STATE OF VERMONT
AGENCY OF TRANPORTATION

Scoping Report

FOR

Chelsea BHF 0169(9)

VT ROUTE 110, Bridge #9
OVER THE FIRST BRANCH OF THE WHITE RIVER

December, 2012

Table of Contents

Table of Contents **2**

I. Site Information **3**

Need 3

Traffic 3

Design Criteria 4

Inspection Report Summary 5

Hydraulics 5

Utilities 5

Right Of Way 6

Environmental Resources 6

Wetlands: 6

Wildlife Habitat: 6

Rare, Threatened and Endangered Species: 6

II. Maintenance of Traffic **7**

Option 1: Off-Site Detour 7

Option 2: On-Site Detour via Temporary Bridge 8

Option 3: Phased Construction 9

III. Alternatives Discussion **9**

Alternative 1: No Action 9

Alternative 2: Minor Rehabilitation 9

Alternative 3: Deck Replacement 10

Alternative 4: Superstructure and Deck Replacement 10

Alternative 5: Full Bridge Replacement 11

IV. Alternatives Summary **11**

V. Costs **12**

VI. Conclusion **13**

VII. Appendices **14**

I. Site Information

The bridge is located on VT Route 110 approximately 0.2 miles south of the junction with VT 113. VT Route 110 passes through the downtown area of Chelsea at the location of this bridge. The existing conditions were gathered from a combination of a Site Visit, the Inspection Report, the Route Log, and the existing Survey. See correspondence in the Appendix for more detailed information.

Roadway Classification	Rural Major Collector, State Highway
Bridge Type	Cast in Place Concrete Deck on Rolled Beams, Cast-In-Place Skeleton Abutments, 5 ft. sidewalk on west side, skew 45 degrees
Bridge Length	84 Feet Long, Single Span
Year Built	1936
Ownership	State of Vermont

Need

Bridge 9 carries VT Route 110 across the First Branch White River. The following is a list of the deficiencies of Bridge 9:

1. The deck is in poor condition with a rating of 4 (Poor) in the latest inspection report. There is presently a steel plate covering holes in the deck, which rocks under traffic loads, making it impossible to maintain smooth pavement.

2. The bridge does not meet the hydraulic standard.

3. The width of the bridge deck is substandard.

4. The transition from approach guardrail to bridge guardrail and the approach guardrail ends do not meet the current standard. Additionally, the approach guardrail ends do not meet the current standard.

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. There are no high crash locations in Chelsea. See the next page for traffic data.

TRAFFIC DATA	2015	2035
ADT	1500	1600
DHV	190	200
ADTT	170	270
%T	0.6	0.9
%D	52	52

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 between 1500 and 2000 and a design speed of 30 mph for Rural Major Collectors.

Design Criteria	Source	Existing Condition	Minimum Standard	Comment
Approach Lane and Shoulder Widths	VSS Table 5.3	5'-12'-12'-2' (31')	10'/3' (26')	Substandard on southern approach
Bridge Lane and Shoulder Widths	VSS Table 5.3	1'-9'-9'-1' (20')	10'/3' (26')	Substandard
Clear Zone Distance	VSS Table 5.5	(3) Utility poles are from 10-11 ft from traveled way	14' fill / 12' cut	
Banking	2004 Structures Manual 13.1.4	Normal crown	Normal crown is appropriate on low speed (<45mph) village streets	
Speed		30 mph (Posted)	30 mph (Design)	
Horizontal Alignment	AASHTO Green Book Table 3-10b	Bridge is located on nearly straight section of road	R_{min}=3130'	
Vertical Grade	VSS Table 5.6	(+2)% south (-.15% to (+2%) north	9% (max) for level terrain	
K Values for Vertical Curves	VSS Table 5.1	Bridge located on crest (K =55)	30 crest / 40 sag	
Vertical Clearance Issues	VSS Section 5.8	None noted	14'-3" (min)	
Stopping Sight Distance	VSS Table 5.1	Virtually straight	200'	
Bicycle/Pedestrian Criteria	VSS Table 5.9	5' sidewalk west side, < 2' east side	3' Shoulder	
Bridge Railing	2010 Structures Manual Section 13	Decorative concrete rail with windows	TL-2	Unknown

Inspection Report Summary

Deck Rating	4 Poor
Superstructure Rating	6 Satisfactory
Substructure Rating	7 Good
Channel Rating	8 Very Good
Scour	8 Stable for scour

From Inspection Report:

"9/16/2011 – IRENE Heavy debris build up abut 1 needs to be removed. ~MK JM"

"4/12/2011 & 11/8/2011 – The deck is in need of full replacement. Local deck failures may occur anytime anywhere. The concrete spindles on both sides are in need of repair work. The steel is in need of full paint recoat. The left beam rail and posts of approach No. 2 are in need of repairs. ~PLB"

"4/8/2009 – Bridge needs deck replacement. Steel superstructure and the concrete substructure units need only minor attention. The asphalt overlay has chronic deterioration as the supplemental steel plating flexes and loosens over time. ~MJ/DS"

Hydraulics

The preliminary hydraulics report for this project states that the existing bridge does not meet the hydraulic standards for a State project on a Rural Major Collector. While the standard calls for passing the 50 year event with 1.0 ft. of freeboard, this bridge is capable of passing only the 2.33 year event with approximately 9" of freeboard. During most flood events, a portion of the flow leaves the channel and runs over the roadway south of the bridge, creating a natural overflow spillway. When the 50 year event is modeled, the water surface elevation is predicted to be 5.0 ft. above the low chord elevation of the bridge. Even with a full bridge replacement, building to meet hydraulic standards will not be feasible, due to existing nearby features and the fact that raising the roadway to match a higher bridge will create a dam effect for the flow in the natural overflow spillway. The hydraulics report recommends extending the bridge span to approximately 92 'and raising the south end of the bridge approximately 5". However, this results in a negligible improvement in water surface elevation during the design 50 year event.

Utilities

There are overhead utilities on the east side of the road. Utility relocation may be necessary for work to be done. The utility wires do not cross the road at the location of the bridge. An 8" D.I. buried water line is on the east side of the bridge and crosses under the river on that side. It becomes 12" north of the river crossing. A buried sanitary

sewer is on the west side of the bridge, size unknown. It also crosses under the river away from and west of the bridge. A sewer line runs down Creamery Road, crosses VT 110 just north of the bridge, and connects to the line running on the west side of the bridge. There are two small diameter (1-1.5" dia.) conduits on the west exterior beam crossing the bridge. These are believed to be abandoned phone lines. With the exception of the small abandoned phone lines, the utilities can be seen on the existing conditions plan in the Appendix.

Right Of Way

The existing Right-of-Way is shown on the Layout sheet.

Environmental Resources

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

Agricultural:

Agricultural land has not been identified in the project area.

Archaeological:

No Archaeological Resources have been identified at this site.

Biological:

The only regulated resource in the area is the First Branch White River. The First Branch White River is not classified as Essential Fish Habitat, and there are no wetlands present at the site.

Wetlands:

There are no wetlands present in the project area.

Wildlife Habitat:

There is no wildlife present in the project area, although it is possible that there is wildlife habitat nearby.

Rare, Threatened and Endangered Species:

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

Hazardous Materials:

There are no hazardous waste sites that will be disturbed by the project.

Historic:

The bridge is a historic bridge located within a historic district. Per the resource ID, the bridge has Section 106 and Section 4(f) properties.

Stormwater:

There are no concerns of note related to stormwater 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 where appropriate, rather than providing temporary bridges. This means that travelers would be expected to use off-site bypasses of their own choosing or designated detours, both of which are typically longer in length and time, and perhaps are lower class roadways. Trucks would be required to travel on designated detours. 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 traveling public while maintaining project quality. The following options have been considered:

Option 1: Off-Site Detour

This option would close the bridge for a specific length of time while critical work is being done. It allows the project to be built using accelerated construction materials and methods to reduce the construction time to one season and reduce the length of time the road is closed. The shortest acceptable State detour route is:

- South on VT 110 to VT 14 or I-89 in Royalton.
- North on VT 14 or I-89 to Barre, where the two routes converge.
- North into the city, then west on US 302, back to VT 110.
- VT 110 south to Chelsea.

This detour adds 14 miles to the through route of 27 miles. The end to end distance is approximately 68 miles. There are no good alternatives to this route due to the lack of Class 1 Town Highways and other State routes in the area.

There are other possible bypass routes that could be used by local travelers familiar with the area. A bypass route is not a designated, signed detour, but one that local traffic may utilize to get around the project site and avoid the longer official detour. There could be more than one bypass route and each could see increased traffic during the project.

Bypass routes are frequently on Town roads. One potential bypass route could be west of Chelsea via VT 110 south, then west on E. Randolph Road (TH-1, Class 2), north on Brook Road (TH-3, Class 2), north on Pent Road (TH-33, Class 3), east on Lyford Hill Road (TH-4, Class3), and back to VT 110. Lyford Hill Road may also be known as Bobbin Shop Road.

The off-site detour option eliminates the need for a temporary bridge, which would significantly decrease time and cost, both during project development and construction. This option would not require Right-of-Way for a temporary bridge. Due to the long detour route, a bridge closure would have to be of very short duration to be considered acceptable.

Another consideration is emergency coverage. The primary fire coverage for the town comes from the Chelsea Fire Station, which is just north of Bridge 9. If the bridge were to be closed, other departments south of the bridge may be able to better respond to calls there. The other closest fire departments are Tunbridge or East Randolph, approximately 6 to 6.5 miles away accessed from south of the bridge. The nearest ambulance service is either Barre or White River, which are some distance away from the project site. The nearest hospitals are in Randolph or Berlin. There is police coverage based in Chelsea, but for calls south of the bridge when closed, police would need to utilize a bypass of the project to get south of the bridge. Coordination should occur so that coverage can be maintained if the bridge is closed.

Option 2: On-Site Detour via Temporary Bridge

A temporary bridge allows the closure of the bridge without a long detour imposed on the public. If a temporary bridge is chosen for traffic maintenance, a one lane bridge with traffic signals at each end meets the standard criteria. Traffic would alternate in each direction. The west side of the bridge would be preferred, as this avoids crossing Creamery Road (TH-77, Class 3), existing overhead utilities, and the 8" D.I. water on the east side. Coordination would be required to avoid the sanitary sewer (size and type unknown) on the west side. Both water and sewer cross under the river and are not dependent on the bridge to cross. There are several historic properties on both sides of the roadway, some of which would be impacted by any fill and grading activities associated with a temporary bridge. Some trees would need to be removed on the west side at the river's edge, and temporary fill used to establish access to the temporary bridge. The recommended low beam elevation for a temporary bridge was not established in the preliminary hydraulics report, so this would need to be resolved at a later time if this option is chosen.

A temporary bridge is costly both in time and dollars. Project development time would be increased by a year or more by temporary Right of Way requirements alone, and sensitive historical areas adjacent to the bridge may generate additional permit review and mitigation time, and conceivably may prohibit this use. The cost of the temporary bridge itself is substantial, as is the cost and time to erect and remove the bridge and temporary approaches. The advantage of a temporary bridge is in the fact that traffic can

continue to flow through the project area without a longer detour, although delays would occur regularly for alternating traffic.

Option 3: Phased Construction

Phased construction allows alternating traffic to be maintained on one lane of the bridge while work proceeds on the other. As with a one lane temporary bridge, a one way alternating lane with traffic signals at each end is appropriate for this location. This eliminates the lengthy detour and saves the cost of a temporary bridge and the associated temporary Right of Way. The time required for plan development is also shorter than that for the temporary bridge option due to simplification of the Right of Way process and reduced impacts on adjacent properties, some of them historically sensitive. However, the construction duration can still be quite lengthy because the bridge is built only one half at a time, with some construction tasks being performed more than once. The safety of the public and the construction workers in phased construction is reduced due to close proximity of traffic to the work in progress, which also affects the pace of the work. Traffic delays would be minor as the movement through the work zone would be in alternating directions.

III. Alternatives Discussion

The intent of this project is to address the needs of the bridge at this river crossing. No improvements to the roadway are anticipated with the exception of blending any changes to the bridge geometry into the existing roadway.

Alternative 1: No Action

This alternative involves leaving the bridge in its current condition. If no action is taken, the deck will continue to deteriorate and the geometric deficiencies will not be corrected. Many temporary repairs to the deck have already been made, and additional repairs will be more involved, costly, and more short-lived. Maintenance efforts would steadily increase and emergency closures would become more likely as time goes by.

From the standpoint of safety, economics, and convenience, the No Action alternative is not recommended.

Alternative 2: Minor Rehabilitation

Bridge repair was considered, which would include repairs to the deck, removal of corrosion and new coating on the beams, repairs to any cracking and surface deficiencies on the abutments, replacement of the bridge and approach railings, and new membrane and pavement. However, because of the fact that the deck has already been repaired multiple times, the difficulty anticipated in attaching new railing to the deteriorating

deck, the geometric deficiencies (deck width) that would not be corrected, and other unknowns, this alternative is not recommended and will not be considered further.

Alternative 3: Deck Replacement

Alternative 3 would include repairs to any cracking and surface deficiencies on the abutments, and removal of corrosion and installation of new coating on the existing beams. These tasks could be done while the bridge is open to traffic. The existing deck would then be removed and a new precast deck installed. The addition of shear studs to increase the strength of the existing beams should be considered. Although there is a sidewalk on the existing bridge, it is proposed that pedestrians be accommodated in the proposed 3 ft. wide shoulder since bridge sidewalks are not maintained in winter and there are no sidewalks leading to and from this bridge. This also provides for pedestrian travel on both sides of the road and eliminates the need for a crosswalk. Therefore a sidewalk is not proposed for the new deck. Construction of a deck with lane and shoulder widths of 3-10-10-3, a 28 ft. wide deck would be proposed (assuming a new combination concrete/steel railing), which would be approximately the same width as the existing. The 81 ft. span would be unchanged. The bridge and approach railing would be replaced. This alternative would resolve the deck structural and geometry deficiencies.

Traffic could be maintained by using the off-site detour, the on-site detour with temporary bridge, or by phasing. If using the off-site detour, a two week closure for removal and replacement of the deck using rapid construction methods would be proposed. If phasing is used, a very short term closure would be proposed on the order of 3 days, to get the first phase in place to support traffic for the remainder of the work. A centerline alignment shift of approximately two feet would be expected. Anticipating that the substructure would reach the end of its life before the beams, this alternative would add approximately 40-50 years to the service life of the bridge.

Alternative 4: Superstructure and Deck Replacement

Repair of the substructure and replacement of the superstructure and deck were considered. This alternative is identical to Alternative 3, except the superstructure gets replaced in Alternative 4. The substructure cracks and surface deficiencies could be repaired with traffic on the bridge. Superstructure and deck replacement lend themselves well to rapid construction techniques and materials. Any abutment work could also be done with traffic on the bridge. The 81 ft. span would be unchanged. The existing sidewalk would not be replaced. Prefabricated Bridge Units would be appropriate structurally and consideration should be given to designing shallower beams or girders to maintain the waterway opening under the bridge at the current area as a minimum. The existing 45 degree skew may be too much to consider precast Box Beams or Next Beams here. This alternative would resolve the deck structural and geometry deficiencies. New bridge and approach railings would be constructed.

Considerations for traffic maintenance for Alternative 4 would be the same as for Alternative 3. This alternative is anticipated to add approximately 40-50 years to the life of the bridge.

Alternative 5: Full Bridge Replacement

The final alternative considered was the replacement of all bridge components; substructure, superstructure, deck, and railing. This alternative is the most costly, but provides the full 80 year service life estimated for new bridge construction. Typically, integral abutments would be the foundation type of choice, followed by cantilevered stemwalls on spread footings. For this project, conventional piles supporting conventional pile cap abutments were considered because the proximity of Creamery Road (TH-77) on the north end of the bridge leaves insufficient room to rotate the foundations to achieve a 20 degree skew without adverse effects on the river hydraulics. Cantilevered stemwalls would require work near or in the streambed, which is undesirable. With a conventional pile foundation, expansion joints would be necessary, but rapid construction methods could still be used.

Prefabricated Bridge Units (PBU's)would be appropriate structurally, and could be designed shallower than normal to avoid a reduction in the waterway under the bridge This alternative would resolve the deck structural and geometry deficiencies, and a small amount of channel work is proposed to minimize any channel restrictions at the bridge.

The proposed features would include:

Span:	92 ft. for abutments on conventional piles.
Deck Width:	28 ft. total; 3-10-10-3 lane and shoulder
Skew:	45 degrees
Horizontal Alignment:	Unchanged
Vertical Alignment:	Virtually Unchanged
Railing:	Combination Rail; Crash-tested, TL-2

Traffic maintenance could be by any of the three options discussed above; off-site detour, on-site detour via temporary bridge, or phased construction. A phased construction option would likely necessitate a shift in centerline alignment.

IV. Alternatives Summary

Based on the existing site conditions and the condition of the bridge, there are several viable alternatives:

Alternative 3:	Deck Replacement, Phased Construction
Alternative 4:	Superstructure/Deck Replacement, Phased Construction
Alternative 5a:	Full Bridge Replacement, Phased Construction

Alternative 5b: Full Bridge Replacement, Temporary Bridge

A cost comparison for each of the alternatives is shown below. Note that no detailed design has been done and all costs are preliminary estimates.

V. Costs

Chelsea BHF 0169(9)		Alt 3 Deck Replace, phased	Alt 4 Superstructure and Deck Replace, phased	Alt 5a Full Bridge Replacement, phased	Alt 5b Full Bridge Replacement Temp. bridge
COST	Bridge Cost	$377,200	$452,000	$700,300	$700,300
	Removal of Structure	$35,300	$40,300	$70,500	$70,500
	Channel Work	$75,000	$75,000	$75,000	$75,000
	Roadway	$153,500	$180,800	$369,450	$369,450
	Erosion Control	$6,400	$6,400	$6,400	$10,000
	Traffic Maintenance	$90,000	$90,000	$90,000	$150,000
	Construction Costs	$737,400	$844,500	$1,311,650	$1,375,250
	Preliminary Engineering	$221,000	$253,000	$394,000	$412,000
	Right of Way	$0	$0	$0	$105,000
	Construction Costs + Construction Engineering + Contingencies	$885,000	$1,013,400	$1,574,000	$1,650,300
	Total Costs	**$1,106,000**	**$1,266,400**	**$1,968,000**	**$2,167,300**
	Annualized Cost	**$22,100**	**$25,300**	**$24,600**	**$27,100**
ENGINEERING	Typical Section - Roadway (feet)	3-10-10-3	3-10-10-3	3-10-10-3	3-10-10-3
	Typical Section - Bridge (feet)	3-10-10-3	3-10-10-3	3-10-10-3	3-10-10-3
	Traffic Safety	Improved	Improved	Improved	Improved
	Alignment Change	Yes	Yes	Yes	No
	Bicycle Access	Yes	Yes	Yes	Yes
	Hydraulic Opening	Substandard	Substandard	Substandard	Substandard
	Pedestrian Access	Yes	Yes	Yes	Yes
	Utility Impacts	Yes	Yes	Yes	Yes
SCHEDULING	Project Development Duration	2 years	2 years	2 years	4 years
	Construction Duration	6 months	6 months	12 months	2 years
	Road Closure Duration	3 days	3 days	3 weeks	None
OTHER	ROW Acquisition	No	No	No	Temporary
	Design Life	40-50 years	40-50 years	80 years	80 years

VI. Conclusion

The proposed alternatives were reviewed with respect to cost effectiveness, property impacts, and time requirements for both project delivery and construction schedules. **Alternative 4 is the recommended alternative.** This alternative would include minor repairs to the abutments and replacement of the deck and superstructure. Traffic maintenance would be by phasing with a 3 day closure at the beginning to establish one lane for the initial phase. The following characteristics are proposed:

- The current abutments would be retained. The current skew is roughly 45 degrees.
- Shallow PBU's or a precast concrete option that can be installed rapidly would be constructed as the new superstructure. PBU's may require less preparation to the seats and bearings for the new superstructure. The skew of the superstructure to the abutments would be 45 degrees, so precast concrete may not be feasible.
- An expansion joint is recommended.
- Span would remain at approximately 81 ft.
- Deck width would be 28 ft. total, with lane and shoulder widths of 3-10-10-3.
- Because the bridge is in an historic district, a combination concrete/steel railing (TL-2) is proposed.
- Horizontal alignment shifts to the west approximately 2 ft.
- Vertical alignment would be virtually unchanged, but smoothed slightly.
- The construction phase of this project would be done using rapid construction methods in phases to minimize traffic impacts.
- Functional and structural deficiencies would be resolved with this alternative and a 40-50 year service life provided.
- Hydraulic standards would not be met with any of the alternatives considered. It is not feasible to raise the bridge several feet to meet the standards, and in fact raising the bridge this much could make matters worse by damming up the river overflow.
- The Complete Streets Check List is under way.

Discussion in support of Alternative 4:

Structure

- ❖ The substructure and superstructure ratings are 7 and 6 respectively. Alternatives 3 and 4 are desirable due to the assumption that the substructures would be retained for continued service. Their initial costs are lower than the other alternatives.
- ❖ Alternative 4 includes the replacement of the superstructure because lead paint removal in Alternative 3 is very likely to be required before recoating the steel beams. This expense would be high enough to make replacement of the superstructure in Alternative 4 look favorable.

- ❖ It does not seem reasonable to demolish substructures with such high ratings and stable scour conditions.

Traffic Maintenance

- ❖ All traffic maintenance options could be feasible for this project, although closing the bridge imposes a long off-site detour. In addition to the length of the detour, emergency coverage could be difficult in this rural area.
- ❖ A temporary bridge would require negotiations for temporary Right of Way, and the costs associated with them. The parcels subject to this disturbance are historic properties, which would extend the permit process.
- ❖ It is proposed that this project be constructed using a combination of a short term closure and phasing. After advance preparations to the abutments to receive the new superstructure, the bridge would be closed for a 3 day period, possibly encompassing a long weekend. Traffic for this long weekend would use the designated detour, or the bypasses for local traffic. One lane would be established using a portion of the new superstructure. Then, one way alternating traffic would be maintained while the other lane and all other work is completed. Phasing the project for maintenance of traffic will carry the typical challenges; worker safety, repetitive steps, and slower progress. This option would also require a centerline shift of approximately 2 ft., but this can occur within the Right of Way.

VII. Appendices

- Site Pictures
- Town Map
- Bridge Inspection Report
- Hydraulics Memo
- Preliminary Geotechnical Information
- Natural Resources Memo
- Archaeology Memo
- Historic Memo
- Stormwater Memo
- Resource ID Completion Memo
- Plans
    - Existing Conditions
    - Typical Sections
    - Layout
    - Profile
    - Truck Detour Route
    - Potential Bypass
    - Phasing Plans
    - Temporary Bridge Layout

Southbound Approach

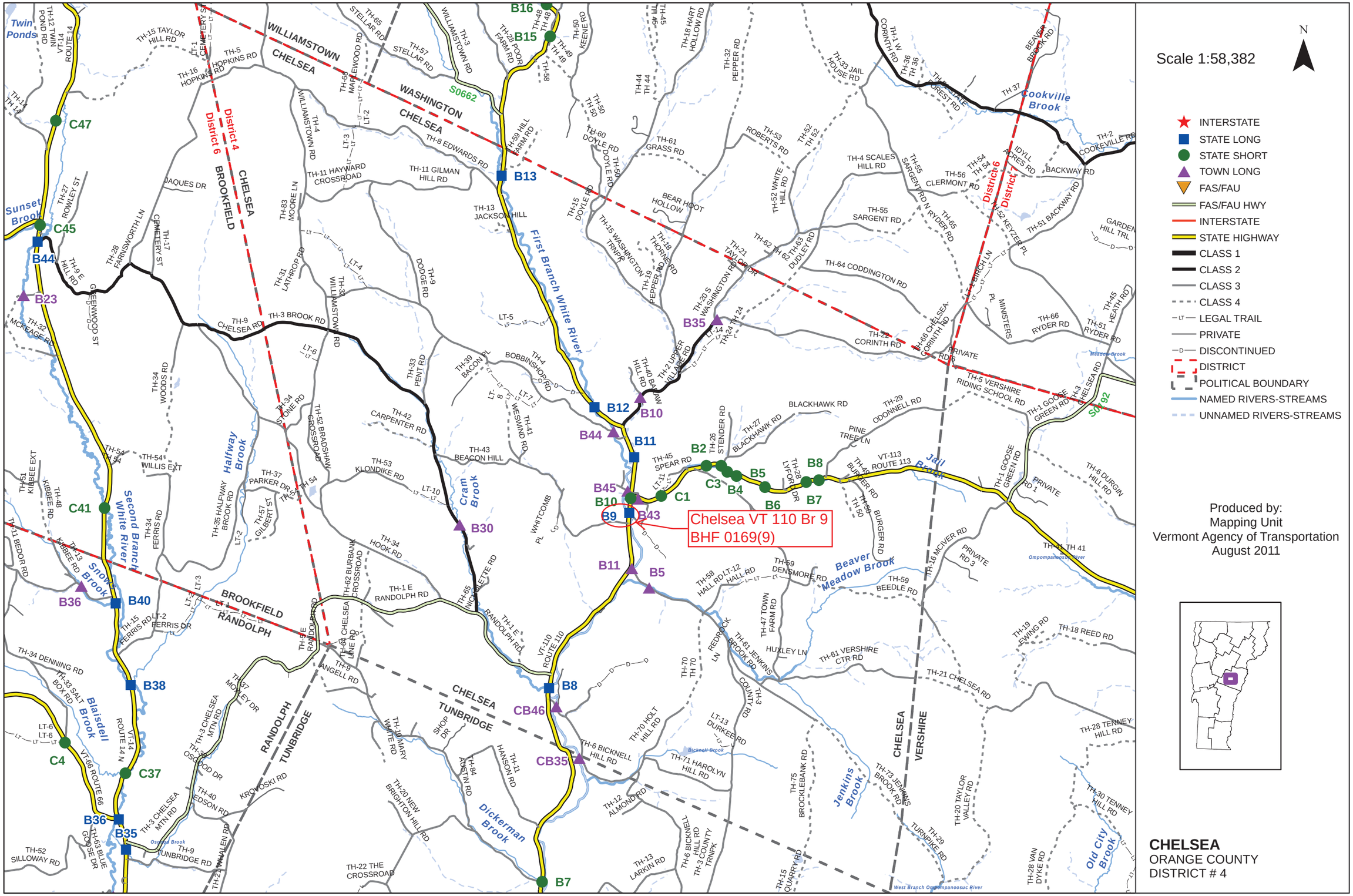
Northbound Approach

Looking Upstream

Looking Downstream

Deteriorated Concrete Deck and Steel Beam Surface Corrosion

Deteriorated Concrete Deck and Steel Beam Surface Corrosion


Scale 1:58,382
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
Chelsea VT 110 Br 9
BHF 0169(9)
Produced by:
Mapping Unit
Vermont Agency of Transportation
August 2011
CHELSEA
ORANGE COUNTY
DISTRICT # 4
First Branch White River
Second Branch White River
Jail Branch
Cookville Brook
Sunset Brook
Halfway Brook
Cram Brook
Snow Brook
Blaisdell Brook
Beaver Meadow Brook
Dickerman Brook
Jenkins Brook
Old City Brook
Meadow Brook
Bicknell Brook
Osgood Brook
West Branch Ompompanoosuc River
Twin Ponds
District 4
District 6
District 7
WILLIAMSTOWN
CHELSEA
WASHINGTON
BROOKFIELD
RANDOLPH
TUNBRIDGE
VERSHIRE
S0662
S0092

STRUCTURE INSPECTION, INVENTORY and APPRAISAL SHEET

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

Inspection Report for CHELSEA **bridge no.:** 00009 **District:** 4

Located on: VT 00110 ML **over** 1ST BRANCH WHITE R **approximately** 0.2 MI S JCT. VT.113 **Owner:** 01 STATE-OWNED

CONDITION

Deck Rating: 4 POOR

Superstructure Rating: 6 SATISFACTORY

Substructure Rating: 7 GOOD

Channel Rating: 8 VERY GOOD

Culvert Rating: N NOT APPLICABLE

Federal Str. Number: 200169000909042

Federal Sufficiency Rating: 58.9

Deficiency Status of Structure: SD

AGE and SERVICE

Year Built: 1936 **Year Reconstructed:** 0000

Service On: 5 HIGHWAY-PEDESTRIAN

Service Under: 5 WATERWAY

Lanes On the Structure: 02

Lanes Under the Structure: 00

Bypass, Detour Length (miles): 37

ADT: 002100 **% Truck ADT:** 06

Year of ADT: 1998

GEOMETRIC DATA

Length of Maximum Span (ft): 0081

Structure Length (ft): 000084

Lt Curb/Sidewalk Width (ft): 5

Rt Curb/Sidewalk Width (ft): 0.7

Bridge Rdwy Width Curb-to-Curb (ft): 25.2

Deck Width Out-to-Out (ft): 27.6

Appr. Roadway Width (ft): 031

Skew: 45

Bridge Median: 0 NO MEDIAN

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

Feature Under: FEATURE NOT A HIGHWAY OR RAILROAD

Min Vertical Underclr (ft): 00 FT 00 IN

STRUCTURE TYPE and MATERIALS

Bridge Type: ROLLED BEAM

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

Kind of Material and/or Design: 3 STEEL

Deck Structure Type: 1 CONCRETE CIP

Type of Wearing Surface: 6 BITUMINOUS

Type of Membrane 0 NONE

Deck Protection: 0 NONE

APPRAISAL *AS COMPARED TO FEDERAL STANDARDS

Bridge Railings: 1 MEETS 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: 6 EQUAL TO MINIMUM CRITERIA

Deck Geometry: 2 INTOLERABLE, REPLACEMENT NEEDED

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: D OPEN, TEMPORARY SHORING

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

09/16/2011 IRENE Heavy debris build up abut 1 needs to be removed. MK JM

04/12/2011 & 11/08/2011 The deck is in need of full replacement. Local deck failures may occcur anytime anywhere. The concrete spindles on both sides are in need of repair work. The steel is in need of full paint recoat. The left beam rail and posts of approach No.2 are in need of repairs. 11/08/2011 Assessment inspection after Tropical Storm Irene (Round #2). Debris build-up lies between the steel beams and in front of abutment No.1. Removal is needed. PLB

04/08/2009 - Bridge needs deck replacement. Steel superstructure and the concrete substructure units need only minor attention. The asphalt overlay has chronic deterioration as the supplemental steel plating flexes and loosens over time. - MJ/DS

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: August 27, 2012

SUBJECT: CHELSEA – BHF-0169(9) – VT 110 Bridge 9 over 1st Branch of White River

---

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

Existing Bridge Information

The original bridge was constructed in 1936 based on available information. The bridge is owned by the State. The bridge is a 2-lane single-span constructed of rolled beams having a concrete deck with an asphalt surface. There is also a sidewalk on the West side of the bridge. The total width of bridge is approximately 28 feet normal to the roadway. The normal clear span to the river between the abutment faces is approximately 55 feet, but the bridge is significantly askew to the river at approximately 45° which has a clear span of approximately 78 feet along the roadway. The effective width of the bridge along the river when accounting for the skew is approximately 40 feet. The total existing superstructure depth is approximately 4 feet based on record information and verified with field measurements. The existing 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 is approximately 7 - 8 feet. The structure is located on an incised channel in a relatively straight reach of the river having a wide floodplain area with bends in the channel located just upstream and downstream of the bridge.

The calculated Q_{50} design event flow does not pass through the existing structure and overtops the roadway to the South of the bridge location. None of the flow events meet the hydraulic standard for this structure based on our analysis of the Existing Conditions. There are a significant amount of site constraints for this bridge location which include existing utilities, streets, driveways and houses located adjacent to the bridge location. We did not evaluate the scour for the existing or any proposed bridge configurations as part of the preliminary design. Scour calculations will be performed during final hydraulics.

Recommendations

When reviewing possible options, it is apparent that a replacement bridge meeting the hydraulic standard cannot be achieved for this location. The bridge location has too many site constraints by being located in a village setting with existing streets, driveways and houses which limit the bridge span and vertical roadway geometry. To further restrict the site conditions, the existing bridge is located within a very flat natural floodplain area where the roadway to the south of the bridge allows for a significant amount of flood relief flow over the roadway. Therefore, the bridge option selection criteria should be to provide a bridge opening that does not restrict the bank full width of the existing channel and does not create any worse backwater flooding conditions than the existing conditions.

It is assumed a replacement structure will be located in the existing roadway alignment based on the site constraints. It is also anticipated the proposed deck 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 sloped stone fill scour protection placed in front of the abutments.

Based on our analysis using a new structure, the recommendation will be to use a bridge having a 65-foot clear span normal to the stream channel (between the abutment faces) with a low beam elevation at or above 808.1 feet at the Right (South) Abutment with 3H:2V stone fill protection in front of the abutments. The actual clear span of the bridge along the roadway will be approximately 92 feet based on the 45° skew of the bridge. To match the existing roadway alignment along the 45° skew, the bridge should also have the abutments parallel to the stream. The proposed wider structure will not constrict the stream channel width and match the VANR Bank Full Width Equation width. It was assumed that the bridge deck should have a slope of approximately 0.5% in a North to South direction. Therefore, the new top of bridge final grade should be basically the same on the Left (North) approach and transitioned back down to the existing roadway grades on the Right (South) approach to the structure. The roadway to the South of the bridge will continue to allow the flood waters to overtop the roadway and act as a relief channel for flooding events or in the event of a blockage of the bridge opening. It is noted that this option passes the $Q_{2.33}$ flow event with about 1.1' of freeboard which is greater than the Existing Conditions.

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 channel banks near the replacement structure.

Temporary Bridge

It is unclear whether a temporary 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

From: Laura Ripley, Geotechnical Intern, via Christopher C. Benda P. E., Soils and Foundations Engineer

Date: June 27, 2012

Subject: Chelsea BHF 0169(9) Preliminary Geotechnical Information

1.0 INTRODUCTION

The Soils and Foundations Unit within the Materials and Research Section has performed a preliminary geotechnical investigation for Bridge No. 9, which crosses the first branch of the White River in the town of Chelsea, VT. This structure is located on VT Route 110, about 0.2 miles south of the intersection of VT 110 and VT 113. This report includes a site description, available data, and any pertinent field observations. The materials referenced in this investigation include: 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 INVESTIGATION

2.1 Previous Projects

Record plans were reviewed for the project bridge, however no subsurface information was available. The plans included details of the abutments, which are cantilevered stemwalls reinforced with hooked F-bars. There were also details for the 5-foot sidewalk on the west side of the bridge, which currently has experienced significant erosion.

2.2 Water Well Logs

The ANR provides published water well logs, which were referenced with data from wells that were within a 625 foot radius. The data provided an estimated depth to bedrock and soils types expected to be encountered on the site. It should be noted that this information is dependent upon field data collection by various unknown personnel and therefore provides only an approximation of the field conditions. The corresponding well locations are highlighted in Figure 1.

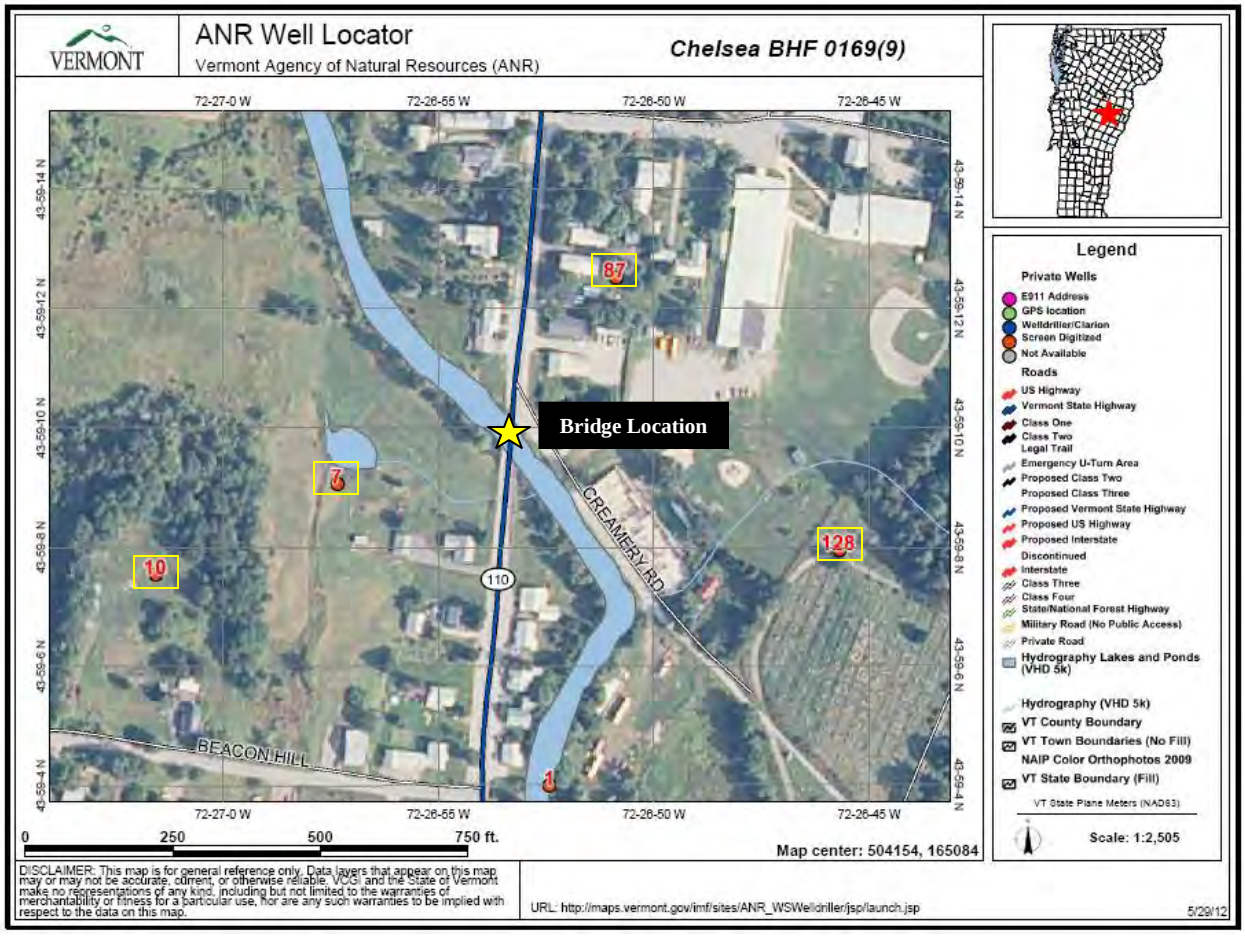


Figure 1. Site map with well locations.

Four wells were identified within the 625 foot radius from the bridge site. The bedrock and overburden information for each well is listed in Table 1.

Table 1. ANR Water Well logs.

Well Number	Distance From Project (feet)	Depth to Bedrock (feet)	Overburden Material
87	330	41	Gravel
7	320	15	Clay; gravel and sand
128	600	25	Hardpan (very dense gravelly silt)
10	625	18	Sand and coarse gravel

2.4 USDA Soil Survey

The U.S. Department of Agriculture provides online geology maps with published soil data. These indicated that the existing soils at the project site consist of Hadley very fine sandy loam. These soils are typically very deep to bedrock and well draining, with a water table depth around 4.0 to 6.0 feet.

2.5 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 meta-limestone, and are described as "*dark-gray to silvery-gray, lustrous, carbonaceous muscovite-biotite-quartz (+/-garnet) phyllite containing abundant beds of punky-brown-weathering, dark-bluish-gray micaceous quartz-rich limestone in beds ranging from 10 cm to 10 m thick.*"

3.0 FIELD OBSERVATIONS

A site visit was conducted on June 7, 2012. Pertinent information was gathered in order to determine any potential issues with future boring locations and/or foundation design considerations.

Figure 3. View of existing bridge, facing south.

The streambed material consisted of cobbles, with a higher concentration upstream. There were large rectangular rip rap stones lining the channel on either side under the bridge as well as downstream. This condition could cause conflicts with both boring and construction operations.

Overhead utilities were observed on the east side of the bridge, which may pose problems during construction or drilling as well. There were also two utility conduits noted that run along the west side, as well as a water main under the bridge. A sewer main was located on the southwest side of the project; offset about 10 feet from pavement. Surrounding residential areas may require permission to drill on private property; however it is recommended that the borings are drilled in the roadway due to the location and high concentration of utilities in the area.
When determining appropriate traffic control measures during construction and the drilling operations, consideration should be given to the nearby intersection with Creamery Rd. has poor visibility due to bridge rails obstructing sight distances; see Figure 4.

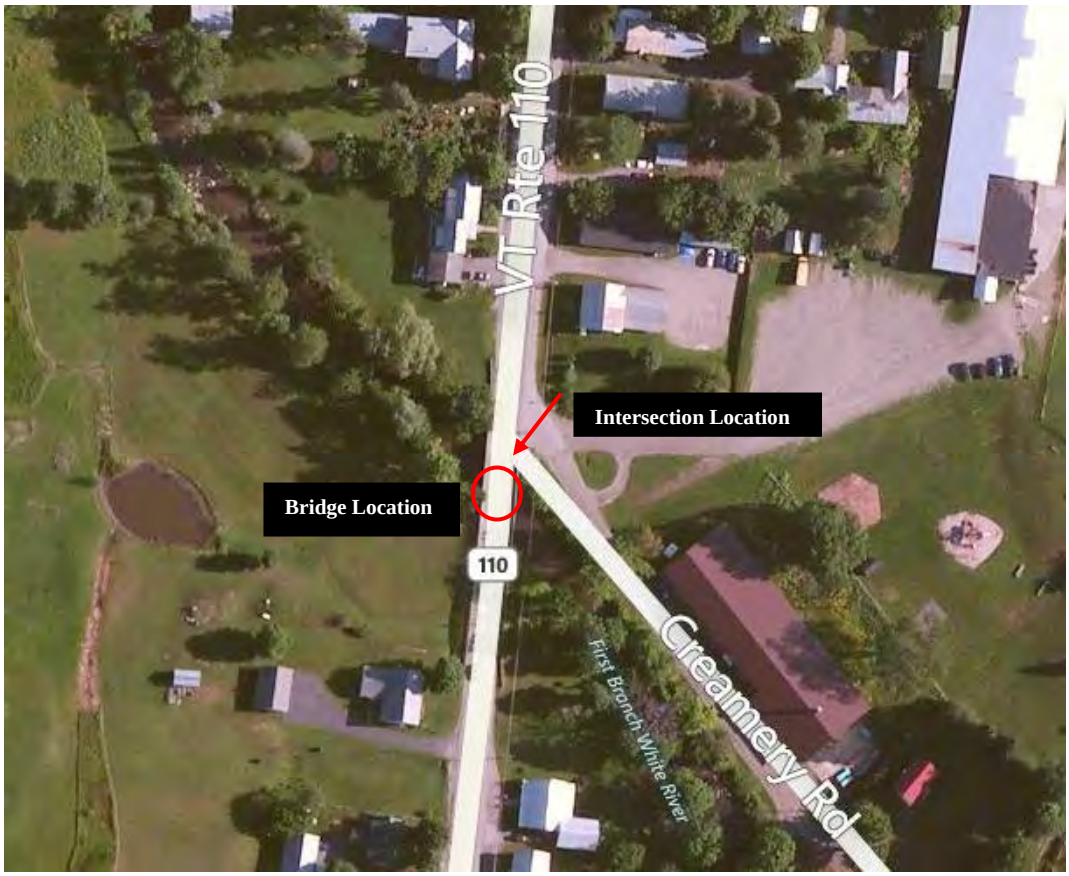


Figure 4. Bridge proximity to the Creamery Rd. junction.

4.0 RECOMMENDATIONS

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

- Cantilevered stemwall on spread footings
- Pile caps on a single row of H-piles
- Stub abutment on MSE walls

It is recommended that a minimum of two borings drilled to bedrock be taken at opposite corners of the bridge in order to assess the subsurface conditions. The suggested locations for these

borings are in the roadway; one in the northwest and southeast corners. If necessary and depending on the soil strata, an additional two hand steel soundings can be taken at corresponding ends on order to obtain accurate bedrock information. If any variable conditions are noted, the recommendations should be reevaluated.

5.0 CONCLUSION

If you have any questions or would like to discuss this report, please contact us by phone at (802) 828-2561.

LAR

cc: Read File
Project File/CCB

AGENCY OF TRANSPORTATION **OFFICE MEMORANDUM**

TO: Lee Goldstein, Environmental Specialist

FROM: John Lepore, Transportation Biologist

DATE: April 2, 2012

SUBJECT: Chelsea BHF 0169 (9) & (10)
VT 110 Br. 9 & 11 over First Branch White River

The purpose of this memorandum is to let you know that only regulated resource in this immediate area is the First Branch itself. Wetlands, species/habitat(s) and agricultural soils are all absent.

There First Branch is also not classified as Essential Fish Habitat.

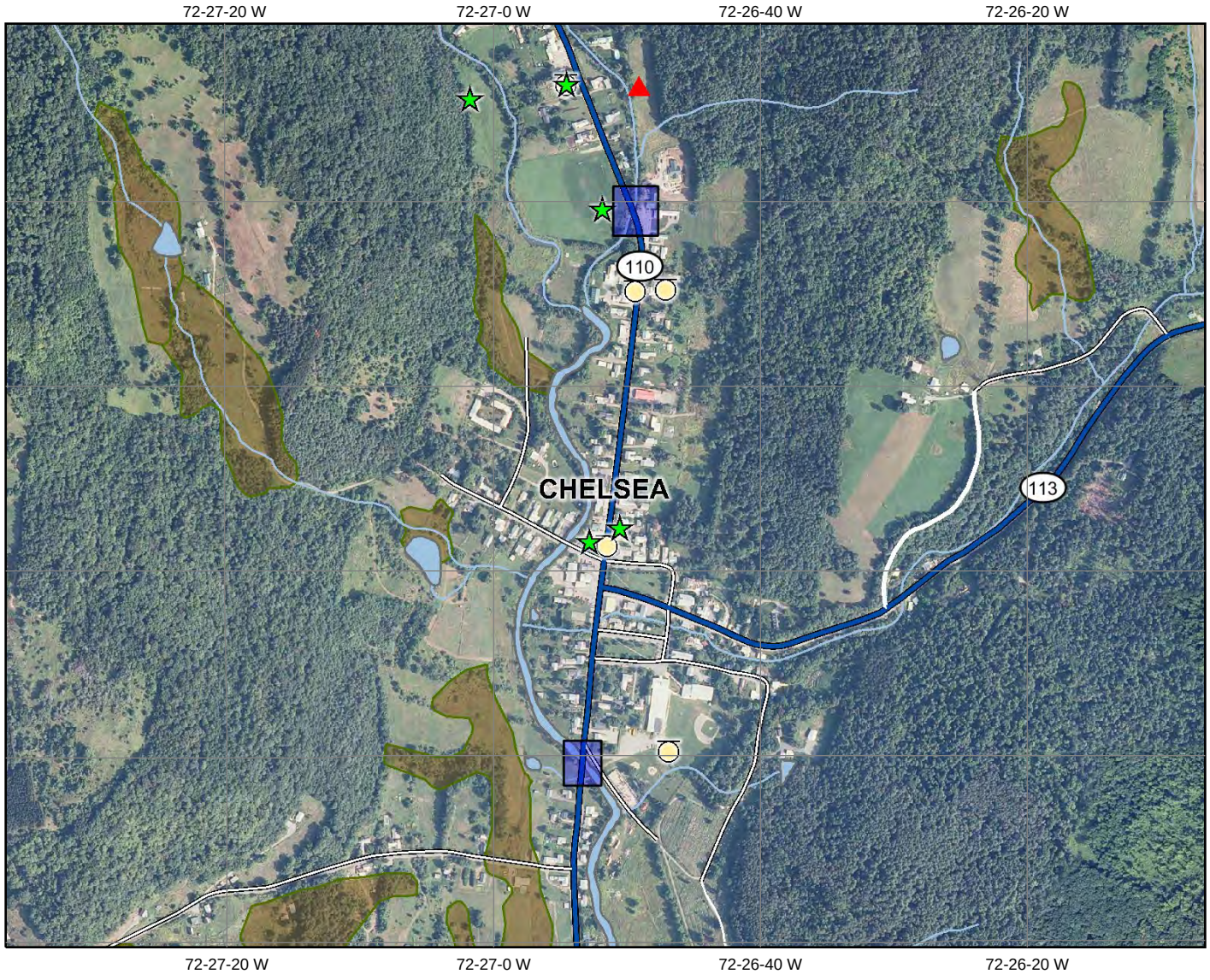
There is no preference as to the where a temporary structure would be placed, but I do ask that the entire channel (beyond OHW) be spanned for ease of permitting…

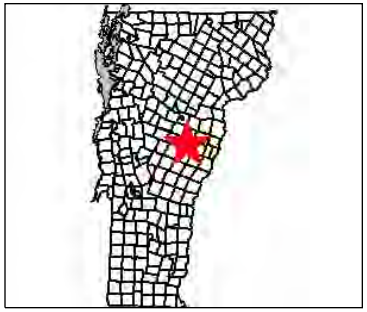
If you have any questions about this, call me at 828-3963.

ANR Environmental Interest Locator

Vermont Agency of Natural Resources (ANR)

Chelsea BHF 0169(9) & (10)





Legend

- Brownfields
- ACT250 PERMITS
- Stormwater Permits (Status: Issued)
- Hazardous Waste Site
- Hazardous Waste Site Generator
- Underground Storage Tank

Roads

- US Highway
- Vermont State Highway
- Class One
- Class Two
- Legal Trail
- Emergency U-Turn Area
- Proposed Class Two
- Proposed Class Three
- Proposed Vermont State Highway
- Proposed US Highway
- Proposed Interstate
- Discontinued
- Interstate
- Class Three
- Class Four
- State/National Forest Highway
- Military Road (No Public Access)
- Private Road
- Wetland Advisory Layer: Class 3 Wetlands

VSWI

- Class 1 Wetland
- Class 2 Wetland
- Hydrography Lakes and Ponds (VHD 5k)
- Hydrography (VHD 5k)
- VT County Boundary

Hydric Soils

- Hydric Soils
- VT Town Boundaries (No Fill)
- NAIP Color Orthophotos 2009
- VT State Boundary (Fill)

VT State Plane Meters (NAD83)

N

Scale: 1:10,779

Map center: 504198, 165551

DISCLAIMER: This map is for general reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable. VCGI and the State of Vermont make no representations of any kind, including but not limited to the warranties of merchantability or fitness for a particular use, nor are any such warranties to be implied with respect to the data on this map.

Notes: No existing stormwater permits or HazMat sites located within either project APE-4/13/12.

URL: http://maps.vermont.gov/imf/sites/ANR_NATRESViewer/jsp/launch.jsp

4/13/12

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: 6/1/2012

Subject: Chelsea BHF 0169(9) – Archaeological Resource ID

Lee,

A field visit for Chelsea BHF 0169(9) was conducted on 5/25/2012 with a finding of no archaeological resources within the general project area. The overall site rates low on the environmental predictive model for precontact archaeology. Therefore, there are *no archaeological resources* present within the current project area.

Please feel free to contact me with any questions or concerns,

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: Tuesday, June 26, 2012 3:10 PM
To: Goldstein, Lee
Subject: Historic Resource ID - Chelsea BHF 0169(9)

Lee,

I have completed the historic resource ID for Chelsea BHF 0169(9): Bridge 9 is a historic concrete bridge and is located within a historic district. These are Section 106 and Section 4(f) properties. These resources have been digitally mapped in Arcmap in the historic preservation database.

Thanks,
Kaitlin

Kaitlin O'Shea
Historic Preservation Specialist
Vermont Agency of Transportation

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

Goldstein, Lee

From: Armstrong, Jon
Sent: Thursday, May 17, 2012 3:44 PM
To: Goldstein, Lee
Subject: RE: Environmental Request NOTIFICATION: CHELSEA BHF 0169(9)

Hi Lee,
I have no stormwater related concerns of note for this project.

Jonathan B. Armstrong, PE
VTrans Stormwater Management Engineer
(802) 828-1332

"*We forget that the water cycle and the life cycle are one*."
- Jacques Cousteau

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From: Goldstein, Lee
Sent: Tuesday, March 27, 2012 4:45 PM
To: Gingras, Glenn; Armstrong, Jon; O'Shea, Kaitlin; Gauthier, Brennan
Subject: FW: Environmental Request NOTIFICATION: CHELSEA BHF 0169(9)

Hi pilot team—resource ID requested!
Thanks…
Lee

Lee D.R. Goldstein, MLA
Environmental Specialist, SE Region
VTrans PDD, Environmental Section
Vermont Agency of Transportation
1 National Life Drive--Drawer 33
Montpelier, VT 05633
e-mail: lee.goldstein@state.vt.us
Tel.: 802-828-3985 Fax: 802-828-2334

From: EnterpriseSQL@state.vt.us [mailto:EnterpriseSQL@state.vt.us]
Sent: Tuesday, March 27, 2012 12:08 PM
To: Goldstein, Lee; Narowski, John; Ramsey, Jeff; Slesar, Chris
Cc: Magnan, Steph; Spencer, Lisa
Subject: Environmental Request NOTIFICATION: CHELSEA BHF 0169(9)

Please do not reply to this email.

NOTIFICATION EMAIL

The following Environmental\Hydraulic Request has been successfully submitted:

Date Requested: Mar 27 2012 12:07PM
Project Request Type: Capital Program
Pin: 12C150

Project Name and Number: CHELSEA BHF 0169(9)

Request Activity: Arch\Hist\Bio Resource Identification

Other Request Activity Description: N/A

Proposed Due Date: May 2 2012 12:00AM

File(s): Z:\Projects-Engineering\ChelseaBHF0169(9)12c150\Structures\Memos\2012\CHELSEA_Town_Map_BR9.pdf

Comments: The resource ID will be conducted by a pilot group under PDWP GIS/GPS work plan. This group is part of the GIS Experimental work plan and is researching innovative ways to streamline the ID process.

Contact Information:

Name: WILLIAMS, CHRISTOPHER (Structures)

Phone Number: (802) 828-0051

Email: chris.williams@state.vt.us;

Additional Contact(s): gary.sweeny@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

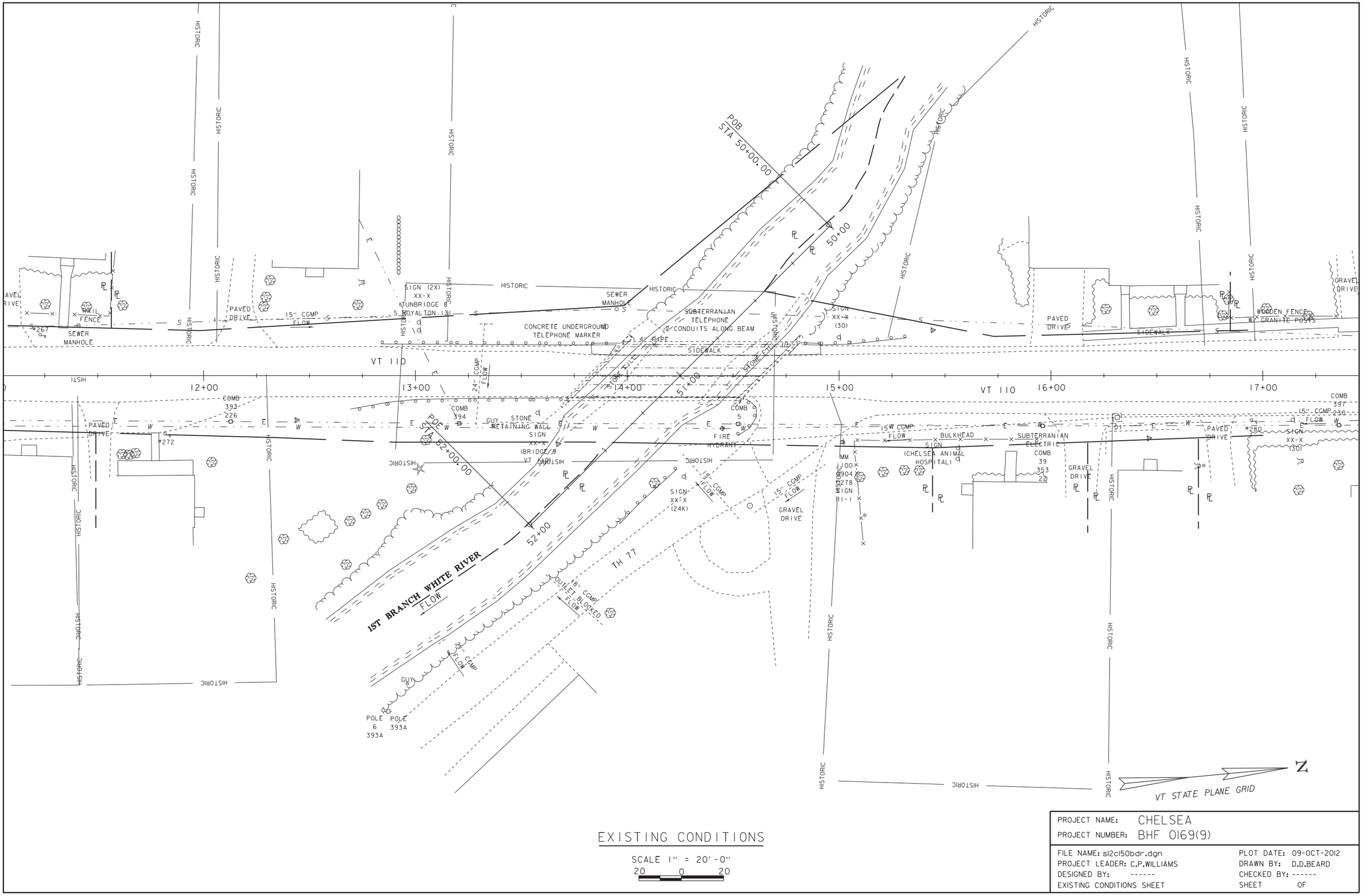
Project: **Chelsea BHF 0169(9); VT 110, BR 9—First Branch White River**

ENVIRONMENTAL RESOURCES:

Wetlands:	___	X	
Historic/Historic District:	X	___	6/26/12
Archaeological Site:	___	X	6/1/12
4(f) Property:	X	___	6/26/12
6(f) Property:	___	X	
Agricultural Land:	___	X	
Fish & Wildlife Habitat:	___	X	
Endangered Species:	___	X	
Hazardous Waste:	___	X	
Stormwater:	___	X	5/17/12
USDA-Forest Service Lands:	___	X	
Wildlife Habitat Connectivity:	___	X	possible nearby--see ArcMap for linkage info
Scenic Highway/ Byway:	___	X	
Act 250 Permits:	___	X	

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

cc:
Project File

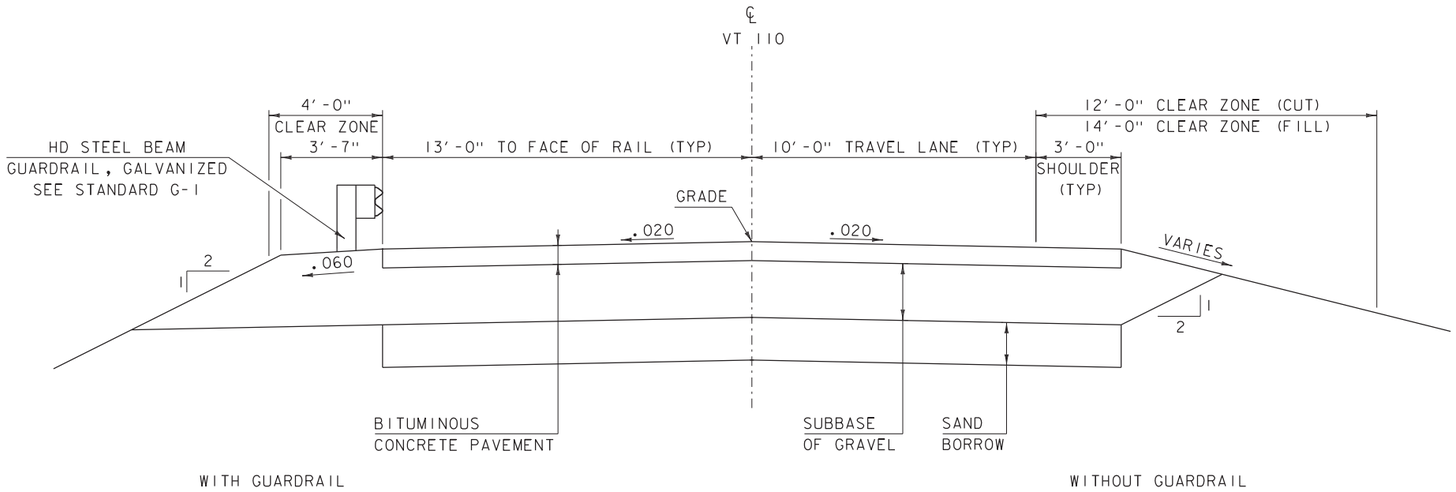


EXISTING CONDITIONS

SCALE 1" = 20'-0"

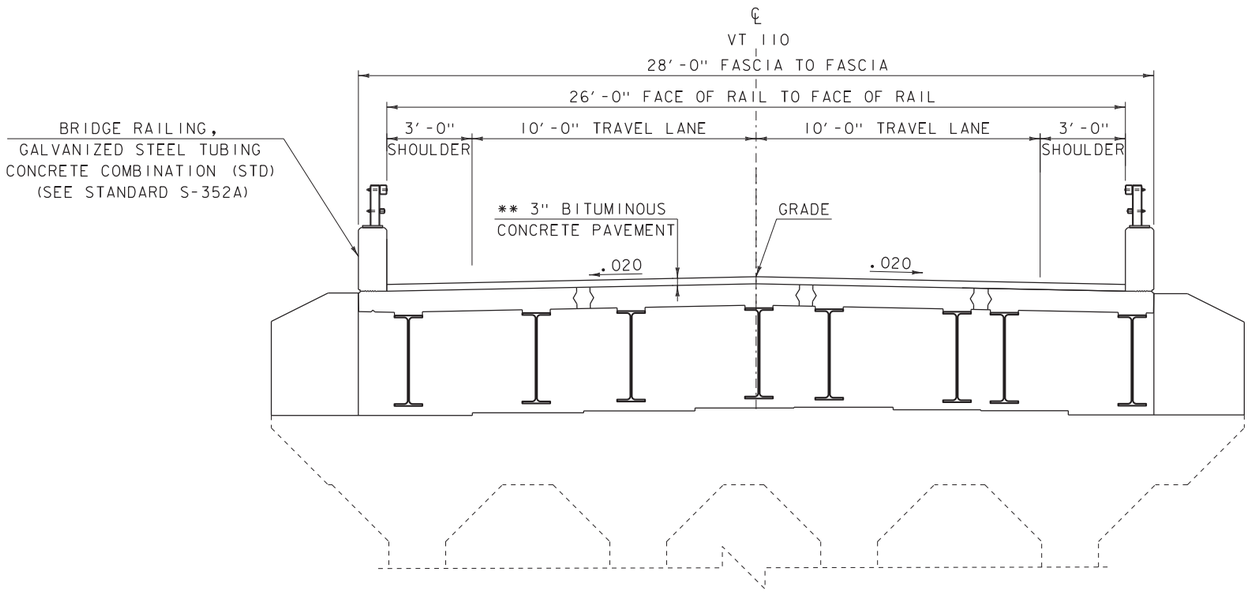
20 0 20

PROJECT NAME:	CHELSEA
PROJECT NUMBER:	BHF 0169(9)
FILE NAME: sl2cl50bdr.dgn	PLOT DATE: 09-OCT-2012
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
EXISTING CONDITIONS SHEET	SHEET OF



VT ROUTE 110 TYPICAL ROADWAY SECTION

SCALE 3/8" = 1'-0"



PROPOSED 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: CHELSEA
PROJECT NUMBER: BHF 0169(9)

FILE NAME: 12c150/sl2c150typical.dgn
PROJECT LEADER: C.P.WILLIAMS
DESIGNED BY: ------
TYPICAL SECTIONS

PLOT DATE: 21-DEC-2012
DRAWN BY: L.E.GALIHER
CHECKED BY: D.D.BEARD
SHEET 1 OF 6

BEGIN APPROACH
STA 143+00.00

PC
STA 143+19.26

BEGIN PROJECT
STA 144+00.00

PRC
STA 144+26.31

PI #2
STA 144+79.84 AHD=
STA 144+79.83 BK

BEGIN BRIDGE
STA 145+34.70

END BRIDGE
STA 146+16.70

PI #3
STA 146+70.27 AHD=
STA 146+70.27 BK

END PROJECT
STA 147+50.00

PT
STA 148+30.85

END APPROACH
STA 148+50.00

VT 110

143+00 144+00 145+00 146+00 147+00 148+00

PI #1
STA 143+72.79 AHD=
STA 143+72.78 BK

EXISTING
ALIGNMENT

PT
STA 145+33.36

PC
STA 146+16.75

PRC
STA 147+23.80

PI #4
STA 147+77.32 AHD=
STA 147+77.32 BK

1ST BRANCH WHITE RIVER

TH 77

HISTORIC

PAVED DRIVE

GRAVEL DRIVE

SIDEWALK

WOODEN FENCE W/ GRANITE POSTS

WIRE FENCE

SEWER MANHOLE

CONCRETE UNDERGROUND TELEPHONE MARKER

SUBTERRANEAN TELEPHONE CONDUITS ALONG BEAM

STONE FILLED CONCRETE BULKHEAD

4' RIDF

SIGN (2X) XX-X (TUNBRIDGE & ROYALTON I-3)

SIGN XX-X (24K)

SIGN XX-X (30)

SIGN (BRIDGE/3 VT 110)

SIGN (CHELSEA ANIMAL HOSPITAL)

SIGN RI-1

GUY

STONE RETAINING WALL

FIRE HYDRANT

MM 100 2904 3278

POLE 6

POLE 393A

COMB 393 226

COMB 394

COMB 5

COMB 397

COMB 39 353 22

#267

#272

#280

15" CCMP FLOW

18" CCMP FLOW

24" CCMP FLOW

48" CCMP OUTLET BLOCKED BELOW

15" CCMP 230 FLOW W

15W CCMP FLOW

BULKHEAD

SUBTERRANIAN ELECTRIC

CURVE (1)
DELTA = 1°04' 14"
D = 1°00' 00"
R = 5729.58'
T = 53.53'
L = 107.05'
E = 0.25'

CURVE (2)
DELTA = 1°04' 14"
D = 1°00' 00"
R = 5729.58'
T = 53.53'
L = 107.05'
E = 0.25'

CURVE (3)
DELTA = 1°04' 14"
D = 1°00' 00"
R = 5729.58'
T = 53.53'
L = 107.05'
E = 0.25'

CURVE (4)
DELTA = 1°04' 14"
D = 1°00' 00"
R = 5729.58'
T = 53.53'
L = 107.05'
E = 0.25'

N
VT STATE PLANE GRID

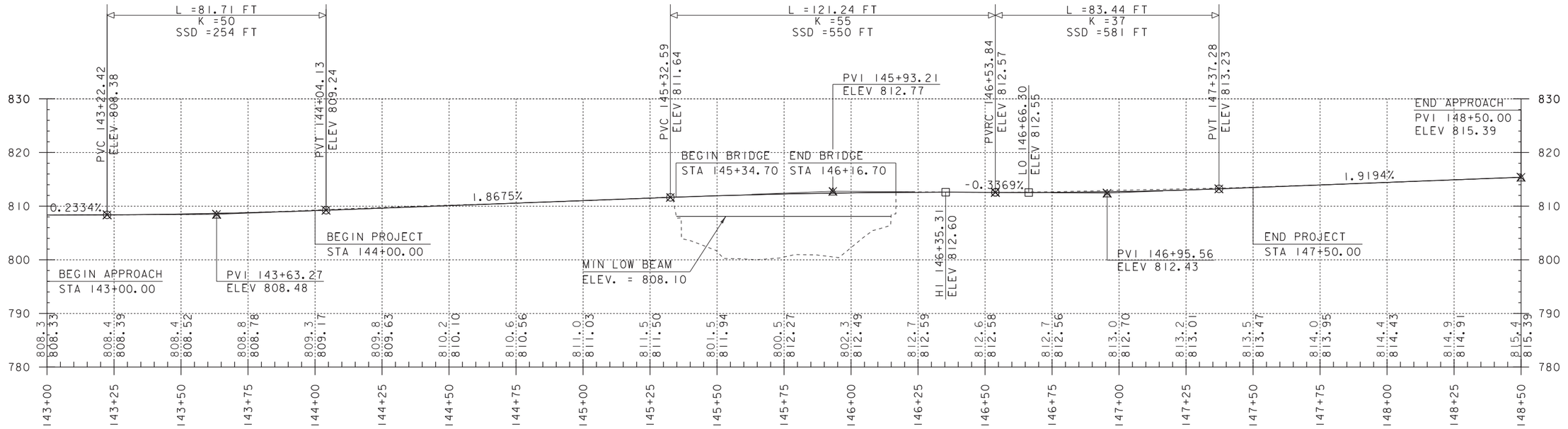
LAYOUT

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

PROJECT NAME: CHELSEA
PROJECT NUMBER: BHF 0169(9)

FILE NAME: sl2cl50bdr.dgn
PROJECT LEADER: C.P.WILLIAMS
DESIGNED BY: ------
LAYOUT SHEET

PLOT DATE: 21-DEC-2012
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 2 OF 6



VT RT 110 PROFILE
PROPOSED ALIGNMENT 2' UPSTREAM

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

NOTE:

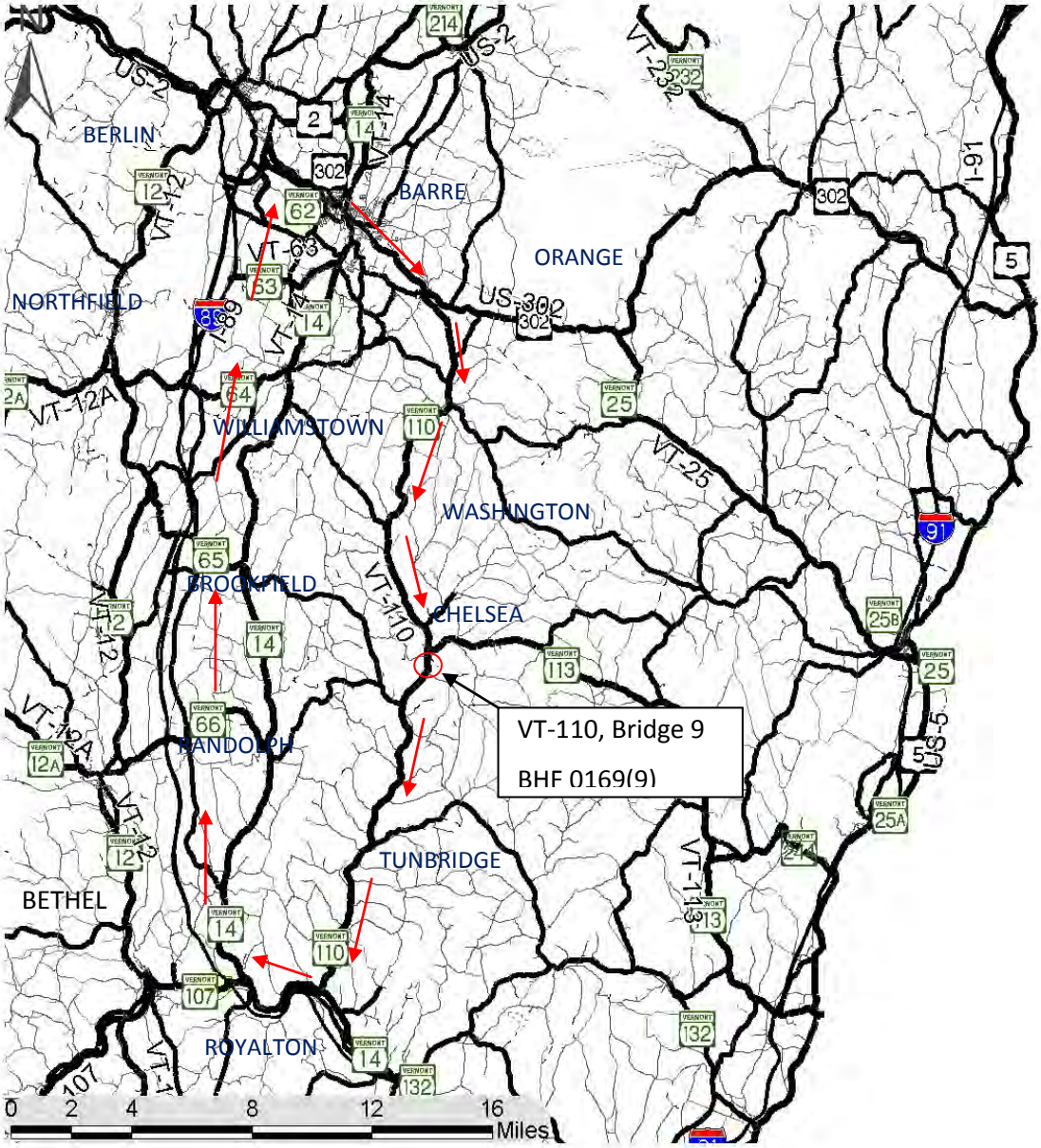
GRADES SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG ℄

GRADES SHOWN TO THE NEAREST HUNDREDTH ARE FINISH GRADE ALONG ℄

PROJECT NAME: CHELSEA
PROJECT NUMBER: BHF 0169(9)

FILE NAME: sl2cl50profile.dgn
PROJECT LEADER: C.P.WILLIAMS
DESIGNED BY: ------
PROFILE SHEET

PLOT DATE: 21-DEC-2012
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 3 OF 6



Detour Route: VT 110 to VT 14 to VT 107 to
Interstate 89 North (Exit 3) to Route 62 (Exit 7) to
US 302 South in Barre, back to VT 110.

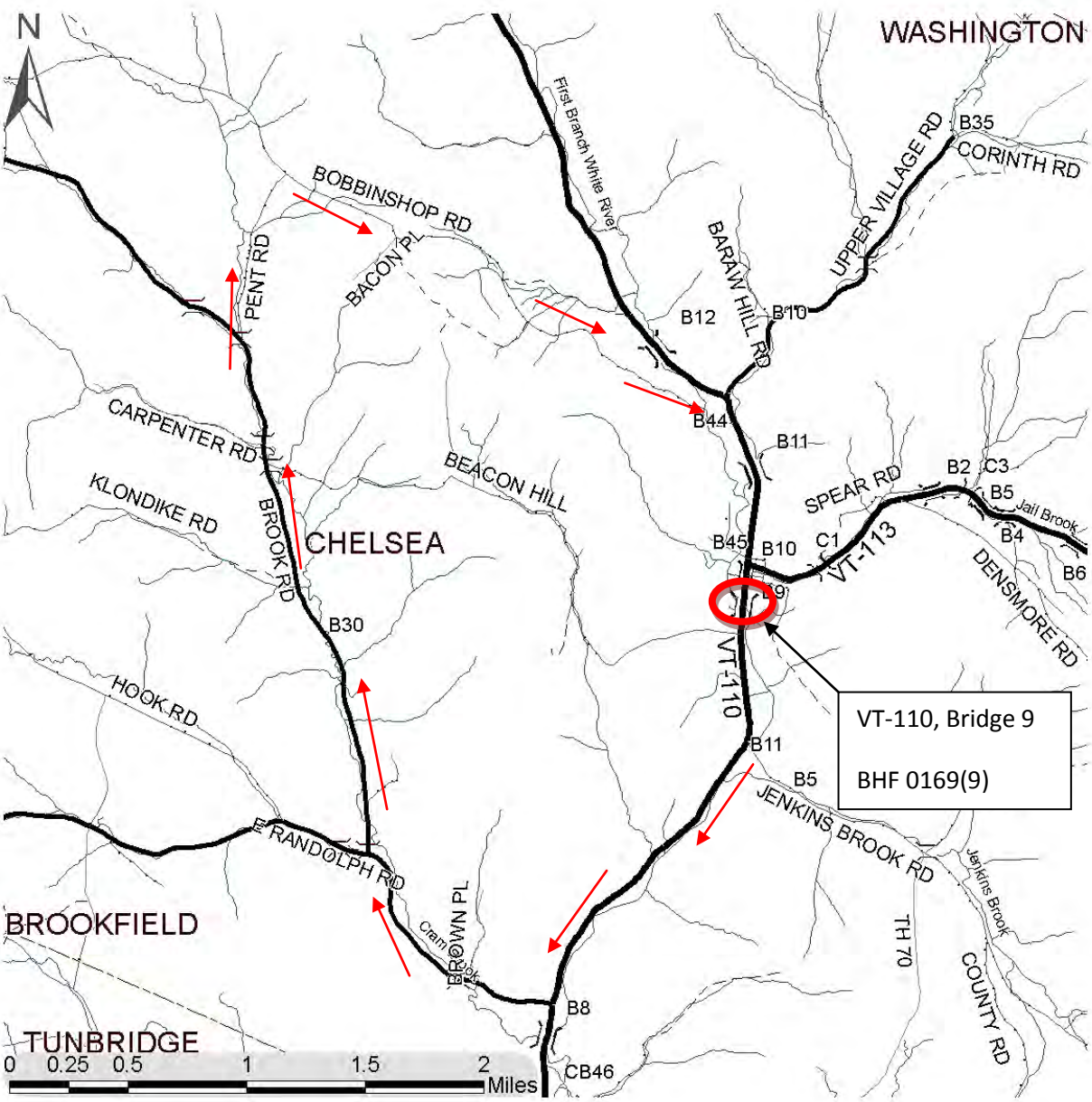
Distance for Thru Route: 27 miles
Detour Route: 41 miles
Additional Distance: 14 miles
End to End Distance: 68 miles

<u>Chelsea, Bridge 9</u>

Detoured ADT: 1500

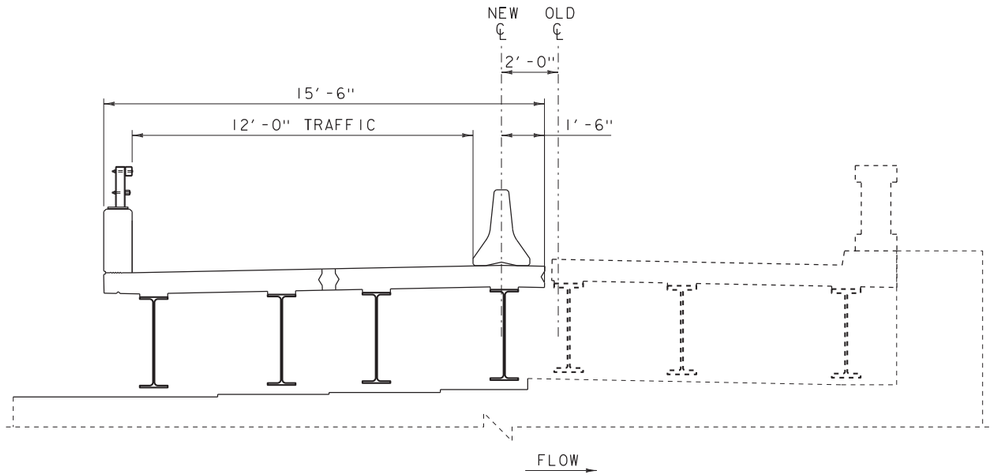
Detoured %T: 0.6%

3 Day closure duration



Bypass Route: VT 110 to East Randolph Road (TH-1, FAS 0264, Class 2, Paved) to
Brook Road (TH-3, Class 2, Gravel) to
Pent Road (TH-33, Class 3, Gravel) to
Bobbin Shop Road (TH-4, Class 3, Gravel), back to VT 110.

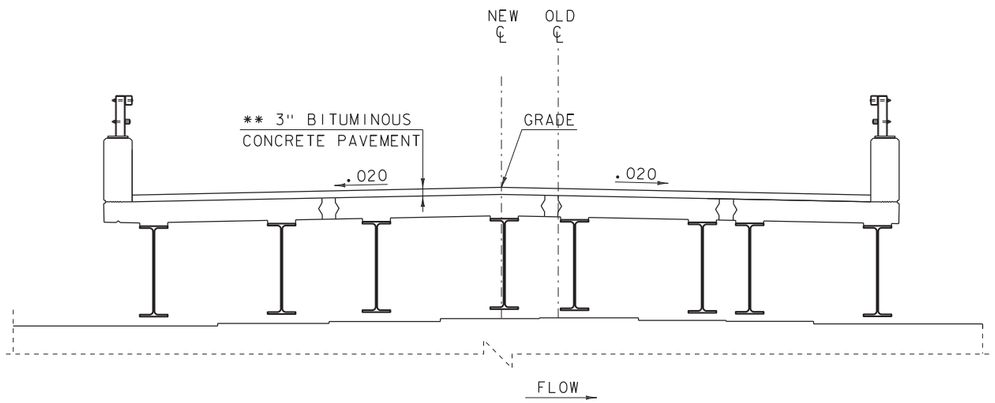
Distance for		
	Thru Route:	2.79 miles
	Bypass Route:	6.59 miles
	Additional Distance:	3.80 miles
	End to End Distance:	9.38 miles



PHASE #1 TYPICAL SECTION

BRIDGE WILL BE CLOSED PRIOR TO THIS PHASE

SCALE 3/8" = 1'-0"

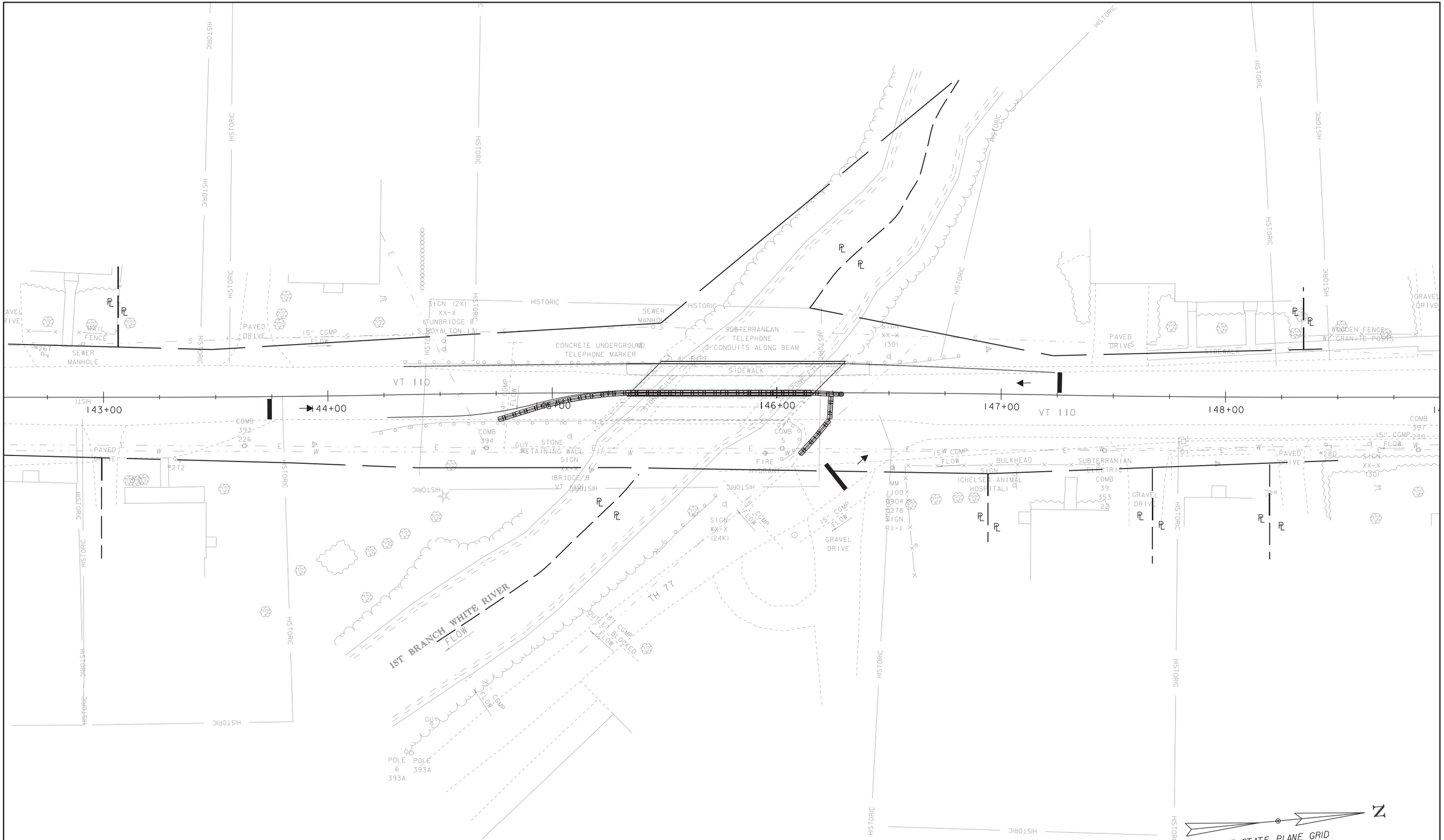


PHASE #2 TYPICAL SECTION

SCALE 3/8" = 1'-0"

PROJECT NAME:	CHELSEA
PROJECT NUMBER:	BHF 0169(9)

FILE NAME: 12c150/sl2c150typical.dgn	PLOT DATE: 21-DEC-2012
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: G.SWEENY
PHASED CONSTRUCTION TYPICAL SECTIONS	SHEET 4 OF 6

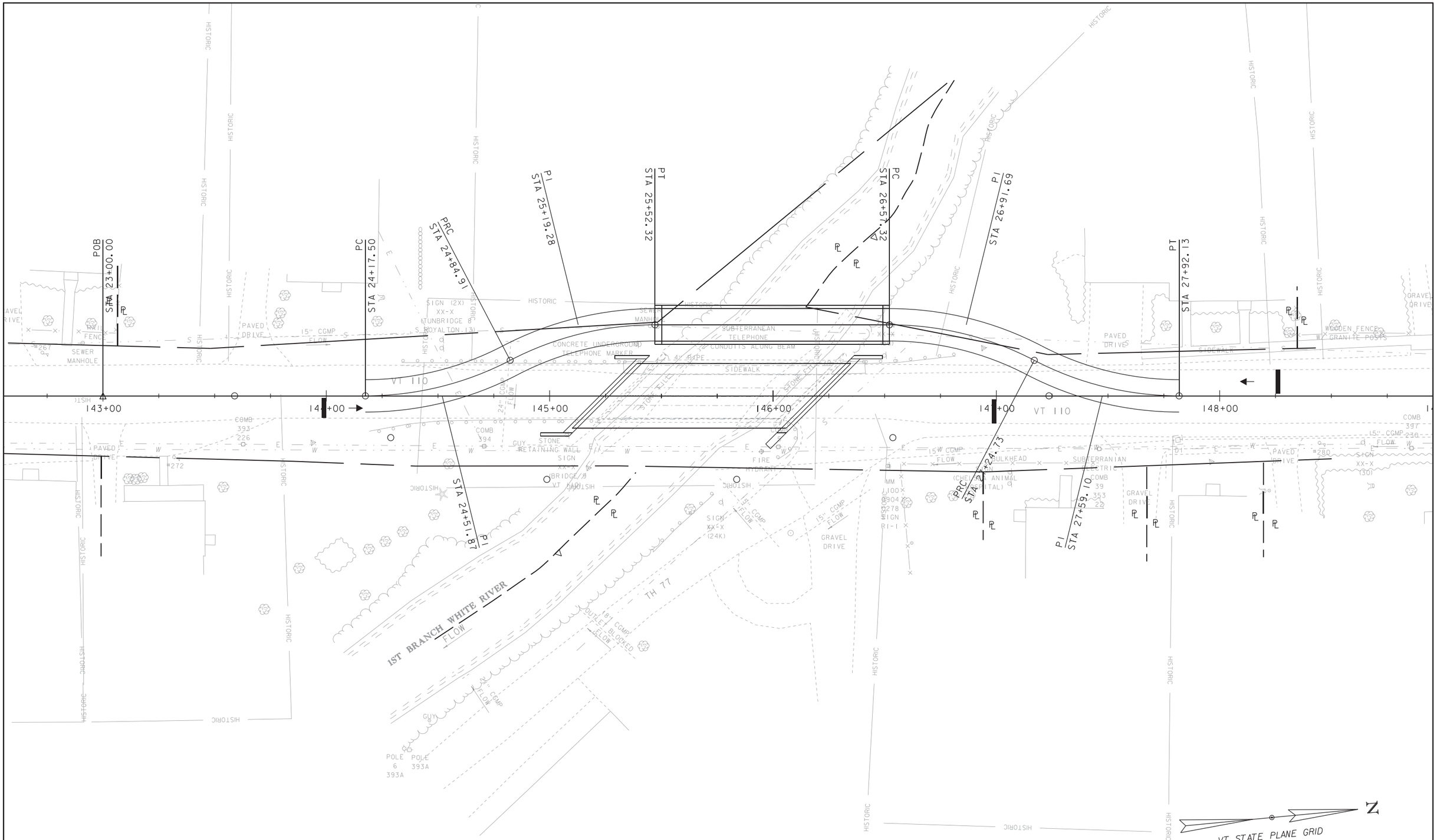


PHASE #1 LAYOUT

SCALE 1" = 20'-0"

20 0 20

PROJECT NAME:	CHELSEA
PROJECT NUMBER:	BHF 0169(9)
FILE NAME: sl2cl50bdr.dgn	PLOT DATE: 21-DEC-2012
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
PHASE I LAYOUT SHEET	SHEET 5 OF 6



ONE WAY TEMPORARY BRIDGE LAYOUT

SCALE 1" = 20'-0"

20 0 20

TEMPORARY BRIDGE IS DESIGNED FOR 20 MPH AT A 2% SUPERELEVATION.

PROJECT NAME:	CHELSEA
PROJECT NUMBER:	BHF 0169(9)
FILE NAME: sl2cl50bdr.dgn	PLOT DATE: 21-DEC-2012
PROJECT LEADER: C.P.WILLIAMS	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
ONE WAY TEMPORARY BRIDGE LAYOUT SHEET	SHEET 6 OF 6