
OTHER	ROW Acquisition	No	No	No	No	Yes
	Road Closure	No	Yes	No	Yes	No
	Design Life	<10 years	40 years	40 years	80 years	80 years

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

VI. Conclusion

We recommend **Alternative 1a**; to replace the existing superstructure while maintaining traffic on an offsite detour.

Structure:
The annualized cost for a superstructure replacement is less expensive than the complete replacement option. It also has the lowest upfront costs. Since the substructure is rated as satisfactory, it is reasonable to assume that it has 40 years of life remaining. Additionally, the Q_{50} design flow passes under the existing structure.

The new superstructure will be precast to minimize the closure period. The scope of work will include the following substructure repairs:

- Undermining along the eastern abutment should be filled in, and measures should be taken to protect against future undermining.

- Repair of minor spalling along the water line.

None of the alternatives considered would have rectified the substandard horizontal curve at this location or the substandard shoulder width along VT RT 11. The existing shoulders on the bridge will be widened to meet the 5 foot standard.

Traffic Control:
The recommended method of traffic control is to close the bridge for two weeks, and maintain traffic on an offsite detour. The detour for this project location would add approximately 13.9 miles to the through route, and have an end-to-end distance of 42.7 miles. There are multiple local bypass routes, which would most likely be used by local traffic. The shortest local bypass route adds 1.4 miles to the through route, and has an end-to-end distance of 6.4 miles.

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.

VII. Appendices

- Site Pictures
- Town Map
- Bridge Inspection Report
- Hydraulics Memo
- Preliminary Geotechnical Information
- Natural Resources Memo
- Archeology Memo
- Historic Memo
- Resource ID Completion Memo
- Detour and Local Bypass Maps
- Plans
    - Existing Conditions
    - Proposed Typical Sections
    - Superstructure Replacement Layout
    - Proposed Profile
    - Full Bridge Replacement Layout
    - Temporary Bridge Layouts
    - Phasing Typical Sections
    - Phasing Layouts

Westbound Approach

Eastbound Approach

Looking Downstream

Looking Upstream

West Abutment (Note Deck/T-Beam Deterioration)

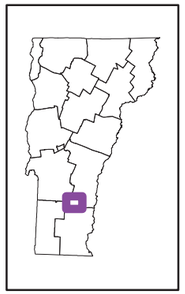
Exposed Reinforcing Steel in Deck

Scale 1:57,424

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



ANDOVER
WINDSOR COUNTY
DISTRICT # 2

STRUCTURE INSPECTION, INVENTORY and APPRAISAL SHEET

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

Inspection Report for ANDOVER **bridge no.:** 00041 **District:** 2

Located on: VT 00011 ML **over** MID. BR WILLIAMS RI **approximately** 4.0 MI E JCT VT 121 **Owner:** 01 STATE-OWNED

CONDITION

Deck Rating: 4 POOR

Superstructure Rating: 5 FAIR

Substructure Rating: 6 SATISFACTORY

Channel Rating: 5 FAIR

Culvert Rating: N NOT APPLICABLE

Federal Str. Number: 200016004114012

Federal Sufficiency Rating: 69.1

Deficiency Status of Structure: SD

AGE and SERVICE

Year Built: 1927 **Year Reconstructed:** 1963

Service On: 1 HIGHWAY

Service Under: 5 WATERWAY

Lanes On the Structure: 02

Lanes Under the Structure: 00

Bypass, Detour Length (miles): 14

ADT: 002100 **% Truck ADT:** 09

Year of ADT: 1998

GEOMETRIC DATA

Length of Maximum Span (ft): 0044

Structure Length (ft): 000046

Lt Curb/Sidewalk Width (ft): 1.5

Rt Curb/Sidewalk Width (ft): 1.5

Bridge Rdwy Width Curb-to-Curb (ft): 30

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

Appr. Roadway Width (ft): 028

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: TBEAM WIDE W/ STL BM

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: 0 DOES NOT MEET CURRENT STANDARD

Transitions: 0 DOES NOT MEET CURRENT STANDARD

Approach Guardrail: 1 MEETS CURRENT STANDARD

Approach Guardrail Ends: 0 DOES NOT MEET 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: 3 FREQUENT OVERTOPPING OF BRIDGE & ROADWAY WITH SIGNIFICANT TRAFFIC DELAYS

Approach Roadway Alignment: 7 BETTER THAN MINIMUM CRITERIA

Scour Critical Bridges: 3 SCOUR CRITICAL

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: 042011 **Insp. Freq. (months)** 24 **X-Ref. BrNum:**

INSPECTION SUMMARY and NEEDS

10/26/11 Approach embankment filled in and behind the wings and in front of the abutment. DCP & FRE

09/13/2011 - Irene note: Heavy erosion along upstream side approaches has been filled in by the district. Original stem portion of the east abutment has significant undermining. Loss of material support is deceiving as the area is filled with loose sentiments. The voiding is roughly 6 inches to a foot deep and extends in up to 4 to 6 feet and is approximately 14 feet long. The void basically extends between the footings of the widened portions. There is scour to the clay streambed along the upstream wing at the east abutment but no undermining. The undermining along the east abutment stem needs to be filled in creating a shallow knee wall and the abutment protected with jagged riprap and the channel also needs alterations to improve alignment. ~ MJ/DK

04/ 07/11 Deck continues to deteriorate and full depth holes could occur any time. Tee beams 4&5 continue to deteriorate. Abutments are in satisfactory condition. There is some scour along abutment 1 exposing the footing. DCP & FRE

VT AGENCY OF TRANSPORTATION PROGRAM DEVELOPMENT DIVISION

HYDRAULICS UNIT

TO: Chris Williams, Structures Project Manager

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

DATE: October 12, 2012

SUBJECT: ANDOVER – BHF-016-1(29) – VT 11 Bridge 41 over Middle Branch of the Williams 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 1927 and widened in 1963 based on available information. The bridge is a 2-lane single-span constructed of concrete T-beams with the widening being rolled beams and having a concrete deck with an asphalt surface over the entire deck. The total width of bridge is approximately 35 feet normal to the roadway. The normal clear span to the river between the abutment faces is approximately 42 feet just below the bridge seats with slightly battered abutment faces down to a clear span of approximately 40.5 feet at streambed elevation. The existing bridge is basically normal to the river at this location. The total existing superstructure depth is approximately 4 feet based field measurements and confirmed with record information. The existing slightly battered-faced abutments are cast-in-place concrete. These abutments are basically parallel with the stream channel at this location. The approximate maximum height to the bottom of the superstructure to the streambed varies between approximately 9 – 9.5 feet. The structure is located on an incised channel having a cobble streambed between two bends in the stream. It appears the Right (East) Bank just upstream of the bridge location appears to have had some erosion occurring during T. S. Irene with a cobble bench/bar at the toe of slope.

The Q_{50} design event flow does pass through the existing structure. 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.

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, as well as not create any worse backwater flooding conditions than the existing conditions. The VANR Bank Full Width (BFW) Equation estimates the width to be approximately 39 feet, but the actual post-T.S. Irene BFW varies from 45 feet to 60 feet within the reach of the existing bridge. The pre-T.S. Irene BFW has been estimated to be 35 to 50 feet based on old photographic evidence.

It has been assumed a replacement structure will be located in the existing roadway alignment based on the site constraints. It is also anticipated the proposed deck elevations will be similar to the Existing Conditions. For a replacement structure, we have anticipated that the proposed abutments will be vertical face concrete abutments with 3H:2V sloped stone fill scour protection placed in front of the abutments up at least 5 feet above the streambed elevation.

Based on our analysis using a new structure, the recommendation will be to use a replacement bridge having a 55-foot clear span normal to the stream channel (between the abutment faces) with a low beam elevation at or above 1064.7 feet with the stone fill protection in front of the abutments. The proposed wider structure will not constrict the stream channel's bank full width from the current post-T.S. Irene BFW conditions and be similar to the existing low flow conditions. The proposed structure will also provide just over 1.0 feet of freeboard at the Q_{50} design storm event and meet the hydraulic design standard.

As noted above, scour was not reviewed during the preliminary design. However based on the velocities from the analyses and evidence from the site, it is anticipated that Type 3 Stone Fill will be necessary for armoring the abutments and disturbed channel banks near the replacement structure. Although stone fill sizing will be verified during final hydraulic design.

Temporary Bridge

It is unclear whether a temporary bridge or a detour will be used during the construction of the new bridge, but this issue will need to be resolved prior to final hydraulics.

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

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, Geotechnical Engineer, via Christopher C. Benda P. E., Soils and Foundations Engineer

Date: June 11, 2012

Subject: Andover BHF 016-1(29) VT-11 Bridge No. 41 Preliminary Geotechnical Information

1.0 INTRODUCTION

We have completed our preliminary geotechnical investigation for the replacement of Bridge No. 41 on VT-11, in the town of Andover, VT. Located approximately 4 miles east of the junction with VT-121, the subject project consists of replacing the existing concrete slab bridge. This report documents our initial search of historical information and field observations to determine the characteristics of the site. A number of materials were reviewed including: VTrans boring files and record plans, Agency of Natural Resources (ANR) water well logs, USDA Surficial Geologic maps and VTrans Bridge Inspection Photos.

2.0 SUBSURFACE INFORMATION

2.1 Previous Projects

Record plans were found for the project bridge, however no subsurface information was available

2.2 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. Three 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 a red box. Three water wells within a 1000 foot radius were used to get an estimate of the depth to bedrock and types of soils likely to be encountered on the project.

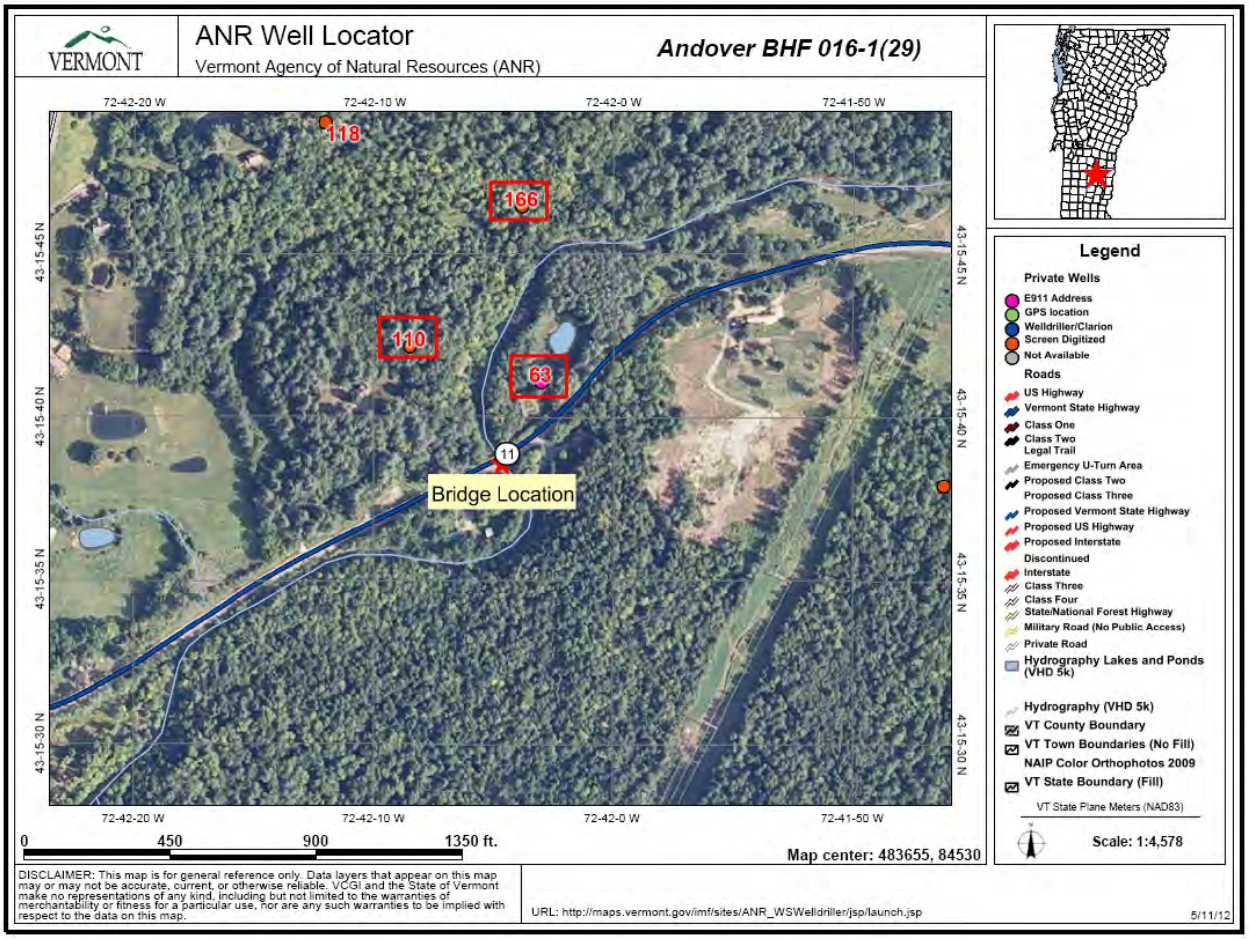


Figure 1. Highlighted well locations near subject project.

Table 1 lists the well sites used in gathering the surrounding information. Three water 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
63	270	98	Sand and gravel
110	320	96	Gravel and boulders to 22', then hardpan
166	780	97	Clay, with gravel from 12'-28'

2.3 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 Colton fine sandy loam, which is very deep to bedrock and excessively draining.

2.4 USGS Bedrock Maps

The United States Geologic Survey (USGS) publishes online bedrock maps with subsurface information. The data corresponding to this site location indicates that the bedrock conditions consist of phyllite, and are described as "*predominantly dark-gray to black, carbonaceous to highly graphitic, fine-grained sulfidic biotite-muscovite-quartz phyllite having silicic laminae.*"

3.0 FIELD OBSERVATIONS

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 May 10, 2012.

Figure 2. View of bridge, facing west.

Overhead power crosses the road before the bridge approach and runs along the south side of the road, which in combination with a power pole in the southwest corner, may interfere with the borings. Numerous cobbles and some small boulders were prevalent in the streambed and along the banks, which may also impede boring and construction operations. Several residential houses were noted in close proximity to the bridge, which will need consideration during the design and construction phases. These are seen in Figure 3.

Figure 3. Proximity of residential houses to project location.

4.0 RECOMMENDATIONS

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

- Reinforced concrete abutments on spread footings
- Stub abutments supported on MSE walls
- Pile caps on a single row of H-Piles

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.

5.0 CONCLUSION

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.Metlzer@state.vt.us.

cc: Project File/CCB
NSM

AGENCY OF TRANSPORTATION **OFFICE MEMORANDUM**

TO: Lee Goldstein, Environmental Specialist

FROM: John Lepore, Transportation Biologist

DATE: April 2, 2012

SUBJECT: ANDOVER BHF 016-1 (29)
VT 11, Bridge 41 over Middle Branch of Williams River

The purpose of this memorandum is to let you know that I have completed my initial review of this project have concluded that the only regulated resource in the immediate area is the river itself. In other words, wetlands, floodplains, agricultural lands, and species/ habitats of special concern are not in the area.

This area was smacked hard by Irene and there's a lot of channel instability which may need to be addressed during the design process.

Should you have any questions, come see me.

~ John ~

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: Lee Goldstein, VTrans Environmental Specialist

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

Date: 6/15/2012

Subject: Andover BHF 016-1(29) – Archaeological Resource ID

Lee,

A field visit for Andover BHF 016-1(29) was conducted on 6/14/2012 as part of the 2012 scoping initiative. There are no areas of archaeological sensitivity present in the general area around Bridge 41 on VT Rt.11 in Andover. Disturbance was evident in all four quadrants of the project, and no historic structural remains were identified.

~Brennan

Brennan Gauthier
VTrans Assistant Archaeologist
tel. 802-828-3965
Brennan.Gauthier@state.vt.us

VTrans Working to Get You There
Vermont Agency of Transportation

Goldstein, Lee

From: O'Shea, Kaitlin
Sent: Thursday, April 12, 2012 3:58 PM
To: Goldstein, Lee
Cc: Newman, Scott; Williams, Chris
Subject: Pilot Project - Andover BHF016-1(29) Historic Resource ID

Good afternoon,

I have completed the historic resource review for Andover BHF016-1(29): Bridge 41 is not historic and there are no historic resources within the project area.

This resource ID is part of the GPS/GIS Pilot Project. As discussed, initial review for historic resources is completed via desk review (maps, bridge inspection photos, Google Earth) and can be determined to have no historic resources without site visits. Other projects will require a site visit in order to determine if there are historic resources located within the project area. Historic resources will continue to be identified on a map and scanned for the project files. When appropriate, historic resources will be mapped by the GPS in order to compare and contrast the effectiveness and application of these resource ID procedures.

I am keeping a spreadsheet for these pilot projects which outlines review methods, resource notes, resource ID and how the ID is submitted (GPS data, email memo, resource map, etc.) I'll bring this to the next project meeting.

Let me know if you have any questions.
Thanks,
Kaitlin

Kaitlin O'Shea
Historic Preservation Specialist
Vermont Agency of Transportation

802-279-0869
Kaitlin.O'Shea@state.vt.us

OFFICE MEMORANDUM

AOT - PROGRAM DEVELOPMENT DIVISION

RESOURCE IDENTIFICATION COMPLETION MEMO

TO: Chris Williams, Project Manager
FROM: Lee Goldstein, Environmental Specialist
DATE: April 12, 2012

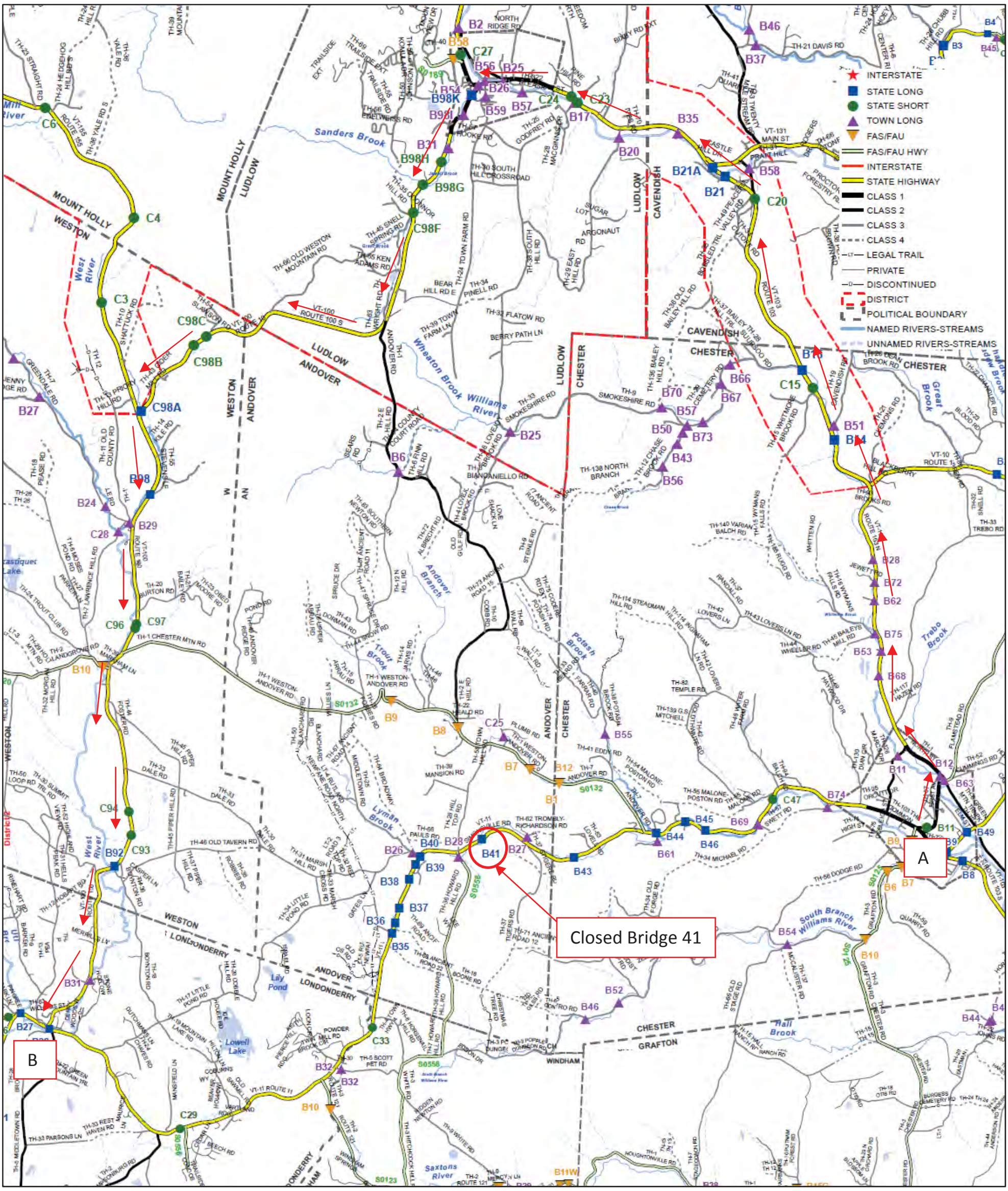
Project: **Andover BHF 016-1(29); VT 11, BR 41—Middle Branch Williams River**

ENVIRONMENTAL RESOURCES:

Wetlands:	___ Yes	X No	4/2/12
Historic/Historic District:	___ Yes	X No	4/12/12
Archaeological Site:	___ Yes	X No	6/15/12
4(f) Property:	___ Yes	X No	4/12/12
6(f) Property:	___ Yes	X No	
Agricultural Land:	___ Yes	X No	
Fish & Wildlife Habitat:	___ Yes	X No	
Endangered Species:	___ Yes	X No	
Hazardous Waste:	___ Yes	X No	
Stormwater:	___ Yes	X No	5/17/12
USDA-Forest Service Lands:	___ Yes	X No	
Wildlife Habitat Connectivity:	___ Yes	X No	
Scenic Highway/ Byway:	___ Yes	X No	
Act 250 Permits:	___ Yes	X No	

If you have any questions or need additional information please let me know.
Thanks,

cc:
Project File

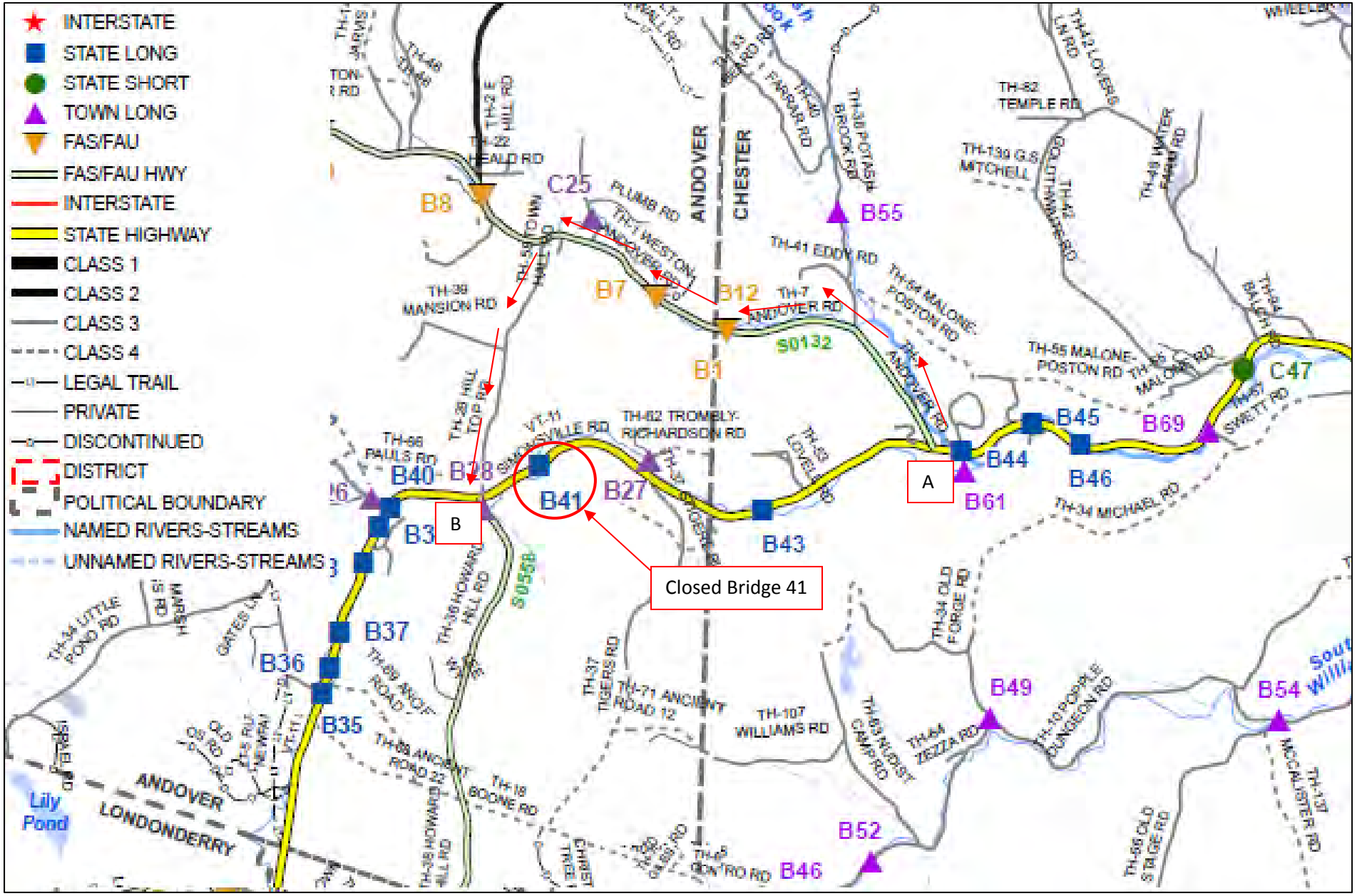


Detour Route

VT Route 11, to VT Route 103, and VT Route 100 back to VT Route 11

A-B on Through Route: 14.4 Miles
A-B on Detour Route: 28.3 Miles

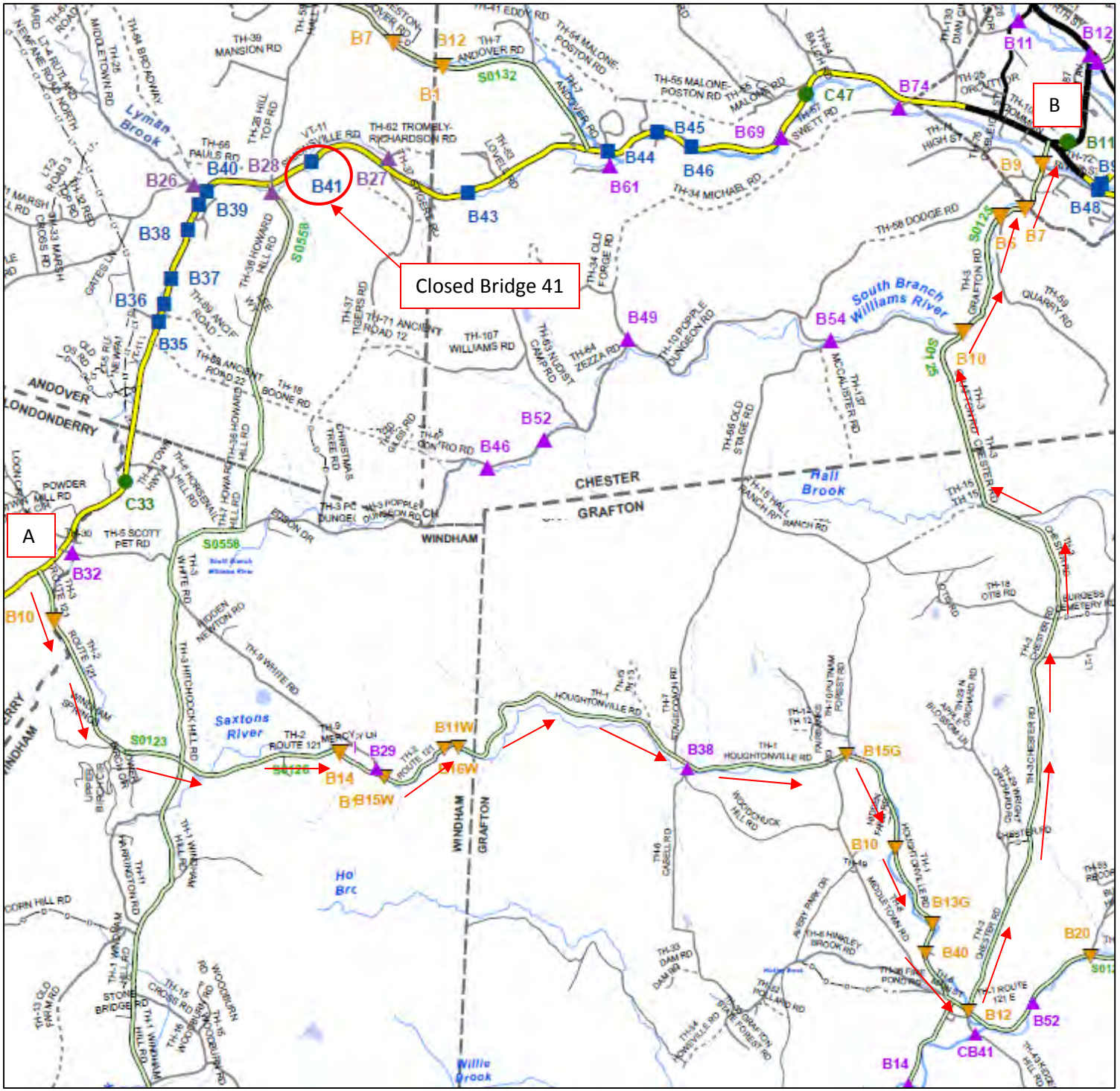
Added Miles: 13.9 Miles
End-End Distance: 42.7 Miles



Local Bypass 1

VT Route 11, to Hill Top Road, Weston – Andover Road, and Andover Road, back to VT Route 11

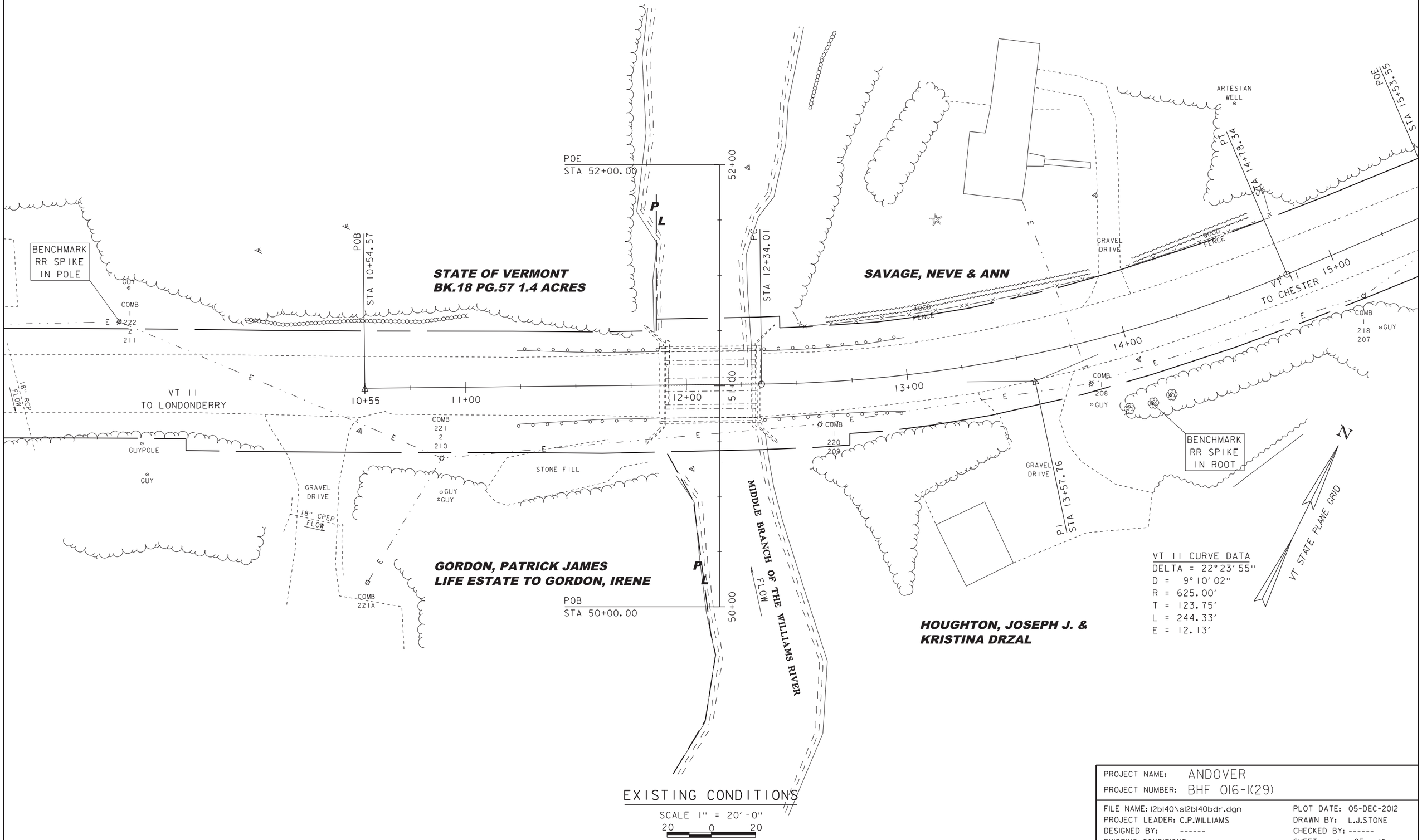
A-B on Through Route: 2.5 Miles
A-B on Bypass Route: 3.9 Miles
Added Miles: 1.4 Miles
End-End Distance: 6.4 Miles



Local Bypass 2

VT Route 11, to VT Route 121, and VT Route 35, back to VT Route 11

A-B on Through Route: 10.1 Miles
A-B on Bypass Route: 17.0 Miles
Added Miles: 6.9 Miles
End-End Distance: 27.1 Miles

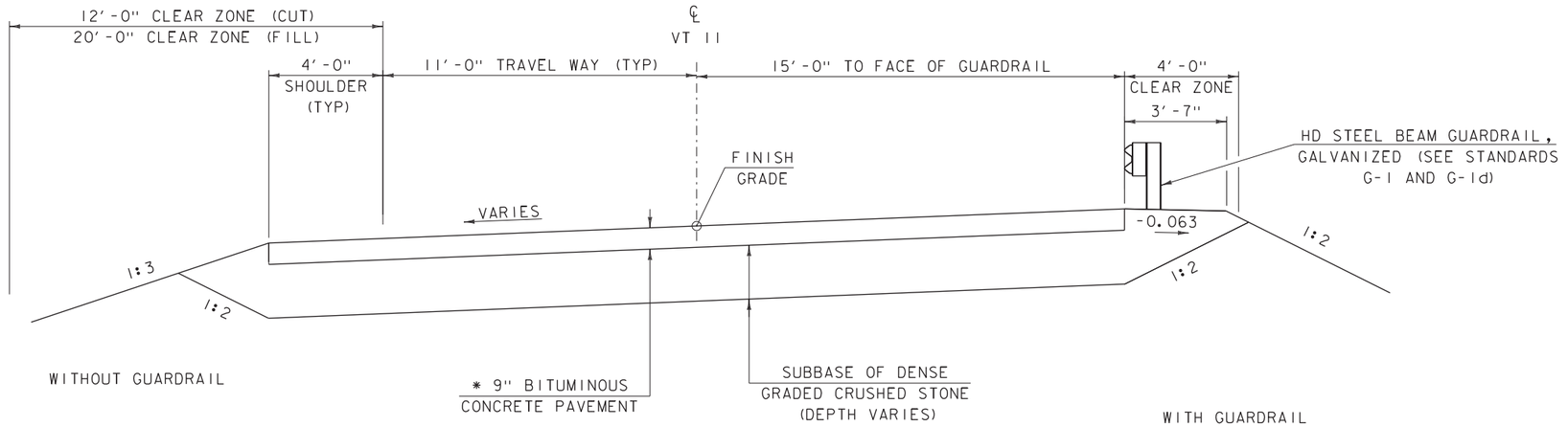


VT II CURVE DATA
DELTA = 22°23'55"
D = 9°10'02"
R = 625.00'
T = 123.75'
L = 244.33'
E = 12.13'

EXISTING CONDITIONS

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

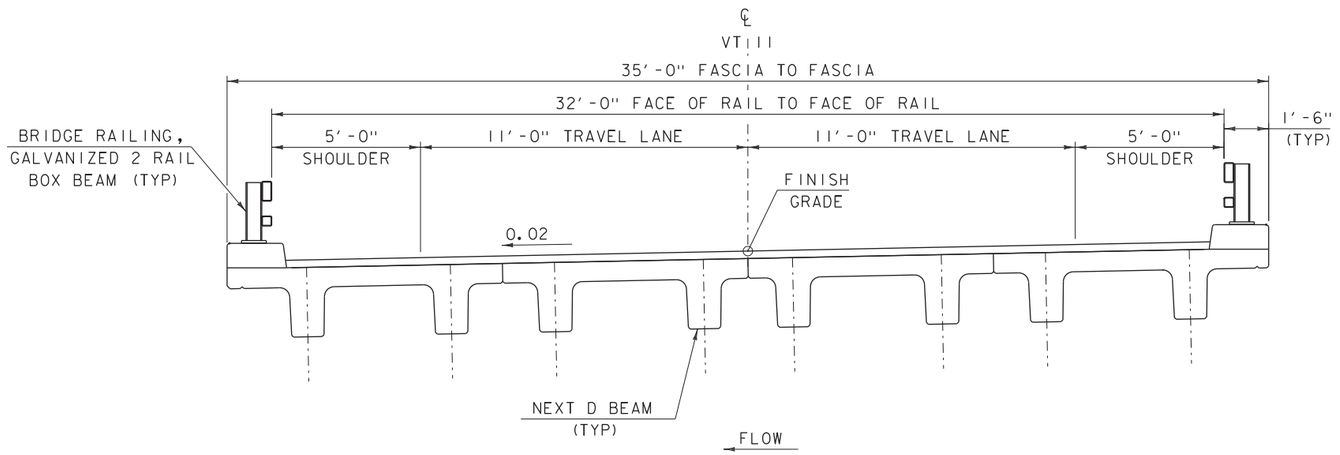
PROJECT NAME:	ANDOVER
PROJECT NUMBER:	BHF 016-1(29)
FILE NAME:	12b140\s12b140bdr.dgn
PROJECT LEADER:	C.P.WILLIAMS
DESIGNED BY:	------
EXISTING CONDITIONS	
PLOT DATE:	05-DEC-2012
DRAWN BY:	L.J.STONE
CHECKED BY:	------
SHEET	1 OF 10



VT ROUTE 11 ROADWAY TYPICAL SECTION

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

* 1 1/2" TYPE IVS OVER
1 1/2" TYPE IVS OVER
3" TYPE IIS OVER
3" TYPE IIS



BRIDGE TYPICAL SECTION

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

MATERIAL TOLERANCES

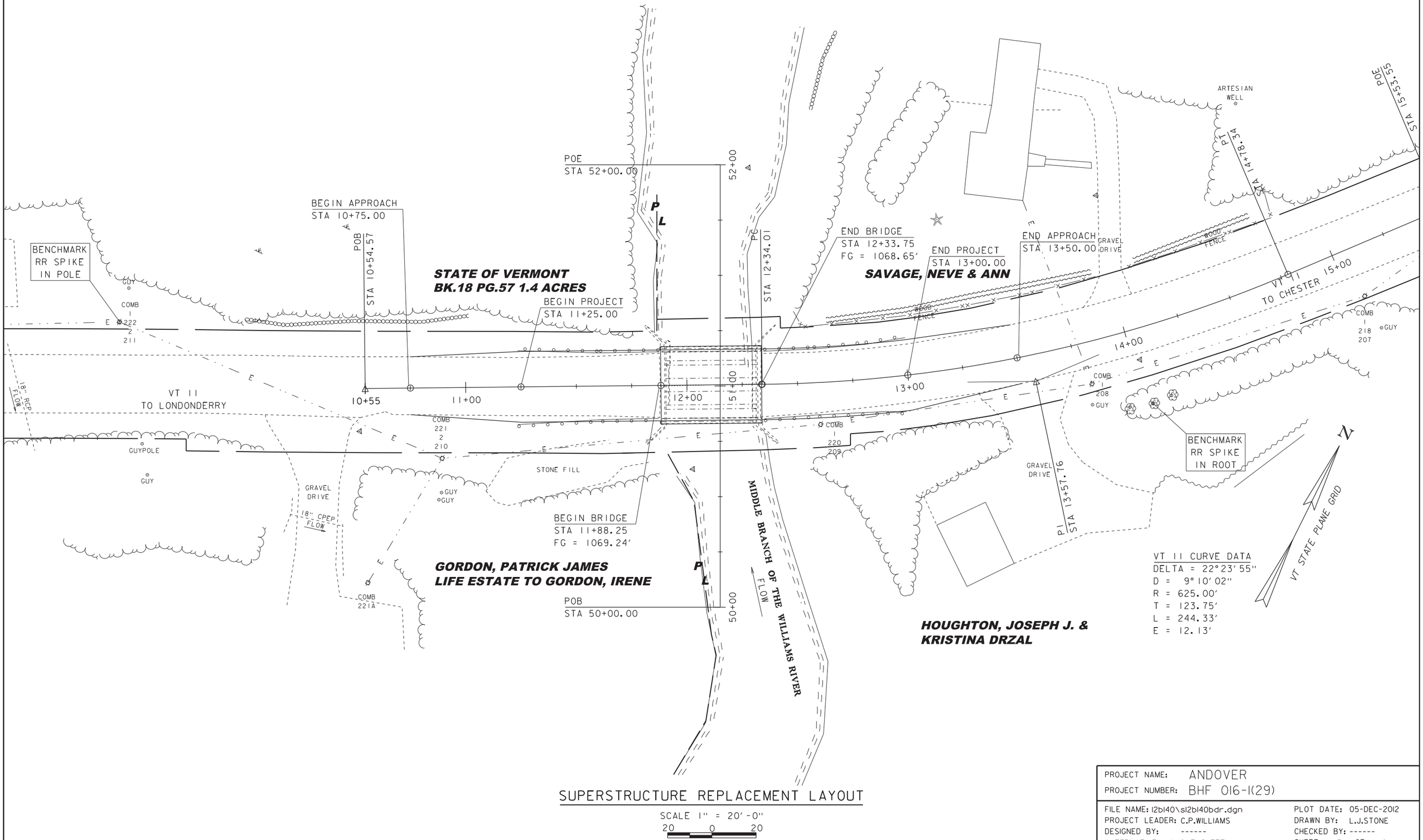
(IF USED ON PROJECT)

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

PROJECT NAME: ANDOVER
PROJECT NUMBER: BHF 016-1(29)

FILE NAME: sl2bl40typ.dgn
PROJECT LEADER: C.P.WILLIAMS
DESIGNED BY: L.STONE
TYPICAL SECTIONS

PLOT DATE: 05-DEC-2012
DRAWN BY: L.STONE
CHECKED BY:
SHEET 2 OF 10

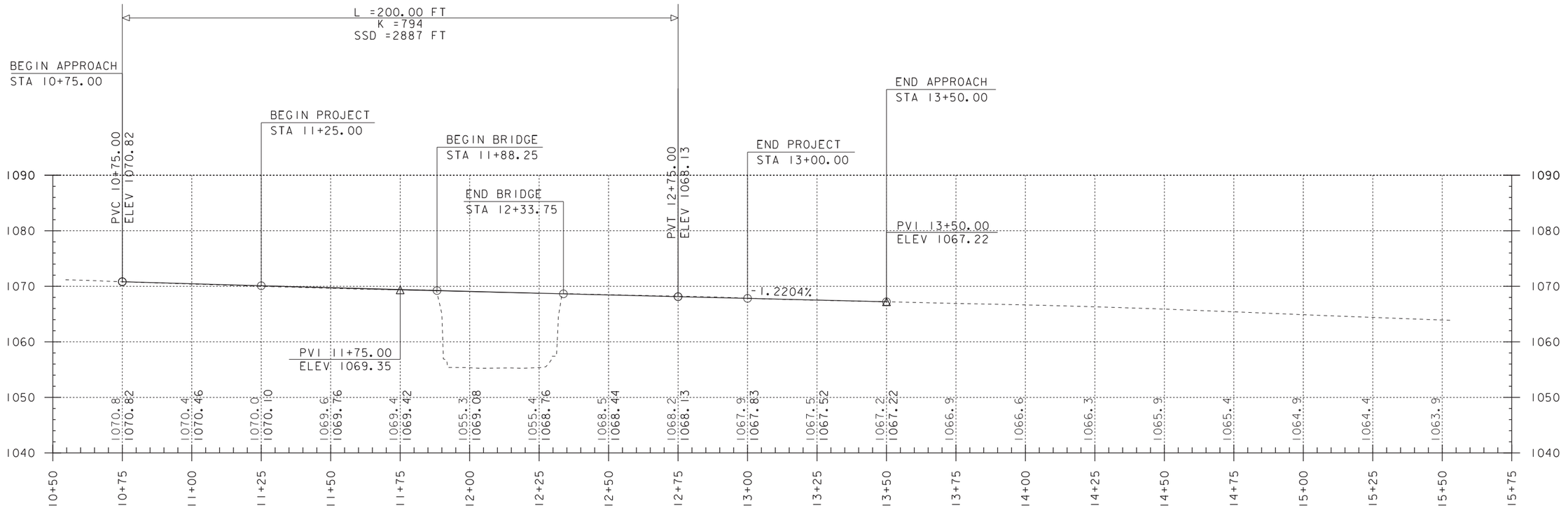


SUPERSTRUCTURE REPLACEMENT LAYOUT

SCALE 1" = 20'-0"

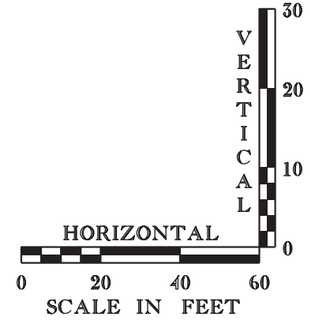
20 0 20

PROJECT NAME:	ANDOVER
PROJECT NUMBER:	BHF 016-1(29)
FILE NAME:	12b140\sl2b140bdr.dgn
PROJECT LEADER:	C.P.WILLIAMS
DESIGNED BY:	------
ALTERNATIVE 1	LAYOUT SHEET
PLOT DATE:	05-DEC-2012
DRAWN BY:	L.J.STONE
CHECKED BY:	------
SHEET	3 OF 10



LINE	SURFACE	OFFSET
--------	x12b140og	0.00
Scaled	2.0000	Times Ver.
Scaled	1.0000	Times Hor.

VT RT 11 PROFILE FOR SUPERSTRUCTURE REPLACEMENT



NOTE:

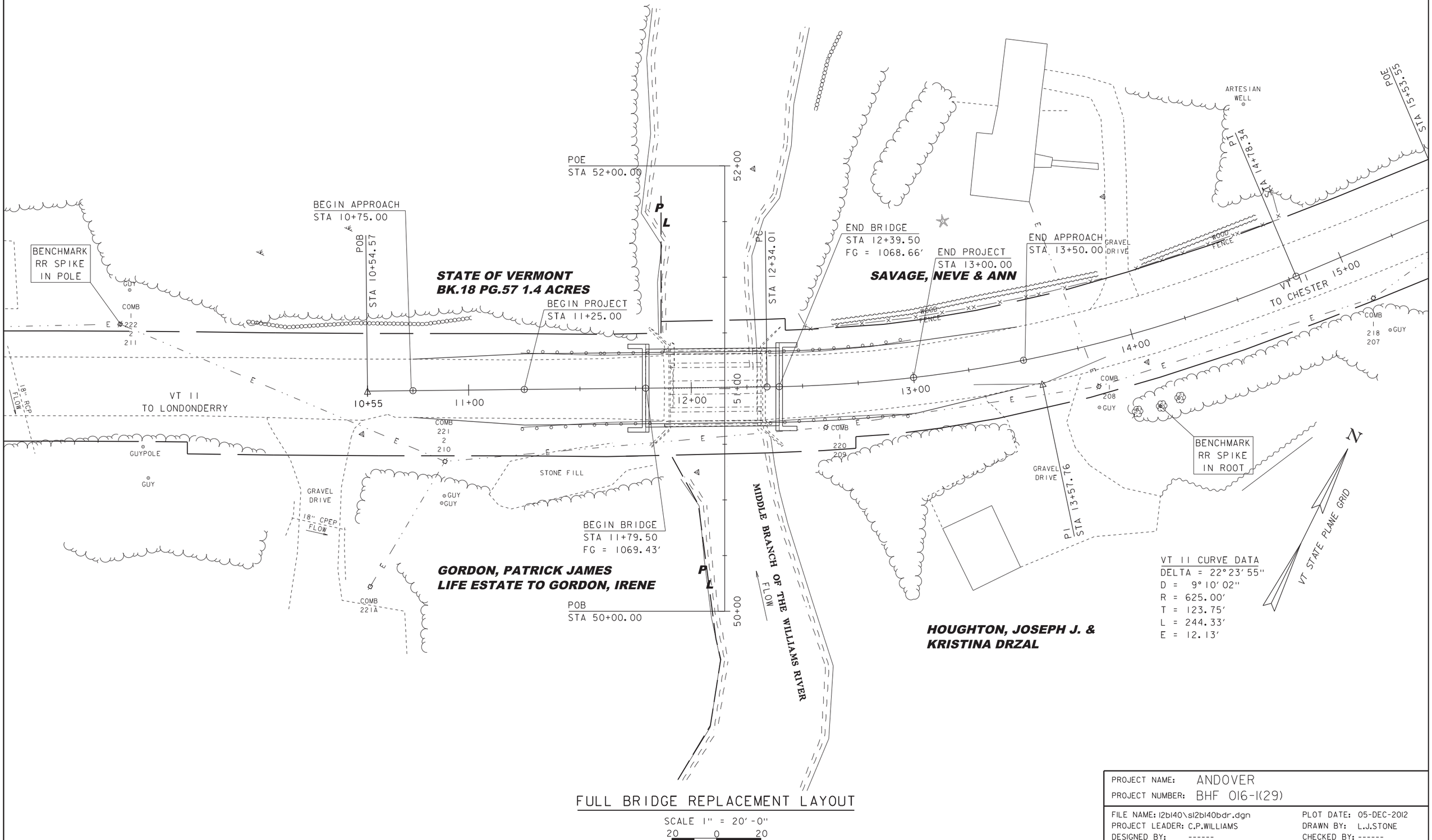
GRADES SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG ℄

GRADES SHOWN TO THE NEAREST HUNDREDTH ARE FINISH GRADE ALONG ℄

PROJECT NAME: ANDOVER
PROJECT NUMBER: BHF 016-1(29)

FILE NAME: 12b140\sl2b140profile.dgn
PROJECT LEADER: C.P.WILLIAMS
DESIGNED BY: ------
PROFILE SHEET

PLOT DATE: 05-DEC-2012
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 4 OF 10

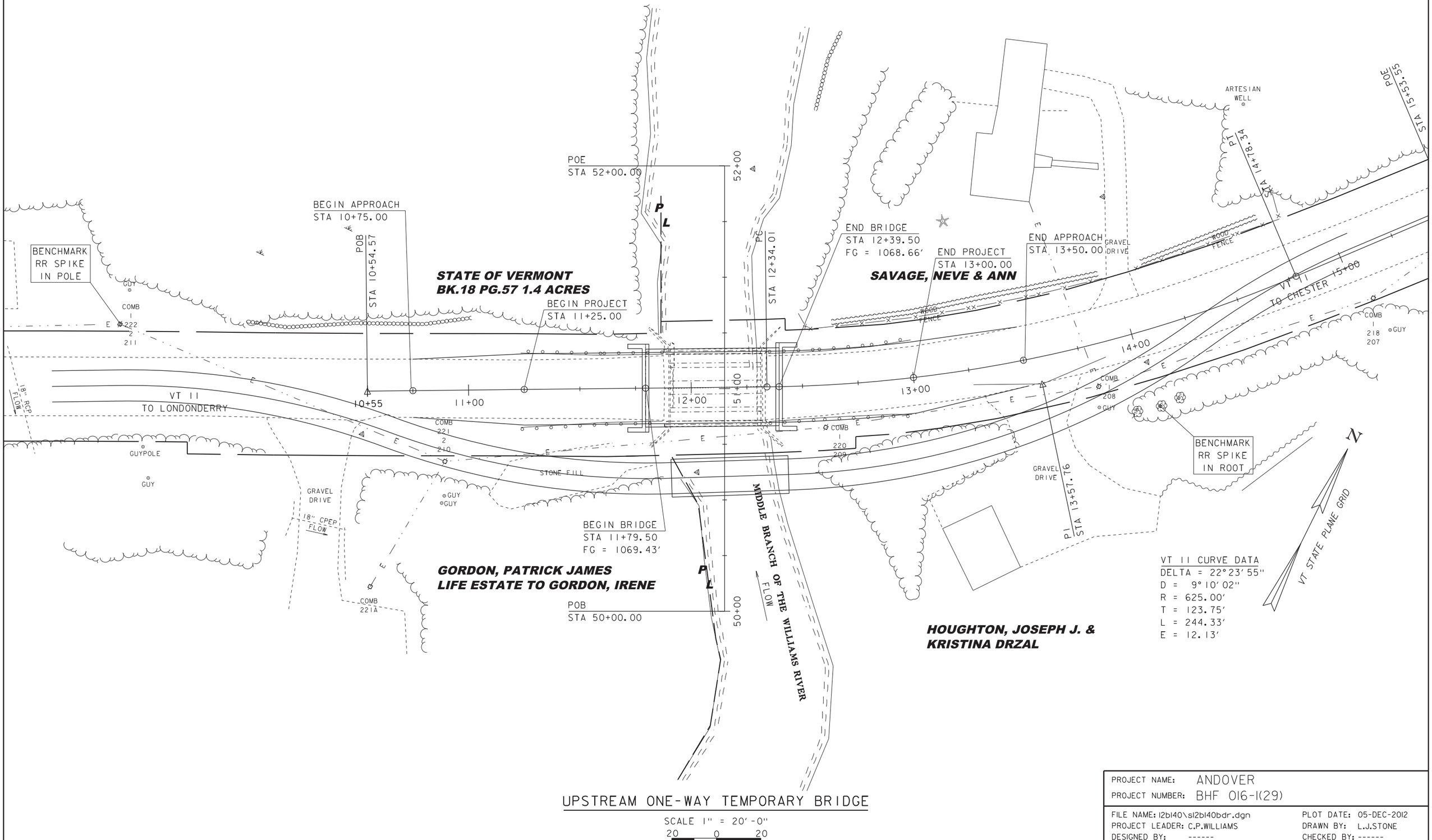


FULL BRIDGE REPLACEMENT LAYOUT

SCALE 1" = 20'-0"

20 0 20

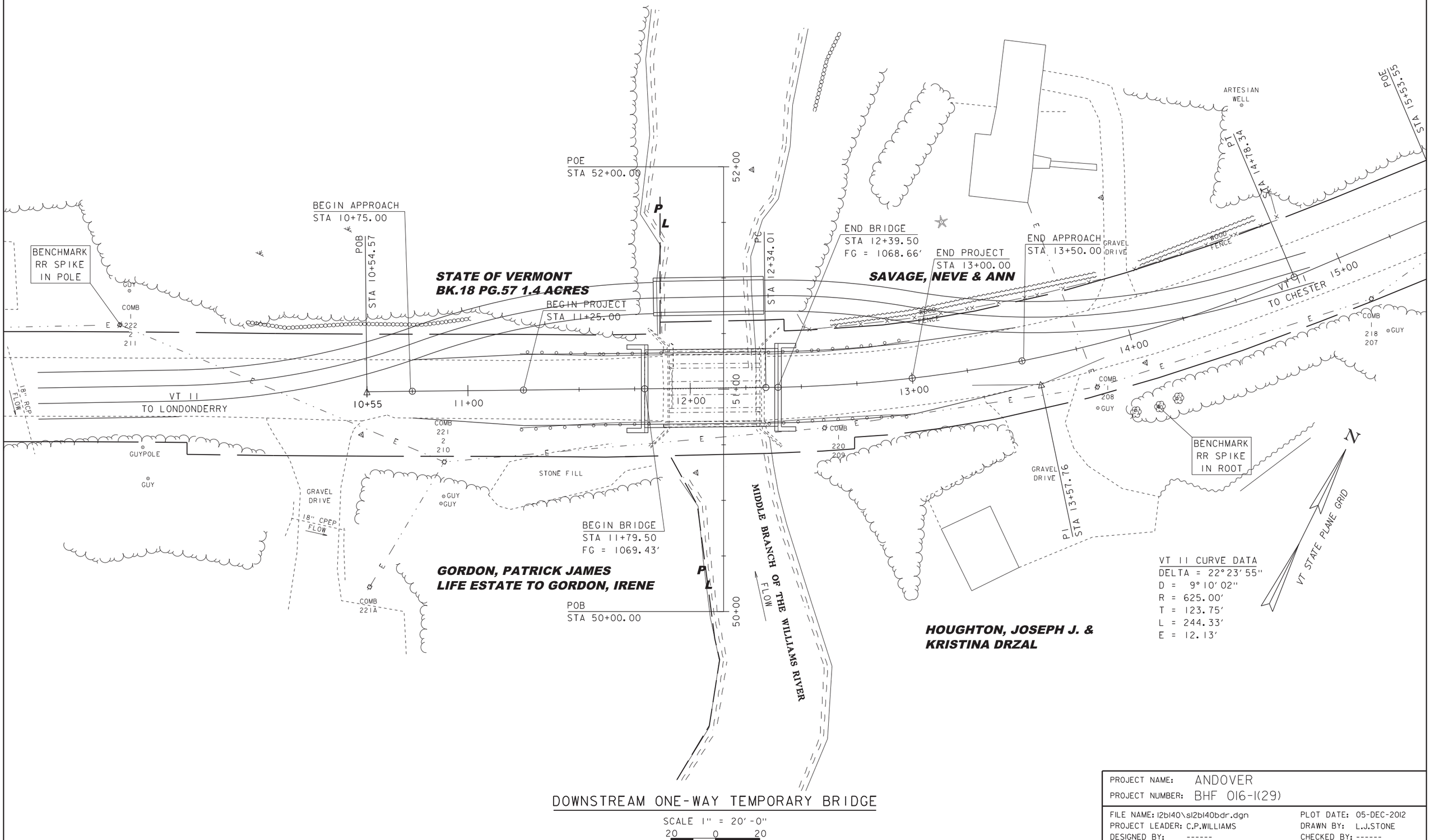
PROJECT NAME:	ANDOVER
PROJECT NUMBER:	BHF 016-1(29)
FILE NAME:	12b140\sl2b140bdr.dgn
PROJECT LEADER:	C.P.WILLIAMS
DESIGNED BY:	------
ALTERNATIVE 2 LAYOUT SHEET	
PLOT DATE:	05-DEC-2012
DRAWN BY:	L.J.STONE
CHECKED BY:	------
SHEET	5 OF 10



UPSTREAM ONE-WAY TEMPORARY BRIDGE

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

PROJECT NAME:	ANDOVER
PROJECT NUMBER:	BHF 016-1(29)
FILE NAME:	12bl40\sl2bl40bdr.dgn
PROJECT LEADER:	C.P.WILLIAMS
DESIGNED BY:	------
UPSTREAM TEMPORARY BRIDGE	
PLOT DATE:	05-DEC-2012
DRAWN BY:	L.J.STONE
CHECKED BY:	------
SHEET	6 OF 10

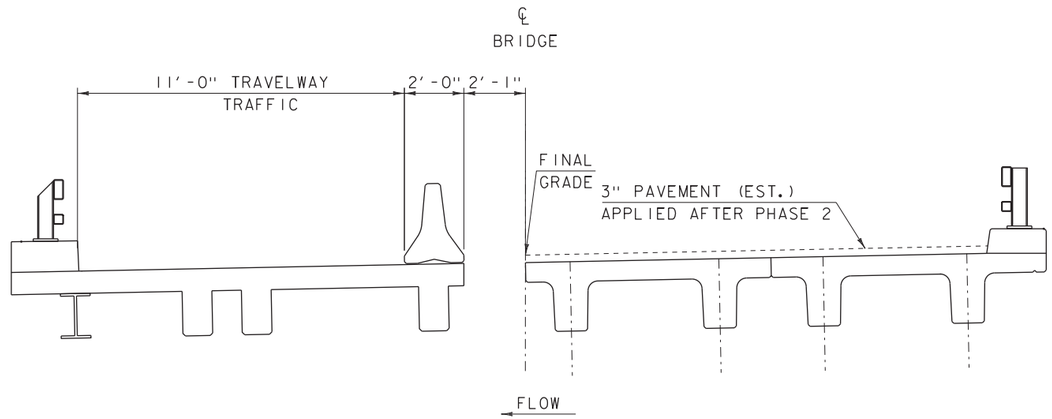


DOWNSTREAM ONE-WAY TEMPORARY BRIDGE

SCALE 1" = 20'-0"

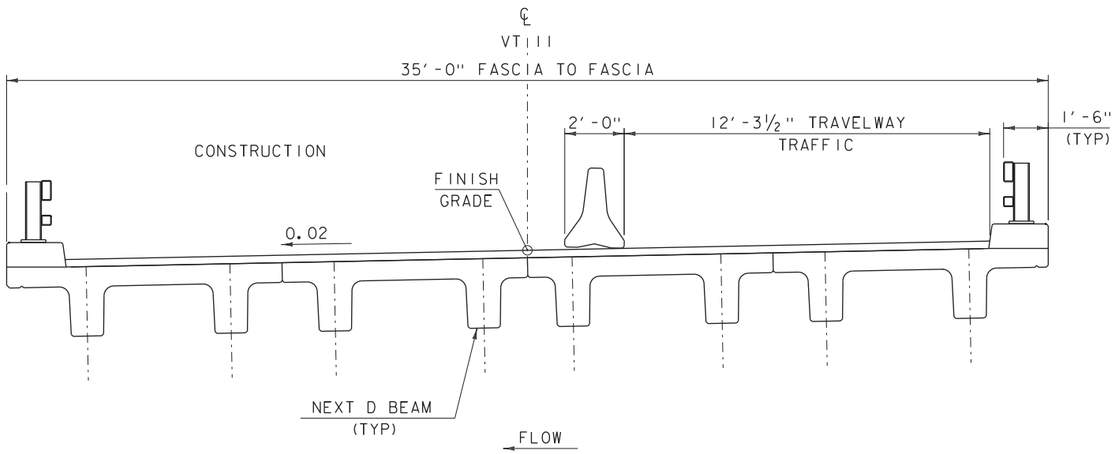
20 0 20

PROJECT NAME:	ANDOVER
PROJECT NUMBER:	BHF 016-1(29)
FILE NAME:	12b140\s12b140bdr.dgn
PROJECT LEADER:	C.P.WILLIAMS
DESIGNED BY:	------
DOWNSTREAM TEMPORARY BRIDGE	
PLOT DATE:	05-DEC-2012
DRAWN BY:	L.J.STONE
CHECKED BY:	------
SHEET	7 OF 10



BRIDGE REPLACEMENT PHASE #1 TYPICAL SECTION

SCALE 3/8" = 1'-0"

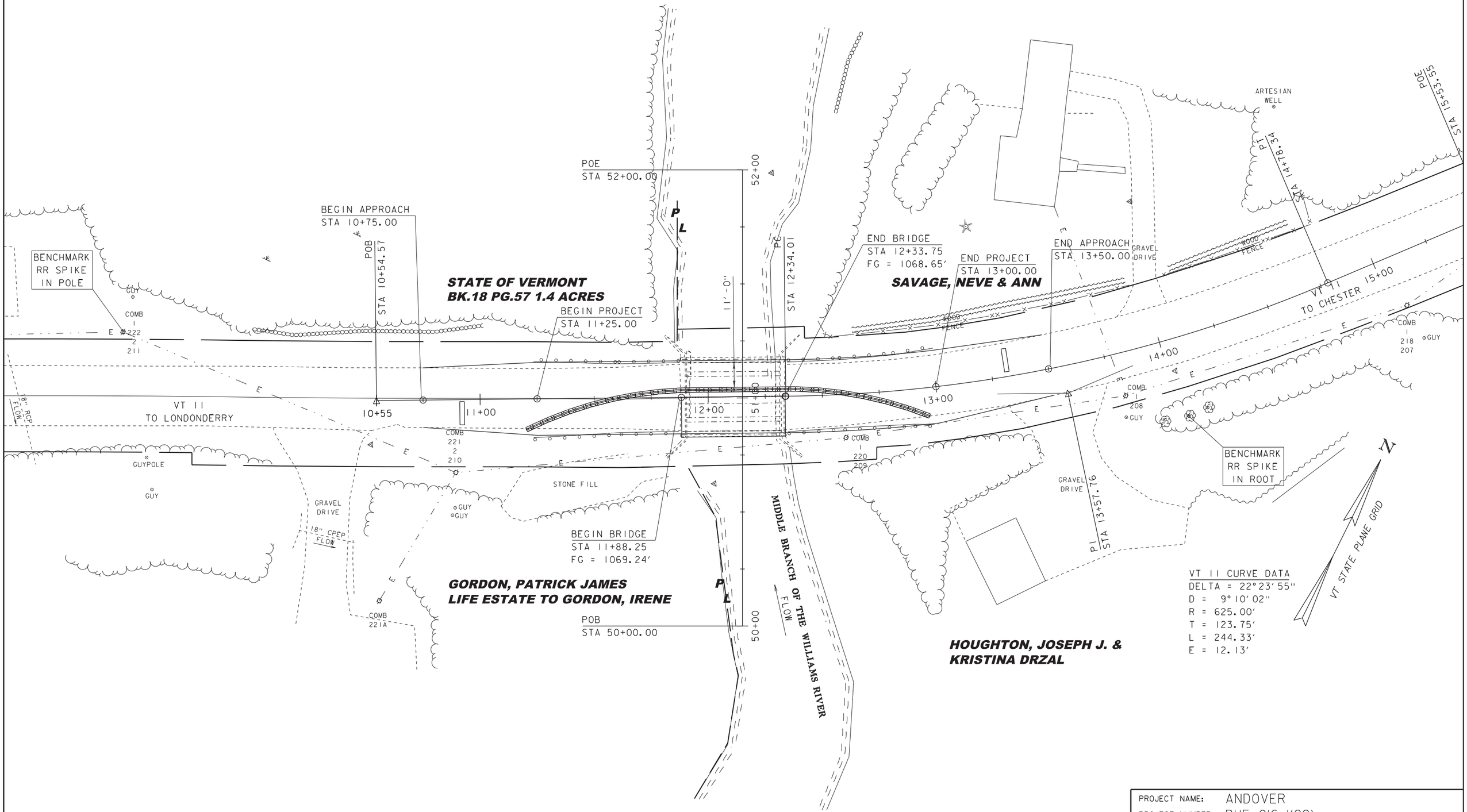


FLOW

BRIDGE REPLACEMENT PHASE #2 TYPICAL SECTION

SCALE 3/8" = 1'-0"

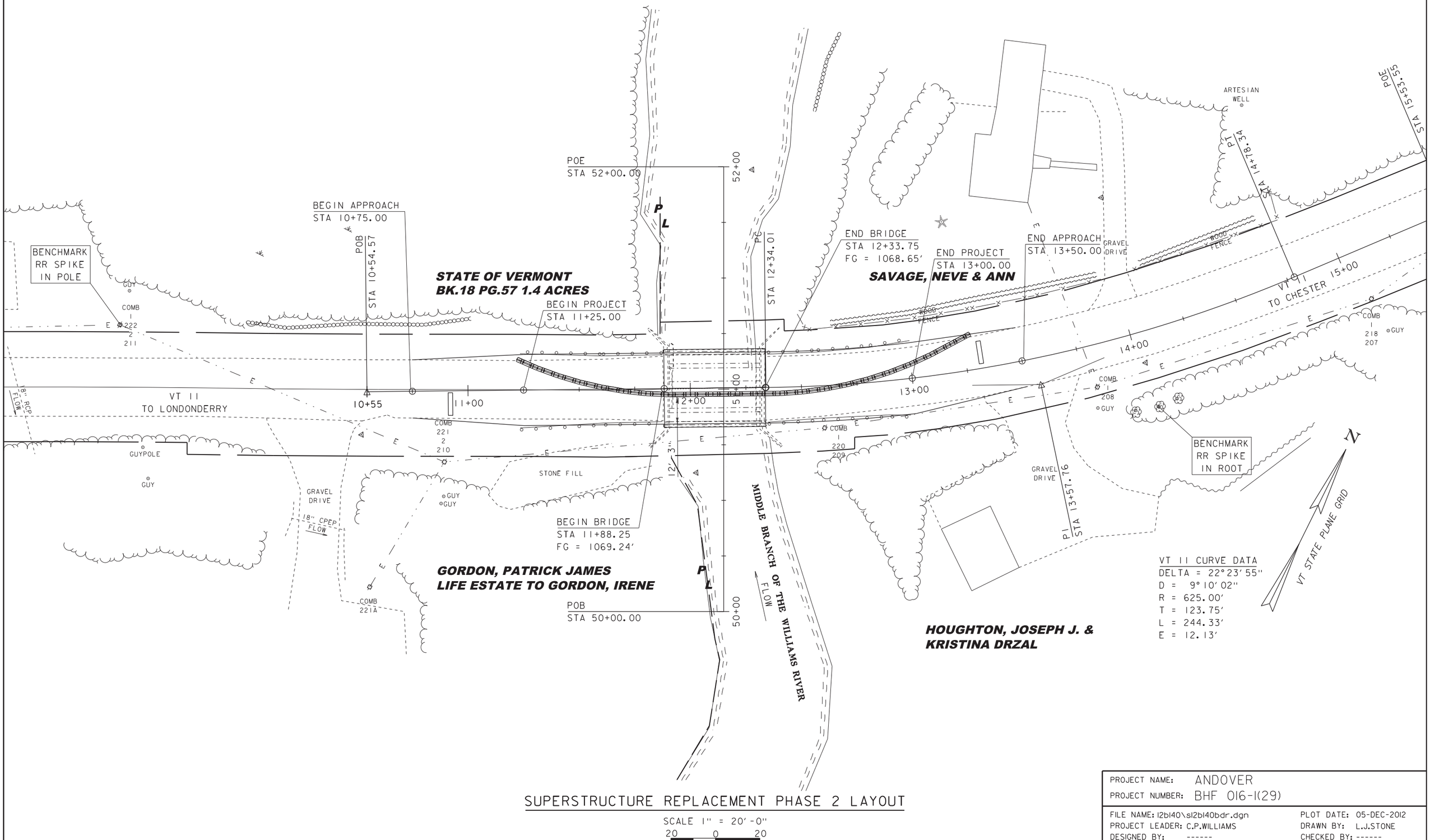
PROJECT NAME:	ANDOVER
PROJECT NUMBER:	BHF 016-1(29)
FILE NAME: sl2b140typ.dgn	PLOT DATE: 05-DEC-2012
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: L.STONE
DESIGNED BY: L.STONE	CHECKED BY:
PHASING TYPICAL SECTIONS	SHEET 8 OF 10



SUPERSTRUCTURE REPLACEMENT PHASE I LAYOUT

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

PROJECT NAME:	ANDOVER
PROJECT NUMBER:	BHF 016-1(29)
FILE NAME:	12b140\s12b140bdr.dgn
PROJECT LEADER:	C.P.WILLIAMS
DESIGNED BY:	------
PHASE I LAYOUT SHEET	
PLOT DATE:	05-DEC-2012
DRAWN BY:	L.J.STONE
CHECKED BY:	------
SHEET	9 OF 10



SUPERSTRUCTURE REPLACEMENT PHASE 2 LAYOUT

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME:	ANDOVER
PROJECT NUMBER:	BHF 016-1(29)
FILE NAME:	12b140\s12b140bdr.dgn
PROJECT LEADER:	C.P.WILLIAMS
DESIGNED BY:	------
PHASE 2 LAYOUT SHEET	
PLOT DATE:	05-DEC-2012
DRAWN BY:	L.J.STONE
CHECKED BY:	------
SHEET	10 OF 10