Engineering Report

Rochester ER BRF 0162(18)

Bridge No. 19 – VT 73 over the White River

Bridge Improvement Project – Rochester, VT

Prepared for: Vermont Agency of Transportation
Prepared by: Vanasse Hangen Brustlin, Inc.
Date: June 1, 2012

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Executive Summary

The purpose of this Alternatives Report is to evaluate the replacement alternatives for the temporary bridge on VT 73 over the White River (Bridge No. 19) in Rochester, Vermont. This report summarizes the study and provides a discussion of the existing conditions, replacement alternatives, and recommendations.

A temporary bridge was installed as an emergency repair in response to the destruction of the west abutment and subsequent failure of the superstructure during Tropical Storm Irene in August 2011. This structure was not intended as a permanent solution. The existing temporary bridge is 24′-0″ from rail-to-rail and does not match the existing roadway width or meet the required shoulder width based on the current Average Daily Traffic (ADT) for a rural collector in accordance with the Vermont State Design Standards. The turning radius off of the bridge at the intersection of VT 73 and VT 100 is not adequate and school buses and tractor trailers are unable to negotiate the turn at the intersection without encroaching into the other lane and oncoming traffic.

The feasible alternatives studied are:

A. Do Nothing
B. Steel Plate Girder Bridge
C. Prestressed Concrete Box Beam Bridge

Alternative B, Steel Plate Girder Bridge is the recommended alternative primarily because it provides a reasonable construction cost and the best fit to the required bridge deck geometry which is wider at the east end of the bridge to improve the turning radius between VT 73 and VT 100. Additionally, transportation and erection issues are mitigated with Alternative B as a steel plate girder is capable of being shipped in two sections and field spliced.

Only minor environmental impacts are anticipated as a result of this project. Acquisitions of Right-Of-Way and temporary easements are expected as discussed in this report, and are being addressed expeditiously in order to maintain the project schedule.

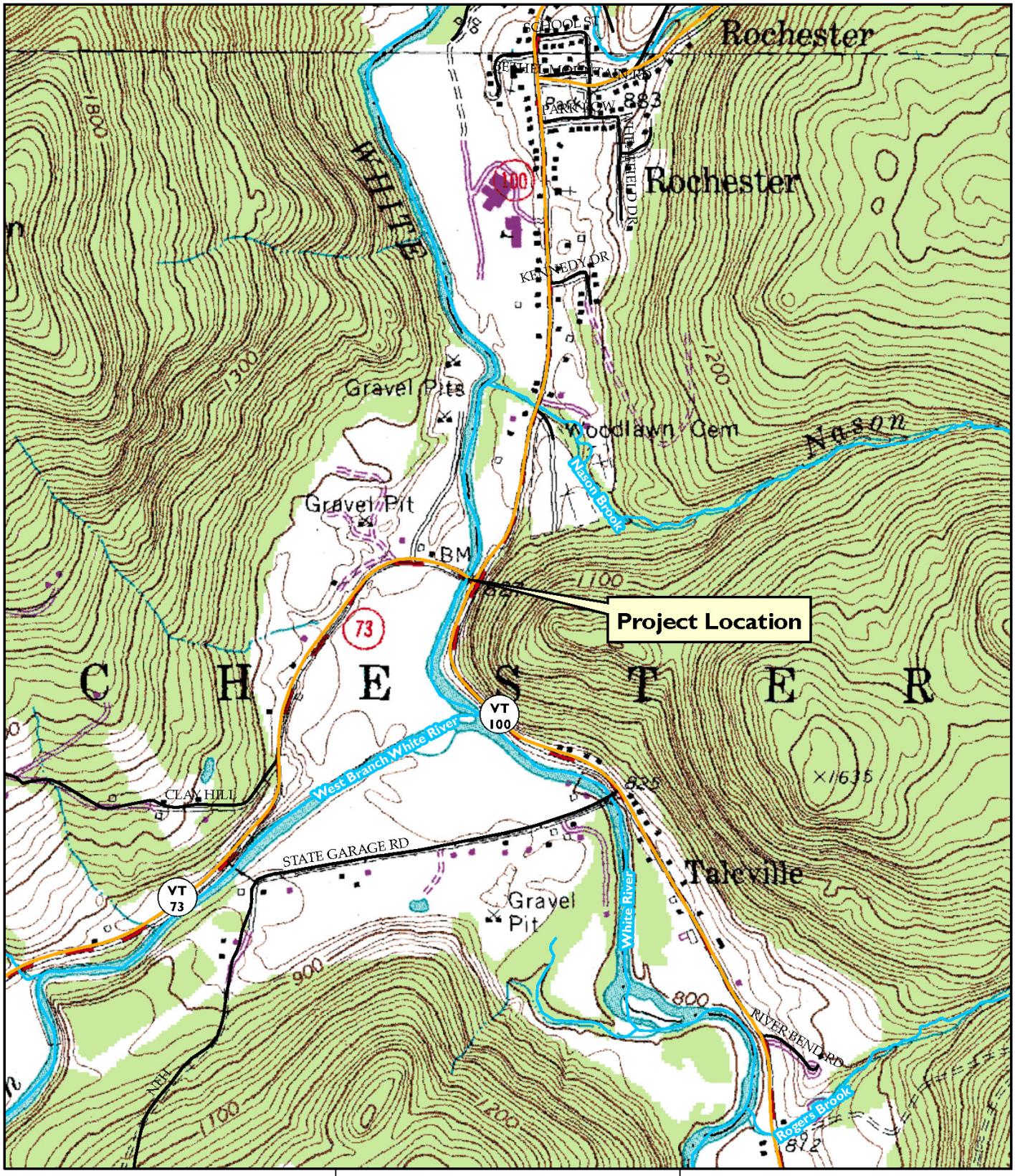
Project Overview

Project Background

The project is located in the Town of Rochester, Vermont on VT 73 at its intersection with the White River and just west of the end of VT 73 at its junction with VT 100. The project is located in a largely undeveloped, rural area with fields on both sides of VT 73 west of the White River and VT 100 on the east side of the river. Steep forested hills are located directly east of VT 100. Rochester Village is approximately 0.6 miles north of the bridge on VT 100. A single dwelling is located to the west of the bridge on the north side of VT 73. The river flows in a southerly direction under Bridge No. 19 and continues to flow south until it turns toward the east in the Town of Stockbridge, VT. The river continues to flow in that general direction until its confluence with the Connecticut River in the Town of Hartford, VT.

The existing bridge was severely damaged due to the failure of the west substructure during Tropical Storm Irene in August 2011. The west bank of the White River was eroded during the storm and widened the channel of the river at the bridge location. In order to reopen VT 73 a 132′-0″ long by 24′-0″ wide temporary two-lane single span Acrow (thru truss) Bridge was used. The existing bridge was approximately 74′-0″ long. The temporary bridge was placed on a new concrete stub abutment on the west side of the river and supported on the existing abutment on the east side.

While the condition of the temporary bridge is not a justification for its replacement, Bridge 19 requires replacement because the temporary bridge rail-to-rail width does not match the roadway width of VT 73, the temporary bridge shoulder width does not meet the Vermont State Design Standards for a rural collector, and the turning radius at the intersection of VT 73 and VT 100 is not adequate for school buses or tractor trailers, which must encroach into oncoming traffic to turn onto and off of VT 73. Additionally, the east abutment is a temporary stub abutment supported on stone fill that does not have adequate frost protection. Site photos of the temporary bridge, roadway, and channel are included in Appendix A.



Legend
- State Named Highway
- Road
- Stream (VHD 08)

Prepared by: Jtherrien

Project Location Map
Bridge #19 on VT-73
Over the White River
Rochester ER BRF 0162(18)

1,000 500 0 1,000 Feet

Sources: Background - USGS Topo Quads (Rochester and Hancock 1997); Roads downloaded from VCGI (2010); VHD streams downloaded from VCGI (2009).

Vanasse Hangen Brustlin, Inc.

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WHITE RIVER

The headwaters of the White River originate in the Green Mountains in Addison County to the northwest of Rochester. The River generally flows in a southerly direction to the Town of Stockbridge, VT where it changes direction and flows to the northeast and then to the southeast to its confluence with the Connecticut River in the Town of Hartford, VT. At the bridge location the White River watershed consists of an area measuring approximately 79 square miles.

VT 73 BRIDGE No. 19

VT 73 is a two lane, west to east state highway starting to the west in Orwell at the intersection with VT 22A and ending to the east in Rochester at the intersection with VT 100. A majority of the road is maintained by the State, including the project area. The roadway through the immediate project area is a rural major collector and is relatively flat. The posted speed limit is 50 miles per hour, and the estimated 2014 AADT is 1500 vehicles per day. The existing structure is an emergency repair installed after the loss of the previous bridge during Tropical Storm Irene.

The temporary bridge is in good condition. The temporary bridge is 132-feet in length and 24-feet rail-to-rail to accommodate two-way traffic. The west abutment is a new concrete stub abutment that was constructed in the fall of 2011 to replace the existing abutment that was destroyed by Tropical Storm Irene. The east abutment is the existing bridge abutment that was originally constructed in the early 1930s, rehabilitated and reconfigured in the early 1970's when the superstructure was removed and replaced with the pre-Irene superstructure. In 2003 the southeast wingwall of the east abutment was reconstructed and lengthened. Stone Fill has been placed in front of both abutments and just upstream of the east abutment and immediately downstream of the east abutment on the side slope of VT 100 which is also the east bank of the White River. Due to erosion on the west bank of the White River the temporary bridge is longer than the previous bridge which was 74'-0" in length. There are currently no overhead utility lines along VT 73 within the project area as they were also damaged during Tropical Strom Irene and relocated to the field south of VT 73. As part of this project the utilities are to be relocated within the State ROW on the south side of VT 73.

Right-of-Way

The State Right-of-Way on VT 73 is approximately 3.5 rods at the start of the project west of Bridge No. 19. The State ROW transitions from 3.5 rods at the beginning of the project to 4.5 rods at the approximate location of the previous west abutment, which is located east of the current western abutment. The State ROW then turns 90˚ inward and reduces to three (3) rods and intersects the State ROW on VT 100. The State ROW on VT 100 within the project area is three (3) rods.

There will be Right-of-Way acquisitions and temporary easements required for this project. The permanent takings will be required to construction the wingwalls on the east abutment. The temporary easements will be required to construct a cattle path in front of the new west abutment and for the detour and temporary bridge which will be located south of the current temporary bridge location (Appendix B).

Environmental Resources

Resource mapping based on available GIS databases and wetland and stream delineation was performed by VHB. A Natural Resources Identification Memorandum, dated March 5, 2012, was prepared to summarize this information (Appendix C). The following summarizes the resource assessment to date:

- One wetland feature was located adjacent to the study area, within an existing field on the west side of the White River and contiguous with a VSWI mapped wetland. If construction activities are sited near the wetland or proposed 50-foot Class II buffer, a detailed delineation during the growing season is recommended.
- The NHIP staff identified two uncommon (not listed) species, cutleaf toothwort (cardamine concatenate, plant) and southern pygmy clubtail (lanthus vernalis-dragonfly) which are reported to occur within the greater vicinity of the bridge but most likely not within the investigation area due to lack of habitat. Based on the NHIP database query results, it is not likely that any rare, threatened, endangered (RTE) species occur in the investigation area and therefore further RTE field surveys are not warranted.
- There are about 6.6 acres of prime agricultural soil within the investigation area. The bridge replacement will not likely reduce the agricultural potential of the land and therefore no further surveys should be needed.
- Title 19 review, following the requirements of a Stream Alteration Individual Permit, may be required. Further discussions with Vermont River Management Engineer (Patrick Ross) are needed to determine whether this project is exempt from further Title 19 review or Stream Obstruction review.
- The investigation area is located within a FEMA Special Flood Hazard Area. A flood hazard area permit may be required. Coordination will need to be made with the Vermont ANR Rivers Management Program for determination.
- The White River from the mouth to the source is considered navigable water and would require a Section 10 Permit under the Rivers and Harbors Act.
- The White River is considered EFH for Atlantic salmon by the NMFS.
- There are no mapped or field sightings of necessary wildlife habitat or significant natural communities.

Cultural Resources

Historic resources in the project investigation area were investigated by (1) recording results of a Vermont Division for Historic Preservation site file search for previously recorded above-ground historic properties, and (2) field observations on February 16, 2012 to determine potential effects to historic properties. The results of investigations are summarized in a memo dated March 1, 2012 (Appendix D). The following summarizes the resource assessment to date:

- There are no previously recorded properties located within the project area. There are no properties listed in the National Register or State Register located within the vicinity of the project area. The field visit identified one farmstead that has not been previously recorded, but may be eligible for the National Register.
- The proposed project will not have any adverse effect to any historic properties listed in, or potentially eligible for, listing in the National Register.

Hydraulic Study

The bridge is located within a FEMA Special Flood Hazard Area. VHB is currently performing preliminary hydraulics. Based on the initial findings the pre-Irene bridge and the proposed bridge have nearly the same hydraulic opening. The pre-Irene superstructure had a higher low chord elevation than the proposed superstructure due to the increase in span length. However, this increase in span length provides a greater horizontal clear distance for the proposed bridge which results in a larger hydraulic opening. Neither the pre-Irene bridge nor the proposed bridge is capable of passing a Q_{50} Storm Event with one foot of free board. It is not possible to increase the grade of the proposed bridge due to the intersection with VT 100 on the east side of the bridge. Based on the grade restraint at the VT 100 intersection and the similar hydraulic openings VHB intends to verify that there is no adverse effect (no rise condition) as a result of the construction of the proposed bridge.

Geotechnical Investigation

VTrans performed subsurface investigations and prepared a Subsurface Investigation Memorandum submitted on May 1, 2012 (Appendix E). The purpose of the geotechnical investigations was to determine the existing soil conditions and verify the depth of ledge at the bridge location. As part of the subsurface investigation three (3) borings were completed.

The subsurface investigations revealed that ledge was approximately 73.0 feet below existing grade at the west abutment and approximately 24.0 to 25.5 feet below existing grade at the east abutment. The recommended substructure should be an integral abutment supported on piles for the west abutment and either a semi-integral or a conventional abutment on a spread footing bearing on competent bedrock at the east abutment.

Alternatives Analysis

Alternative Identification

This section of the report provides a discussion of alternatives which have been identified for this project, involving a combination of structure types and methods of construction.

Following are the most critical considerations in development and evaluation of the project alternatives (not in order of priority):

- Depth and Transportability of superstructure components
- Best fit for existing roadway geometry
- Construction costs
- Future maintenance costs
- Environmental impacts
- ROW impacts

Alternative A: Do Nothing

The "Do Nothing" alternative would require the temporary bridge to remain permanently. Although this is not a viable alternative, it is included in our study. The Do Nothing alternative would result in continued encroachment into oncoming traffic by school buses and tractor trailers negotiating the turn from VT 73 onto VT 100 and result in a bridge width that is less than the required roadway width based on the Vermont State Design Standards. The Do Nothing alternative does not meet the project need.

Alternative B: Steel Plate Girder Bridge

Construction of a steel plate girder bridge using a combination of integral abutment and a spread footing on ledge is a conventional and cost effective solution for this type of project. The required span length for this project is approximately 130-feet long. The intersection of VT-73 and VT-100 is approximately 15-feet from the east end of the bridge; therefore the edge of pavement radius will transition onto the east side of the bridge. Given the rural location of this project site, the length of the bridge

will make it challenging to utilize beam elements that are fabricated and shipped in one continuous piece. Steel superstructures are ideal for conventional construction of multiple beam elements, as they can easily be transported to the site in several pieces and field spliced to the length required. This is the primary advantage of this alternative. Additionally, beams can be easily flared or supplemental "sub-girders" can be framed into the primary girders near the east end of the bridge if needed in order to accommodate the edge of pavement radius required at the intersection of VT-100. Steel superstructures are also generally lighter than concrete superstructures, thereby making transportation and erection of long elements easier. The east abutment will be a spread footing founded on ledge whereas the west abutment will be an integral abutment founded on a single row of piles. The channel embankments at the bridge will be armored with riprap.

Advantages of Alternative B

- Beams can be transported in short segments and field spliced
- Conventional method of construction
- Lightest superstructure elements, simplifying transportation and erection
- Low construction cost
- Low future maintenance costs

Disadvantages of Alternative B

- Requires deck forming between girder elements
- Slightly deeper structure depth

Alternative C: Precast/Prestressed Concrete Box Beam Bridge

The prestressed concrete box beam bridge is another alternative that provides low cost of construction and utilizes abutment types similar to Alternative B. The primary difference between this alternative and Alternative B is the type of superstructure. Prestressed box beam superstructures cannot be field spliced; therefore they must be shipped to the site in one piece, a major disadvantage for this site due to the rural location of this project. Additionally, at an overall length of 130-feet, there are other disadvantages for box beams, including camber related issues. Adjacent box beam structures need to be transversely post-tensioned. This is problematic at long spans due to potential variations in beam camber. Box beams at this length are exceptionally heavy, and at 130-feet in length, they are close to their structural limit. Additionally, box beams cannot be flared, and it is uncommon to frame additional members into the ends of the beams to accommodate a flared deck. A few notable advantages are that the structure depth is less than that of the steel alternative, and this type of structure does not require deck forms between units, thereby simplifying concrete deck construction. Additionally, the superstructure depth is approximately 1.5-feet less than that of the steel girder alternative, which allows for greater hydraulic efficiency. The channel embankments at the bridge will be armored with riprap.

Advantages of Alternative C

- No formwork required between beams for deck construction
- Conventional method of construction
- Shallow overall structure depth
- Low future maintenance costs

Disadvantages of Alternative C

- Beams must be transported at full length, cannot be field spliced
- Heavy beams require larger cranes for erection of superstructure
- Less flexibility with framing layout to accommodate atypical deck geometries
- Beam camber can be problematic for adjacent beams at this length

Maintenance of Traffic

The existing temporary bridge will be relocated to the south and two-way traffic will be maintained during construction. VT 73 will be closed for a 6 to 12 hour period while the existing temporary bridge is relocated to the south. As there are no local detours, the detour would require traffic to continue north on VT 100 or US 7 and head west or east on VT 125. The approximate detour length would be 34 miles. The distance between Rochester and Brandon on VT 73 is 17 miles.

Evaluation Matrix - Rochester VT 73 Bridge No. 19 over the White River				
Scoping Report		**Alternative A**	**Alternative B**	**Alternative C**
		Do Nothing	Steel Plate Girder Bridge	Precast/Prestressed Concrete Box Beam Bridge
Cost	Roadway Improvements	$0.00	$750,000.00	$750,000.00
	Bridge Improvements	$0.00	$1,750,000.00	$1,750,000.00
	Construction Engineering	$0.00	$250,000.00	$250,000.00
	Right-of-Way Acquisition	$0.00	$50,000.00	$50,000.00
	Preliminary Engineering	$100,000.00	$90,000.00	$90,000.00
	SUBTOTAL:	$100,000.00	$2,890,000.00	$2,890,000.00
	TOTAL:	**$100,000.00**	**$2,900,000.00**	**$2,900,000.00**
Engineering	Typical Section Roadway	No Change	3-11-11-3	3-11-11-3
	Typical Section Bridge	No Change	4-11-11-4	4-11-11-4
	Traffic Safety	No Change	Enhancement	Enhancement
	Alignment Change	No Change	Enhancement	Enhancement
	Hydraulic Performance	No Change	No Change	No Change
	Utility	Relocation Required	Relocation Required	Relocation Required
Impacts	Agricultural Lands	No	No	No
	Archaeological	No	No	No
	Historic Structures, Sites and Districts	No	No	No
	Hazardous Materials	No	No	No
	Floodplain	No	No	No
	Fish & Wildlife	No	No	No
	Rare, Threatened & Endangered Species	No	No	No
	Public Lands	No	No	No
	LWCF	No	No	No
	Wetlands	No	No	No
Local and Regional Issues	Concerns	Not Met	Satisfied	Satisfied
	Community Character	No Change	No Change	No Change
	Economic Impacts	No Change	Unknown	Unknown
	Satisfies Project Need	No	Yes	Yes
Permits	Act 250 Amendment	No	No	No
	Rivers and Harbors Act Section 10	No	Yes	Yes
	401 Water Quality	No	Yes	Yes
	404 ACOE Permit	No	Yes	Yes
	Stream Alteration Coordination	No	Yes	Yes
	Vermont Wetlands Permit	No	No	No
	Stormwater Discharge	No	No	No
	Lakes and Ponds	No	No	No
	Endangered and Threatened Species Taking	No	No	No
	Construction Stormwater Discharge	No	No	No
	SHPO	No	No	No
Other	Land Acquisition	No	Yes	Yes

Figure 2 – Evaluation Matrix

Recommendations

Alternative B – Steel Plate Girder Bridge with a combination of integral and spread footing abutments is the recommended alternative, primarily because shorter beam segments can be transported and field spliced on-site. This project utilizes conventional construction techniques and a temporary bridge to maintain traffic during construction, therefore phased construction is not required at this site.

Appendix

APPENDIX A

PROJECT PHOTOGRAPHS

Looking East on VT 73

Looking West on VT 73

Looking North on VT 100

Looking South on VT 100

North Elevation of Temporary Bridge

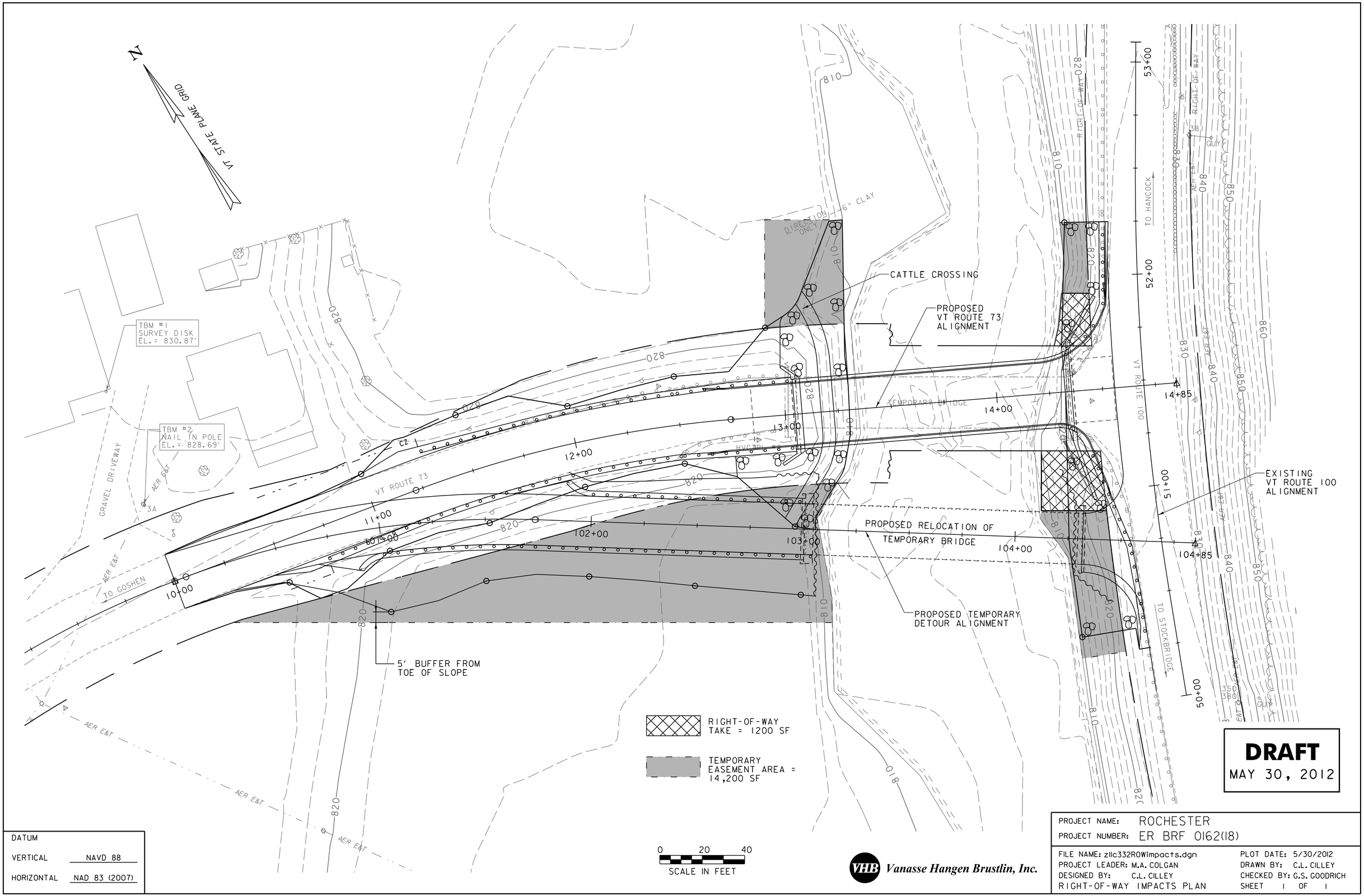
West Abutment

Existing East Abutment

Existing Utilities in Field South of Temporary Bridge

APPENDIX B

RIGHT-OF-WAY IMPACTS PLAN



DATUM	
VERTICAL	NAVD 88
HORIZONTAL	NAD 83 (2007)

Vanasse Hangen Brustlin, Inc.

PROJECT NAME: ROCHESTER
PROJECT NUMBER: ER BRF 0162(18)

FILE NAME: z11c332ROWimpacts.dgn
PROJECT LEADER: M.A. COLGAN
DESIGNED BY: C.L. CILLEY
RIGHT-OF-WAY IMPACTS PLAN

PLOT DATE: 5/30/2012
DRAWN BY: C.L. CILLEY
CHECKED BY: G.S. GOODRICH
SHEET 1 OF 1

VHB 57517.00

APPENDIX C

NATURAL RESOURCES IDENTIFICATION MEMORANDUM

VHB MEMORANDUM

NATURAL RESOURCES IDENTIFICATION MEMO

TO: Jennifer Fitch, Project Manager
Mark A. Colgan, VHB Project Manager
FROM: Joseph L. Burt, VHB Environmental Scientist
Adam R. Crary, PWD, PWS, VHB Senior Wetland Scientist
DATE: Draft: March 5, 2012

Project: Rochester ER BRF 0162(18) – VT 73 Br. No. 19 Over the White River

The attached technical memorandum addresses the following environmental criteria:

1. Wetlands
2. Waters
3. Significant Natural Communities
4. Necessary Wildlife Habitat
5. Rare, Threatened, and Endangered Species
6. Prime Agricultural Soils

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

Joseph L. Burt

cc:
Project File

TECHNICAL MEMORANDUM
Rochester ER BRF 0162 (18)
Rochester, Vermont

Proposed Bridge Replacement

Town of Rochester Bridge No. 19, Route 73, Over the White River,
Rochester, Vermont

Date: Draft: March 5, 2012
Re: Natural Resources Identification and Regulatory Discussion

INTRODUCTION:
Vanasse Hangen Brustlin, Inc. (VHB) performed natural resource assessments in support of Bridge No. 19 replacement (Project) on VT Route 73, at the intersection of VT Route 100 and VT Route 73 in Rochester, Vermont. The location consists of an existing temporary bridge carrying VT Route 73 over the White River. The previous bridge collapsed due to flooding related to Tropical Storm Irene in late August 2011. This technical memorandum describes the applicable Vermont and Federal regulatory programs for the resources investigated, site characteristics, study methods, and resource determinations conducted for the study area. Included in the Attachment are the Wetland and Waters Delineation Map, Watershed Sizes Map, and Wetland and Stream Delineation Photographs.

The study for the Project site included both database review as well as a field investigation, and is intended to include an evaluation of the following resources:

Wetlands (*Vermont Wetland Rules (VWR), U.S. Army Corps of Engineers (USACE) Section 404 of the Clean Water Act (CWA), and Vermont Department of Environmental Conservation (VT DEC) Water Quality Certification pursuant to Section 401 of the CWA*)
Projects are required to comply with the VWR (VT NRB 2010), which regulate impacts to significant wetlands (Class I and Class II wetlands) and their buffers; impacts to Class III wetlands are not regulated by the VWR. All impacts to jurisdictional wetlands are regulated by the USACE under the Section 404 permit program, which also triggers review under Section 401 Water Quality Certification (WQC) from the Vermont Department of Environmental Conservation (VT DEC).

Waters (*Vermont Title 19 Stream Alteration Review, Vermont Stream Obstruction Review, USACE Section 404, Section 10 of the Rivers and Harbors Act, VT DEC Section 401 Water Quality Review, Federal Emergency Management Agency (FEMA) Special Flood Hazard Areas/National Flood Insurance Program (NFIP), and Essential Fish Habitat (EFH)*)
Currently, non-exempt work within a perennial stream often requires a Stream Alteration Permit (SAP) from the VT DEC, which is reviewed under 19 VSA Section 10 (12) (VT DEC 2011). In-stream work may also require stream obstruction review from a Vermont Agency of Natural Resources (ANR) fisheries biologist[1]. The USACE Section 404 regulatory program regulates the placement of fill within jurisdictional Waters of the United States and any unavoidable impacts may require Clean Water Act Section 404/401 permit authorization. Additionally, work in or over designated navigable waters may require approval under Section 10 of the Rivers and Harbors

[1] Stream Obstruction Vermont law (10 V.S.A. § 4607) prohibits the installation of a structure that prevents fish movement, such as a rack, weir or other obstruction, unless an approval has been granted by the Commissioner of Fish and Wildlife.

Act[2]. As part of a Permit screening process, USACE will coordinate with National Marine Fisheries Service (NMFS) to determine EFH protective measures. Work within designated FEMA Special Flood Hazard Areas may require approval by VT DEC Rivers Management Program under NFIP regulations (VT ANR 2007).

Significant Natural Communities *(§ 6086(a)(8))*
Should the bridge Project require an Act 250 Permit or Permit Amendment, the Vermont Natural Heritage Information Program (NHIP) can recommend that significant natural communities be deemed Rare and Irreplaceable Natural Areas (RINA) under Act 250 Criterion 8, based on the combination of the natural community rarity and quality ranking. Under Act 250, a project must be shown to have no undue adverse effect on RINA. The presence of rare, threatened, or endangered (RTE) species and these communities may be used by the NHIP to make RINA recommendations. Rare (S1 and S2) natural communities can be considered RINA when quality-ranked as A, B, or C. Uncommon (S3) types require a quality rank of A or B to be considered as RINA. Assemblages of natural communities can also be considered RINA.

Necessary Wildlife Habitat *(§6086(a)(8)(A))*
Should the bridge Project require an Act 250 Permit or Permit Amendment, it must not cause an undue adverse impact on necessary wildlife habitat (NWH). NWH is most often defined as deer wintering areas (DWA), black bear forage habitat (beech mast or wetlands), black bear travel corridors, or in some cases, moose overwintering area.

Rare, Threatened, and Endangered Species (RTE) (*Vermont State Takings Permit, Federal Section 10 Takings Permit*)
The Project should also not significantly impact or destroy Vermont or Federally listed Endangered or Threatened Species.[3] If impacts to State threatened or endangered species or their critical habitat are unavoidable, a Vermont takings permit will likely be required (VT ANR 2004). If impacts to Federally listed species or their critical habitat are unavoidable, as determined through Endangered Species Act (ESA) Section 7 - Interagency Cooperation, a Section 10 Takings Permit may be required (USFWS 2011).

Prime Agricultural Soils *(§ 6086 (a)(9)(B))*
Should the bridge Project require an Act 250 Permit or Permit Amendment, the Project must be shown to have no undue adverse effect on any reduction in the agricultural potential of the primary agricultural soils under Act 250 Criterion 9.

SITE DESCRIPTION:
Town of Rochester Bridge No. 19 on VT Route 73 is located in a largely undeveloped, rural area (72°48'37.44"W 43°51'48.18"N) with limited residential development (see Attachment, page 1, Wetland and Waters Delineation Map). The Project site is within Windsor County, in the Town of Rochester, Vermont and located in the White River Basin (HUC 8: 01080105). The investigation concentrated on 12 acres around the temporary bridge that would likely be needed for replacement construction activities. The temporary bridge is a steel structure spanning the White River with an approximate distance of 128 feet between abutments. The west bank of the White River adjacent (upstream and downstream) to the bridge was eroded during the Tropical Storm Irene flash flooding, which widened the river channel adjacent to the bridge.

[2]Section 10 of the Rivers and Harbors Appropriation Act of 1899. (33 U.S.C. 403. Construction of bridges, overhead lines, causeways, dams or dikes generally)
[3] Federal-listed species are protected under the U.S. Endangered Species Act and Vermont-listed species are protected under 10 V.S.A. §123.

ASSESSMENT METHODOLOGIES:

Wetlands

VHB Environmental Scientists Chelsea Martin and Joseph Burt identified wetland resources in the field during non-growing season conditions, in accordance with applicable methodologies outlined in the USACE regional wetland delineation supplement (USACE 2009). The regional supplement requires the presence of three parameters to establish the occurrence of wetland resources: hydric soils, hydrophytic vegetation, and wetland hydrology. Under normal circumstances, all three parameters must be met for an area to qualify as a wetland. Wetlands are classified in accordance with the *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin, et al. 1979). Wetlands are also classified using guidance from Section 4 of the VWR (VT NRB 2010). Since the delineation occurred outside the growing season and during frozen ground conditions, surface hydrology and remnant hydrophytic vegetation were relied on when soil profiles could not be examined. Wetlands were flagged in the field using pink "wetland delineation" survey tape and labeled to include wetland ID and flag number (e.g., VHB-2011-C1-1). Information pertaining to the vegetation, soil type, and hydrologic characteristics were noted in the field. USACE wetland determination data forms could not be completed due to frozen ground conditions, and as such this delineation may be considered preliminary.

Waters

VHB Environmental Scientists Chelsea Martin and Joseph Burt conducted the stream and wetland delineation on December 28, 2011. Ordinary High Water (OHW) width and Top of Slope (TOS) was flagged in the field using guidance provided in the USACE "Regulatory Guidance Letter: Subject- Ordinary High Water Identification" (USACE 2005). Streams are also flagged according to the Agency of Natural Resources (ANR) Riparian Buffer Guidance (ANR 2005). Stream TOS is flagged using orange survey tape and labeled "TOS" and includes the stream ID and flag number (e.g., VHB 2011-TOS-C1a-1). OHW limits in the investigation area are marked with blue flagging tape and labeled by stream ID and flag number (e.g., VHB 2011-OHW-C1a-1).

VHB located wetland and stream delineation flags in the field using a Trimble® GPS unit capable of sub-meter accuracy. Data were post-processed using Trimble® Pathfinder software for enhanced accuracy. A VHB survey crew also surveyed delineation flags to be used in bridge design planning.

FEMA floodway data were obtained from the Vermont Center for Geographic Information (VCGI) (2010) and included on the Wetland and Waters Delineation map (page 1 of the Attachment). Stream drainage areas were obtained using VT DEC Watershed Sizes Maps (VT DEC 2011) and the U.S. Geological Survey (USGS) website Stream Stats (USGS 2012). The bank full width was calculated by inputting the approximate drainage area into the Vermont Regional Hydraulic Geometry Curve (VT DEC 2006).

EFH locations were reviewed to determine if NMFS has declared the Project site portion of the White River to be EFH (USACE 2007).

Significant Natural Communities

In order to identify potential occurrences of known significant natural communities, VHB researched the NHIP database for the presence of known Element Occurrences (EOs) of significant natural community types within and adjacent to the study area. A one-mile radius was used when querying the NHIP database and information specific to each EO identified within the radius was requested and received from NHIP on January 13, 2012.

Necessary Wildlife Habitat
In order to identify the potential occurrence of NWH, VHB reviewed GIS data provided by the Vermont ANR for the presence of NWH. VHB Wildlife Biologist, Joseph Burt, also field reviewed the Project site on December 28, 2011 for evidence of on-site NWH.

Rare, Threatened, and Endangered Species
In order to identify known or potential occurrences of RTE, particularly those that are Federal or Vermont-listed threatened or endangered, VHB researched the NHIP database for the presence of known EOs of RTE within and adjacent to the study area. A 1-mile radius was used when querying the NHIP database and information specific to each EO identified within the radius was requested and received from NHIP on January 13, 2012.

Prime Agricultural Soils
VHB researched available data provided by the VCGI for U.S. Geological Survey mapped prime agricultural soils within and adjacent to the study area.

RESULTS:
Wetlands
VHB delineated one wetland feature (2011-C1) which is located adjacent to the study area, within an existing field on the west side of the White River and contiguous with a Vermont Significant Wetland Inventory (VSWI) - mapped wetland (see page 1 of the Attachment). VHB proposes this wetland would be Class II based on the VWR Section 4.6 Presumption that wetlands contiguous with VSWI-mapped wetlands are presumed to be Class II (VT NRB 2010). The primary function of 2011-C1 is water storage for flood water and storm runoff (5.1 VWR) (VT NRB 2010). The feature is a palustrine emergent (PEM) wetland, located west of the southwest end of 2011-TOS-C1. Dominant vegetation includes sensitive fern (*Onoclea sensibilis*) and soft rush (*Juncus effusus*). The conditions at the time of the delineation were frozen ground, the majority snow covered, and there was sediment within the wetland from flooding deposition creating atypical conditions, therefore the mapped boundary of 2011-C1 is approximate and should only be used for planning purposes. If construction activities are sited near the wetland or proposed 50-foot Class II buffer, a detailed delineation during the growing season is recommended. The wetland delineation has not been field reviewed by VT DEC or USACE.

Waters
VHB delineated one stream feature, the White River, in and adjacent to the study area. Stream features are shown on the Wetland and Waters Delineation Map (Page 1 of the Attachment). The OHW and TOS of the White River were delineated using the methodologies described above and are identified in the field as 2011-TOS-C1 and 2011-OHW-C1. The west river bank, north of the VSWI wetland had been reshaped during post-flood rebuilding activities and the pre-Tropical Storm Irene TOS and OHW were not evident at the time of the investigation. The new-normal TOS and OHW was interpolated using upstream and downstream characteristics as guidance, which should be considered "new normal circumstance" should no further bank or channel restoration activities occur here. OHW of the White River in the investigation area ranges from approximately 75 to 125 feet. Representative photographs of the White River can be found in the Attachment (pages 3 through 5).

The investigation area is located within a FEMA Special Flood Hazard Area (see Wetland and Waters Map, page 1 in the Attachment) and the White River is considered Class B under the Vermont Water Quality Standards (VT NRB 2008). According to the VT DEC Watershed Sizes Map (page 2 of the Attachment) the drainage area for the White River is greater than 10 square miles (approximately 79 square miles as calculated using USGS Stream

Stats) at the Project site. The bank full width as calculated from the temporary bridge location averages approximately 90 feet.

The White River from the mouth to the source is considered navigable water and would require a Section 10 permit. The White River is also considered EFH for Atlantic salmon (*Salmo salar*) by the NMFS (USACE 2007).

Necessary Wildlife Habitat
The database search did not identify NWH within or adjacent to the Project area. Field investigations corroborated the database search.

Significant Natural Communities
A query of the NHIP database returned no known EOs of significant natural communities within the Project investigation area or within a one mile search radius. Based on the NHIP database query results, it is unlikely there are significant natural communities in the investigation area and therefore further significant natural community field surveys are not warranted.

Rare, Threatened, and Endangered Species
A query of the NHIP database returned no known EOs of State or Federal-listed threatened or endangered plant or animal species within the project investigation area or within a one-mile search radius.

Correspondence with NHIP staff identified two uncommon (not listed) species, cutleaf toothwort (*Cardamine concatenate*) (S3-Plant) and southern pygmy clubtail (*Lanthus vernalis*) (S3- dragonfly), which are reported to occur within the greater vicinity of the bridge. The cutleaf toothwort was reported at the confluence of West Branch of the White River and the White River (about 900 feet downstream of the bridge) and the southern pygmy clubtail was reported to occur on the White River (about 1.5 miles upstream of the bridge).

The cutleaf toothwort typically occurs in moist, rich forests (Gleason and Cronquist 1991). The onsite habitat conditions are generally open fields, gravel banks, and rip rap banks, therefore, cutleaf toothwort is not likely to occur in the investigation area. NHIP staff indicated southern pygmy clubtail breeds in small shady spring-fed creeks. There is no likely habitat in the investigation area for the southern pygmy clubtail, as the White River is widened at this section and exposed to the sun and thermal warming. Based on the NHIP database query results, it is not likely that any RTE species occur in the investigation area and therefore further RTE field surveys are not warranted.

Prime Agricultural Soils
The database search for prime agricultural soils indicate there to be about 6.6 acres of prime agricultural soil within the investigation area. Though the investigation area contains mapped prime agricultural soils, the bridge replacement will not likely reduce the agricultural potential of the land and therefore no further surveys should be needed.

REGULATORY DISCUSSION:
The following is a brief discussion of the most pertinent regulatory programs that may be applicable to this review and also provides VHB's recommendations to coordinate under the specific program requirements:

Vermont Stream Alteration Permit (Title 19 Review)
Any work within a perennial stream will require Title 19 review for VTrans projects if the project will result in the movement, excavation, or fill involving 10 or more cubic yards within the watercourse. The White River watercourse has a drainage area greater than 10 square miles, therefore, Title 19 review, following the requirements of a Stream Alteration Individual Permit, may be required. The bridge replacement may be considered exempt or a Non-Reporting Activity under Vermont Stream Alteration General Permit requirements under Title 19 review, if the Project can meet the following guidelines:

- Scour protection or erosion treatments do not reduce the channel cross section dimensions and cross-sectional area; and
- There is no channel realignment; and
- There is no roadway realignment ; and
- The repaired or replacement structure provides a span length 1.2X bank full width or greater at the streambed elevation; and
- The repaired or replacement structure provides a Q25 headwater depth + one (1) foot that is no higher than the elevation of the lowest superstructure element; and
- Any temporary structure for traffic maintenance during construction provides a span length 1.0X bank full width or greater.

VHB recommends initial coordination with the Vermont River Management Engineer (Patrick Ross), to identify if the Project is exempt from further Title 19 review or Stream Obstruction review. If not exempt or any non-reporting activities criteria cannot be met, the bridge project may be required to meet Individual Stream Alteration Permit guidelines, as it has a watershed area greater than 10 square miles (VT DEC 2011).

Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act
The USACE regulates the placement of fill material into U.S. Waterways and their tributaries including adjacent wetlands under Section 404 of the Clean Water Act. As a waterway crossing activity under Appendix A.I (c), the project will likely qualify for a General Permit under Category 1, if certain conditions can be met. If the conditions of Category 1 cannot be met, the Project may be considered for a Category 2 General Permit or Individual Permit (USACE 2007).

Providing the Section 404 permit is a General Permit, the General Permit conditions of the Section 10 Rivers and Harbors Act Permit will apply; and if an Individual Section 404 Permit is required ,the Individual Permit conditions of the Section 10 Rivers and Harbors Act will apply. The bridge replacement should not, however, have an impact on the navigability of the White River.

Section 401 Water Quality Certification
If the Project requires a Section 404 permit for impacts to jurisdictional waters of the United States, then a Section 401 Water Quality Certification from the VT DEC would be required. If a Department of Army Vermont General Permit is necessary, then a General 401 Water Quality Certification would be required; and if a USACE Individual Permit is necessary then an Individual 401 Water Quality Certification would be required.

Vermont Wetland Rules
The VT DEC administers the VWR, which require a Vermont Wetlands Permit prior to activities within Class I or Class II wetlands or their associated buffers, if the activities are not allowed uses. This project should be able to avoid work in Class II wetlands or associated buffer; but if not, the bridge replacement should be an allowed

use under VWR Section 6.12 (VT NRB 2010). Coordination with the Vermont DEC to review the classification and the Project activity is recommended to determine if a Vermont Wetland Permit is required.

National Flood Insurance Program (NFIP)
A flood hazard area permit may be required as the Project occurs within a Special Flood Hazard Area. These permits are reviewed by Vermont ANR to ensure compliance with NFIP minimum standards (VT ANR 2007). To determine NFIP requirements, coordination with the Vermont ANR Rivers Management Program is recommended.

REFERENCES

Cowardin, et al. 1979. Classification of Wetlands and Deepwater Habitat of the United States. U.S. Fish and Wildlife Service. FWS/OBD-79/31. 103pp.

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Vermont Department of Environmental Conservation (VT DEC). 2011. The Vermont Stream Alteration regulatory program guidelines and watershed size maps can be found at http://www.anr.state.vt.us/dec/waterq/rivers/htm/rv_management.htm

Vermont Natural Resources Board (VT NRB). 2008. Vermont Water Quality Standards (Vt. Code R 12 004 052), Effective January 1, 2008.

Vermont Natural Resources Board (VT NRB). 2010. Vermont Wetland Rules. Effective August 1, 2010. Available online at: http://www.nrb.state.vt.us/wrp/rulemaking/wetlands2010/filedruledocs/VWR%207-16-10.pdf

Attachments:

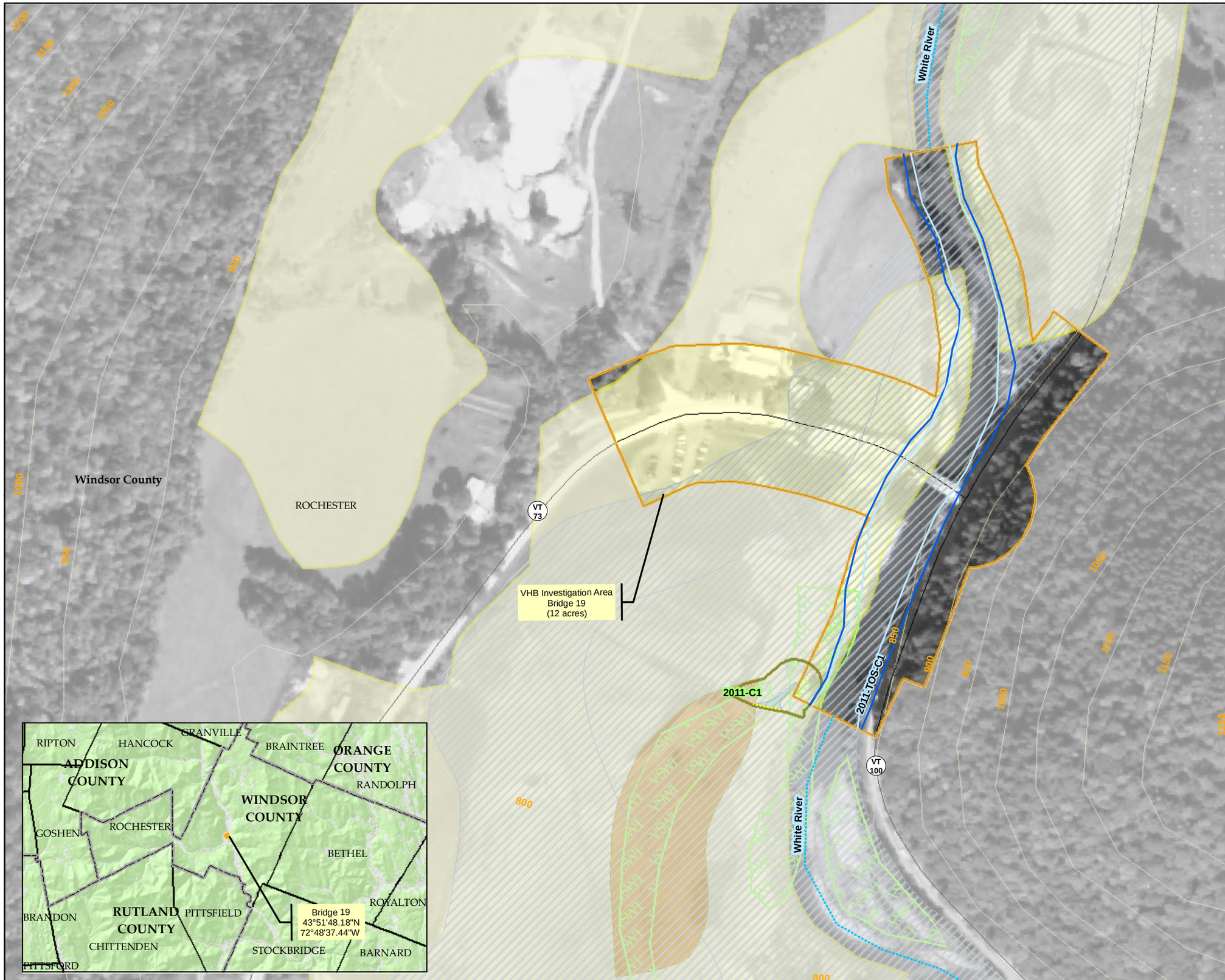
- Wetland and Waters Delineation Map
- Watershed Sizes Map
- Wetland and Stream Delineation Photographs

ATTACHMENT

Rochester, ER BRF 0162(18) Wetland and Waters Delineation VT73 Over the White River Bridge 19 Rochester, Vermont

1

Date: February 06, 2012



200 100 0 200 Feet

Legend

- VHB Investigation Area
- VHB Ordinary High Water (2011)
- VHB Stream Top of Slope (2011)
- VHB Proposed Class II Wetland
- VHB Wetland Continues
- Proposed Class II Wetland Buffer
- RTE Species/ Communities (NHIP)
- VSWI Wetland
- Prime Agricultural Soils
- Hydric Soils
- 100 Year Floodzone
- Roads (VTRANS)
- Stream (VHD 08)
- 50' Contours
- County Boundary
- Town Boundary

N

VHB Vanasse Hangen Brustlin, Inc.

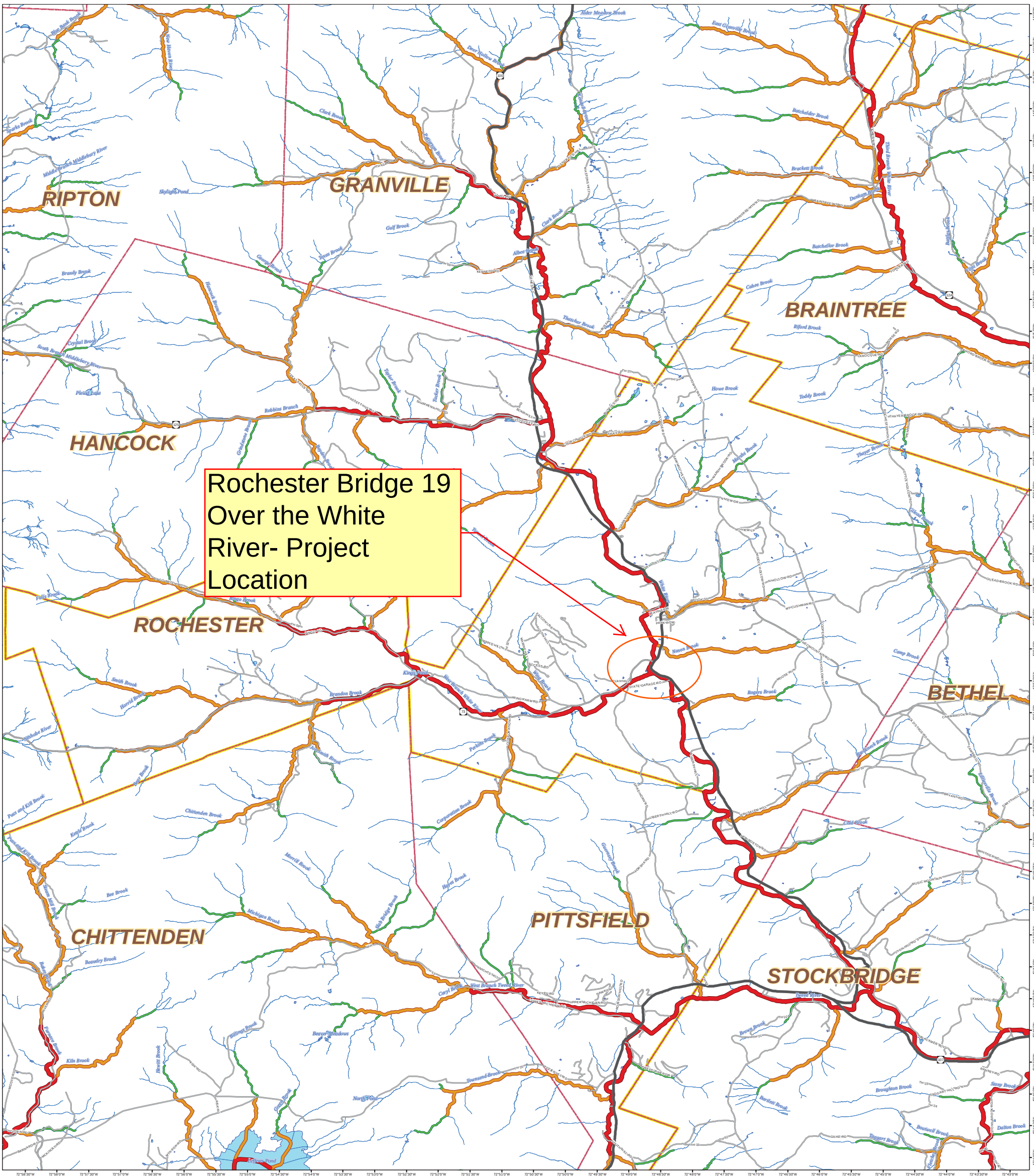
Sources: Aerial Photography provided by USDA NAIP (2011); VHD Streams, Flood data, Contours, Town and County Boundaries and Roads from VCGI (2010); RTE and VSWI Features by ANR (2011); Investigation Area, Delineated Streams and Wetlands by VHB (2011)

Prepared by: cmartin

Path: F:\57517.00\GIS\Project\RochesterWetland_fieldmap_Bridge19.mxd

Watershed Sizes Used as Guidance in Stream Alteration Regulations

ROCHESTER



Map Disclaimer

This map represents guidance on watershed sizes using data and methods that have a certain amount of error associated with them. The accuracy of watershed sizing maps using the Vermont Hydrography Data Set and produced with computer automated methods may be exceeded by other methods using more accurate data. The regulated public may request River Management Program (RMP) approval, or the RMP may decide, to use watershed sizes based on more accurate methods and data.

0 0.45 0.9 1.8 2.7 3.6 Miles

Map Description

This map product indicates the reaches of stream and river in a given town that would be at or below the 0.5, 1.0, and 10.0 square mile watershed thresholds used for jurisdictional determinations under the Vermont ANR Stream Alteration Regulatory Program.

RMP contacts and information about the Stream Alteration GP may be obtained at: http://www.anr.state.vt.us/dec/waterq/rivers/htm/rv_management.htm

Map Created by, Erik Engstrom. ANR GIS. April 1st, 2011.

LEGEND

Roads
- Principal Arterial
- Minor Arterial
- Urban
- Rural
- Local

Drainage Area
- >10 Square Miles
- 1 - 10 Square Miles
- .5 - 1 Square Mile
- <.5 Square Mile
- Lake/Pond

- VT Town Boundaries
- VT County Boundary

N

NATURAL RESOURCES MEMORANDUM
Rochester ER BRF 0162 (18) - Rochester, VT
Bridge No. 19, Route 73 WETLAND AND STREAM DELINEATION PHOTOGRAPHS
February 16, 2012

Photo 1: View looking north at temporary bridge location and new channel characteristic on the White River following tropical storm- Irene flooding. Photograph taken by Chelsea Martin of VHB on 12/28/11

Photo 2: View of White River looking west from 2011-TOS-C1a. Photograph taken by Chelsea Martin of VHB on 12/28/11

NATURAL RESOURCES MEMORANDUM
Rochester ER BRF 0162 (18) - Rochester, VT
Bridge No. 19, Route 73 WETLAND AND STREAM DELINEATION PHOTOGRAPHS
February 16, 2012

Photo 3: View of re-shaped west edge of White River, due to post-Irene channel erosion and substrate re-grading. Photograph taken by Chelsea Martin of VHB on 12/28/10

Photo 4: View looking south at Bridge No. 19 temporary replacement over the White River. Photograph taken by Chelsea Martin of VHB on 12/28/10

NATURAL RESOURCES MEMORANDUM
Rochester ER BRF 0162 (18) - Rochester, VT
Bridge No. 19, Route 73 WETLAND AND STREAM DELINEATION PHOTOGRAPHS
February 16, 2012

Photo 5: View of east bank of the White River, upstream of Temporary Bridge No. 19. Photograph taken by VHB on 12/05/11

Photo 6: View looking north of Temporary Bridge No. 19 at White River. Photograph taken by VHB on 12/13/10

APPENDIX D

HISTORIC PROPERTIES MEMORANDUM

Transportation
Land Development
Environmental
Services

Vanasse Hangen Brustlin, Inc.

101 Walnut Street
P. O. Box 9151
Watertown, MA 02471-9151
617 924 1770
FAX 617 924 2286

Memorandum

To: Mark Colgan, Director of Transportation Engineering

Date: March 1, 2012

Project No.: 57517.00

From: Nicole Benjamin-Ma, Preservation Planner and Rita Walsh, Senior Preservation Planner

Re: Results of Vermont Division for Historic Preservation (DHP) site file search and field visit, Bridge 19, Rochester, VT

Introduction

This memo serves three purposes: 1) to record the results of a Vermont Division for Historic Preservation (DHP) site file search for previously recorded above-ground historic properties and 2) to report field observations regarding potential effects to historic properties, both previously listed or inventoried or newly identified, within the area of effect for the Bridge 19 replacement project in Rochester, Vermont, and 3) to present our opinion as to whether or not the project will have an effect or adverse effect on any historic properties. .

The limit of direct physical work for this project is defined as the area immediately surrounding the current bridge, extending approximately 500 feet north and south of the bridge along the White River and Route 100, and approximately 1000 feet along Brandon Mountain Road (Route 73). The site file investigation and field inspection extended further out from this direct impact area, to account for historic properties' views to and from the bridge.

The intention of the site file search was to identify properties in the vicinity of the project area listed in the National and State Registers of Historic Places and/ or recorded in the state inventory. During the subsequent field visit, an evaluation was made regarding the potential effects of the bridge replacement on any recorded properties, as well as additional properties that would be considered potentially eligible for listing in the National Register.

It is our opinion that the project will not have an adverse effect to any historic properties listed in, or potentially eligible for listing in, the National Register.

Methods

Site file search

We limited our site file search to a one-half mile radius around the project area, which was anticipated to be a reasonable distance to consider possible visual impacts. The extent of this study radius was modified during the subsequent field investigation to reflect actual field visibility (see field visit methods). The site file search was conducted on February 16, 2012 at the DHP office in Montpelier. Maps accompanying the National Register nomination forms on file were used to identify listed individual property and districts in the vicinity of the project area. Properties listed in

the State Register, as well as recorded properties which have not been added to either the State Register or the National Register, were accompanied by a map of the property location.

Field visit

A field visit was conducted on February 16, 2012 to evaluate potential effects of the bridge replacement on previously recorded properties identified during the site file search. An effort was also made during the field visit to identify properties that have the potential to be considered eligible for the National Register, and to evaluate any potential effects to these resources.

All roads located within one-eighth to one-third mile of the project area were included in the field visit to identify any additional potentially eligible properties. The field investigation area was smaller for directions in which topography or road curves impeded views of the bridge.

Results and Recommendations

Site file search

There are no previously recorded properties located within the vicinity of the project area. There are no properties listed in the National Register or State Register located within the vicinity of the project area.

Field investigation

Along Route 100, road curvature and vegetation along the river limit visibility of the bridge to approximately 1000 feet north of the project area. South of the project area, a curve in Route 100 limits visibility of the bridge to approximately 500 feet. Along Brandon Mountain Road (Route 73), flat topography allows visibility of the bridge approximately 2000 feet west of the project area. The field investigation indicated five properties from with the bridge are visible. Three modest mid-20th century dwellings, one with an associated garage, are located along Brandon Mountain Road. Woodlawn Cemetery is located atop a hill approximately 1000 feet south of the project area, and it is likely that the bridge is visible from the hill (the cemetery access road was snow-covered during the field investigation, so a visibility determination from the top of the hill was not accomplished). In addition, an early20th century farmstead (84 Brandon Mountain Road) with farmhouse, dairy barn, silo, garage, and possible henhouse, is located adjacent to the west of the bridge (see photographs in Attachment A). Fields located along the White River north and south of the farm building cluster also appear to be associated with the farmstead. The farmstead retains a high degree of integrity, and appears to be eligible for the National Register as a well-preserved example of an early 20th-century farmstead with a number of associated outbuildings. However, replacement of the current bridge will not have an adverse effect on the setting of the property, unless the proposed design includes elements above the roadway that are significantly different than the previous bridge elements.

Conclusions

There were no previously recorded or listed properties in the vicinity of the project area. The field visit identified one farmstead that has not been previously recorded, but may be eligible for the National Register.

Our opinion is that the proposed project will not have any adverse effect to any historic properties listed in, or potentially eligible for listing in, the National Register.

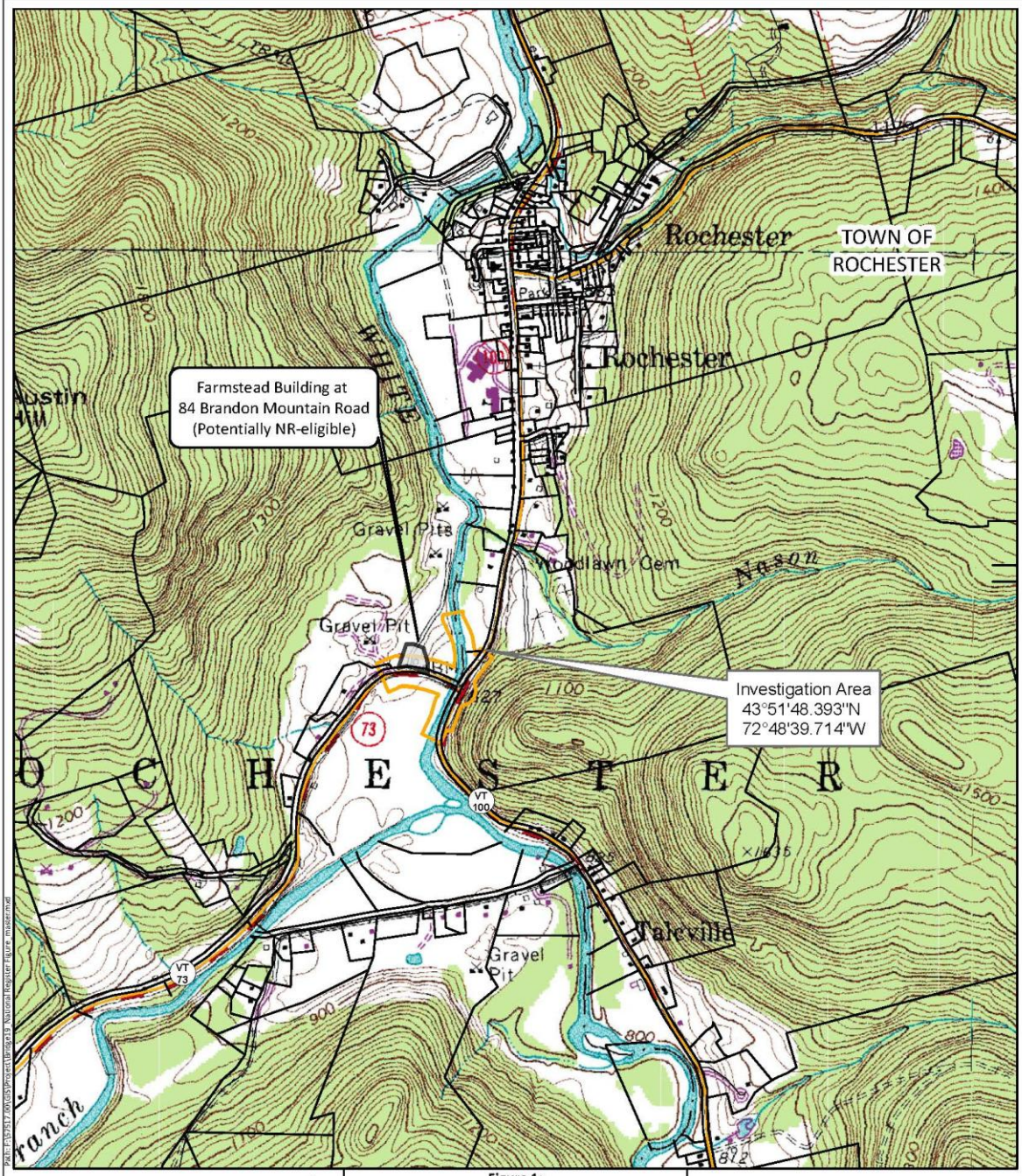
Please let me or Rita Walsh know if we can be of any further assistance.

Farmstead buildings at 84 Brandon Mountain Road, facing northeast.

Farmhouse at 84 Brandon Mountain Road, facing northeast.

Barn and silo complex at 84 Brandon Mountain Road, facing north.

Outbuildings at 84 Brandon Mountain Road, facing northeast.



Legend
- Potentially National Register Eligible Property
- Rochester Parcels
- VHB Investigation Area
- Town Boundary
- Interstate
- US Highway
- State Named Highway
- Town Road

N

Figure 1:
Vermont Agency of Transportation (VTrans)
Rochester, Vermont
Bridge 19
National Register Properties

March 01, 2012

1,200 600 0 1,200 Feet

Sources: Roads by VTrans (2009), VHD Streams, Town and County Boundaries and Roads from VCGI (2010),Register sites located by VHB (2012).

VHB Vanasse Hangen Brustlin, Inc.

User: CMartin

APPENDIX E

SUBSURFACE INVESTIGATION MEMORANDUM

AGENCY OF TRANSPORTATION **OFFICE MEMORANDUM**

To: Jennifer Fitch, Structures Project Manager

CEE CCB

From: Callie Ewald, Geotechnical Engineer via Christopher C. Benda, P.E., Soils and Foundations Engineer

Date: May 1st, 2012

Subject: Rochester ER STP 0162(18) – Subsurface Investigation

1.0 INTRODUCTION

We have completed our geological and geotechnical subsurface investigation for the proposed replacement of Bridge 19 located on VT Route 73 in Rochester, Vermont. Currently, a temporary bridge exists over the White River in the same location as the original bridge that was destroyed during Tropical Storm Irene and removed shortly after. Contained herein are the results of field sampling and testing, laboratory analyses of soil and rock samples, as well as a boring location map and boring logs.

2.0 FIELD INVESTIGATION

The field investigation was conducted between March 27th and March 29th, 2012. Three standard penetration borings were drilled to determine the existing subsurface stratum at each abutment as well as attain a profile of the shallow bedrock surface encountered at the eastern abutment. A summary of the location of each boring and corresponding ground surface elevation as well as elevation of bedrock can be found in Table 1. The values for the Northings and Eastings are based on the Vermont State Plane Grid Coordinate System NAD 83, and were located by VHB after drilling operations were complete. A boring location plan created by VHB can be found attached.

Table 1: Boring Locations and Elevations

Boring Number	Easting (ft)	Northing (ft)	Ground Elevation (ft)	Depth to Bedrock (ft)	Bedrock Elevation (ft)
B – 102	1558458.4	497119.9	824.8	73.0	751.8
B – 103	1558593.0	497057.5	826.6	24.0	802.6
B – 104	1558581.8	497038.7	826.7	25.5	801.2

During the boring operations, split spoon samples and standard penetration tests (SPT) were taken continuously to bedrock in all of the borings. When bedrock was encountered, NX rock cores were taken 10 feet into bedrock to collect five foot core sample runs. The drillers noted cobbles and boulders as well as a few voids, sometimes greater than 2 feet, between 12 feet and bedrock in Borings B-103 and B-104 at the eastern abutment. A possible log mat was encountered 18 feet below the ground surface in Boring B-104. For each boring, soil samples were visually classified and SPT blow counts were recorded on the boring logs.

3.0 FIELD AND LABORATORY TESTING

The standard penetration resistance of the in-situ soil is determined by the number of blows required to drive a 2 inch OD split barrel sampler into the soil with a 140 pound hammer dropped from a height of 30 inches, in accordance with procedures specified in AASHTO T206. During the standard penetration test (SPT), the sampler is driven for a total length of 2 feet, while counting the blows for each 6 inch increment. The SPT N-value, which is defined as the sum of the number of blows required to drive the sampler through the second and third increments, is commonly used with established correlations to estimate a number of soil parameters, particularly the shear strength and density of cohesionless soils. The N values provided on the boring logs are raw values and have not been corrected for energy, borehole diameter, rod length or overburden pressure. The VT Agency of Transportation has determined a hammer correction value, C_E, to account for the efficiency of the SPT hammer on the drill rig. For this project a CME 45C Track Rig was used, with a hammer energy correction factor of 1.34. This value, included on the boring logs, was used in calculations to determine soil parameters. Laboratory tests were conducted on all samples to evaluate grain size, moisture content, and percent finer than No. 200 sieve. This testing was conducted on all of the soil samples and results can be found on the attached boring logs.

A detailed description of the rock cores is presented on the logs in addition to Recovery and Rock Quality Designation (RQD). The percent recovery is defined as the length of core obtained expressed as a percentage of the total length cored. RQD is the total length of core pieces, 4 inches or greater in length, expressed as a percentage of the total length cored. RQD provides an indication of the integrity of the rock mass and relative extent of seams, jointing and bedding planes.

4.0 FOUNDATION RECOMMENDATIONS

Based on a preliminary look at the subsurface investigation results, an integral abutment supported on piles appears to be feasible at the western abutment, while either a semi-integral or a conventional abutment on a spread footing on rock appear feasible at the eastern abutment location. This assumes an alignment similar to what is currently in place.

5.0 CONCLUSION

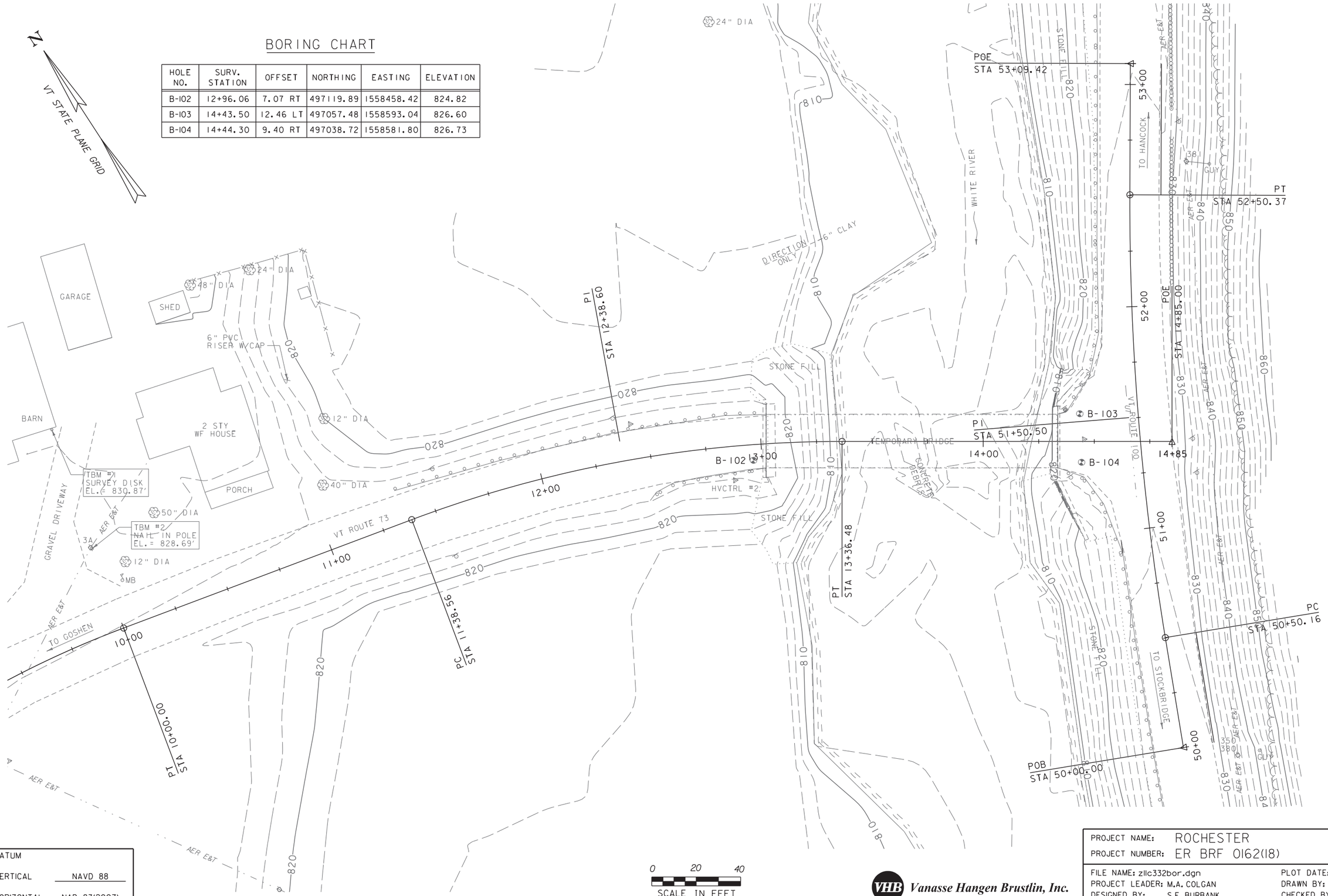
Once further information becomes available, we would be happy to assist in the analysis and design of component of the substructure. If you have any questions, or you would like to discuss this report, please contact us at (802) 828-2561. The boring logs are attached as available in the M:Projects\11c332\MaterialsResearch folder.

Enclosures: Boring Location Plan – 1 page
Boring Logs – 4 pages

cc: Electronic Read File/WEA
Project File/CCB
CEE

BORING CHART

HOLE NO.	SURV. STATION	OFFSET	NORTHING	EASTING	ELEVATION
B-102	12+96.06	7.07 RT	497119.89	1558458.42	824.82
B-103	14+43.50	12.46 LT	497057.48	1558593.04	826.60
B-104	14+44.30	9.40 RT	497038.72	1558581.80	826.73



DATUM	
VERTICAL	NAVD 88
HORIZONTAL	NAD 83(2007)

Vanasse Hangen Brustlin, Inc.

PROJECT NAME: ROCHESTER
PROJECT NUMBER: ER BRF 0162(18)

FILE NAME: z11c332bor.dgn
PROJECT LEADER: M.A. COLGAN
DESIGNED BY: S.E. BURBANK
BORING SHEET

PLOT DATE: 4/25/2012
DRAWN BY: E.A. FIALA
CHECKED BY: S.E. BURBANK
SHEET 1 OF 1

VHB 57517

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH SECTION
SUBSURFACE INFORMATION

BORING LOG

ROCHESTER
ER-BRF 0162(18)
VT-73 BR-19

Boring No.: **B-102**
Page No.: 1 of 2
Pin No.: 11C332
Checked By: CEE

Boring Crew: SALISBURY, GARROW
Date Started: 3/27/12 Date Finished: 3/29/12
VTSPG NAD83: N 497119.90 ft E 1558458.40 ft
Station: 12+96 Offset: 7.00
Ground Elevation: 824.8 ft

	Casing	Sampler
Type:	WB	SS
I.D.:	4 in	1.5 in
Hammer Wt:	N.A.	140 lb.
Hammer Fall:	N.A.	30 in.
Hammer/Rod Type:	Auto/AWJ	
Rig:	CME 45C TRACK	C_F = 1.34

Groundwater Observations

Date	Depth (ft)	Notes
03/28/12	8.0	AM

Depth (ft)	Strata (1)	CLASSIFICATION OF MATERIALS (Description)	Run (Dip deg.)	Core Rec. % (RQD %)	Drill Rate minutes/ft	Blows/6" (N Value)	Moisture Content %	Gravel %	Sand %	Fines %
		Asphalt Pavement, 0.0 ft - 0.5 ft								
		A-1-b, SaGr, brn, Moist, Rec. = 1.0 ft, NXDC				6-12-8-10 (20)	8.1	44.9	38.7	16.4
		A-1-a, SaGr, brn, Moist, Rec. = 1.0 ft, NXDC				5-13-13-12 (26)	7.4	54.9	32.4	12.7
5		A-1-b, SaGr, grn-brn, Moist, Rec. = 0.8 ft, NXDC				20-15-18-25 (33)	6.8	52.6	32.8	14.6
		Field Note:, No Recovery, Rock in sampler.				R@5.0"				
		Field Note:, NXDC, Cobbles								
10		A-1-a, SaGr, brn, Moist, Rec. = 1.3 ft, NXDC				12-22-23-18 (45)	9.8	52.4	35.1	12.5
		A-1-b, GrSa, brn, Moist, Rec. = 1.1 ft, NXDC				3-8-6-4 (14)	13.9	43.1	44.5	12.4
		A-1-b, GrSa, brn, Moist, Rec. = 1.1 ft, NXDC, Lost water return at 13.0 ft.				4-3-2-5 (5)	15.3	34.8	51.7	13.5
15		A-4, SiSa Varved, brn, Moist, Rec. = 1.3 ft, NXDC				3-2-2-4 (4)	33.7	6.2	51.1	42.7
		A-2-4, GrSa Varved, brn, Moist, Rec. = 1.0 ft, NXDC				3-2-2-4 (4)	27.9	43.0	45.9	11.1
20		A-1-b, SaGr, brn, Moist, Rec. = 1.0 ft, NXDC				7-8-5-4 (13)	12.8	48.5	42.6	8.9
		Field Note:, No Recovery, NXDC, Gravel				3-4-4-1 (8)				
		Field Note:, No Recovery, Rock in sampler.				5-5-5-6 (10)				
25		A-1-a, SaGr, brn, Moist, Rec. = 1.2 ft, NXDC				6-7-8-8 (15)	12.4	52.3	38.3	9.4
		A-2-4, GrSa, brn, Moist, Rec. = 1.1 ft, NXDC				6-4-5-8 (9)	17.2	26.8	54.7	18.5
30		A-1-b, GrSa, brn, Moist, Rec. = 0.8 ft, NXDC				6-6-4-5 (10)	15.1	32.8	57.4	9.8
		A-1-a, SaGr, brn, Moist, Rec. = 0.8 ft, NXDC				3-3-4-9 (7)	15.0	64.7	26.3	9.0
35										
		Field Note:, NXDC, Gravel								
		A-4, SiSa, brn, Moist, Rec. = 1.0 ft				6-5-6-7 (11)	25.4	0.2	63.4	36.4
40										
		A-2-4, Sa, brn, Moist, Rec. = 1.0 ft				3-4-4-5 (8)	26.3	7.4	75.7	16.9

Notes:
1. Stratification lines represent approximate boundary between material types. Transition may be gradual.
2. N Values have not been corrected for hammer energy. C_E is the hammer energy correction factor.
3. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH SECTION
SUBSURFACE INFORMATION

BORING LOG

ROCHESTER
ER-BRF 0162(18)
VT-73 BR-19

Boring No.: **B-102**
Page No.: 2 of 2
Pin No.: 11C332
Checked By: CEE

Boring Crew: SALISBURY, GARROW
Date Started: 3/27/12 Date Finished: 3/29/12
VTSPG NAD83: N 497119.90 ft E 1558458.40 ft
Station: 12+96 Offset: 7.00
Ground Elevation: 824.8 ft

	Casing	Sampler
Type:	WB	SS
I.D.:	4 in	1.5 in
Hammer Wt:	N.A.	140 lb.
Hammer Fall:	N.A.	30 in.
Hammer/Rod Type:	Auto/AWJ	
Rig:	CME 45C TRACK	C_F = 1.34

Groundwater Observations

Date	Depth (ft)	Notes
03/28/12	8.0	AM

Depth (ft)	Strata (1)	CLASSIFICATION OF MATERIALS (Description)	Run (Dip deg.)	Core Rec. % (RQD %)	Drill Rate minutes/ft	Blows/6" (N Value)	Moisture Content %	Gravel %	Sand %	Fines %
		Field Note:, No Recovery				5-5-6-6 (11)				
50										
		Field Note:, NXDC, Sand, Used Bentonite.								
		A-2-4, Sa, brn, Moist, Rec. = 1.4 ft				6-7-9-8 (16)	26.4		87.6	12.4
55		Field Note:, Casing locked up at 55.0 ft., Very fine sand. Sleaved down to 3 inch casing.								
		A-4, SiSa, brn, Moist, Rec. = 1.4 ft				7-8-12-12 (20)	23.3		53.9	46.1
60										
		A-2-4, GrSiSa, brn, Moist, Rec. = 1.0 ft				12-15-13-15 (28)	24.0	20.1	59.6	20.3
65		A-4, SiSa, gry, Moist, Rec. = 0.5 ft					27.9		63.3	36.7
		A-2-4, SiSa, brn, Moist, Rec. = 1.4 ft				15-16-16-20 (32)	23.8	7.7	62.6	29.7
70		Field Note:, BXDC, Very weathered bedrock								
75		73.0 ft - 78.0 ft, Pale green, Quartz-sericite Schist, and chloritoid phyllite with quartzite. Moderately soft, Unweathered, Fair rock, BXGDC, Poor RQD may be the result of mechanical breakage. RMR = 49	1 (55)	74 (0)	5 4 5 4 5	Top of Bedrock @ 73.0 ft				
80		78.0 ft - 83.0 ft, Pale green, Quartz-sericite Schist, and chloritoid phyllite with quartzite. Moderately soft, Unweathered, Fair rock, BXGDC, Poor RQD may be the result of mechanical breakage. RMR = 49	2 (55)	76 (0)	5 7 6 6 6					
85		Hole stopped @ 83.0 ft								

Notes:
1. Stratification lines represent approximate boundary between material types. Transition may be gradual.
2. N Values have not been corrected for hammer energy. C_E is the hammer energy correction factor.
3. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH SECTION
SUBSURFACE INFORMATION

BORING LOG

ROCHESTER
ER-BRF 0162(18)
VT-73 BR-19

Boring No.: **B-103**
Page No.: 1 of 1
Pin No.: 11C332
Checked By: CEE

Boring Crew: SALISBURY, GARROW
Date Started: 3/27/12 Date Finished: 3/28/12
VTSPG NAD83: N 497057.50 ft E 1558593.00 ft
Station: 14+43 Offset: -12.50
Ground Elevation: 826.6 ft

	Casing	Sampler
Type:	WB	SS
I.D.:	4 in	1.5 in
Hammer Wt:	N.A.	140 lb.
Hammer Fall:	N.A.	30 in.
Hammer/Rod Type:	Auto/AWJ	
Rig:	CME 45C TRACK	C_F = 1.34

Groundwater Observations

Date	Depth (ft)	Notes
03/27/12	7.4	AM

Depth (ft)	Strata (1)	CLASSIFICATION OF MATERIALS (Description)	Run (Dip deg.)	Core Rec. % (RQD %)	Drill Rate minutes/ft	Blows/6" (N Value)	Moisture Content %	Gravel %	Sand %	Fines %
		Asphalt Pavement, 0.0 ft - 1.3 ft								
		A-1-b, SaGr, brn, Moist, Rec. = 1.0 ft				5-5-6-10 (11)	10.7	44.3	41.3	14.4
5		A-1-b, SaGr, brn, Moist, Rec. = 0.7 ft				2-4-4-3 (8)	15.7	54.7	27.0	18.3
		A-2-4, SiGrSa, brn, Moist, Rec. = 1.0 ft				6-3-2-3 (5)	17.3	29.0	49.8	21.2
		A-2-4, GrSa, brn, Moist, Rec. = 0.7 ft				3-3-3-3 (6)	12.4	31.8	50.7	17.5
10		A-2-4, GrSa, brn, Moist, Rec. = 0.7 ft				3-2-3-2 (5)	12.6	29.2	56.9	13.9
		A-1-b, GrSa, brn, Moist, Rec. = 0.3 ft, Broken Rock was within sample. Advanced casing.				R@3.5"	14.1	29.3	56.4	14.3
		Field Note:, NXMDC, Boulders								
15		Field Note:, Possible Void								
		Field Note:, NXMDC, Boulders								
20		Field Note:, Possible Void								
		A-1-b, Weathered Rock with Sandy Gravel, brn, Moist, Rec. = 0.8 ft				4-5-R@6.0"	11.4	49.0	34.4	16.6
25		24.0 ft - 29.0 ft, Gray, Grading to pale green quartz-sericite Schist, with quartzite. Medium hard, Unweathered, Fair rock, NXMDC, RMR = 59	1 (55)	86 (54)	8 5 6 5 5	Top of Bedrock @ 24.0 ft				
30		29.0 ft - 34.0 ft, Pale green, Quartz-sericite Schist, with quartzite. Moderately hard, Unweathered, Good rock, NXMDC, RMR = 63	2 (55)	94 (86)	5 7 7 7 8					
35		Hole stopped @ 34.0 ft								
40										
45										

Notes:
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3. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH SECTION
SUBSURFACE INFORMATION

BORING LOG

ROCHESTER
ER-BRF 0162(18)
VT-73 BR-19

Boring No.: **B-104**
Page No.: 1 of 1
Pin No.: 11C332
Checked By: CEE

Boring Crew: SALISBURY, GARROW
Date Started: 3/27/12 Date Finished: 3/27/12
VTSPG NAD83: N 497038.70 ft E 1558581.80 ft
Station: 14+44 Offset: 9.50
Ground Elevation: 826.7 ft

	Casing	Sampler
Type:	WB	SS
I.D.:	4 in	1.5 in
Hammer Wt:	N.A.	140 lb.
Hammer Fall:	N.A.	30 in.
Hammer/Rod Type:	Auto/AWJ	
Rig:	CME 45C TRACK	C_F = 1.34

Groundwater Observations

Date	Depth (ft)	Notes
		None Taken.

Depth (ft)	Strata (1)	CLASSIFICATION OF MATERIALS (Description)	Run (Dip deg.)	Core Rec. % (RQD %)	Drill Rate minutes/ft	Blows/6" (N Value)	Moisture Content %	Gravel %	Sand %	Fines %
		Asphalt Pavement, 0.0 ft - 1.1 ft								
		Field Note:, NXDC, Gravel A-1-b, GrSa, brn, Moist, Rec. = 0.8 ft				5-5-4-4 (9)	10.3	34.7	50.9	14.4
5										
		Field Note:, NXDC, Gr Sa Si A-2-4, GrSa, brn, Moist, Rec. = 0.8 ft				3-2-3-3 (5)	12.9	20.3	61.2	18.5
10										
		Field Note:, NXDC, Gravel A-1-b, SaGr, brn, Moist, Rec. = 1.0 ft, Broken Rock was within sample.				3-4-14-12 (18)	9.1	57.7	31.8	10.5
15										
		Field Note:, Possible Void Field Note:, NXDC, Possible Silt Visual Description, Large chunks of Wood with sand & gravel, brn, Moist, Rec. = 0.5 ft				8-3-5-8 (8)				
20										
		Field Note:, NXDC A-1-a, Weathered Rock with Sand & Gravel, brn, Moist, Rec. = 1.1 ft				10-8-7-17 (15)	8.8	58.5	28.2	13.3
25										
		25.5 ft - 30.5 ft, Pale green, Quartz-sericite Schist, and chloritoid phyllite with quartzite. Moderately soft to moderately hard, Unweathered, Fair rock, NXMDC, RMR = 54	1 (55)	100 (40)	5 6 8 6 6	Top of Bedrock @ 25.5 ft				
30		30.5 ft - 35.5 ft, Pale green, Quartz-sericite Schist, with quartzite. Moderately hard, Unweathered, Fair rock, NXMDC, Severely weathered vug at 32.7 feet. RMR = 59	2 (55)	100 (64)	5 6 4 5 6					
35		Hole stopped @ 35.5 ft								
40										
45										

Notes:
1. Stratification lines represent approximate boundary between material types. Transition may be gradual.
2. N Values have not been corrected for hammer energy. C_E is the hammer energy correction factor.
3. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

APPENDIX F

TRAFFIC DATA

AGENCY OF TRANSPORTATION **OFFICE MEMORANDUM**

POLICY, PLANNING AND INTERMODAL DEVELOPMENT DIVISION

TO: Jennifer Fitch, Structures Project Manager

FROM: Maureen Carr, Traffic Analysis Engineer MC
Colin Philbrook, Traffic Analysis Technician CCP

DATE: December 29, 2011

RE: Rochester ER BRF 0162(18)
VT 73, BR #19

As requested in your December 28, 2011 memo, please find complete estimated traffic data on the above project in the town of Rochester. The data for the years 2014, 2034 and 2054 is included in the table below.

If you have any questions, or if further information is needed, please call at x3667.

TRAFFIC DATA	2014	2034	2054
AADT	1500	1600	~
DHV	190	200	~
ADTT	130	190	~
%T	6.9	10.1	~
%D	57	57	~
FLEXIBLE ESAL	~	2014~ 2034 614,000	2014~ 2054 1,399,000

CC: Chris Cole, Director of Policy, Planning and Intermodal Development
Data Analysis Files

Rochester ER BRF 0162(18)-Memo.doc

APPENDIX G

PROJECT PURPOSE AND NEED STATEMENT

ROCHESTER

ER BRF 0162(18)

VT 73 Bridge No. 19 over the White River

Project Purpose & Need:

The purpose of the project is to replace the temporary structure with a permanent structure that provides sufficient hydraulic capacity and properly incorporates the intersection of VT Route 73 and VT Route 100. The temporary structure was an emergency repair for extensive damaged caused by Tropical Storm Irene and was not intended as a permanent solution.

The need for the project is to replace a temporary structure that was constructed for short term use. The temporary structure rests on a temporary abutment on the west end and restricts the allowable turning movements for trucks on the east approach at the intersection of VT Route 73 and VT Route 100.

Right of Way

New ROW Acquisition	fee simple	Yes ___X___	No _____
	permanent easement	Yes ___X___	No _____
	temporary easement	Yes ___X___	No _____

Description of taking: lands to be used for construction of east wingwalls and relocation of temporary bridge off alignment and temporary construction staging area.

Public Participation Opportunity

Pre-Design Site Meeting	Yes _____	No ___X___	Date _____
Public Information Meeting	Yes ___X___	No _____	Date ___5/14/2012___
Public Hearing Required (502)	Yes ___X___	No _____	Date ___TBD___

Comments by Local Officials/RPC's: Through traffic should be maintained during construction. The turning radius on the east approach is too tight.

APPENDIX H

LOCAL CONCERNS MEETING NOTES

Transportation
Land Development
Environmental
Services

Vanasse Hangen Brustlin, Inc.

7056 US Route 7
Post Office Box 120
North Ferrisburgh, VT 05473
Telephone 802.425.7788
Fax 802.425.7799
www.vhb.com

Local Concerns Meeting Notes

Attendees:	Joanne McDonnell, Larry Straus, Doon Hinderyckx, Rob Young (VTrans), Mark Colgan (VHB), public audience	Date/ Time:	2/ 13/ 2012 6:30 PM – 7:30 PM
		Project No.:	57517.00, 57518.00, 57526.00, 57527.00
Place:	Rochester Town Office 67 School Street Rochester, VT	Re:	Rochester VT 73 Four Bridges
		Notes taken by:	M. Colgan

MEETING PURPOSE:

The purpose of this Local Concerns Meeting was to provide the public and the local and regional officials an opportunity to provide input on their concerns for the projects.
The four projects are as follows:

Rochester ER STP 0162(19) – Bridge 13: VT73 over Brandon Brook
Rochester BRF 0162(16) – Bridge 15: VT73 over Brandon Brook
Rochester BRF 0162(17) – Bridge 16: VT73 over Corporation Brook
Rochester ER BRF 0162(18) – Bridge 19: VT73 over White River

Following are the comments received from the public during the Local Concerns Meeting. VHB responses are in ***bold italics*** following each comment.

COMMENTS:

ROCHESTER ER STP 0162(19) – BRIDGE 13 – No comments

ROCHESTER BRF 0162(16) – BRIDGE 15 –

1. A new alignment behind properties would make more sense.

   This concept will be discussed as part of the alternatives analysis. The current goal is to minimize property impacts for all four projects.

2. Channel constriction is a problem for water and ice. Would we need a longer bridge?

   A longer bridge has been recommended as part of the preliminary hydraulics analysis.

3. The State had a design ten years ago that went behind the church. Will that design be considered with this new project?

   This concept will be discussed as part of the alternatives analysis.

4. The alignment needs to be fixed.

   Options for alignment improvements will be evaluated.

ROCHESTER BRF 0162(17) – BRIDGE 16 – No comments

ROCHESTER ER BRF 0162(18) – BRIDGE 19 –

1. Please don't close the road. Through traffic should be maintained.

   Traffic control options will be evaluated for all four projects that will include both "closure" and "no closure" alternatives.

2. Will property owners receive special consideration for their concerns?

   Individual meetings will be held with those property owners who have parcels with proposed impacts.

3. There is some concern that a longer bridge would impact property more, but agreed that it should be lengthened.

   Longer bridge options would likely move the west abutment further west as existing channel is in line with the east abutment and the proximity of VT 100 restricts lengthening eastward.

4. Concern about the selection of a contractor by the low bid selection. Will the contractor be qualified?

   Vermont has a prequalification process and generally has a strong list of qualified bidders on any typical project. The procurement process requires a low bid selection.

5. Residents were labeled the "Island People" on VT 73 after Tropical Storm Irene.

   We understand many of the local hardships Rochester experienced post-Irene and we were involved in the recovery efforts locally. Efforts will be made to reduce impacts to traveling public where possible, but impacts must occur in order to replace these structures.

6. The turning radius is too tight.

   We will evaluate the truck turning radius on the East approach to the bridge.

7. How would a new bridge be built in the same place?

   There are options for this that include "no closure" and "temporary closure" of VT 73. We will evaluate both on-alignment and off-alignment options.

8. Will the septic system be impacted?

   The septic system impacts will be evaluated as part of the alternatives evaluation process.

9. Will you come back to present alternatives to the town?

   Yes, we will return to present the results of the alternatives analysis.

Rochester ER BRF 0162(18)
VHB Vanasse Hangen Brustlin, Inc.