STATE OF VERMONT
AGENCY OF TRANSPORTATION

Scoping Report

FOR

STATEWIDE NORTHWEST STP CULV(90): ESSEX VT15 BR #2

VT ROUTE 15, BRIDGE 2 OVER INDIAN BROOK

October 25, 2023

Table of Contents

I. Site Information

Bridge 2 is a State-owned bridge located on VT Route 15 in the Town of Essex approximately 0.3 miles southwest of the junction with VT-289. 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	Principle Arterial
Bridge Type	Single Span Reinforced Concrete box culvert
Culvert Span	8 feet
Culvert Length	76.25 feet
Average Cover	7 feet
Year Built	Unknown
Ownership	State of Vermont

Need

Bridge 2 carries VT Route 15 across Indian Brook. The following is a list of deficiencies of Bridge 2 and VT Route 15 in this location:

1. The culvert is in Poor condition:
    a. The concrete box has (2) full perimeter cracks with heavy efflorescence leakage, rust staining, and heavy saturation. Timber bracing was placed between the midspan and upstream end to prevent further spalling and settlement in the roadway.
    b. Box spalling and delamination's are present along both upper portions of the cold joint locations with a large full depth hole present on the upstream cold joint.
    c. The box needs cleaning and patching at both cold joints to repair delaminated concrete, spalling and the full depth hole.
2. The existing culvert does not meet the measured bank full width.
3. VT Route 15 has substandard shoulder widths along the VT Route 15 corridor through the project area.

Traffic

A traffic study of this site was performed by the Vermont Agency of Transportation. The traffic volumes are projected for the years 2027 and 2047.

TRAFFIC DATA	2027	2047
AADT	10,657	11,692
DHV	1,298	1,467
%T	2.5	3.5
%D	50	50
ADTT	529	806
Flexible ESALS:	**2027~2047**	**2027~2067**
	3,827,000	8,628,000

Design Criteria

The design standards for this bridge project are the Vermont State Standards, dated October 22, 1997. Minimum standards are based on an ADT of 11,692, a DHV of 1,467, and a design speed of 40 mph for a Principal Arterial.

Design Criteria	Source	Existing Condition	Minimum Standard	Comment
Roadway Lane and Shoulder Widths	VSS Table 3.3	4'/11'/11'/6' (32')	10'/11'/11'/10' (42')	Substandard shoulder widths
Clear Zone Distance	VSS Table 3.4	No Issues Noted	14' fill / 14' cut	
Banking	VSS Section 3.13	Normal Crown (2%-0.7%)	8% (max)	
Speed	VSS Section 3.3	40 mph (Posted)	40 mph (design)	
Horizontal Alignment	AASHTO Green book Table 3-10b	$R = \infty$	R_{min} = 6710' @ NC	
Vertical Grade	VSS Table 3.5	-4.5% (max)	6% (max) for level terrain	
K Values for Vertical Curves	AASHTO Table 3-37	K_{sag} = 27	44 crest / 64 sag	
Vertical Clearance	VSS Section 3.8	No Issues Noted	16'-3" (min)	
Stopping Sight Distance	AASHTO Table 3-37	161' (Headlight Sight Distance)	305'	
Bicycle/Pedestrian Criteria	VSS Table 3.8	4'-6' shoulder	4' (min) paved shoulders	
Hydraulics	VTrans Hydraulics Section	HW/D @ 2% AEP = 0.91 HW/D @ 1% AEP = 1.04 Span: 8 feet	HW/D $\leq$ 1.2 @ 2% AEP HW/D $\leq$ 1.5 @ 1% AEP Minimum Bankfull Width: 12 feet	Meets HW/D ratios but Substandard BFW
Structural Capacity	SM, Ch. 3.4.1	Structurally Inadequate	Design Live Load: HL-93	Poor rated culvert

Inspection Report Summary

Culvert Rating	4 Poor
Channel Rating	7 Good

11/28/2022 Reinforced concrete box is in poor condition having two (2) full perimeter cracks with heavy efflorescence leakage, rust staining and heavy saturation. Box spalling and delamination's are present along both upper portions of cold joint locations with large full depth hole present on the upstream cold joint. Box is in need of cleaning and patching at both cold joints to repair delaminated concrete, spalling and full depth hole.

11/17/2021 Large holes around first construction joint have been covered with temporary supports to prevent further loss of material from above bank. Second construction joint has leakage with efflorescence and rust staining. Moderate cracking on both side walls with heavy rust staining. Map cracking throughout substructure. Impact damage on northern guardrail and minor settlement near north guardrail just above structure.

11/14/2016 The construction joints have heavy saturation throughout and extensive spalling with large delaminations. The spalling at the inlet segment joint penetrates as much as 8" and there is exposed reinforcing. This structure needs to have concrete repairs made at the construction joints with all loose concrete removed. JW/TB/AC

Hydraulics

The existing 8-foot span x 6-foot rise concrete box culvert does meet current standards of the VTrans Hydraulic Manual. However, it does not meet the state stream equilibrium standards for bankfull width (span length). The existing structure constricts the channel width, as it does not meet the 12-foot bank full width, resulting in an increased potential for debris blockage. This structure results in a headwater depth of 5.5 feet at 2% AEP and 6.3 feet at 1% AEP. VTrans Hydraulics has made several recommendations for a rehabilitation or replacement structure; these options are outlined in the preliminary hydraulics report in Appendix D.

Utilities

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

Underground:

- Comcast
- Consolidated Communications
- Firstlight Fiber
- Vermont Gas Systems
- Village of Essex Junction Water & Sewer

The water and gas lines run parallel to VT Route 15 on the southeast side of the roadway.

Aerial:

- Comcast
- Consolidated Communications
- Firstlight Fiber
- Green Mountain Power
- Vermont Electric Power Company
- Vermont Telephone Company

It is anticipated that all aerial and underground utilities will need to be relocated for construction of the preferred alternative.

Right Of Way

The existing Right-of-Way (ROW) is plotted on the Existing Conditions Layout Sheet. The structure is located outside of the existing State-owned ROW at both the inlet and outlet. It is anticipated that additional rights will need to be acquired for any construction alternative.

Environmental and Cultural Resources

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

Biological:

VTrans hired the consultant, Bear Creek Environmental, to perform a natural resource evaluation at this site.

Wetlands/Floodplains

There are wetland complexes mapped on both the inlet end and outlet end of the culvert along either side of the Indian Brook within the study area. The Vermont Fish and Wildlife Department is requiring full aquatic organism passage for both replacement and retrofit of this Route 2A BR 11 structure. For additional information, see the Existing Conditions Layout Sheet and the Natural Resources Memo in Appendix G.

Rare, Threatened, and Endangered Species

Lasmigona compressa (Creek Heelsplitter), a rare (S2 state rank) freshwater mussel, is the only rare animal species that has been documented within the vicinity of the project site according to the Vermont Natural Heritage database. Occurrences of Creek Heelsplitter from 2002 and 2006 were recorded several tenths of a mile downstream of the VT-15 BR 2 study area in Indian Brook.

Mark Ferguson of the Vermont Fish and Wildlife Department was contacted for a determination of whether a mussel survey of Indian Brook would be required if instream work for a culvert project were needed. In an email response Mr. Ferguson stated that there is little chance of any threatened or endangered mussel species occurring in this stream section and did not see a need for a formal survey.

Wildlife Habitat

According to the Vermont Conservation Design database on the Vermont Agency of Natural Resources BioFinder Mapping Tool, the study area has Surface Water and Riparian Areas and Physical Landscape Diversity rated as highest priority adjacent to Indian Brook within the study area.

Archeological:

The VTrans Archaeology Apprentice conducted a resource identification field visit on September 27th, 2019 and found one known VAI archaeological site (VTCH-9191) within a half kilometer of Bridge No. 2 over Indian Brook on Vermont Route 15 in Essex. Due to the close proximity of the site to the bridge, it is advisable to mark all undisturbed areas as archaeologically sensitive. Roadway prism disturbance is obvious at this location, so any area outside of the prism and/or utilities is deemed archaeologically sensitive. For additional information, see the Existing Conditions Layout Sheet and the Archeologic Memo in Appendix H.

Historic:

Bridge 2 is not historic. There was one property that was identified as a potentially NRHP-eligible property within a likely area of potential effect was identified at 38 Upper Main Street in Essex, at the northeastern quadrant of Bridge No. 2. Impacts to the former Abbott House at 38 Upper Main Street will most likely be avoided if work associated with replacing Bridge No. 2 is confined to the existing right of way.

Hazardous Materials:

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

Stormwater:

For the Essex VT Route 15 culvert, several of the adjacent properties have existing operational stormwater permits, however it is not anticipated that repair or replacement of the culverts would impact those permits. This culvert conveys Indian Brook and is located within the Indian Brook watershed, which is considered impaired due to stormwater-related issues and is listed on EPA's 303(d) list. This designation is unlikely to affect the culvert projects, but it does elevate the need for a design that is sensitive to this context.

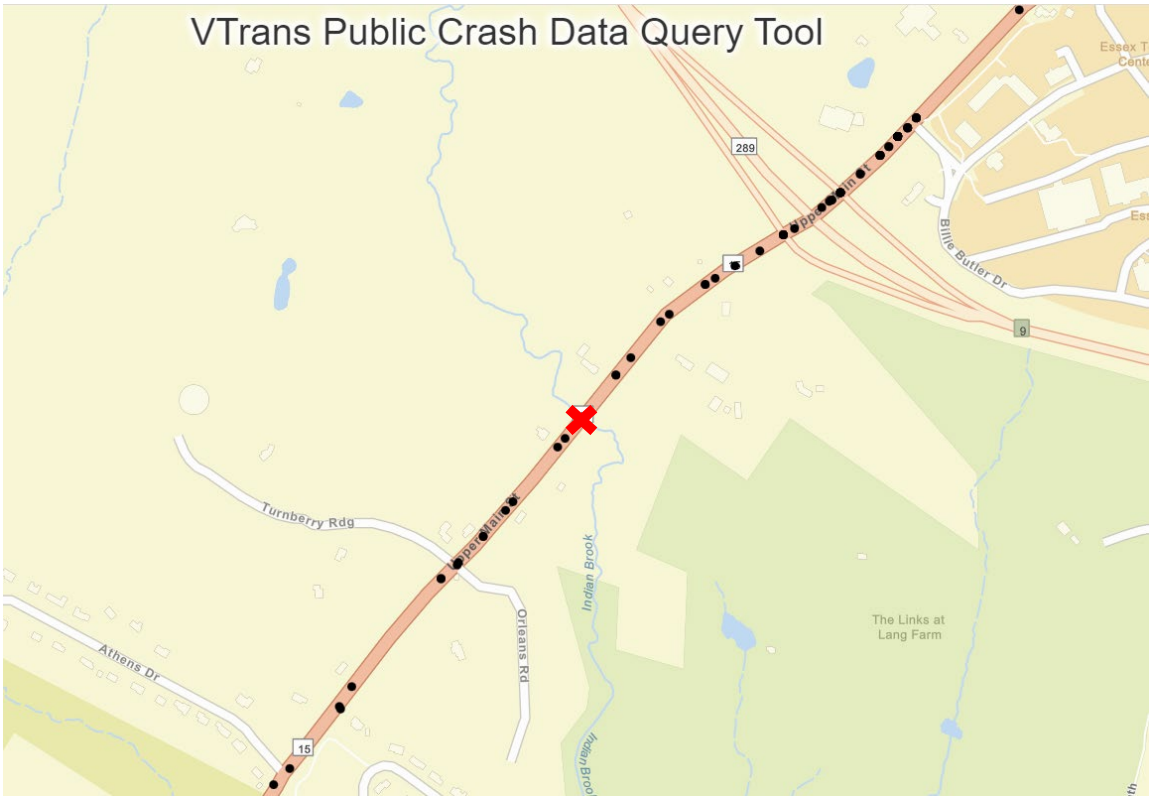
It is strongly encouraged that drainage work associated with this project, particularly around any ditching and culvert work, be aligned with the VTrans Phosphorus Control Highway Drainage Management Standards, as this may allow future credit toward achieving phosphorus reduction goals required by the Agency's TS4 permit.

Landscape Clearance

The VTrans landscape architect conducted a resource identification study on April 18th, 2022, and determined that there are potentially minor buffer impacts occurring as a result of the proposed work. It is recommended that re-vegetating the area with native trees and shrubs for river buffers, willow fascines or live stakes (depending on soil conditions at the waters' edge), and a diverse pollinator seed mix.

II. Safety

There have been 404 crashes along VT Route 15 in Essex in the last five-year period. 8 of those crashes were within approximately 1 mile the project area. The structure is not located within a designated high crash location section.



III. Local Concerns

A local concerns questionnaire was sent to the Town. The Town of Essex sent a reply on July 25th, 2022, and didn't have any concerns or issues with the project, but they did provide some comments in the Land Use section of the questionnaire. There is a copy of the questionnaire in Appendix N.

IV. Operations Concerns

An Operations questionnaire was sent to the VTrans maintenance District 5. No response has been received to date. There is a copy of the questionnaire in Appendix O.

V. Maintenance of Traffic

The Vermont Agency of Transportation has created 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 helps in this endeavor is closing bridges for portions of the construction period, rather than providing temporary bridges. In addition to saving money, the intention is to minimize the closure period with faster construction techniques and incentives to contractors to complete projects early. The Agency will consider the closure option on most projects where rapid reconstruction or rehabilitation is feasible. The use of prefabricated elements in new bridges will also expedite construction schedules. This can apply to decks, superstructures, and substructures. Accelerated Construction should provide enhanced safety for the workers and the travelling public while maintaining project quality. The following options have been considered:

Option 1: Off-Site Detour

This option would close the bridge and reroute traffic onto an official, signed State detour. There are two detours that could be used if the bridge is closed during construction. The two potential State-signed detours are as follows:

1. VT Route 15, to VT Route 289, to VT Route 2A, back to VT Route 15 (5.6 miles end-to-end)

2. VT Route 15, to VT Route 289, to VT Route 117, back to VT Route 15 (6.6 miles end-to-end)

A map of the detour routes can be found in Appendix P.

Advantages: This option would have minimal impacts to natural and cultural resources located up and downstream of the structure. This option reduces the time and cost of the project both at the development stage and construction. This is the safest traffic control option since the traveling public is removed from the construction site.

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

Option 2: Phased Construction

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

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

Based on the current AADT and DHV of 10,657 veh/day and 1,298 veh/hr respectively, 2-way traffic would need to be maintained throughout construction, in order to avoid considerable delays. Based on the current length of the culvert and fill over the culvert, 2-way traffic could be maintained with phased construction by widening VT Route 15 through the project area during construction. Due to the poor condition of the existing culvert, cutting the culvert in half while it is under live loading presents additional risk to the project. Additionally, the location of the joint between phases would need to be considered carefully in design with the location of existing cold joints in mind.

Advantages: Two-way traffic flow would be maintained through the project corridor during construction. Also, this option would have minimal impacts to adjacent properties and environmental and cultural resources. Right-of-Way would not be required for this maintenance of traffic option.

Disadvantages: Phased construction generally involves higher costs and complexity of construction. Costs are usually higher and construction duration is longer since many construction activities must be performed two times. Because this corridor has such high traffic volumes there would be increased traffic delays and backups around the project area. Additionally, since cars are traveling near construction activity, there is decreased safety.

Option 3: Temporary Bridge

From a constructability standpoint, a temporary bridge could be placed either upstream or downstream of the existing structure. A temporary bridge on either the upstream (northwestern) or downstream (southeastern) side of the road would have major impacts to wetlands, archeologically sensitive areas, and utilities. A temporary bridge on the upstream side of the culvert would require tree clearing and an aerial utility relocation. A downstream temporary bridge alignment would have impacts to an existing underground gas line and waterline.

Additional costs would be incurred to construct a temporary bridge, including the cost of fill for the approaches and the bridge itself, installation and removal of the temporary bridges and approaches, restoration of the disturbed area, and the time and money associated with the temporary Right-of-Way.

If a temporary bridge is chosen as the preferred method of traffic control, based on the traffic volumes, it should be a two-lane bridge. See the Temporary Bridge Layout Sheets in Appendix Q.

Advantages: Traffic flow can be maintained along the VT Route 15 corridor.

Disadvantages: This option would require multiple utility relocations and would have adverse impacts to surrounding wetlands and archeologic sensitive areas. There would be decreased safety to the workers and to vehicular traffic, because of cars driving near the construction site, and construction vehicles entering and exiting the construction site. This traffic control option would be more costly, and time consuming than an offsite detour. Additional Right-of-Way would need to be acquired for a temporary bridge either up or downstream.

VI. Alternatives Discussion

No Action

This alternative is not recommended. The culvert is in poor condition and will continue to deteriorate if no action is taken. The concrete box has two full perimeter cracks with heavy efflorescence leakage, rust staining, and heavy saturation. There is timber bracing between midspan and the upstream end to prevent further spalling and settlement in roadway along with delamination's on both upper portions of cold joint locations with large full depth hole present on the upstream cold joint. In the interest of safety to the traveling public, the No Action alternative is not recommended. No cost estimate has been provided for this alternative since there are no immediate costs.

Rehabilitation

This alternative is not recommended. Typically, a culvert rehabilitation option includes minimal amounts of work necessary to address maintenance needs, correct substandard features, and extends the useful life of the culvert. In this case rehabilitation options such as invert repair, pipe liner options, or embankment/channel improvements are not an adequate solution since they would reduce the hydraulic capacity of the already hydraulically inadequate structure and would not adequately improve on the structural condition of an already failing box culvert.

This structure is over 100 years old. This structure has outlived its expected design life and any rehabilitation option proposed would only extend the life of this structure a small amount until it would require eventual replacement. For these reasons, a rehabilitation option will not be considered.

Culvert Replacement with a New Buried Structure Using Open Cut

This alternative involves removing the existing concrete box culvert and replacing it with a new precast structure having a minimum span of 12 feet and minimum height of 8 feet. Since there is approximately 7 feet of fill above the existing culvert, there would not be a considerable amount of earthwork involved. Wingwalls would be required only to retain roadway fill. The various considerations under this option include: the roadway width, structure type, culvert length; and skew.

a. Roadway Width

The existing roadway is 32 feet wide which does not meet the minimum standard of 42 feet as set forth in the Vermont State Standards for areas with guardrail. The shoulder widths along the VT

Route 15 corridor near our project area do not meet the 8-foot width standard of a Principal Arterial. Since a new 75+ year structure is being proposed, the new structure length will be designed to be long enough to account for any future road widening project that came through this VT15 corridor. The roadway width will be designed to match back into the existing corridor.

b. Structure Type

The most common structure types for the recommended opening size are a 4-sided precast box culvert, or a 3-sided open bottom concrete structure. A plate arch is not recommended at this site, since it would have a reduced design life compared to a reinforced concrete structure. Soil and bedrock samples from the initial geotechnical investigation indicate that the site consists primarily of silt with varying amounts of sand and gravel below the subbase to the top of bedrock, located at approximately 15 feet below ground level. From the initial geotechnical investigation, possible foundation options for bridge replacement at a similar elevation as the existing structure is a buried structure supported with spread footings on soil or bedrock.

c. Culvert Size, Length and Skew

The existing culvert is a reinforced concrete box with an inside opening span of 8 feet and a clear height of 6 feet, providing a waterway opening of 48 square feet. If a new structure is chosen, the VTrans Hydraulics section recommended a structure with a minimum span of 12 feet and a minimum clear height of 6 feet. If a new reinforced concrete box culvert is chosen it should have a 12-foot span and 8-foot height, with the invert buried 2 feet, bed retention sills, and filled with E-Stone Type II. If a concrete rigid frame is chosen, that structure should have a 12-foot span and minimum height of 6 feet. In order to accommodate a 42-foot-wide roadway, the proposed barrel length will be approximately 80 feet long. The culvert will have a skew of 90 degrees to the roadway to match the existing skew of the channel.

d. Maintenance of Traffic

Either an off-site detour, phased construction, or a temporary culvert/roadway would be appropriate measures for traffic control at this site.

Advantages: This alternative would address the structural deficiencies of the existing culvert, with a brand-new culvert with a 75-year design life. This option would not meet the minimum roadway width standards. This option would have minimal future maintenance costs.

Disadvantages: This option has the highest upfront costs.

VII. Alternatives Summary

Based on the existing site conditions, culvert condition, and recommendations from hydraulics and others, the following alternatives are offered:

- Alternative 1a: New Precast Box Culvert or 3-Sided Structure (open cut) with Traffic Maintained on Offsite Detour
- Alternative 1b: New Precast Box Culvert or 3-Sided Structure (open cut) with Traffic Maintained with Phased Construction
- Alternative 1c: New Precast Box Culvert or 3-Sided Structure (open cut) with Traffic Maintained on a Temporary Bridge

A cost evaluation for each of the alternatives is shown below.

VIII. Cost Matrix[1]

Essex VT15 BR#2		Do Nothing	Alternative 1		
			Culvert Replacement with Buried Structure		
			On-Alignment		
			a. Offsite Detour	b. Phased Construction	c. Temporary Bridge
COST	Structure Cost	$0	$357,694	$411,348	$357,694
	Removal of Structure	$0	$60,000	$103,500	$60,000
	Roadway	$0	$215,919	$602,809	$419,346
	Maintenance of Traffic	$0	$119,900	$734,100	$529,040
	Construction Costs	$0	$753,513	$1,851,757	$1,366,079
	Construction Engineering & Contingencies	$0	$226,054	$462,939	$341,520
	Accelerated Premium	$0	$30,141	$0	$0
	Total Construction Costs w CEC	$0	$1,009,707	$2,314,696	$1,707,599
	Preliminary Engineering	$0	$263,729	$462,939	$341,520
	Right of Way	$0	$10,000	$35,000	$60,000
	Total Project Costs	$0	$1,283,437	$2,812,636	$2,109,119
	Annualized Costs	$0	$17,200	$37,600	$28,200
TOWN SHARE	No Local Share				
TOWN %					
SCHEDULEING	Project Development Duration	N/A	4 years	4 years	4 years
	Construction Duration	N/A	6-8 months	8 months	8 months
	Closure Duration (If Applicable)	N/A	3 to 7 days	NA	NA
ENGINEERING	Typical Section - Roadway (feet)	32	32	32	32
	Geometric Design Criteria	No Change	Substandard shoulder widths		
	Traffic Safety	No Change	Improved	Improved	Improved
	Alignment Change	No Change	No Change	No Change	No Change
	Bicycle Access	No Change	Meets Minimum Standards		
	Pedestrian Access	No Change	No Change	No Change	No Change
	Hydraulics	Substandard BFW	Meets Minimum BFW and VTrans Hydraulic Standards		
	Utilities	No Change	Requires aerial and underground relocation		
OTHER	ROW Acquisition	No Change	Yes	Yes	Yes
	Road Closure	No Change	Yes	No	No
	Design Life (years)	No Change	75	75	75

[1] Costs are estimates only, used for comparison purposes.

IX. Conclusion

Alternative 1c is recommended; to replace the existing culvert with a new precast buried structure while traffic is maintained on either an offsite detour or phased construction.

Structure:
The existing culvert is likely around 100 years old and has reached the end of its anticipated design life. Additionally, the current culvert does not meet the minimum hydraulic standard for bank full width, and would become even more substandard if rehabilitated, further warranting a full replacement. Aquatic organism passage (AOP) is important for this culvert which can be better accommodated with a full structure replacement.

Due to the structural condition of the existing culvert along with the required bank full width of a new structure, a new buried structure is more cost effective than a rehabilitation effort.

The new culvert will be a precast concrete buried structure having a minimum clear span of 12 feet and minimum clear rise of 6 feet, as per the VTrans Hydraulic Section's recommendation. Either a 4-sided precast box culvert or a 3-sided rigid frame structure should be considered for replacement. If a 4-sided precast box culvert is chosen bed retention sills will be required to allow for a natural channel bottom to form, accommodating aquatic organism passage. The new culvert should have headwalls that extend four feet below the channel bottom at the inlet and the outlet to prevent undermining. This structure will have no roadway overtopping below the Q_{100} storm event.

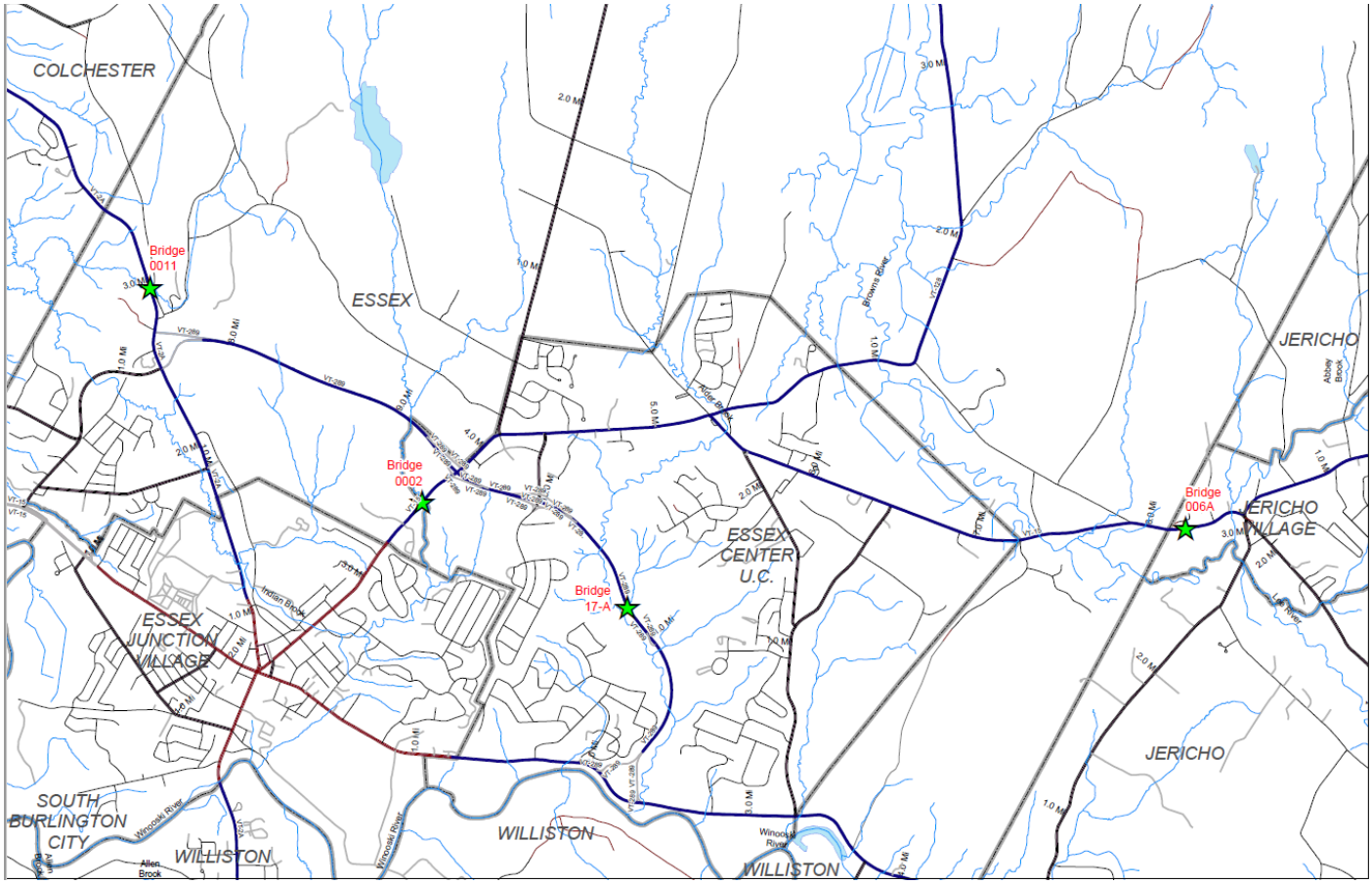
The existing roadway through the project area has a 32-foot width which does not meet the minimum Vermont State Standards of 42-feet. The minimum width specifies (2) 11-foot travel lanes with 10-foot shoulders. The corridor along VT Route 15 does not meet the minimum standard width, so consideration should be given into constructing the box long enough to accommodate a 42-foot paved width in the future and constructing the VT Route 15 roadway over the culvert to match the current corridor. This would result in an approximate 80-foot-long buried structure.

Traffic Control:
To reduce impacts to utilities and environmental and cultural resources, a temporary bridge will not be constructed. The best regional detour route available has an end-to-end distance of approximately 5.6 miles. The traffic volumes along this corridor are very high, however, there are many local detour routes that the traveling public can use to avoid this section of road during a short-term closure. Using a combination of an offsite detour and a phased single-lane closure approach may be a good method of managing traffic volumes by keeping the corridor partially open during construction. Using either an offside detour or phased construction practices will not greatly impact the environmental and cultural resources in the project area, which benefits the project timeline and cost. The final decision on a maintenance of traffic plan will be determined in the design phase of this project.

Statewide Northwest STP CULV(90) Bridge Locations:
There are several structures within the Statewide Northwest STP CULV(90) project. The structures are as follows:

- ESSEX VT2A Bridge 11 over unnamed brook.
- ESSEX VT15 Bridge 2 over Indian brook.
- ESSEX VT289 Bridge 17-A over unnamed brook.
- JERICHO VT15 Bridge 6A over unnamed brook.

These bridges are being bundled together for scoping, design and/or construction.



X. Appendices

- Appendix A: Site Pictures
- Appendix B: Town Map
- Appendix C: Bridge Inspection Report
- Appendix D: Hydraulics Memo
- Appendix E: Preliminary Geotechnical Information
- Appendix F: Resource Identification Completion Memo
- Appendix G: Natural Resources Memo
- Appendix H: Archeology Memo
- Appendix I: Historic Memo
- Appendix J: Environmental Specialist resource ID
- Appendix K: Hazardous Sites Map
- Appendix L: Stormwater Resource ID
- Appendix M: Landscape Clearance Resource ID
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- Appendix O: Operations Input
- Appendix P: Detour Map
- Appendix Q: Plans

Appendix A: Site Pictures

Upstream Elevation (Inspection photo 2021)

Upstream Rail (Inspection photo 2020)

Timber bunker below Upstream Spall (Inspection photo 2021)

Box Soffit Shallow Rebar below Roadway (Inspection photo 2021)

Eastern Box Wall - 1 (Inspection photo 2021)

Eastern Box Wall - 2 (Inspection photo 2021)

Eastern Box Wall Upstream (Inspection photo 2021)

Timber Bunker (Inspection photo 2021)

Box from upstream End (Inspection photo 2021)

Downstream Area of Box (Inspection photo 2021)

Inspection finding photo 2021

Inspection finding photo 2021

Inspection finding photo 2021

Inspection finding photo 2021

Inspection finding photo 2021

Depression along North Side with Barrel (Inspection photo 2021)

Impact Damage Northern Side Rail (Inspection photo 2021)

Appendix B: Town Map

ESSEX
VT-15 BR 2

Scale: 1:46,980

N

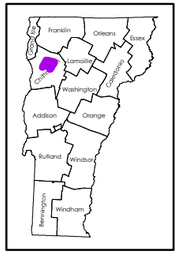
- INTERSTATE
- STATE LONG
- STATE SHORT
- TOWN LONG
- FEDERAL AID
- BIKE PATH
- INTERSTATE
- STATE HIGHWAY
- CLASS 1
- CLASS 2
- CLASS 3
- CLASS 4
- LEGAL TRAIL
- PRIVATE
- DISCONTINUED
- FEDERAL AID
- MAINTENANCE DISTRICT

NEIGHBORING DISTRICT (WITH BUFFERED EXTENSION)

- 8 - St. Albans
- POLITICAL BOUNDARY
- VTRANS REGION BOUNDARY
- NAMED RIVER-STREAM
- UNNAMED RIVER-STREAM
- Point from Local Bridge Data *
- Point from Local Culvert Data *

* Points are from local town bridge and culvert inventories. Some points may overlap where VTrans has also conducted an inventory on the Town highway.
Data source: VOBCIT aka VTCulverts

Produced by:
Mapping Section
Division of Policy, Planning and Intermodal Development
Vermont Agency of Transportation
March 2021



ESSEX

COUNTY-TOWN CODE: **0406-0**
CHITTENDEN COUNTY
DISTRICT # 5
District Long Name: Colchester District
VTrans Four Region: Northwest

This map was funded in part through grants from the Federal Highway Administration, U.S. Department of Transportation. The representation of the authors expressed herein do not necessarily state or reflect those of the U. S. Department of Transportation.

Appendix C: Bridge Inspection Report

VERMONT
AGENCY OF TRANSPORTATION

Route VT15 /
Structure #0002 / (Routine)
VT15 over INDIAN BROOK
Team Lead: Stephen Piro, **Inspection Date:** 11/28/2022

Town: 70 - ESSEX

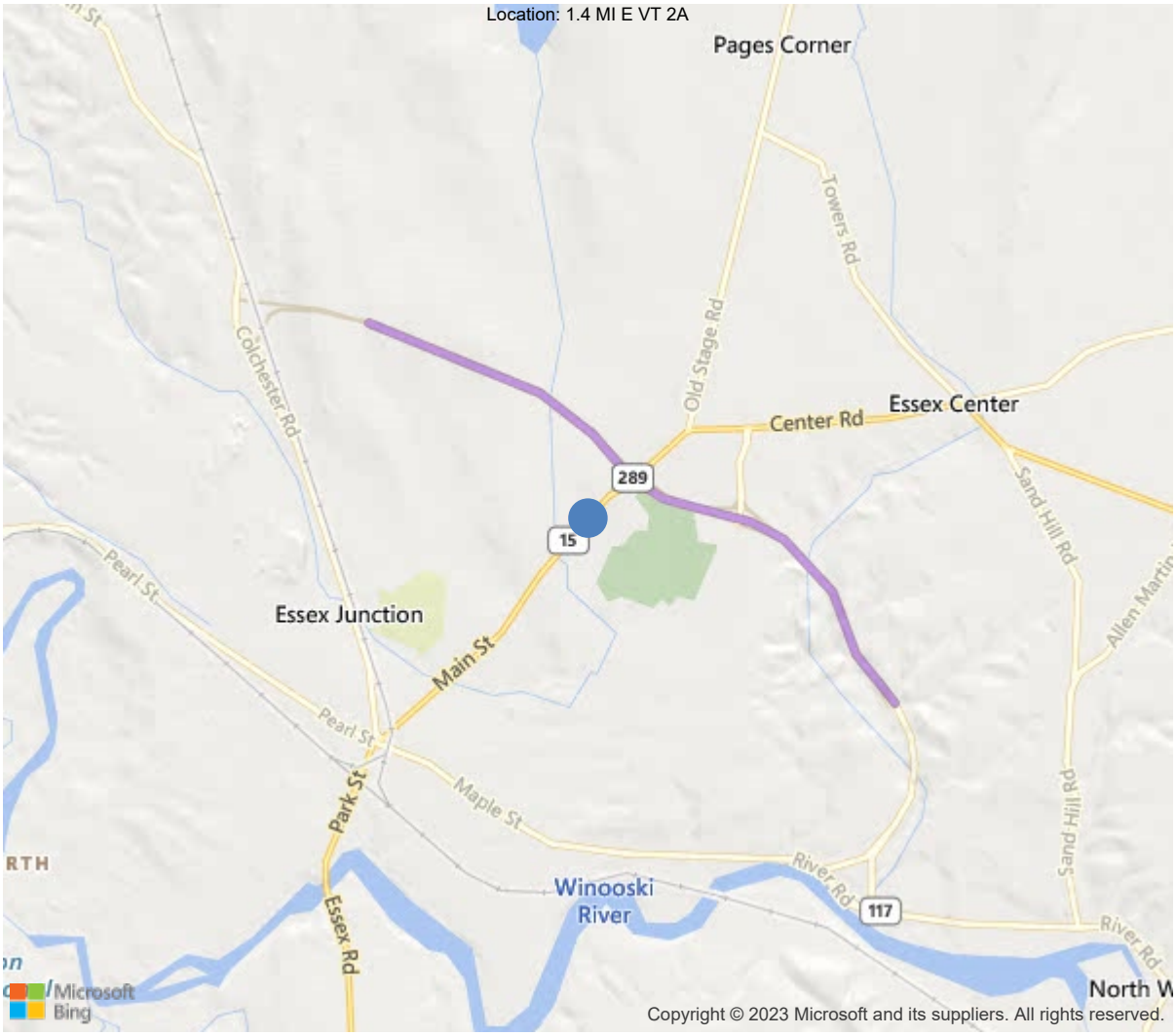
District 5, 7 - CHITTENDEN County

Owner:

Maintenance Responsibility: 1 - State Highway Agency

VERMONT
AGENCY OF TRANSPORTATION

Route VT15 /
Structure #0002 / (Routine)
VT15 over INDIAN BROOK
Team Lead: Stephen Piro, **Inspection Date:** 11/28/2022



44.50456, -73.09232

VERMONT
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Route VT15 /
Structure #0002 / (Routine)
VT15 over INDIAN BROOK

Team Lead: Stephen Piro, **Inspection Date:** 11/28/2022

IDENTIFICATION	
(1) State Names	50 - Vermont
(8) Structure Number	300030000204061
(5) Inventory Route	
(2) Highway Agency District	5 - District 5
(3) County Code	7 - CHITTENDEN
(4) Place Code	24175
(6) Features Intersected	INDIAN BROOK
(7) Facility Carried	VT15
(9) Location	1.4 MI E VT 2A
(11) Mile Point	mi
(12) Base Highway Network	No
(13) LRS Inventory Rte & Subrte	
(16) Latitude	44.5045611111111
(17) Longitude	-73.0923166666667
(98) Border Bridge State Code	
(99) Border Bridge Structure No.	
STRUCTURE TYPE AND MATERIAL	
(43) Main Structure Type	119
Material	1 - Concrete
Type	19 - Culvert
(44) Approach Structure Type	
Material	
Type	
(45) No. of Spans in Main Unit	1
(46) No. of Approach Spans	
(107) Deck Structure Type	N - Not applicable
(108) Wearing Surface/Protective System	
Type of Wearing Surface	N - Not applicable (applies only to stru
Type of Membrane	N - Not applicable (applies only to stru
Type of Deck Protection	N - Not applicable (applies only to stru
AGE AND SERVICE	
(27) Year Built	1919
(106) Year Reconstructed	
(42) Type of Service	15
On	1 - Highway
Under	5 - Waterway
(28) Lane	
On	2
Under	0
(29) Average Daily Traffic	10100
(30) Year of ADT	1996
(109) Truck ADT	%
(19) Bypass, Detour Length	2 mi
GEOMETRIC DATA	
(48) Length of Maximum Span	8 ft
(49) Structure Length	12 ft
(50) Curb or Sidewalk Width	
Left	0 ft
Right	0 ft
(51) Bridge Roadway Width Curb to Curb	0 ft
(52) Deck Width Out to Out	0 ft
(32) Approach Roadway Width (W/Shoulders)	38 ft
(33) Bridge Median	0 - No median
(34) Skew	0 Deg
(35) Structure Flared	
(10) Inventory Route Min Vert Clear	ft
(47) Inventory Route Total Horiz Clear	33.5 ft
(53) Min Vert Clear Over Bridge Rdwy	ft
(54) Min Vert Underclear	6 ft
Ref:	
(55) Min Lat Underclear RT	ft
Ref:	
(56) Min Lat Underclear LT	ft
NAVIGATION DATA	
(38) Navigation Control	
(111) Pier Protection	
(39) Navigation Vertical Clearance	ft
(116) Vert-Lift Bridge Nav Min Vert Clear	ft
(40) Navigation Horizontal Clearance	ft

CLASSIFICATION	
(112) NBIS Bridge Length	
(104) Highway System	
(26) Functional Class	14 - Urban Other Principal Art
(100) Defense Highway	
(101) Parallel Structure	
(102) Direction of Traffic	
(103) Temporary Structure	
(105) Federal Lands Highways	
(110) Designated National Network	
(20) Toll	
(21) Maintain	1 - State Highway Agency
(22) Owner	
(37) Historical Significance	
CONDITION	
(58) Deck	N
(59) Superstructure	N
(60) Substructure	N
(61) Channel & Channel Protection	7
(62) Culverts	4
LOAD RATING AND POSTING	
(31) Design Load	
(63) Operating Rating Method	
(64) Operating Rating	
Type	
Rating	
(65) Inventory Rating Method	
(66) Inventory Rating	
Type	
Rating	
(70) Bridge Posting	
(41) Structure Open/Posted/Closed	
APPRAISAL	
(67) Structural Evaluation	
(68) Deck Geometry	
(69) Clearances, Vertical/Horizontal	
(71) Waterway Adequacy	
(72) Approach Roadway Alignment	8
(36A) Bridge Railings	
(36B) Transitions	
(36C) Approach Guardrail	
(36D) Approach Guardrail Ends	
(113) Scour Critical Bridges	
PROPOSED IMPROVEMENTS	
(75) Type of Work	
(76) Length of Structure Improvement	ft
(94) Bridge Improvement Cost	$
(95) Roadway Improvement Cost	$
(96) Total Project Cost	$
(97) Year of Improvement Cost Estimate	
(114) Future ADT	
(115) Year of Future ADT	

INSPECTIONS *			
(90) Inspection Date			11/28/2022
(91) Frequency			12
(92) Critical Feature Inspection	Done	Freq. (Mon)	Date
A: Fracture Critical Detail	No		
B: Underwater Inspection	No		
C: Other Special Inspection			

* The inspection date and frequency information in this box contains the current NBI date and frequency information. Please refer to the report header for the date this inspection was conducted.

VERMONT
AGENCY OF TRANSPORTATION

Route VT15 /
Structure #0002 / (Routine)
VT15 over INDIAN BROOK
Team Lead: Stephen Piro, **Inspection Date:** 11/28/2022

Maintenance Needs

Date Reported:	11/28/2022
Priority:	4 - Maintenance Finding - Next Inspection Cycle
Type of Work:	56 - Culvert - Culvert reconstruction/rehabilitation
Status:	Open
Component:	Culvert

Deficiency Description

Reinforced concrete box is in poor condition having two (2) full perimeter cracks with heavy efflorescence leakage, rust staining and heavy saturation. Box spalling and delaminations are present along both upper portions of cold joint locations with large full depth hole present on the upstream cold joint. Box is in need of cleaning and patching at both cold joints to repair delaminated concrete, spalling and full depth hole.

Remarks

Displacement in Box with Heavy Saturation, Rust

Timber Blocking to prevent further Spalling / Settlement in Roadway Near Upstream End / Below Approach Rail

VERMONT
AGENCY OF TRANSPORTATION

Route VT15 /
Structure #0002 / (Routine)
VT15 over INDIAN BROOK
Team Lead: Stephen Piro, **Inspection Date:** 11/28/2022

Approach from East

Approach From West

Top of Culvert Facing Upstream

Upstream End of Culvert

VERMONT
AGENCY OF TRANSPORTATION

Route VT15 /
Structure #0002 / (Routine)
VT15 over INDIAN BROOK
Team Lead: Stephen Piro, **Inspection Date:** 11/28/2022

Eastern Wingwall Upstream End

Western Wingwall Upstream End

Upstream End facing downstream

Efflorescence on Eastern Side of Culvert near Upstream End

VERMONT
AGENCY OF TRANSPORTATION

Route VT15 /
Structure #0002 / (Routine)
VT15 over INDIAN BROOK
Team Lead: Stephen Piro, **Inspection Date:** 11/28/2022

Timber Supports between Midspan and upstream End

Cracking and Efflorescence on downstream Side of Timber supports

Through shot facing downstream

Cracking and Efflorescence on Western Side of Culvert near Midspan

VERMONT
AGENCY OF TRANSPORTATION

Route VT15 /
Structure #0002 / (Routine)
VT15 over INDIAN BROOK
Team Lead: Stephen Piro, **Inspection Date:** 11/28/2022

Cracking, Efflorescence and Rust staining on Eastern Side of Culvert near Midspan

Cracking and Efflorescence and sagging along western side and top of culvert near downstream end

Downstream End

Top of culvert facing downstream

VERMONT
AGENCY OF TRANSPORTATION

Route VT15 /
Structure #0002 / (Routine)
VT15 over INDIAN BROOK
Team Lead: Stephen Piro, **Inspection Date:** 11/28/2022

Downstream End of Culvert

Displacement in Box with Heavy Saturation, Rust Staining and Efflorescence at Widening/ Lengthening Joint Downstream

Displacement in Box with Heavy Saturation, Rust Staining and Efflorescence at Widening/ Lengthening Joint Downstream

Displacement in Box with Heavy Saturation, Rust Staining and Efflorescence at Widening/ Lengthening Joint Downstream

VERMONT
AGENCY OF TRANSPORTATION

Route VT15 /
Structure #0002 / (Routine)
VT15 over INDIAN BROOK
Team Lead: Stephen Piro, **Inspection Date:** 11/28/2022

Box looking Downstream

Box looking Downstream

Full Depth Hole near Upstream End below Approach Rail

Timber Blocking to prevent further Spalling / Settlement in Roadway Near Upstream End / Below Approach Rail

VERMONT
AGENCY OF TRANSPORTATION

Route VT15 /
Structure #0002 / (Routine)
VT15 over INDIAN BROOK
Team Lead: Stephen Piro, **Inspection Date:** 11/28/2022

Timber Blocking to prevent further Spalling / Settlement in Roadway Near Upstream End / Below Approach Rail

Timber Blocking to prevent further Spalling / Settlement in Roadway Near Upstream End / Below Approach Rail

Timber Blocking to prevent further Spalling / Settlement in Roadway Near Upstream End / Below Approach Rail

Timber Blocking to prevent further Spalling / Settlement in Roadway Near Upstream End / Below Approach Rail

VERMONT
AGENCY OF TRANSPORTATION

Route VT15 /
Structure #0002 / (Routine)
VT15 over INDIAN BROOK
Team Lead: Stephen Piro, **Inspection Date:** 11/28/2022

Upstream Elevation

Eastern Approach

Traffic Barrel on Upstream Rail

Upstream Channel

Upstream Approach Rail

Appendix D: Hydraulics Memo

VERMONT

State of Vermont
Structures and Hydraulics Section
Barre City Place, 219 North Main Street
Barre, Vermont 05641
vtrans.vermont.gov

Agency of Transportation

[phone] 802-595-6493

TO: Laura Stone, Structures Scoping Project Manager

CC: Patrick Ross, Hydraulics Engineer

FROM: Keith Friedland, Hydraulics Technician

DATE: March 8, 2023

SUBJECT: STATEWIDE - NORTHWEST STP CULV(90), pin#22b044
Site location: Essex VT-15, Br2, mm3.56 over Indian Brook tributary to Lake Champlain
Coordinates: 44.504560, -73.092316

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

VTrans Hydraulics Unit visited this site on 10/10/2022. Field measurements of bankfull width varied from 7 to 12 feet upstream and downstream of the structure. An email was sent to the ANR on 3/3/2023 to indicate that we are recommending a span of 12 feet for this perennial stream crossing.

Design Storm Flow is 2% AEP (Q50).

Existing Structure:

- Reinforced concrete box with an inside opening span of 8 feet and a clear height of 6 feet, providing a waterway opening of 48 square feet.
- This structure results in a headwater depth of 5.5 feet at 2% AEP and 6.3 feet at 1% AEP.
    - The headwater to depth ratio (HW/D) is 0.91 at 2% AEP and 1.04 at 1% AEP.
- Our calculations, field observations and measurements indicate the existing structure does meet current standards of the VTrans Hydraulic Manual. However, it does not meet the state stream equilibrium standards for bankfull width (span length). The existing structure constricts the channel width, resulting in an increased potential for debris blockage.

Proposed Structures:

Option 1: Concrete box culvert with an inside opening span of 12 feet and minimum height of 8 feet.

- The box invert should be buried 2 feet. This will result in a clear height of 6 feet above streambed, providing 72 square feet of waterway area.
- Bed retention sills should be added in the bottom of the structure. Sills should be 12 inches high at the edges of the box and 6 inches high in the center, creating a V-shape across the full width of the box. Sills should be spaced no more than 8 feet apart throughout the structure with one sill placed at both the inlet and the outlet. The structure should be filled level to the streambed with E-Stone, Type II, allowing flow to be kept above the surface, providing the conditions necessary for aquatic organism passage.
- This structure results in a headwater depth of 4.7 feet at 2% AEP and 5.3 feet at 1% AEP.
    - The headwater to depth ratio (HW/D) is 0.79 at 2% AEP and 0.89 at 1% AEP.

Option 2: Corrugated metal pipe arch with a clear span of 154.4 inches and height of 99.7 inches.

- The invert should be buried 2 feet. This will result in a clear height of 6.3 feet above streambed, providing 64 square feet of waterway area.
- Bed retention sills need to be added and filled as described for the box above.
- This structure results in a headwater depth of 5.1 feet at 2% AEP 5.9 and feet at 1% AEP.
    - The HW/D is 0.81 at 2% AEP and 0.93 at 1% AEP.

Option 3: Concrete open bottom rigid frame with an inside opening span of 12 feet and minimum height of 6 feet.

- Provides an approximate waterway area of 72 square feet.
- E-Stone, Type II, may need to be used to build the channel through this structure.
- This structure results in a headwater depth of 4.7 feet at 2% AEP and 5.3 feet at 1% AEP.
    - The headwater to depth ratio (HW/D) is 0.79 at 2% AEP and 0.89 at 1% AEP.

Option 4: Open bottom arch with an inside opening span of 13 feet and minimum height of 6.8 feet.

- Provides an approximate waterway area of 70 square feet.
- E-Stone, Type II, may need to be used to build the channel through this structure.
- This structure results in a headwater depth of 5.0 feet at 2% AEP and 5.7 feet at 1% AEP.
    - The HW/D is 0.74 at 2% AEP and 0.84 at 1% AEP.

For the proposed structures we assumed a similar structure alignment, skew, and slope as the existing conditions.

General Comments:

Stone Fill, Type II should be used to protect any disturbed channel banks or roadway slopes at the structure's inlet and outlet, up to a height of at least one-foot above the top of the opening. The stone fill should not constrict the channel or structure opening.

It is always desirable for a new structure to have flared wingwalls, matched into the channel banks at the inlet and outlet, to smoothly transition flow and protect the structure and roadway approaches from erosion. It is also recommended that full height concrete headwalls be constructed at the inlet and outlet. Any closed bottom structure should also be equipped with cutoff walls, extending to a depth equal to the culvert rise, up to 4 feet, or to ledge, to serve as undermining prevention. E-Stone thickness plus the bottom of structure thickness should be included when determining the total cutoff wall depth.

If a new 3-sided open bottom structure is installed, the bottom of abutment footings should be at least 6 feet below the channel bottom, or to ledge, to prevent undermining.

Any new structure should be properly aligned with the channel, span the natural channel width, and be constructed on a grade that matches the channel.

The proposed structures meet the requirements of the VTrans Hydraulics Manual. Other similar sized structures could be considered for this site. If another alternative is considered, coordinate with the Hydraulics Unit to perform additionally analyses.

Please contact us with any questions.

Appendix E: Preliminary Geotechnical Information

AGENCY OF TRANSPORTATION **OFFICE MEMORANDUM**

To: Laura Stone, P.E., Scoping Engineer

SPM

From: Stephen Madden, Geotechnical Engineer

Date: October 26th, 2022

Subject: Statewide-Northwest STP CULV(90) – Essex VT-15, Br. 2, Preliminary Geotechnical Information

1.0 INTRODUCTION

As requested, we have completed our preliminary geotechnical investigation of Bridge 2 on VT Route 15 over Indian Brook in the town of Essex, VT. Bridge 2 is a reinforced concrete box culvert located approximately 0.2 miles south of the intersection of VT-15 and VT-289. This review included a subsurface investigation, hazardous site information on file at the Vermont Agency of Natural Resources (ANR), as well as published geologic maps relating to surficial and bedrock data. This project is currently in the scoping phase.

2.0 SUBSURFACE INFORMATION

2.1 Published Geologic Data

Mapping conducted in 1970 for the Surficial Geologic Map of Vermont shows the project site consists of glacial deposits of till (Doll, 1970).

According to the Bedrock Map of Vermont from 2011, published by the USGS and State of Vermont, the project site is underlain with bedrock consisting of Phyllite of the Fairfield Pond Formation (Ratliffe, et. al, 2011).

2.2 Hazardous Materials and Underground Storage Tanks

The Vermont ANR Atlas maintains a database of all known hazardous waste sites and underground storage tanks. Their records show the location of the project is not on the Hazardous Site List. There is one site (gas station) within a 0.5-mile radius of the project containing an underground storage tank and listed as a hazardous site and hazardous waste generator. This site is not anticipated to impact construction for this project.

2.3 Record Plans

Historic record plans for the existing culvert were not found.

3.0 FIELD INVESTIGATION

A field investigation was conducted between September 14th and 15th, 2022. Two standard penetration borings were advanced in either shoulder of the roadway at opposite corners of the existing structure, one near the inlet (B-101) and one near the outlet (B-102) to evaluate the subsurface profile and aid in design and construction of a replacement structure. A summary of the final location of each boring with corresponding ground surface elevation can be found in Table 3.1 below. The values for Northings and Eastings as well as ground surface elevations are based on the Vermont State Plane Grid Coordinate System NAD 83 and North American Vertical

Datum, NAVD 88, and were located by a VTrans survey crew following the completion of drilling. The locations and elevations of the borings should be considered accurate only to the degree implied by the method used to determine them.

During drilling operations, split spoon samples and standard penetration tests (SPT) were taken continuously until a depth of approximately 11 feet (ft) below ground surface (bgs), then every 5 ft until bedrock was encountered. Bedrock was confirmed with two five-foot NX cores at each boring location.

Soil samples were visually identified in the field and SPT blow counts were recorded on the boring logs. Soil and rock samples were preserved and returned to the Construction and Materials Bureau Central Laboratory for testing and further evaluation. Upon completion of the laboratory testing, the boring logs were revised to reflect the results of the laboratory classification results.

Table 3.1 *Boring Locations and Elevations*

Boring No.	Northing (ft)	Easting (ft)	Station	Offset (ft)	Approx. Ground Surface Elevation (ft)	Approx. Top of Bedrock Elevation (ft)
B-101	731231.3	1485882.0	N.A.	10.5’ WB	437.0	420.0
B-102	731198.8	1485884.0	N.A.	11.5’ EB	436.8	421.8

4.0 SOIL PROFILE

The field investigation indicates that the soil strata of the project site generally consist of loose to medium dense granular soils, with sand and gravel encountered beneath the existing roadway (presumed to be existing roadway subbase materials). Soils generally described and classified primarily as silt with varying amounts of sand and gravel below the subbase to the top of bedrock. The thickness of asphalt pavement varied from 0.8 ft (B-101) to 1.2 ft (B-102). Broken and fractured rock was encountered directly above bedrock. Bedrock was encountered at a depth of 17.0 ft bgs in B-101 and 15.0 ft bgs in B-102, corresponding to approximate elevations of 420.0 ft and 421.8 ft, respectively. Bedrock present at the project site consists of Phyllite with quartz veins. Recovered cores from B-101 had an average RQD of 8%. The two recovered bedrock cores from B-102 had an RQD of 0%.

Groundwater was measured in B-101 after drilling on September 14th, 2022, at a depth of 7.6 ft bgs, corresponding to an approximate elevation of 429.4 ft. Groundwater was measured in B-102 after drilling on September 15th, 2022, at a depth of 8.1 ft bgs, corresponding to an approximate elevation of 428.7 ft. It should be noted that groundwater elevations are subject to change given the fact that the boreholes were generally left open for a short period of time. Because groundwater elevations can fluctuate seasonally and are affected by temperature and precipitation, groundwater conditions encountered during construction may vary.

5.0 RECOMMENDATIONS

Based on this information, possible foundation options for bridge replacement at a similar elevation as the existing structure include the following:

- Reinforced concrete box with new wingwalls and headwalls with spread footings founded on soil or bedrock.
- Concrete rigid frame or buried structure supported on spread footings on bedrock.

When a design alternative, as well as a preliminary alignment has been chosen, the Geotechnical Engineering Section can review the preferred alternative and assist with any further geotechnical analyses and review of foundation elements required.

If you have any questions or would like to discuss this report, please contact us via email.

6.0 REFERENCES

Doll, C. G., 1970, Surficial Geologic Map of Vermont, Vermont Geological Survey, Montpelier, VT.

Ratcliffe, N. M., Stanley, R. S., Gale, M. H., Thompson, P. J., Walsh, G. J., 2011, Bedrock Geologic Map of Vermont, Vermont Geological Survey, Montpelier, VT.

Vermont Agency of Natural Resources Department of Environmental Conservation, Natural Resources Atlas, www.anr.vermont.gov/maps/nr-atlas%20, accessed 10/10/2022.

Enclosures: Boring Logs (2 Pages)

Reviewed by: August Arles, Geotechnical Engineer AJA

cc: Electronic Read File/MG
Project File/CEE
SPM

Z:\Highways\CMB\GeotechEngineering\Projects\Statewide-Northwest_STP_CULV(90)\REPORTS\Statewide-Northwest_STP_CULV(90)_Essex VT-15_Br 2 - Preliminary Geotechnical Information.docx

STATE OF VERMONT
AGENCY OF TRANSPORTATION
CONSTRUCTION AND
MATERIALS BUREAU
CENTRAL LABORATORY

BORING LOG

Statewide-Northwest
STP CULV(90)
Essex Br. 2, VT Route 15

Boring No.: **B-101 (Br. 2)**
Page No.: 1 of 1
Pin No.: 22b044
Checked By: AJA

Boring Crew: McGinley, Aubut, Zottola
Date Started: 9/14/22 Date Finished: 9/14/22
VTSPG NAD83: N 731231.30 ft E 1485882.00 ft
Station: N.A. Offset: 10.5' WB
Ground Elevation: 437.0 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 SKID	C_E = 1.56

Groundwater Observations

Date	Depth (ft)	Notes
09/14/22	7.6	WT After Drilling

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, Asphalt 0.0'-0.8'								
		A-1-a, SaGr w/ broken rock, Dark brown, MTD, Rec. = 1.0 ft				5-6-9-9 (15)	7.0	60.8	32.0	7.2
		A-1-b, SaGr, brn, Moist, Rec. = 0.5 ft, Lab Note: Asphalt within sample				8-4-7-9 (11)	13.8	54.4	26.5	19.1
5		Field Note, Rec. = 0.0 ft, No Recovery				4-4-4-5 (8)				
		Field Note, Rec. = 0.0 ft, No Recovery				4-3-3-3 (6)				
		A-4, Si, brn, Moist, Rec. = 0.3 ft, Field Note: Rollercone Cleanout 13.0'-15.0'				3-2-4-4 (6)	30.8	18.1	19.7	62.2
10										
15		Visual Description:, GrSa w/ broken and weathered rock, gray, Moist, Rec. = 0.4 ft				29-R (R)				
		17.0 ft - 22.0 ft, Gray & light green, quartz-chlorite-biotite, PHYLLITE with quartz veins. Fine grained. Some discoloration on open joints. Close joint spacing and slightly smooth. Medium hardness. Slight weathering. Poor rock, NX, RMR-32	R-1 (55)	70 (7)	5 6 3 7 10	Top of Bedrock @ 17.0 ft				
20										
		22.0 ft - 27.0 ft, Gray & light green, quartz-chlorite-biotite, PHYLLITE with quartz veins. Fine grained. Some discoloration on open joints. Close joint spacing and slightly smooth. Medium hardness. Slight weathering. Poor rock, NX, RMR-32	R-2 (45)	100 (8)	5 6 5 5 6					
25										
		Hole stopped @ 27.0 ft								
30		Remarks: Hole Collapsed at 17.3'								

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 may occur due to other factors than those present at the time measurements were made.

BORING LOG ESSEX VT 15 BRIDGE 2.GPJ VERMONT AOT.GDT 10/26/22

STATE OF VERMONT
AGENCY OF TRANSPORTATION
CONSTRUCTION AND
MATERIALS BUREAU
CENTRAL LABORATORY

BORING LOG

Statewide-Northwest
STP CULV(90)
Essex Br. 2, VT Route 15

Boring No.: **B-102 (Br. 2)**
Page No.: 1 of 1
Pin No.: 22b044
Checked By: AJA

Boring Crew: McGinley, Aubut, Zottola
Date Started: 9/15/22 Date Finished: 9/15/22
VTSPG NAD83: N 731198.80 ft E 1485884.00 ft
Station: N.A. Offset: 11.5' EB
Ground Elevation: 436.8 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 SKID	C_E = 1.56

Groundwater Observations

Date	Depth (ft)	Notes
09/15/22	8.1	WT After Drilling

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, Asphalt 0.0'-1.3'								
		Visual Description:, GrSa, Dark brown, MTD, Rec. = 1.0 ft				7-6-6-15 (12)				
		A-4, SaSi, brn, MTD, Rec. = 1.5 ft				5-4-3-4 (7)	21.8	11.4	27.4	61.2
5		Visual Description:, SaSi, brn, MTD, Rec. = 1.2 ft				3-3-3-4 (6)				
		A-4, Si, brn, Moist, Rec. = 2.0 ft				4-3-4-3 (7)	30.1	1.6	13.0	85.4
10		A-4, GrSi, brn, Moist, Rec. = 1.5 ft, Lab Note: Clay in sample, tested non plastic				4-2-6-4 (8)	23.0	22.2	18.2	59.6
15		15.0 ft - 20.0 ft, Gray & light green, quartz-chlorite-biotite, PHYLLITE with quartz veins. Fine grained. Some discoloration on open joints. Close joint spacing and slightly smooth. Medium hardness. Slight weathering. Poor rock, NX, RMR=32	R-1 (30)	100 (0)	7 8 3 4 11	Top of Bedrock @ 15.0 ft				
20		20.0 ft - 25.0 ft, Gray & light green, quartz-chlorite-biotite, PHYLLITE with quartz veins. Fine grained. Some discoloration on open joints. Close joint spacing and slightly smooth. Medium hardness. Slight weathering. Poor rock, NX, RMR=32	R-2 (35)	100 (0)	3 6 5 5 7					
25		Hole stopped @ 25.0 ft								
30		Remarks: Hole Collapsed @ 14.3'								

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 may occur due to other factors than those present at the time measurements were made.

BORING LOG ESSEX VT 15 BRIDGE 2.GPJ VERMONT AOT.GDT 10/26/22

Appendix F: Resource ID Completion Memo

OFFICE MEMORANDUM

AOT - PDB - ENVIRONMENTAL SECTION

RESOURCE IDENTIFICATION COMPLETION MEMO

TO: Daniel Beard, Project Manager
FROM: Julie Ann Held, Environmental Specialist (802)917-4319
DATE: December 14, 2022
Project: **Statewide – Northwest STP CULV(90)**

ENVIRONMENTAL RESOURCES:

Archaeological Site:	X	Yes	See Archaeological Resource ID Memo Issued: 12/14/2022
Historic/Historic District:	X	Yes	See Historic Resource ID Memo Issued: 05/26/2022
4(f) Property:		Yes X No	
Wetlands:	X	Yes	See Natural Resource ID Memo Issued: 08/08/2022
Agricultural Land:	X	Yes	See Natural Resource ID Memo Issued: 08/08/2022
Fish & Wildlife Habitat:	X	Yes	See Natural Resource ID Memo Issued: 08/08/2022
Wildlife Habitat Connectivity:		Yes X No	
Endangered Species:	X	Yes	
Stormwater:		Yes X No	
6(f) Property:		Yes X No	
Hazardous Waste:		Yes X No	
VTrans Limited Reuse Soils:	X	Yes	See ES Resource ID
USDA-Forest Service Lands:		Yes X No	
Scenic Highway/Byway:		Yes X No	
Act 250 Permits:	X	Yes	See ES Resource ID
FEMA Floodplains:	X	Yes	Flood Hazard Area/River Corridor Permit may be required
Flood Hazard Area/ River Corridor**:**	X	Yes	Potential Flood Hazard area, may need permits depending on the scope of work.
US Coast Guard:		Yes X No	
Lakes and Ponds:		Yes X No	
Environmental Justice:		Yes X No	
303D List/ Class A Water/ Outstanding Resource Water:		Yes X No	
Source Protection Area:		Yes X No	
Public Water Sources/ Private Wells:		Yes X No	
Other:		Yes X No	

cc:
Project File

Appendix G: Natural Resources Memo

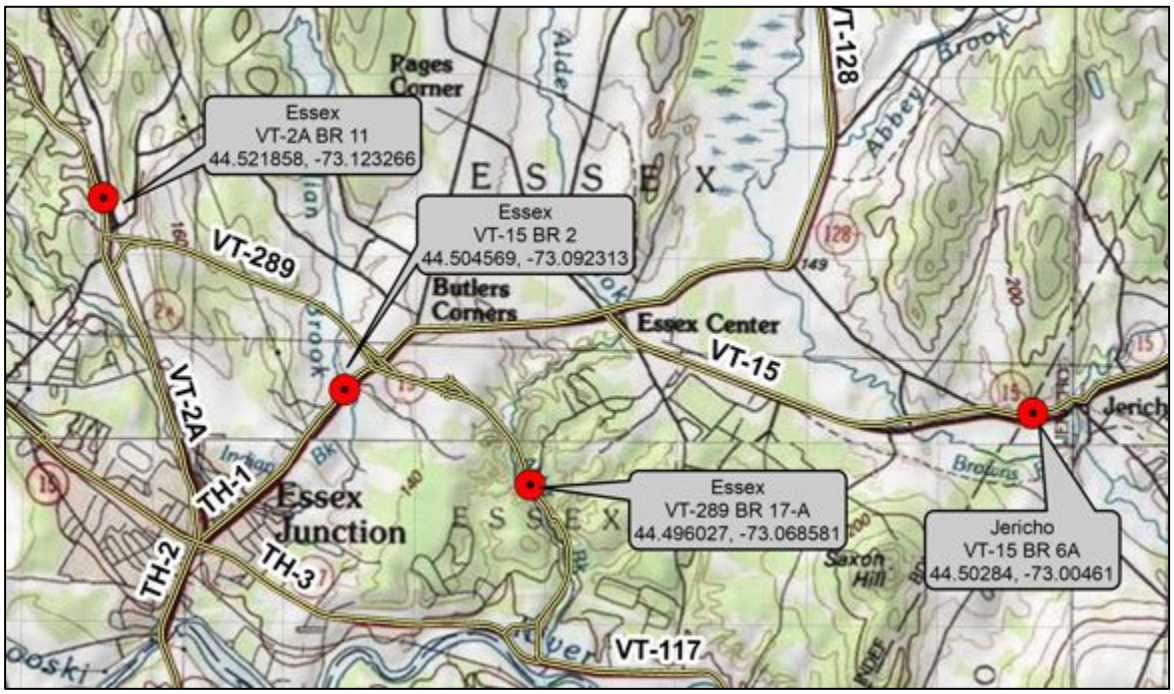
Natural Resource Evaluation

Vermont Agency of Transportation

Northwest STP CULV (90)

- **Essex VT-2A BR 11**
- **Essex VT-15 BR 2**
- **Essex VT-289 BR 17-A**
- **Jericho VT-15 BR 6A**

September 6, 2022
Revised February 8, 2023



Prepared for:
Vermont Agency of Transportation
219 North Main Street
Barre, VT 05641

Prepared by:
Bear Creek Environmental, LLC
Natural Resource Services Team
131 Elm Street, Suite 1
Montpelier, VT 05602

Table of Contents

1.0 EXECUTIVE SUMMARY

- During summer 2022, the Bear Creek Environmental (BCE) Natural Resource Services Team conducted a scoping level natural resource assessment of four stream crossing sites included under the project Northwest CULV (90). Three of the stream crossing sites are located in Essex, and the fourth is in Jericho. This Natural Resource evaluation was revised in February 2023 to correct the location of the Jericho structure, which was originally evaluated as a bridge on the Browns River, rather than a 6-foot diameter structure near Mountain View Road.

- The study area included 75 feet upstream and downstream of the structure and 100 feet on both approaches to the culvert.

- The BCE team conducted mapping exercises to identify pertinent natural resources within and surrounding the study area at each site. In addition to these desktop analyses, the team also conducted field surveys to evaluate wetlands and botanical resources.

- Rare, threatened, and endangered species occurrence reports were reviewed for the project sites. There are several RTE plants that have reported occurrences near the Essex VT-2A BR 11 site. Many of these RTE plants are associated with the Dry Pine-Oak-Heath Sandplain Forest. A botanical survey was performed of the Essex VT-2A BR 11 and the Essex VT-15 BR 2 sites. No RTE plant species were observed.

- The Creek Heelsplitter, a Species of Greatest Conservation Need (SGCN) with a State protection status of S2, has an element occurrence report for locations in Indian Brook below the Essex VT-15 BR 2 study area. Mark Ferguson, a biologist with the VT Department of Fish and Wildlife Department was consulted for guidance regarding this rare mussel. Mr. Ferguson requested that he be contacted four weeks prior to commencement of construction activities to allow time for him to search for and relocate any Creek Heelsplitters from the project area.

- The Bear Creek Environmental team delineated wetlands within the study areas of Essex VT-2A BR 11, Essex VT-15 BR 2, Essex VT-289 BR 17-A sites. A site visit with District Wetland Ecologist, Elijah Schumacher, was completed on July 28, 2022 to confirm the wetland boundaries at the three Essex sites.

- Remote sensing was utilized to identify potential wetlands with the Jericho VT 15 BR 6A study area during winter 2022/2023. Based on imagery, Streetview, Hillshade, and LiDAR contours, the extent of a Class 2 wetland within the study area downstream of the culvert was determined based on best professional judgment. A wetland delineation within the growing season is recommended to verify the extent and class.

- The Vermont Fish and Wildlife Department (VDFW) was consulted regarding requirements of aquatic organism passage (AOP) for the three Essex structures that are culvert crossings during summer 2022. Based on email correspondence from September 1, 2022, full aquatic organism passage will be required for replacement of structures at all three sites. In the event the VT-2A BR 11 and VT-15 BR 2 structures were modified, retrofits of the structures would be required to allow full AOP. Given the close proximity of the structure outlet to Alder Brook, and the long

culvert length, AOP would not be required for modifications to the Essex VT-289 BR 17-A structure.

- During February 2023, the VDFW was contacted regarding AOP recommendations for the Jericho VT-15 BR 6A culvert. Given the small watershed size, the Department has opted to wait until electrofishing can be conducted during the spring or summer to make a determination regarding AOP.

- The project area was not evaluated for RTE bat presence nor was potential habitat quantified; however, it is possible that the Little Brown Bat (state-endangered) and/or Northern Long-eared Bat (state-endangered, federally threatened) could be found in the vicinity of the project sites.

2.0 BACKGROUND

The Bear Creek Environmental Natural Resource Services Team was retained by the Vermont Agency of Transportation (VTrans) to evaluate wetland and wildlife resources in the vicinity of four VTrans stream crossing sites that are included in the Northwest CULV (90) project. The project, which currently is at a scoping level, includes sites:

- VT-2A BR 11 in Essex
- VT-15 BR 2 in Essex
- VT-289 BR 17-A in Essex, and
- VT-15 BR 6A in Jericho.

The sites are located in Essex and Jericho, as shown on the map on page 1 of Appendix A.

Assessment work included remote sensing analysis to evaluate resources at and in the vicinity of the project site. A desktop analysis of wildlife connectivity was also performed.

3.0 REMOTE SENSING

A remote sensing review of natural resources was performed by Bear Creek Environmental for the four study sites. The study involved a review of historic occurrences of rare, threatened, and endangered (RTE) plant and animal species in the vicinity of the project site, as well as an assessment of wildlife connectivity. Ecological Resource maps of the four project sites are provided on pages 2 through 5 of Appendix A.

RTE Plants

The Essex 2A BR 11 was the only site with rare, threatened, and endangered (RTE) plants documented within the vicinity of the project site, based on the Vermont Natural Heritage database. The ecological map on page 2 of the Appendix A includes six RTE plant species, most of which are associated with the Dry Pine-Oak-Heath Sandplain Forest natural community. The RTE plant species documented within the vicinity of Essex 2A BR 11 are:

- *Crocanthemum canadense* (Canada Frostweed) – S2S3
- *Lactuca hirsuta* (Hairy Lettuce) – S1S2 (SGCN)
- *Helianthus strumosus* (Harsh Sunflower) – S2S3 (SGCN)
- *Carex muehlenbergii* var. muehlenbergii (Muehlenberg's Sedge) – S2 (SGCN)
- *Cyperus houghtonii* (Houghton's Flatsedge) – S2 (SGCN)
- *Solidago squarrosa* (Squarrose Goldenrod) – S2S3 (SGCN)

RTE Animals

Lasmigona compressa (Creek Heelsplitter), a rare (S2 state rank) freshwater mussel, is the only rare animal species that has been documented within the vicinity of the four project sites according to the Vermont Natural Heritage database. Occurrences of Creek Heelsplitter from 2002 and 2006 were recorded several tenths of a mile downstream of the VT-15 BR 2 study area in Indian Brook, as shown on the map on page 3 of the Appendix A.

Mark Ferguson of the Vermont Fish and Wildlife Department was contacted for a determination of whether a mussel survey of Indian Brook would be required if instream work for a culvert project were needed. In an email response dated Thursday, August 11, 2022 (Appendix A, page 6), Mr. Ferguson stated the following:

"Since there is little chance of any threatened or endangered mussel species occurring in this stream section, I don't see a need for a formal mussel survey. Since there is some potential for Creek Heelsplitter bring there, I request that I be contacted within four weeks prior to commencement of construction/prep activities so that I can search for and relocate any Creek Heelsplitters from within the project area."

Wildlife Habitat

The Vermont Conservation Design database on the Vermont Agency of Natural Resources BioFinder Mapping Tool was reviewed to assess landscape scale wildlife habitat. A narrative and maps of the results are provided by Alexandra Marcucci of SLR on pages 1 through 6 of Appendix B. A brief summary of the landscape scale wildlife habitat in the vicinity of each study area is provided below:

- VT Route 2A BR 11 – Within the study area, Surface Water and Riparian Areas and Physical Landscape Diversity are rated as highest priority. Residential development along Gentes Road and commercial development on Colchester Road contribute to fragmentation of Riparian and Wildlife Connectivity.

- VT Route 15 BR 2 – Surface Water and Riparian Areas and Physical Landscape Diversity are rated as highest priority adjacent to Indian Brook within the study area.

- VT Route 289 BR 17A – Riparian and Wildlife Connectivity are rated as highest priority both upstream of the culvert under Route 289 and upstream and downstream on the culvert outlet within the Alder Brook corridor.

- VT Route 15 BR 6A – None of the wildlife habitat components were identified as priority or highest priority within the study area.

4.0 FIELD OBSERVATION OF RTE SPECIES

Plants

A site visit was conducted by botanist Elizabeth McLane on July 4, 2022 to investigate the presence of rare plant species within the VT Route 2A BR 11 and the VT Route 15 BR 2 study areas. These two sites were recommended for an RTE plant survey for the following reasons:

- Area dominated by sand and sea-bed soils that can lead to unusual natural community types and associated RTE species;
- Located in vicinity of remnant Dry Pine-Oak-Heath Sandplain Forest Natural Community;
- Not uncommon for rare plant species to be associated with road and stream edges;
- Rare plant species occurrences have been reported within the vicinity of the VT Route 2A BR 11 study area.

No rare or significant Natural Communities were noted at either site during the plant survey. A memorandum summarizing the botanical findings is provided in Appendix C.

Bats

The project area was not evaluated for RTE bat presence nor was potential habitat quantified; however, it is possible that the Little Brown Bat (state-endangered) and/or Northern Long-eared Bat (state-endangered, federally threatened) could be found in the vicinity of the project sites.

5.0 WETLANDS AND STREAMS

Methods

Mary Nealon of Bear Creek Environmental and Alex Marcucci of SLR visited the three Northwest CULV (90) study areas in Essex during July 2022 to delineate jurisdictional wetlands and to perform a functional evaluation of the wetlands. The delineation was performed in accordance with the methods described in the manual prepared by the US Army Corps of Engineers dated 2012 and titled "Regional Supplement to the Corps of Engineers Wetland

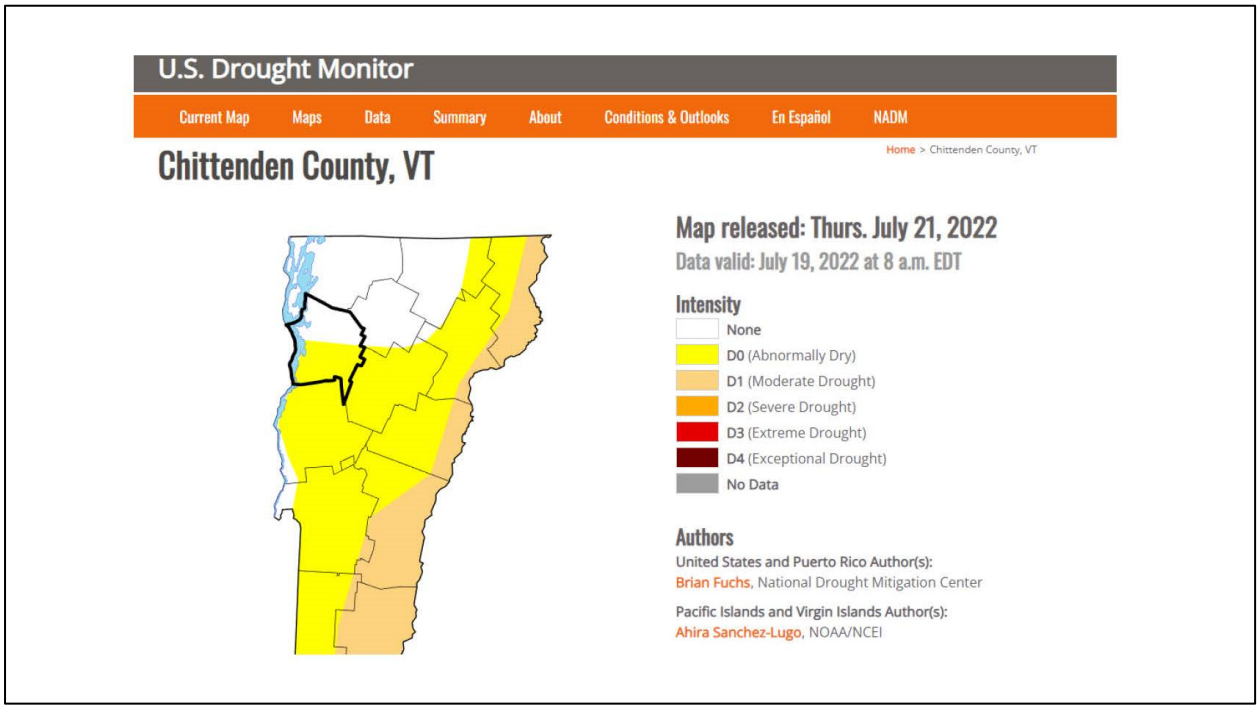
Delineation Manual: Northcentral and Northeast Region". The locations of wetlands were documented in the field using a submeter GPS unit, and functional evaluations were performed. Wetlands were delineated through field observations of soils, vegetation, and hydrology.

The wetlands were identified using the codes of wetland cover types in the United States Fish and Wildlife Service document titled Classification of Wetlands and Deepwater Habitats of the United States 2nd Edition (1.4MB PDF), 2013, by Cowardin, Lewis M. et al. (FGDC, 2013). In the Cowardin system, wetlands are categorized first by landscape position (tidal, riverine, lacustrine, and palustrine), followed by cover type (cover types described below), and then by hydrologic regime (ranging from saturated or temporarily-flooded to permanently flooded).

Class II wetlands are protected under the Vermont Wetland Rules. As such, impacts to Class II wetlands and their 50-foot buffer zones should be avoided whenever possible, in accordance with the rules. If impacts cannot be avoided, they should be minimized. Mitigation may be required for unavoidable wetland impacts to replace impacted functions and values (VANR, 2018).

Results

Maps showing the wetland delineations that were verified by Elijah Schumacher, Vermont Wetland Ecologist on July 28, 2022, are provided on pages 1 through 4 of Appendix D. Climatic / hydrologic conditions at the time of the wetland delineation field work was normal to Abnormally Dry, based on the U.S. Drought Monitor data for Chittenden County.



The U.S. Drought Monitor is jointly produced by the National Drought Mitigation Center at the University of Nebraska-Lincoln, the United States Department of Agriculture, and the National Oceanic and Atmospheric Administration. Map courtesy of NDMC.

The Wetland Determination Forms are provided on pages 5 through 25 of Appendix D, with the Functions and Values following on pages 26 through 58. All the wetlands at the three Essex project sites are palustrine. Palustrine wetlands are defined as nontidal wetlands dominated by trees, shrubs, persistent emergent, emergent mosses or lichens. No wetlands were found at the Jericho site (VT Route 15 BR 6A).

Available stream crossing inventory data was acquired from the Vermont Fish and Wildlife Department link on the Vermont Natural Resources Atlas. Methods for data collection and analysis of the stream crossing data followed the Vermont Agency of Natural Resources (VANR 2009, Milone & MacBrook 2008 and 2009). The stream crossing reports are provided on pages 59 and 60 of Appendix D and are summarized below in Table 1. No report is available for the Route 289 BR17A or the Route 15 BR 6A structure.

The Vermont Fish and Wildlife Department was contacted by Bear Creek Environmental regarding requirements for aquatic organism passage (AOP), should the structure be replaced or retrofitted. Recommendations from the VFWD are included in Appendix D on pages 61 through 67.

Table 1. Stream Crossing Inventory Data from Vermont Agency of Natural Resources

Type and Structure No.	Stream	Road	AOP Coarse Screen	AOP Geomorphic Compatibility	Percent Bankfull Width	Assessment Date
Culvert 2A BR 11 SgaID 400024000004061	Unnamed Tributary to Indian Brook	VT Route 2A, Railroad, Gentes Road	No AOP including Adult Salmonids	Partially Compatible	54%	11/23/2015
Culvert 15 BR 2 SgaID 300015000004062	Indian Brook	VT Route 15 (Upper Main St.)	Reduced AOP	Mostly Compatible	48%	11/23/2015

NA – not applicable
AOP – aquatic organism passage

VT Route 2A BR 11

Wetlands

Wetlands were identified within the VT Route 2A BR 11 study area boundary (page 1 of Appendix D) both above and below the concrete box culvert, which conveys a tributary to Indian Brook.

The size of the upstream wetland within the study area is 0.16 acres. Based on the VSWI Wetland Class Layer, the upstream wetland is connected to a Class II wetland to the east of the study area. Approximately 0.05 acres of wetland was delineated downstream of the box culvert adjacent to the tributary. The entire Class II wetland complex is estimated to be about 3.4 acres.

Wetland above the culvert is classified as Palustrine, dominantly Scrub-Shrub, broadleaved deciduous (PSS1C) and is seasonally flooded. This exhibited saturation and water-stained leaves as primary hydrology indicators and geomorphic position and FAC-neutral test as secondary indicators. Vegetation was dominated by American Elm, Box Elder, Speckled Alder, Sensitive Fern, and Tall Meadowrue (Figure 1).

Wetland below the culvert is Palustrine, dominantly Scrub-Shrub, broadleaved deciduous, mixed with emergent, non-persistent and is seasonally flooded (PSS1/EM2C). Primary indicators of hydrology include: surface water, high water table, saturation, and water-stained leaves. Geomorphic position and FAC-neutral test are secondary hydrology indicators. The wetland below the culvert is dominated by herbaceous vegetation including: Sensitive Fern and Spotted Joe Pyeweed. Speckled Alder is present in the shrub layer (Figure 2).

The wetland complex was found to have the following functions and values: water storage for flood water and storm runoff, surface and groundwater protection, fish habitat, wildlife habitat, and erosion control through binding and stabilizing the soil.

Stream Crossing

The drainage area at the concrete box culvert (7 ft wide and 5 ft high) under Route 2A is 0.79 sq. miles. A culvert assessment was completed on 11/23/2015 of the 100-foot-long stream crossing. Based on the assessment report, there is "no aquatic organism passage (AOP) including adult salmonids" and the structure has partial geomorphic compatibility. A free fall drop of 0.3 was reported at the outlet.

The Vermont Fish and Wildlife Department is requiring full AOP for both culvert retrofit and replacement of this structure.

Figure 1. VT Route 2A BR 11 Wetland above box culvert

Figure 2. VT Route 2A BR 11 Wetland below box culvert

VT Route 15 BR 2

Wetlands

Indian Brook flows through the wetlands at the VT Route 15 BR 2 site. There is a small section of wetland on each side of Indian Brook at the upstream end of the site, totaling less than 0.005 acres (page 2 of Appendix D). This upstream wetland is hydrologically connected to the downstream wetland within the study area, which includes about 0.15 acres below the culvert and adjacent to Indian Brook. Wetland within the study area is connected to a Class II wetland on the VSWI Class Layer, making a total estimated wetland size of about 3.9 acres.

The area adjacent to Indian Brook below the culvert is dominated by Phragmites and wetland grasses, making the wetland a Palustrine, dominantly Emergent, persistent system that is seasonally flooded (PEM1C) as shown in Figure 3. Secondary wetland hydrology indicators include: drainage patterns, geomorphic position, and FAC-Neutral Test.

Figure 3. VT Route 2A BR 11 Wetland below box culvert

The wetland complex was found to have the following functions and values: water storage for flood water and storm runoff, surface and groundwater protection, fish habitat, wildlife habitat, rare, threatened, and endangered species habitat, open space and aesthetics, and erosion control through binding and stabilizing the soil.

Stream Crossing
The drainage area at the outlet of the concrete box culvert (6 ft x 8 feet) is 3.6 square miles. The structure provides reduced AOP and is mostly geomorphically compatible.

The Vermont Fish and Wildlife Department is requiring full aquatic organism passage for both replacement and retrofit of this Route 2A BR 11 structure.

VT Route 289 BR 17A

The study area of the Route 289 BR 17A site was the largest of the four study areas given the length of the culvert.

The wetland above the culvert inlet was dominated by Reed Canary Grass and an obligate wetland grass, *Glyceria striata* (Fowl Manna Grass) as shown in Figure 4. The wetland is Palustrine, dominantly Emergent, non-persistent wetland and is seasonally flooded (PEM2C). A small amount of Salix bebbiana (Bebb's Willow) was present in the upper layer of vegetation. Although the wetland area in the study area was less than 0.04 acres (page 3 of Appendix D), the wetland continues out of the study area to the north and appears to connect into a Class II wetland on the VSWI Class layer.

Figure 4. VT Route 289 BR 17 A wetland above culvert.

Downstream of the culvert, a wetland mosaic is present with a mix of deep water (2 to 2 ½ feet deep) in Alder Brook and wetland areas dominated by Bulrushes, Common Juncus, Giant Goldenrod, Speckled Alder, Willows, and Manna Grasses. The unnamed Tributary to Alder Brook travels only a short distance (~ 20 feet) before reaching Alder Brook (Figure 5), and this mosaic wetland begins along the southern edge of this channel and continues downstream along the eastern side of Alder Brook. The wetland below the culvert is beaver influenced and is characterized as Palustrine, dominantly Emergent, Nonpersistent, Semi permanently flooded mixed with Scrub-Shrub, broadleaved deciduous (PEM2Fb/SS1).

The wetland complex was found to have the following functions and values: water storage for flood water and storm runoff, surface and groundwater protection, fish habitat, wildlife habitat, and erosion control through binding and stabilizing the soil.

Stream Crossing

The Route 289 BR 17A culvert is greater than 500 feet in length and is a 7.1 ft high 6.6 ft high CMP. The outlet of the culvert is free fall (Figure 6) with a scour pool below the structure. At the time of the wetland delineation on July 15, 2022 there was very little water flowing through the structure; however, given the abnormally dry conditions at the time of the survey, it is likely the stream is perennial. Based on StreamStats, the drainage area at the culvert outlet of the unnamed Tributary to Alder Brook is 0.28 square miles.

Given the short distance from the outlet structure to Alder Brook (Figure 7) and the outlet drop of greater than a couple of feet, it would not be possible to retrofit the culvert for AOP. In addition, baffles would likely be needed throughout the 500-foot structure to address the velocity barrier.

Lee Simard, Fisheries Biologist, visited the Route 289 BR 17A site in late August 2022, and has made the recommendation that AOP will only be required if the structure were replaced.

Figure 5. VT 289 BR 17A Beaver Influenced Wetland

Figure 6. VT Route 289 BR 17 A Culvert Outlet

Figure 7. Unnamed Tributary to Alder Brook downstream of VT 289 Culvert

VT Route 15 BR 6A

Wetlands

The resource evaluation of the Route 15 BR 6A site occurred outside of the growing season. Therefore, a wetland delineation could not be performed. Based on remote sensing, possible wetland habitat within the study area was identified. Google Streetview, Bing Streetview, imagery, hillshade, and LiDAR contours were used in combination to identify "possible wetlands". Google Streetview was particularly useful for seeing the vegetated drainage, where the farmer had fenced off. Based on imagery and Streetview, it seems likely the wetland extends outside of this fenced area and is greater than 0.5 acres. A wetland greater than 0.5 acres is assigned a Class 2 wetland designation in Vermont. A map showing the possible extent of the wetland within the Route 15 BR 6A study area boundary is provided in a page 4 of Appendix D. The size of the possible wetland within the study area is approximately 0.05 acres. An open wetland boundary is included to indicate the wetland likely continues to the south.

Figure 7. Google Streetview showing a possible wetland downstream of the Route 15 6A culvert

Stream Crossing

An inspection report for VT-15 BR 6A (VT Agency of Transportation, 2021, indicates the structure is a 6-foot diameter steel culvert that intersects a brook. No photos of the upstream or downstream channel without snow cover are available in the inspection report. Photos of the structure and narrative in the inspection report provide evidence of heavy rust and small holes in the barrel. The size of the channel upstream and downstream of the structure is not reported.

Bear Creek Environmental used a hydrology model in ArcGIS to calculate a rough drainage area at the culvert inlet. The hydrology model uses a Digital Elevation Model (DEM) and flow direction and accumulation. Based on the hydrology model, the drainage area at the culvert inlet is approximately 0.009 sq. miles (Appendix D, page 4). This drainage area seems low relative to the size of the culvert diameter, and may possibly underrepresent the drainage due to manmade alterations in drainage patterns. Field verification of the drainage area could not be completed due to snow cover.

The VFWD was contacted on February 1, 2023 regarding recommendations for AOP at this structure. The Department has deferred a recommendation until this spring or summer, when electrofishing can be conducted to determine if fish are present (refer to email correspondence included in Appendix D, pages 68 and 69).

REFERENCES

Federal Geographic Data Committee (FGDC). 2013. Classification of Wetlands and Deepwater Habitats of the United States. Second Edition. Available at: https://www.fws.gov/wetlands/documents/Classification-of-Wetlands-and-Deepwater-Habitats-of-the-United-States-2013.pdf

Milone & MacBroom, Inc. 2008. The Vermont Culvert Geomorphic Compatibility Screening Tool. South Burlington, VT. 43 pp.

Milone & MacBroom, Inc. 2009. The Vermont Culvert Aquatic Organism Passage Screening Tool. South Burlington, VT 120 pp.

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Vermont Agency of Natural Resources (VANR). 2018. Department of Environmental Conservation, Watershed Management Division – Wetlands Program. Guidance for Determining Wetland Jurisdiction. Available at: http://dec.vermont.gov/sites/dec/files/wsm/wetlands/docs/wl_ClassificationGuidance.pdf

Vermont Agency of Natural Resources (VANR). 2009. Bridge and Culvert Assessment, Appendix B, Stream Geomorphic Assessment Handbooks. 22 pp.

Vermont Agency of Transportation. 2021. Route VT15, Bridge #006A (Routine), VT15 over Brook, Inspection Date: November 29, 2021. 9 pp.

Geospatial and remote sensing data sources include:

Vermont Agency of Natural Resources (VANR). 2022. BioFinder Mapping Tool. Available at: https://anrmaps.vermont.gov/websites/BioFinder/

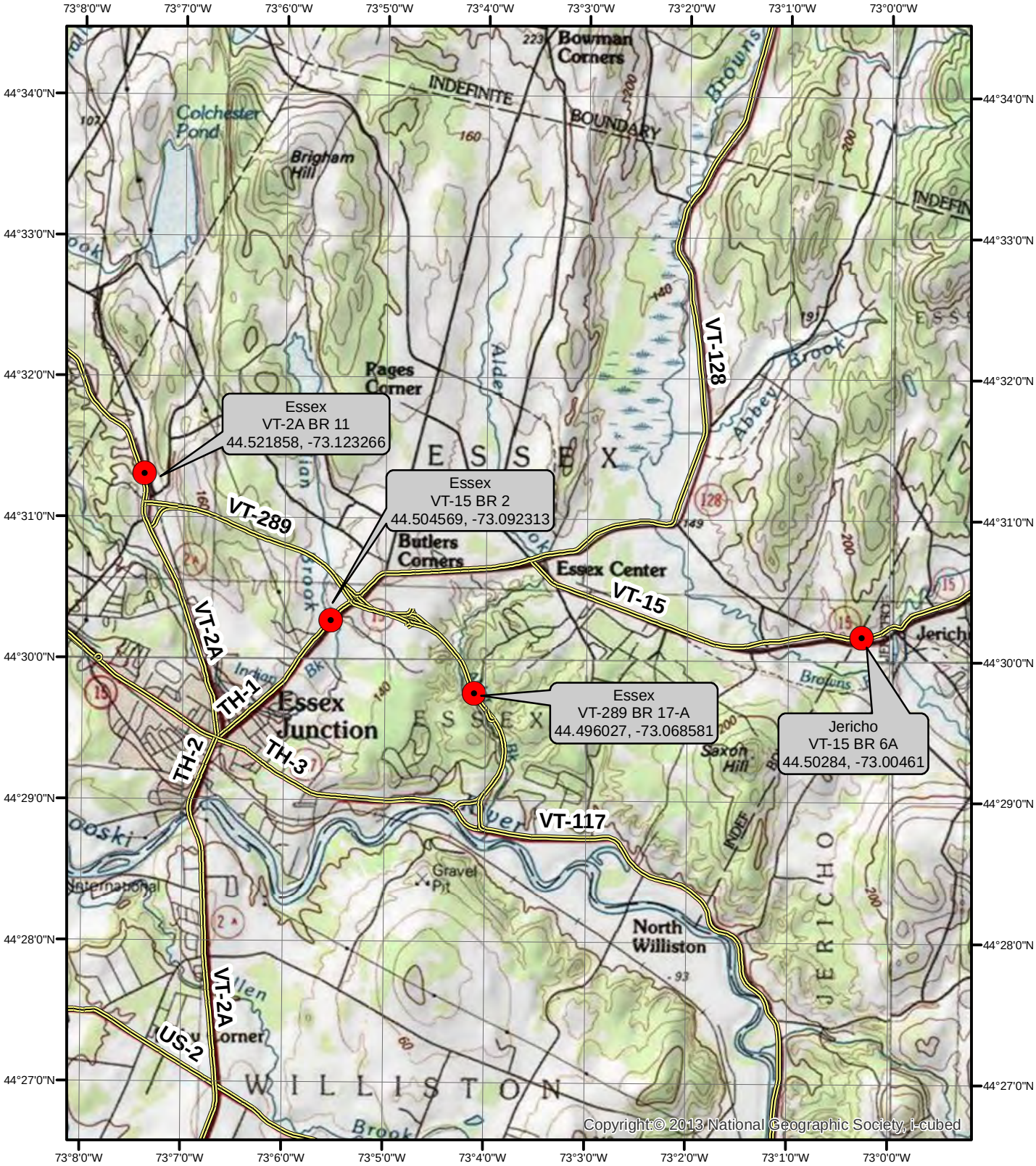
Vermont Agency of Natural Resources (VANR). 2022. Natural Resources Atlas. Available at: http://anrmaps.vermont.gov/websites/anra5/

Vermont Center for Geographic Information (VCGI). Data available at: http://gis.vtanr.opendata.arcgis.com/

Appendix A

Site Location, Ecological Resource Maps and Correspondence

Project Location Map for Northwest STP CULV (90)
Vermont Routes 2A, 15, and 289
Essex and Jericho, Vermont



Legend

- Culvert
- Major Road

Data sources include:
Vermont Center for Geographic Information (VCGI)

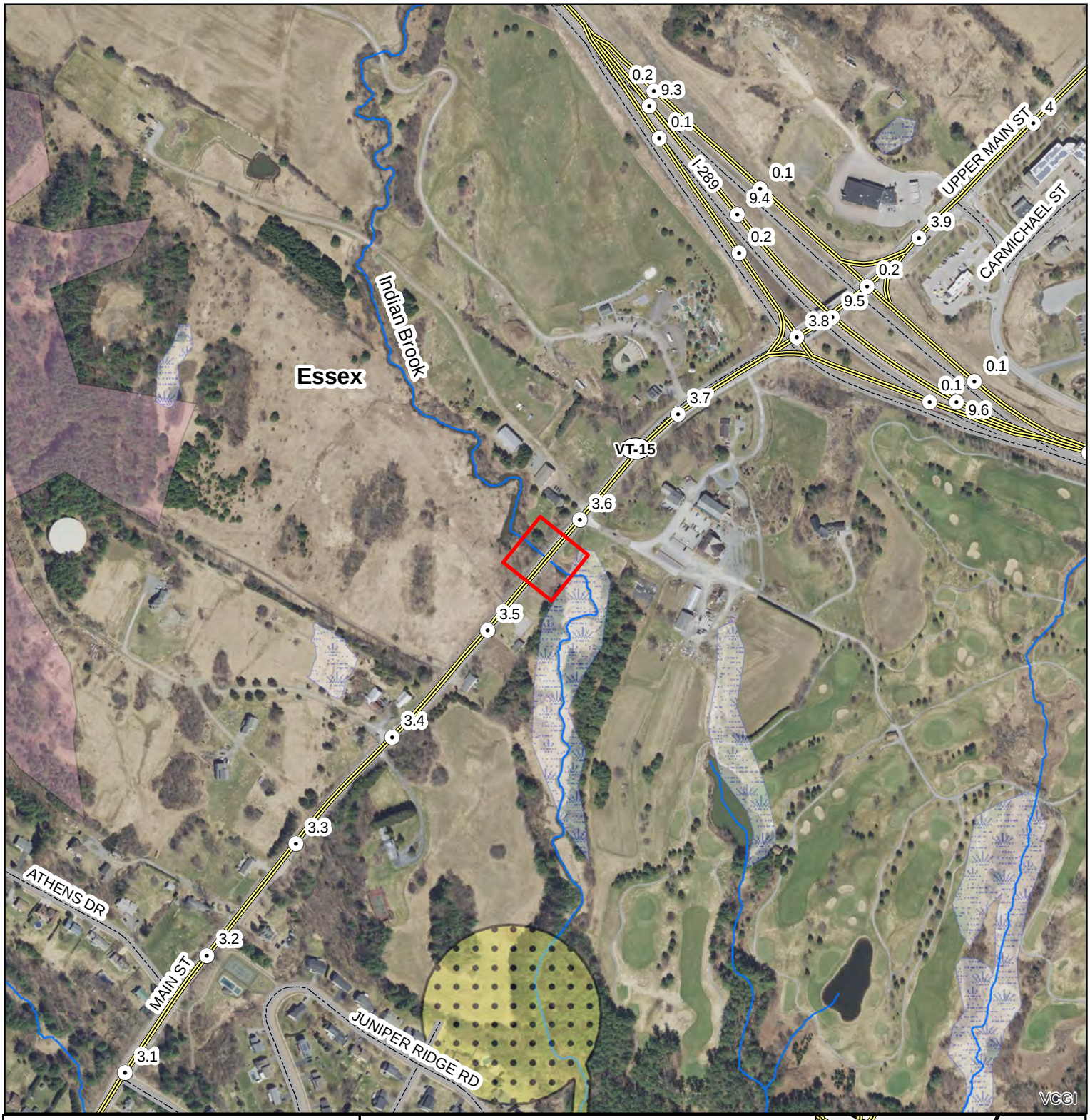
Map composed on June 27, 2022, Revised on January 5, 2023.

Bear Creek Environmental

0 3,000 6,000 Feet

1 inch = 6,000 feet

N



Resource Map - Ecological

Vermont Agency of Transportation
Northwest STP CULV (90)
Vermont Route 15 BR 2
Essex, VT
Chittenden County

Bear Creek Environmental

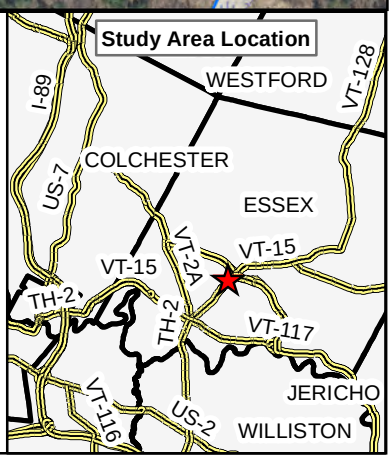
Legend

- Study Area
- Mile Marker - Tenths
- Major Road
- Road
- VHD Stream
- Significant Natural Community
- VSWI Class Layer
- RTE Animal Species
- RTE Plant Species
- Deer Wintering Area
- Core Habitat
- Habitat Block

N

0 125 250 500 Feet

Data sources include Vermont Agency of Natural Resources and Bear Creek Environmental. Map composed on July 13, 2022



From: Ferguson, Mark
To: mary@bearcreekenvironmental.com
Subject: RE: Mussel Survey Required?
Date: Thursday, August 11, 2022 12:11:38 PM
Attachments: image002.png

Hi Mary,
Since there is little chance of any threatened or endangered mussel species occurring in this stream section, I don't see a need for a formal mussel survey. Since there is some potential for Creek Heelsplitter being there, I request that I be contacted within four weeks prior to commencement of construction/prep activities so that I can search for and relocate any Creek Heelsplitters from within the project area. Thanks.

Mark Ferguson
Vermont Department of Fish & Wildlife
Wildlife Division, Wildlife Diversity Program
1 National Life Drive, Davis 2 | Montpelier, VT 05620-3702
802-279-3422 cell
https://vtfishandwildlife.com/

From: mary@bearcreekenvironmental.com <mary@bearcreekenvironmental.com>
Sent: Tuesday, August 9, 2022 5:04 PM
To: Ferguson, Mark <Mark.Ferguson@vermont.gov>
Subject: Mussel Survey Required?

EXTERNAL SENDER: Do not open attachments or click on links unless you recognize and trust the sender.
Good Afternoon Mark:

I am emailing about a VTrans project stream crossing project on Indian Brook in Essex, Vermont. Bear Creek Environmental is working on a scoping level natural resource assessment of the site (Essex VT-15 BR2). I have attached an ecological resource map that BCE prepared for the site to this email.

There are documented occurrences of the Creek Heelsplitter (*Lasmigona compressa*) approximately 0.3 miles downstream of the VT-15 BR 2 site. My question for you is as follows: if instream work for the culvert project were needed, would a mussel survey of Indian Brook be required?

I appreciate any information you can provide.

Thanks so much,

Mary

Mary Nealon
Principal / River Scientist
Professional in Erosion and Sediment Control
Certified Floodplain Manager

131 Elm Street, Suite 1
Montpelier, Vermont 05602
Phone: (802) 223-5140
Email: Mary@BearCreekEnvironmental.com
Website: http://www.bearcreekenvironmental.com

Appendix B

Wildlife Habitat

Vermont Agency of Transportation
Northwest CULV (90)
Essex and Jericho, Vermont

Wildlife Habitat

A desktop analysis was performed to review wildlife habitat in the vicinity of the four project sites. The BioFinder tool published by the Vermont Fish and Wildlife Department and available at https://anrmaps.vermont.gov/websites/BioFinder/ was used to evaluate landscape-scale wildlife habitat. The mapping tool contains two primary datasets – a Landscape Scale layer and a Community and Species Scale layer. The Landscape Scale layer is a composite of six components – Interior Forest Blocks, Connectivity Blocks, Riparian Wildlife Connectivity, Surface Water and Riparian Areas, Physical Landscape Blocks, and Physical Landscape Diversity. The components are ranked as highest priority, priority, or not a priority by geographic area. BioFinder also displays Communities and Species Scale data, which contains the following components: Natural Communities, Aquatic Habitats, Wetlands, Terrestrial Wildlife Crossings, Riparian Wildlife Crossings, and Rare and Uncommon Species.

Essex VT-2A BR 11

The Essex Vermont Route 2A BR 11 site was reviewed using the BioFinder tool. Wildlife habitat data are portrayed on a map on page 3 of Appendix B. The site is the location of a culvert underneath Gentes Road, the railroad, and Vermont Route 2A. The culvert conveys flow from an unnamed tributary to Indian Brook, which is a direct tributary to Lake Champlain. Lands surrounding the project study area are primarily residential, with small areas of forest interspersed. There are numerous houses along Gentes Road and several businesses on Route 2A. Class II wetlands were found at the site during the wetland delineation performed by BCE and SLR on the floodplain of the unnamed tributary both upstream and downstream of the culvert. The riparian area of the brook has received a ranking of highest priority for the following landscape habitat components: Surface Water and Riparian Areas, Riparian and Wildlife Connectivity, and Physical Landscape Diversity. Lands to the west of Route 2A (downstream of the culvert) have been identified as highest priority for the following landscape scale components: Interior Forest Blocks, Connectivity Blocks, and Physical Landscape Diversity. Forested lands to the east of Gentes Road (upstream side of the culvert) have been identified as highest priority for the following components: Connectivity Blocks and Physical Landscape Diversity. There is also a forest block present east of Lamore Road that is noted as highest priority for Connectivity Blocks and Physical Landscape Diversity.

Essex VT-15 BR 2

The Essex Vermont Route 15 BR 2 site was also evaluated for wildlife habitat. The project site centers around a culvert under Route 15 that conveys flow from Indian Brook beneath the road. Lands surrounding the project site are a mix of residential and commercial, with a large meadow and a small amount of forested land present. Lands to the west of Route 15 (upstream side of the culvert) are noted in the BioFinder tool as highest priority for Surface Water and Riparian Areas and Physical Landscape Diversity. Lands to the east of the road (downstream of the culvert) are also highest priority for the same components. Open lands to the northeast of the culvert on the Lang Farm property are designated as priority for Surface Water and Riparian Areas. Sections of the corridor along Indian Brook are also

designated as highest priority for Riparian and Wildlife Connectivity. Landscape scale habitat features for the Essex Route 15 site are shown on a map on page 4 of Appendix B.

Essex VT-289 BR 17A

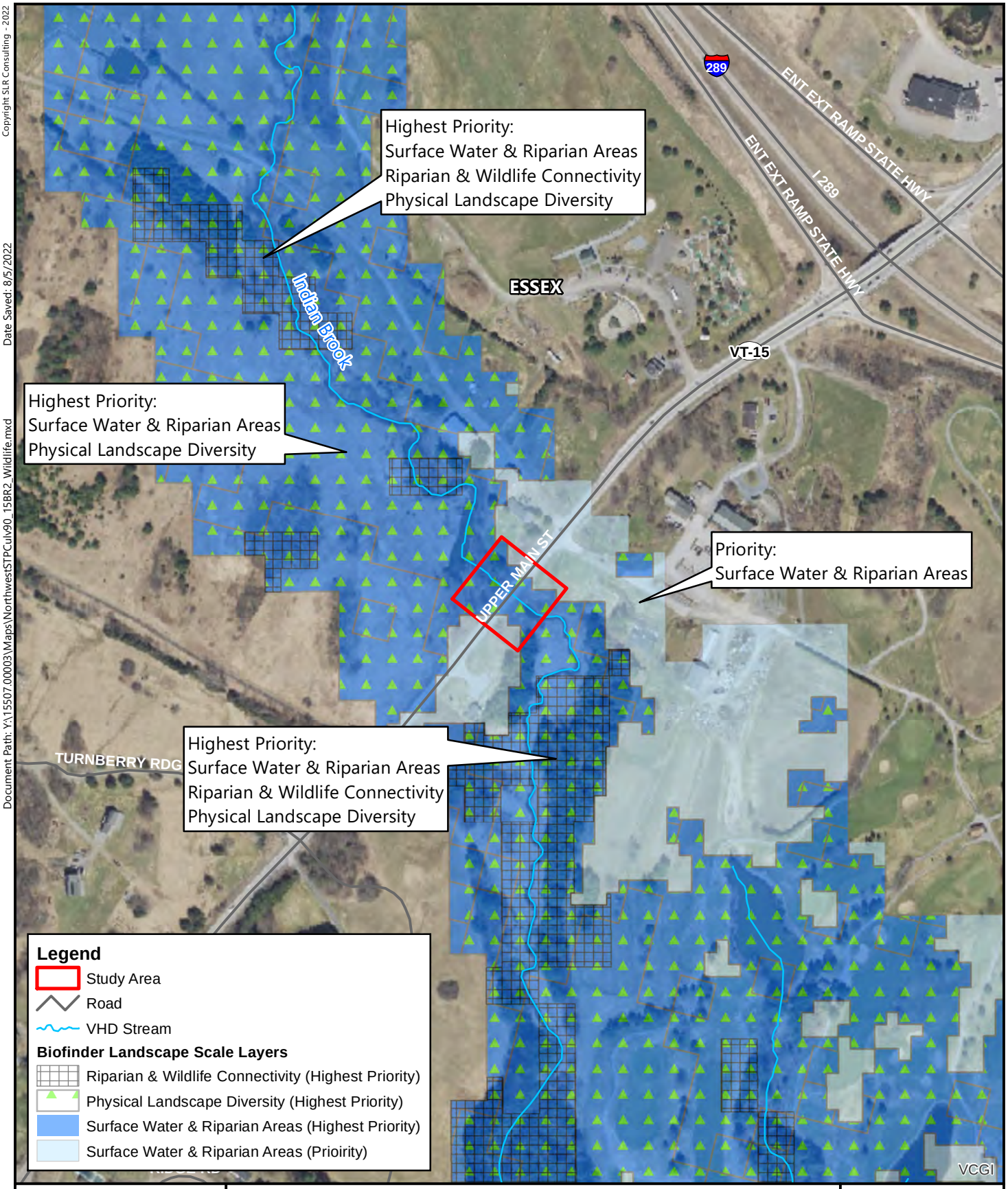
The Interstate 289 BR 17A site is a culvert that conveys flow from an unnamed tributary to Alder Brook beneath Interstate 289. The site is surrounded primarily by forested land and has Class II wetlands both east and west of the road. Forested lands to the east of the road (upstream of the culvert) have been identified as highest priority for the following landscape scale components: Physical Landscape Diversity and Physical Landscape Blocks. They are also priority for Interior Forest Blocks. Alder Brook flows parallel to Interstate 289 to the west of the road through forested land and shrub-sapling wetlands. Beyond the forested land to the west is a residential development. The swath of land along Alder Brook has been identified as highest priority for the following components: Surface Water and Riparian Areas, Riparian and Wildlife Connectivity, and Physical Habitat Diversity, as well as priority for Interior Forest Blocks. Lands to the west in the vicinity of the residential development are priority for Interior Forest Blocks. There is also a narrow band of priority Surface Water and Riparian Areas identified between Alder Brook and I-289, as shown on the map on page 5 of Appendix B.

Jericho VT-15 BR 6A (Revised February 7, 2023)

The Vermont Route 15 BR 6A site is located at a culvert under Route 15 near the intersection with Mountain View Road. Lands within the study area boundary are not identified as priority or highest priority for any of the BioFinder wildlife habitat components. Lands immediately along Route 15 are residential and agricultural. Forested lands are present north of the project site at the edge of a residential development. These forested lands have been identified as priority for the BioFinder landscape component Connectivity Blocks. The Browns River flows through agricultural lands south of the project site. A large area encompassing the corridor of the Browns River has been identified as highest priority for Surface Water and Riparian Areas and Physical Landscape Diversity. A narrower band of land immediately adjacent to the river is also identified as highest priority for Riparian and Wildlife Connectivity.

Date Saved: 8/5/2022

Document Path: Y:\15507.00003\Maps\NorthwestSTPCulv90_15BR2_Wildlife.mxd



SLR
1 SOUTH MAIN ST
WATERBURY, VT 05676
802.882.8335

Wildlife Landscape Habitat Map

Vermont Agency of Transportation
Northwest STP CULV (90)
Vermont Route 15 BR 2
Essex, VT
Chittenden County

N

0 500
Feet

Biofinder data from Vermont Conservation Design Landscape Scale Components layer published by the Vermont Agency of Natural Resources (last updated March 24, 2022).

SCALE 1 " = 500 '
DATE 8/5/2022
146.15507.00003
PROJ. NO.

WILDLIFE MAP

Appendix C

Botanical Resources

Elisabeth McLane, Ecological Consulting.
22 Blue Moon Road
South Strafford, VT 05070
802 765-4745, tii.mclane0123@gmail.com

MEMORANDUM

TO: Mary Nealon, Bear Creek Environmental; VTRANS
FROM: Elisabeth McLane
SUBJECT: VTRANS PROJECT: Statewide – Northwest STP CULV (90).
RTE Plants Evaluation of Rte 2A BR 11, and Rte 15 BR 2.
DATE: July 8, 2022

A site visit for these VRANS-designated culvert projects took place on July 4th, 2022. These two culvert areas were chosen out of the group of 4 named in the project description because they are located in the vicinity of remnant Dry Pine-Oak-Heath Sandplain Forest Natural Communities where many rare plant species have been found. For the Rte 2A culvert, the east side of Gentes Road and the west side of Rte 2A were included. The central area, between those two roads, is the railroad right-of-way and was not surveyed (although a remote evaluation of the area was made). The area surveyed included 100 ft to the east of Gentes Road and 100 ft to the west of Rte 2A, extending for approximately 350 feet along the road edge. The culvert is located in the northern half of the survey area. For the Rte 15 culvert, the survey area was roughly square and centered over the culvert, extending along the road approximately 220 feet and 100 ft to the east and west of the road edge. The site visit to these two culvert areas was designed to determine if Rare, Threatened, or Endangered (RTE) plants or natural communities are present within the site boundaries.

No RTE plants were noted at the Rte 2A-BR 11 and Rte 15-BR 2 sites.

Route 2A BR 11

The Rte 2A site is a complex of wetland, streamside, and moderate to steep wooded slopes bordering a moderately-wide stream valley. Soil maps show this area to be underlain by Munson-Raynham silt loams, with Adams-Windsor loamy sands found just out of the survey area. The latter soil is commonly the substrate underlying the Dry Pine-Oak-Heath Sandplain Forest community, a community that frequently supports RTE plants.

Most of this survey site has been fairly heavily disturbed through road, railroad, and housing development. Throughout most of the survey area, vegetation is dense, with a mix of native and non-native plants. Non-native Robinia pseudo-acacia (black locust) is common in the overstory, and Rhamnus cathartica (common buckthorn), rosa multiflora (multiflora rose), Alliaria petiolata (garlic mustard), and Lonicera morrowii (Morrow's honeysuckle) are all found in the understory, concentrated most heavily on the steep banks to the stream. Phalaris arundinaceae (reed canary grass) is common in the wet stream valley and Lythrum salicarium (purple loosestrife) was noted more occasionally there. Dominant and common native trees include: Acer negundo (box-elder), Fraxinus americana (white ash), Populus deltoides (cottonwood), Quercus rubra (red oak), Ulmus americana (American elm), Rhus typhina (stag-horn sumac), and occasional Carpinus caroliniana (musclewood). Dominant or common native plants include Parthenocissus quinquefolia (Virginia creeper), Solidago canadensis (Canada goldenrod), Solidago gigantea (smooth goldenrod), Circaea canadensis (enchanter's nightshade), Ribes Americanum (American gooseberry), Solanum dulcamara (deadly nightshade), Apios americana (common ground

nut), and vitis spp (grape). The stream drainage floor has been less disturbed, generally, and supports a variety of wet-soil plants and small concentrated wetland areas. Onoclea sensibilis (sensitive fern) is generally a dominant plant throughout, and there are small patches dominated by a variety of different plant species including: Impatiens capensis (jewel-weed), Glyceris grandis (American manna grass), Typha latifolia and T. angustifolia (cattail), Alnus incana (speckled alder), Eurochium maculatum (spotted joe-pye weed), Phalaris arundinacea (reed canary grass), Sambucus pubens (common elder), and Tussalago farfara (coltsfoot). Green and black ash were occasionally found here. These small wetlands are best described as woodland seeps that grade occasionally into cattail marsh or alluvial shrub swamp in the flat floodplain areas next to the brook.

Heavy disturbed forest areas are hard to identify to Natural Community, but the mostly likely fit for this survey area is the Red Oak-Northern Hardwood Forest Natural Community. The southwest corner of this survey area appears significantly drier, with a rolling terrain, and slightly sparser vegetative cover. This area appeared likely to be transitioning to Adams-Windsor loamy sands, the soil type more likely to support the Dry Pine-Oak-Heath Sandplain Forest Natural Community type. The forest in this section is more intact than over the rest of the survey area, but is similarly second growth and is dominated by mid to early successional trees such as: red maple, cottonwood, American elm, white ash, red oak, basswood, and, closer to the stream, box elder. Rhamnus cathartica is a common plant in the mid to under-story. Plants present here and not seen elsewhere included: Hamamelis virginiana (witchhazel), Diervilla lonicera (Canada fly honeysuckle), amphicarpa bracteata (hog peanut), carex leptonervia (nerve-less sedge), solidago caesia (blue-stemmed goldenrod), equisetum hymenale (scouring rush), carex rosea (rosy sedge), carex prasina (drooping sedge), and Polystichum acrostichoides (Christmas fern). Although the vegetation and soils differ somewhat here, the Natural Community Type is still best described by the Red Oak-Northern Hardwood Forest, and no RTE plants were noted here.

Route 15 BR 2

The Rte 15 site divides more simply into distinct communities. Mowed-grass areas are found dominating much of the northeast quarter and very northwest corner. These areas are too heavily disturbed to evaluate effectively and are unlikely to support rare plants. The southeast quarter is dominated by herbaceous plants, with Elymus repens common along the road edge, grading into dense Solidago canadensis to the east. Solidago provides almost complete cover, except for scattered Onoclea sensibilis and Impatiens capensis. A shrub-dominated forest edge begins at the very eastern edge of the survey area. Invasive Rhamnus cathartica and Lonicera morrowii are common here along with native Viburnum recognitum, and Cornus sericea. In a narrow band on the south side of the stream, these species mix with Alnus incana to create a small area of alluvial shrub swamp. Typical wet-soil herbaceous plants are found here and include: Onoclea sensibilis, Eurochium maculatum, Impatiens capensis, Thalictrum pubescens (tall meadow-rue), and Typha angustifolium. The northside of the stream, south of the mowed grass-area, is dominated by a dense thicket of invasive Phragmites australis (common reed). The natural communities that would likely be identifiable here, if not for the dominant Phragmites, include Cattail Marsh or Shallow Emergent Marsh, or a combination of these.

The western side of Rte. 15 is old field that has regenerated to mixed shrubs and trees. Pinus strobus (white pine) is common, as is invasive Robinia pseudo-acacia. Rhus typhina sometimes dominates. Invasive plants are common and include: Rhamnus cathartica, Lonicera morrowii, Alliaria petiolate, and Centauria jacea (brown knapweed). The stream valley is not wide here, with old field re-growth extending almost to the stream edge. Evaluating natural community type in such a disturbed area is difficult, but the most likely choices for the non-wetland areas of this survey areas are Northern Hardwood Forest and Red Oak-Northern Hardwood Forest.

Botanical Findings

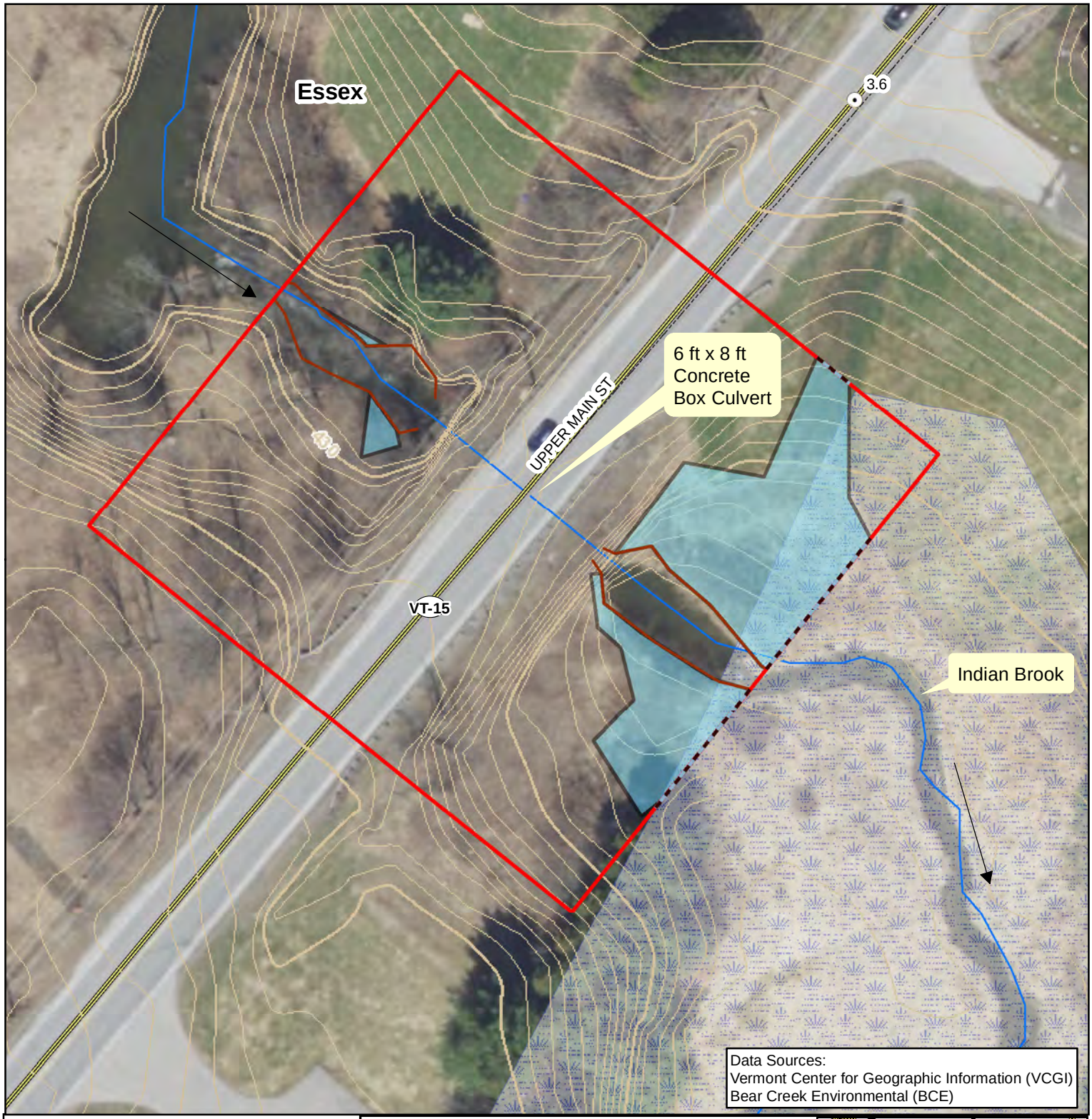
No RTE plants were noted at either the Rte 2A-BR11, or the Rte 15-BR 2 sites.

Natural Community Findings

No rare or significant Natural Communities were noted at either the Rte 2A-BR11, or the Rte 15-BR 2 sites. Invasive plants pose a threat to native plants at both sites.

Appendix D

Wetland and Stream Resources



Field Delineated Wetlands

Vermont Agency of Transportation
Northwest STP CULV (90)
Vermont Route 15 BR 2
Essex, VT
Chittenden County

Bear Creek Environmental

Legend

- Study Area VT-15 BR2
- **Field Delineated Wetland**
  - Class 2
  - Wetland Open Boundary
- OHW (approx.)
- VHD Stream
- VSWI Class Layer
- Major Road

N

0 12.5 25 50 Feet

A wetland delineation was performed in accordance with the methods described in the manual prepared by the US Army Corps of Engineers dated 2012 and titled "Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region". Wetland delineation performed on July 14, 2022. Field delineated wetlands continue beyond the study area boundary, but mapping only occurred within the study area. Wetlands that extend farther are shown with an open boundary (dotted line). Map composed on July 19, 2022 and revised on August 1, 2022. Delineation confirmed by Elijah Schumacher, VT District Wetland Ecologist, on July 28, 2022.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: VTrans NW STP CULV (90) - VT 15 BR 2 City/County: Essex / Chittenden Sampling Date: 7/14/22

Applicant/Owner: VTrans State: VT Sampling Point: Aup

Investigator(s): Mary Nealon (BCE), Alex Marcuci (SLR) Section, Township, Range:

Landform (hillside, terrace, etc.): hillslope Local relief (concave, convex, none): none Slope (%): 15

Subregion (LRR or MLRA): LRR R Lat: 44.504616 Long: -73.091763 Datum: WGS 1984

Soil Map Unit Name: Scantic silt loam, 2 to 6 percent NWI classification: NA

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	**Is the Sampled Area**		
Hydric Soil Present?	Yes X	No ____	**within a Wetland?**	**Yes** ____	**No** X
Wetland Hydrology Present?	Yes ____	No X	If yes, optional Wetland Site ID:		

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): ____
Water Table Present?	Yes ____	No X	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): ____

Wetland Hydrology Present? **Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants. Sampling Point: Aup

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
Herb Stratum (Plot size:)			
1. *Mowed grasses*			
2. *Trifolium repens*	30	Yes	FACU
3. *Taraxacum officinale*	5	No	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	35 =Total Cover		
Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
	=Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	35	x 4 =	140
UPL species	0	x 5 =	0
Column Totals:	35 (A)		140 (B)

Prevalence Index = B/A = 4.00

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ___ **No** X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: Aup

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 4/2	80	5YR 4/6	20	C	M	Loamy/Clayey	Clay loam, 0-12+

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ High Chroma Sands (S11) (**LRR K, L)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) (**LRR K, L**)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** ___

Remarks:

This data form is revised from Northcentral and Northeast Regional Supplement Version 2.0 to reflect the NRCS Field Indicators of Hydric Soils version 7.0 March 2013 Errata. (http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_051293.docx)

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: VTrans NW STP CULV (90) - VT 15 BR 2 City/County: Essex / Chittenden Sampling Date: 7/14/22

Applicant/Owner: VTrans State: VT Sampling Point: Awet

Investigator(s): Mary Nealon (BCE), Alex Marcuci (SLR) Section, Township, Range:

Landform (hillside, terrace, etc.): Floodplain Local relief (concave, convex, none): concave Slope (%): 0

Subregion (LRR or MLRA): LRR R Lat: 44.50454 Long: -73.09191 Datum: WGS 1984

Soil Map Unit Name: Scantic silt loam, 2 to 6 percent NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area**	
Hydric Soil Present?	Yes X	No ____	**within a Wetland?**	**Yes** X **No** ____
Wetland Hydrology Present?	Yes X	No ____	If yes, optional Wetland Site ID:	

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- X Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- X Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches):	
Water Table Present?	Yes ____	No X	Depth (inches):	
Saturation Present? (includes capillary fringe)	Yes X	No ____	Depth (inches): 6	

Wetland Hydrology Present? **Yes** X **No** ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants. Sampling Point: Awet

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
Herb Stratum (Plot size:)			
1. *Phragmites australis*	100	Yes	FACW
2. *Calamagrostis canadensis*	80	Yes	OBL
3. *Solidago canadensis*	5	No	FACU
4. *Epilobium coloratum*	2	No	OBL
5. *Glyceria striata*	1	No	OBL
6. *Eutrochium maculatum*	2	No	OBL
7. *Eupatorium perfoliatum*	1	No	FACW
8.			
9.			
10.			
11.			
12.			
	191 =Total Cover		
Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
	=Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	85	x 1 =	85
FACW species	101	x 2 =	202
FAC species	0	x 3 =	0
FACU species	5	x 4 =	20
UPL species	0	x 5 =	0
Column Totals:	191 (A)		307 (B)

Prevalence Index = B/A = 1.61

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)
Not 100% confident in ID of Calamagrostis canadensis (a reed grass).

SOIL

Sampling Point: Awet

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-15	10YR 4/1	85	5YR 4/6	15	C	M	Loamy/Clayey	rock at 15 inches

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ High Chroma Sands (S11) (**LRR K, L)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) (**LRR K, L**)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock

Depth (inches): 15

Hydric Soil Present? **Yes** X **No** ___

Remarks:

This data form is revised from Northcentral and Northeast Regional Supplement Version 2.0 to reflect the NRCS Field Indicators of Hydric Soils version 7.0 March 2013 Errata. (http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_051293.docx)

VERMONT WETLAND EVALUATION FORM

Wetland ID#: VT-15 BR2, Wetland A Project #: VTrans NW STP CULV (90)

Date: 8/8/22 Investigator: Mary Nealon (BCE), Alex Marcucci (SLR)

SUMMARY OF FUNCTIONAL EVALUATION:
Each function gets a score of 0= not present; L = Low; P = Present; or H = High.

1. Water Storage for Flood Water and Storm Runoff	H	**6. Rare, Threatened, and Endangered Species Habitat**	P
2. Surface & Ground Water Protection	H	**7. Education and Research in Natural Sciences**	0
3. Fish Habitat	P	**8. Recreational Value and Economic Benefits**	0
4. Wildlife Habitat	H	**9. Open Space and Aesthetics**	P
5. Exemplary Wetland Natural Community	0	**10. Erosion Control through Binding and Stabilizing the Soil**	H

Note:

- ***When to use this form:*** This is a field form to help you compile data needed to evaluate the 10 possible functions and values of a wetland as described in the Vermont Wetland Rules. All information in this form is replicated in the applications for both wetland determinations and wetland permits.
- ***Both a desktop review and field examination*** should be employed to accurately determine surrounding land use, hydrology, hydroperiod, vegetation, position in the landscape, and physical attributes.
- ***The entire wetland or wetland complex*** in question must be evaluated to determine the level of function in all ten (10) categories for accurate classification. A wetland complex can be defined as a series of interconnected wetland types.
- ***The surrounding upland and outflow area*** of the wetland should be examined to determine land use, development, nearby natural resources, and hydrology. The surrounding land use, previous development, and cumulative impacts may play a role in the current function of the wetland. For best results please read all descriptions prior to scoring activity.
- ***Evaluation***: The first portion in each section determines whether the wetland does or does not provide the function. If none of the conditions listed in the first section are met, proceed

to the next section. If any of these conditions are met, determine if the wetland provides this function at a higher or lower level based on the information listed in the subsequent sections.

- ***Presumptions:*** Please note that many wetlands are already presumed to be significant under the Vermont Wetland Rules. A wetland is presumed to be significant if:
    - The wetland is mapped on the VSWI map
    - The wetland is contiguous to a VSWI mapped wetland
    - The wetland meets the presumptions of significance under Section 4.6
    - The wetland has a preliminary determination that it is Class II

1. Water Storage for Flood Water and Storm Runoff

■ Function is present and likely to be significant: Any of the following physical and vegetative characteristics indicate the wetland provides this function.

- ■ Constricted outlet or no outlet and an unconstricted inlet.
- ■ Physical space for floodwater expansion and dense, persistent, emergent vegetation or dense woody vegetation that slows down flood waters or stormwater runoff during peak flows and facilitates water removal by evaporation and transpiration.
- ■ If a stream is present, its course is sinuous and there is sufficient woody vegetation to intercept surface flows in the portion of the wetland that floods.
- ☐ Physical evidence of seasonal flooding or ponding such as water stained leaves, water marks on trees, drift rows, debris deposits, or standing water.
- ☐ Hydrologic or hydraulic study indicates wetland attenuates flooding.

If any of the above boxes are checked, the wetland provides this function. Complete the following to determine if the wetland provides this function above or below a moderate level:

☐ Check box if any of the following conditions apply that may indicate the wetland provides this function at a *lower* level.

- ☐ Significant flood storage capacity upstream of the wetland, and the wetland in question provides this function at a negligible level in comparison to upstream storage (unless the upstream storage is temporary such as a beaver impoundment).
- ☐ Wetland is contiguous to a major lake or pond that provides storage benefits independently of the wetland.
- ☐ Wetland's storage capacity is created primarily by recent beaver dams or other temporary structures.
- ☐ Wetland is very small in size, not contiguous to a stream, and not part of a collection of small wetlands in the landscape that provide this function cumulatively.

■ Check box if any of the following conditions apply that may indicate the wetland provides this function at a *higher* level.

- ☐ History of downstream flood damage to public or private property.
- [X] Any of the following conditions present downstream of the wetland, but upstream of a major lake or pond, could be impacted by a loss or reduction of the water storage function.
  - [X] 1. Developed public or private property.
  - [X] 2. Stream banks susceptible to scouring and erosion.
  - [X] 3. Important habitat for aquatic life.
- ■ The wetland is large in size and naturally vegetated.

☐ Any of the following conditions present upstream of the wetland may indicate a large volume of runoff may reach the wetland.

- ☐ 1. A large amount of impervious surface in urbanized areas.
- ☐ 2. Relatively impervious soils.
- ☐ 3. Steep slopes in the adjacent areas.

2. Surface and Ground Water Protection

■ Function is present and likely to be significant: Any of the following physical and vegetative characteristics indicate the wetland provides this function.

- ■ Constricted or no outlets.
- ■ Low water velocity through dense, persistent vegetation.
- ■ Hydroperiod permanently flooded or saturated.
- ■ Wetlands in depositional environments with persistent vegetation wider than 20 feet.
- ☐ Wetlands with persistent vegetation comprising a defined delta, island, bar or peninsula.
- ☐ Presence of seeps or springs.
- ☐ Wetland contains a high amount of microtopography that helps slow and filter surface water.
- ☐ Position in the landscape indicates the wetland is a headwaters area.
- ■ Wetland is adjacent to surface waters.
- ☐ Wetland recharges a drinking water source.
- ☐ Water sampling indicates removal of pollutants or nutrients.
- ☐ Water sampling indicates retention of sediments or organic matter.
- ☐ Fine mineral soils and alkalinity not low.
- ☐ The wetland provides an obvious filter between surface water or ground water and land uses that may contribute point or nonpoint sources of sediments, toxic substances or nutrients to the wetland, such as: steep erodible slopes; row crops; dumps; areas of pesticide, herbicide or fertilizer application; feed lots; parking lots or heavily traveled road; and septic systems.

If any of the above boxes are checked, the wetland provides this function. Complete the following to determine if the wetland provides this function above or below a moderate level.

☐ Check box if any of the following conditions apply that may indicate the wetland provides this function at a *lower* level.

- ☐ Presence of dead forest or shrub areas in sufficient amounts to result in diminished

nutrient uptake.

- ☐ Presence of ditches or channels that confine water and restrict contact of water with vegetation.
- ☐ Wetland is very small in size, not contiguous to a stream, and not part of a collection of small wetlands in the landscape that provide this function cumulatively.
- ☐ Current use in the wetland results in disturbance that compromises this function.

☒ Check box if any of the following conditions apply that may indicate the wetland provides this function at a *higher* level.

- ☐ The wetland is adjacent to a well head or source protection area, and provides ground water recharge.
- ☐ The wetland provides flows to Class A surface waters.
- ☐ The wetland contributes to the protection or improvement of water quality of any impaired waters.
- ☒ The wetland is large in size and naturally vegetated.

3. Fish Habitat

☒ Function is present and likely to be significant: Any of the following physical and vegetative characteristics indicate the wetland provides this function.

- ☒ Contains woody vegetation that overhangs the banks of a stream or river and provides any of the following: shading that controls summer water temperature; cover including refuges created by overhanging branches or undercut banks; source of terrestrial insects as fish food; or streambank stability.
- ☒ Provides spawning, nursery, feeding or cover habitat for fish (documented or professionally judged). Common habitat includes deep marsh and shallow marsh associates with lakes and streams, and seasonally flooded wetlands associated with streams and rivers.
- ☐ Documented or professionally judged spawning habitat for northern pike.
- ☐ Provides cold spring discharge that lowers the temperature of receiving waters and creates summer habitat for salmonoid species.
- ☐ The wetland is located along a tributary that does not support fish, but contributes to a larger body of water that does support fish. The tributary supports downstream fish by providing cooler water, and food sources.

4. Wildlife Habitat

☒ Function is present and likely to be significant: Any of the following physical and vegetative characteristics indicate the wetland provides this function.

- ☒ Provides resting, feeding staging or roosting habitat to support waterfowl migration, and feeding habitat for wading birds. Good habitats for these species include open water wetlands.
- ☒ Habitat to support one or more breeding pairs or broods of waterfowl including all species of ducks, geese, and swans. Good habitats for these species include open water habitats adjacent shallow marsh, deep marsh, shrub wetland, forested wetland, or naturally vegetated buffer zone.
- ☐ Provides a nest site, a buffer for a nest site or feeding habitat for wading birds including but not limited to: great blue heron, black-crowned night heron, green-backed heron, cattle egret, or snowy egret. Good habitats for these species include open water or deep marsh adjacent to forested wetlands, or standing dead trees.
- ☒ Supports or has the habitat to support one or more breeding pairs of any migratory bird that requires wetland habitat for breeding, nesting, rearing of young, feeding, staging roosting, or migration, including: Virginia rail, common snipe, marsh wren, American bittern, northern water thrush, northern harrier, spruce grouse, Cerulean warbler, and common loon.
- ☐ Supports winter habitat for white-tailed deer. Good habitats for these species include softwood swamps. Evidence of use includes deer browsing, bark stripping, worn trails, or pellet piles.
- ☐ Provides important feeding habitat for black bear, bobcat, or moose based on an assessment of use. Good habitat for these types of species includes wetlands located in a forested mosaic.
- ☒ Has the habitat to support muskrat, otter or mink. Good habitats for these species include deep marshes, wetlands adjacent to bodies of water including lakes, ponds, rivers and streams.
- ☐ Supports an active beaver dam, one or more lodges, or evidence of use in two or more consecutive years by an adult beaver population.
- ☐ Provides the following habitats that support the reproduction of Uncommon Vermont amphibian species including:
  - ☐ 1. Wood Frog, Jefferson Salamander, Blue-spotted Salamander, or Spotted Salamander. Breeding habitat for these species includes vernal pools and small ponds.
  - ☐ 2. Northern Dusky Salamander and the Spring Salamander. Habitat for these species includes headwater seeps, springs, and streams.
  - ☒ 3. The Four-toed salamander; Fowler's Toad; Western or Boreal Chorus frog, or other amphibians found in Vermont of similar significance.

- [x] Supports or has the habitat to support significant populations of Vermont amphibian species including, but not limited to Pickerel Frog, Northern Leopard Frog, Mink Frog, and others found in Vermont of similar significance. Good habitat for these types of species includes large marsh systems with open water components.
- [x] Supports or has the habitat to support populations of uncommon Vermont reptile species including: Wood Turtle, Northern Map Turtle, Eastern Musk Turtle, Spotted Turtle, Spiny Softshell, Eastern Ribbonsnake, Northern Watersnake, and others found in Vermont of similar significance.
- [x] Supports or has the habitat to support significant populations of Vermont reptile species, including Smooth Greensnake, DeKay's Brownsnake, or other more common wetland-associated species.
- [ ] Meets four or more of the following conditions indicative of wildlife habitat diversity:
  - [ ] 1. Three or more wetland vegetation classes (greater than 1/2 acre) present including but not limited to: open water contiguous to, but not necessarily part of, the wetland, deep marsh, shallow marsh, shrub swamp, forested swamp, fen, or bog;
  - [ ] 2. The dominant vegetation class is one of the following types: deep marsh, shallow marsh, shrub swamp or, forested swamp;
  - [x] 3. Located adjacent to a lake, pond, river or stream;
  - [ ] 4. Fifty percent or more of surrounding habitat type is one or more of the following: forest, agricultural land, old field or open land;
  - [ ] 5. Emergent or woody vegetation occupies 26 to 75 percent of wetland, the rest is open water;
  - [x] 6. One of the following:
    - [ ] i. hydrologically connected to other wetlands of different dominant classes or open water within 1 mile;
    - [x] ii. hydrologically connected to other wetlands of same dominant class within 1/2 mile;
    - [ ] iii. within 1/4 mile of other wetlands of different dominant classes or open water, but not hydrologically connected;
- [ ] Wetland or wetland complex is owned in whole or in part by state or federal government and managed for wildlife and habitat conservation; and
- [ ] Contains evidence that it is used by wetland dependent wildlife species.

If any of the above boxes are checked, the wetland provides this function. Complete the following to determine if the wetland provides this function above or below a moderate level.

- [ ] Check box if any of the following conditions apply that may indicate the wetland provides this function at a *lower* level.
  - [ ] The wetland is small in size for its type and does not represent fugitive habitat in

developed areas (vernal pools and seeps are generally small in size, so this does not apply).

- ☐ The surrounding land use is densely developed enough to limit use by wildlife species (with the exception of wetlands with open water habitat). Can be negated by evidence of use.
- ☐ The current use in the wetland results in frequent cutting, mowing or other disturbance.
- ☐ The wetland hydrology and character is at a drier end of the scale and does not support wetland dependent species.

☒ Check box if any of the following conditions apply that may indicate the wetland provides this function at a *higher* level.

- ☒ The wetland complex is large in size and high in quality.
- ☒ The habitat has the potential to support several species based on the assessment above.
- ☐ Wetland is associated with an important wildlife corridor.
- ☐ The wetland has been identified by ANR-F&W as important habitat.

5. Exemplary Wetland Natural Community

☐ Function is present and likely to be significant: Any of the following physical and vegetative characteristics indicate the wetland provides this function.

- ☐ Wetlands that are identified as high quality examples of Vermont's natural community types recognized by the Natural Heritage Information Project of the Vermont Fish and Wildlife Department, including rare types such as dwarf shrub bogs, rich fens, alpine peatlands, red maple-black gum swamps and the more common types including deep bulrush marshes, cattail marshes, northern white cedar swamps, spruce-fir-tamarack swamps, and red maple-black ash seepage swamps are automatically significant for this function.

The wetland is also likely to be significant if any of the following conditions are met:

- ☐ Is an example of a wetland natural community type that has been identified and mapped by, or meets the ranking and mapping standards of, the Natural Heritage Information Project of the Vermont Fish and Wildlife Department.
- ☐ Contains ecological features that contribute to Vermont's natural heritage, including, but not limited to:
  - ☐ Deep peat accumulation reflecting a long history of wetland formation;
  - ☐ Forested wetlands displaying very old trees and other old growth characteristics;
  - ☐ A wetland natural community that is at the edge of the normal range for that type;

- ☐ A wetland mosaic containing examples of several to many wetland community types; or
- ☐ A large wetland complex with examples of several wetland community types.

6. Rare, Threatened, and Endangered Species Habitat

☒ Function is present and likely to be significant: Any of the following physical and vegetative characteristics indicate the wetland provides this function.

- ☒ Wetlands that contain one or more species on the federal or state threatened or endangered lists, as well as species that are rare in Vermont, are automatically significant for this function.

  The wetland is also likely to be significant if any of the following apply:

- ☐ There is creditable documentation that the wetland provides important habitat for any species on the federal or state threatened or endangered species lists;
- ☐ There is creditable documentation that threatened or endangered species have been present in past 10 years;
- ☐ There is creditable documentation that the wetland provides important habitat for any species listed as rare in Vermont (S1 or S2 ranks), state historic (SH rank), or rare to uncommon globally (G1, G2, or G3 ranks) by the Natural Heritage Information Project of the Vermont Fish and Wildlife Department;
- ☐ There is creditable documentation that the wetland provides habitat for multiple uncommon species of plants or animals (S3 rank).

List name of species and ranking:

Creek Heelsplitter (Lasmigona compressa) observed in 2002 and 2006 downstream of wetland complex

7. Education and Research in Natural Sciences

☐ Function is present and likely to be significant: Any of the following characteristics indicate the wetland provides this function.

- ☐ Owned by or leased to a public entity dedicated to education or research.
- ☐ History of use for education or research.
- ☐ Has one or more characteristics making it valuable for education or research.

8. Recreational Value and Economic Benefits

☐ Function is present and likely to be significant: Any of the following characteristics indicate the wetland provides this function.

- ☐ Used for, or contributes to, recreational activities.
- ☐ Provides economic benefits.
- ☐ Provides important habitat for fish or wildlife which can be fished, hunted or trapped under applicable state law.
- ☐ Used for harvesting of wild foods.

Comments:

9. Open Space and Aesthetics

☒ Function is present and likely to be significant: Any of the following physical and vegetative characteristics indicate the wetland provides this function.

- ☒ Can be readily observed by the public; and
  - ☐ Possesses special or unique aesthetic qualities; or
  - ☒ Has prominence as a distinct feature in the surrounding landscape;
- ☐ Has been identified as important open space in a municipal, regional or state plan.

10. Erosion Control through Binding and Stabilizing the Soil

☒ Function is present and likely to be significant: Any of the following physical and vegetative characteristics indicate the wetland provides this function.

- ☒ Erosive forces such as wave or current energy are present and any of the following are present as well:
  - ☒ Dense, persistent vegetation along a shoreline or stream bank that reduces an adjacent erosive force.
  - ☒ Good interspersion of persistent emergent vegetation and water along course of water flow.
  - ☐ Studies show that wetlands of similar size, vegetation type, and hydrology are important for erosion control.

What type of erosive forces are present?

- ☐ Lake fetch and waves
- ☒ High current velocities
- ☐ Water level influenced by upstream impoundment

If any of the above boxes are checked, the wetland provides this function. Complete the following to determine if the wetland provides this function above or below a moderate level.

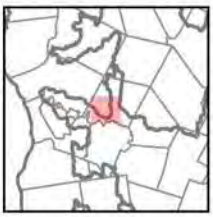
☐ Check box if any of the following conditions apply that may indicate the wetland provides this function at a *lower* level.

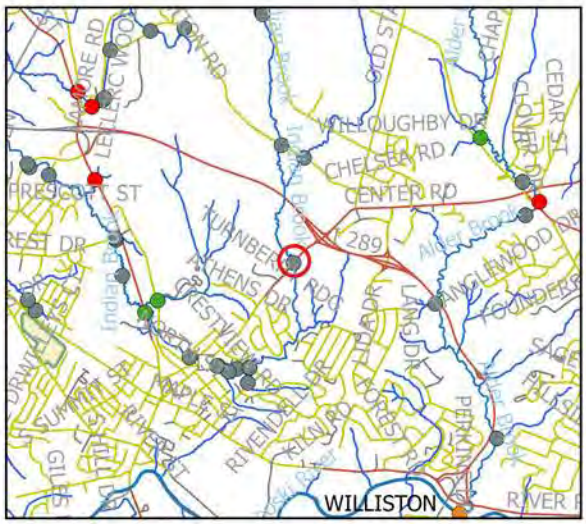
- ☐ The stream is artificially channelized and/or lacks vegetation that contributes to controlling the erosive force.

☒ Check box if any of the following conditions apply that may indicate the wetland provides this function at a *higher* level.

- ☒ The stream contains high sinuosity.
- ☐ Has been identified through fluvial geomorphic assessment to be important in maintaining the natural condition of the stream or river corridor.

SGAID: 300015000004062 **Assessment:** 11/23/2015 **Town:** Essex
Stream: Indian Brook **Latitude:** 44.50457 **Longitude:** -73.09232
Location: By Lang Farm Antiques **Road:** UPPER MAIN ST, **Surface:** Paved





Upstream

Inlet

Downstream

Outlet

Structure

Structure (overflow):	Culvert (No)
Material:	Concrete
Width:	8 ft
Height:	6 ft
Length:	50 ft
Footers:	

Stream

Structure skewed:	No
Floodplain filled:	Entirely
Avulsion (distance):	Cross Road ()
U/S bed (bedrock):	Gravel (Yes)
Struct. bed (bedrock):	None (No)
D/S bed (bedrock):	Sand (No)

Aquatic Organism Passage

Coarse screen	Gray	Pool present:	Yes
Outlet (drop):	Partially Backwatered (0 ft)	Pool depth (at outlet):	1.2 ft
Backwater length:	20 ft	Pool depth (max):	5 ft
Depth at outlet:	1.2 ft	Substrate throughout:	No
Number of culverts:	1	Inlet obstructions:	None
Retrofit potential:	MLL	High Flow Stage:	No

Geomorphic Compatibility

Coarse Screen (25 max)	20	Structure slope:	Same
BFW:	16.5 ft (Measured)	Break in slope:	No
% BFW:	48.5%	U/S erosion:	None
U/S deposits (>50% BFH):	None (No)	D/S erosion:	Low
D/S scour:	None	U/S armoring:	None
D/S bank > U/S Bank:	No	D/S armoring:	None
Approach angle:	Naturally Straight	Steep riffle:	No

Stream Network

U/S Total:	8.6 mi	U/S Mainstem:	0 mi
U/S Net	0 mi	Net:	0 mi
U/S, D/S Barriers:	8, 14		

Comment:

From:	Eldridge, William
To:	mary@bearcreekenvironmental.com; Simard, Lee
Cc:	Pientka, Bernie
Subject:	RE: VTrans Northwest CULV (90) - stream crossings
Date:	Thursday, September 1, 2022 8:50:06 AM

Lee and Mary,

Lee, thanks for visiting the site and reporting your observations to Mary.

Mary, thanks for sharing your concerns and making sure everything is adequately addressed.

Thanks,
Will

VERMONT
Will Eldridge | Aquatic Habitat Biologist
Vermont Fish and Wildlife Department | Fish Division
802-585-4499 cell | william.eldridge@vermont.gov

From: mary@bearcreekenvironmental.com <mary@bearcreekenvironmental.com>
Sent: Thursday, September 1, 2022 7:16 AM
To: Simard, Lee <Lee.Simard@vermont.gov>; Eldridge, William <William.Eldridge@vermont.gov>
Cc: Pientka, Bernie <Bernie.Pientka@vermont.gov>
Subject: RE: VTrans Northwest CULV (90) - stream crossings

Hi Lee,

Thanks for getting back to me. I will add your recommendations to the VTrans report.

Mary

From: Simard, Lee <Lee.Simard@vermont.gov>
Sent: Thursday, September 1, 2022 6:49 AM
To: mary@bearcreekenvironmental.com; Eldridge, William <William.Eldridge@vermont.gov>
Cc: Pientka, Bernie <Bernie.Pientka@vermont.gov>
Subject: RE: VTrans Northwest CULV (90) - stream crossings

Hi Mary,

I was able to stop by this site, although unfortunately with time constraints without bringing a backpack shocker with me. That said, I walked some distance upstream of the culvert and immediately adjacent wetland area and found a well-defined channel with clear flowing water that could serve as suitable habitat for a number of fish species.

I do not believe this changes our recommendations but instead reconfirms that AOP would be required if the structure were to be replaced. If the project does move in this direction, I'd be happy to review the site further if necessary.

I'll be in the field most of today but let me know if you have any questions.
Thanks,
Lee

VERMONT

Lee Simard | Fisheries Biologist
Vermont Fish and Wildlife Department
Fisheries Division
111 West Street | Essex Junction, VT 05452
802-879-5697 office | 802-622-4017 cell | 802-879-5649 fax
www.vtfishandwildlife.com

The Agency of Natural Resources supports telework, and there are times when I may be working from another office location. I am available to connect by phone and email. I am also available to connect in-person upon request.

From: mary@bearcreekenvironmental.com <mary@bearcreekenvironmental.com>
Sent: Sunday, August 28, 2022 1:15 PM
To: Simard, Lee <Lee.Simard@vermont.gov>; Eldridge, William <William.Eldridge@vermont.gov>
Cc: Pientka, Bernie <Bernie.Pientka@vermont.gov>
Subject: RE: VTrans Northwest CULV (90) - stream crossings

EXTERNAL SENDER: Do not open attachments or click on links unless you recognize and trust the sender.
Hi Lee,

Thanks for your offer to swing by the RT 289 site on your way home from work. I'm tied up with field work this week, and won't be able to join you.

Please let me know your thoughts after your site visit. I plan to finalize my VTrans report no later than Thursday of this week.

Best regards,

Mary

From: Simard, Lee <Lee.Simard@vermont.gov>
Sent: Thursday, August 25, 2022 2:42 PM
To: Eldridge, William <William.Eldridge@vermont.gov>; mary@bearcreekenvironmental.com
Cc: Pientka, Bernie <Bernie.Pientka@vermont.gov>
Subject: RE: VTrans Northwest CULV (90) - stream crossings

Hi Mary,

Those recommendations were solely based on a desktop review of watershed size at each structure and the corresponding requirements through the SAGP. If the watershed size is greater than 0.25 mi^2 at a location or fish are known to be present, our recommendation will consistently be that AOP be provided unless the applicant flags specific issues that would negate the need for AOP at a site (e.g., an impassable natural barrier near the structure) or can justify a replacement. Thanks for providing that additional context for this crossing.

I agree with Will's statement that the request for AOP would be based on this structure being replaced. Our preference will usually be for a structure to be replaced rather than repaired to achieve AOP, but do understand the cost constraints, especially in instances such as this where there may be limited habitat upstream of the structure. Ultimately that decision will be made in consultation with the RME.

In this instance, LIDAR imagery does suggest there is some amount of stream channel further upstream, so I'd be interested in conducting a site visit to take a closer look to do my due diligence. I'd be willing to stop by sometime next week on my way home from work but could also coordinate a time with you if you'd like to be present.

Thanks,
Lee

VERMONT

Lee Simard | Fisheries Biologist
Vermont Fish and Wildlife Department
Fisheries Division
111 West Street | Essex Junction, VT 05452
802-879-5697 office | 802-622-4017 cell | 802-879-5649 fax
www.vtfishandwildlife.com

The Agency of Natural Resources supports telework, and there are times when I may be working from another office location. I am available to connect by phone and email. I am also available to connect in-person upon request.

From: Eldridge, William <William.Eldridge@vermont.gov>
Sent: Tuesday, August 23, 2022 4:36 PM
To: mary@bearcreekenvironmental.com
Cc: Simard, Lee <Lee.Simard@vermont.gov>; Pientka, Bernie <Bernie.Pientka@vermont.gov>
Subject: RE: VTrans Northwest CULV (90) - stream crossings

Hi Mary,

I don't know the site and will defer to Lee or Bernie on the habitat quality upstream.

Your points about the constraints to achieving AOP through a retrofit are well taken. I think we would ask that AOP be provided if the structure is replaced.

Thanks,
Will

VERMONT
Will Eldridge | Aquatic Habitat Biologist
Vermont Fish and Wildlife Department
3902 Roxbury Road | Roxbury, VT 05669
802-585-4499 cell
https://vtfishandwildlife.com/vthabitatstamp

From: mary@bearcreekenvironmental.com <mary@bearcreekenvironmental.com>
Sent: Tuesday, August 23, 2022 2:58 PM
To: Eldridge, William <William.Eldridge@vermont.gov>
Cc: Simard, Lee <Lee.Simard@vermont.gov>; Pientka, Bernie <Bernie.Pientka@vermont.gov>
Subject: RE: VTrans Northwest CULV (90) - stream crossings

Hi Lee, Bernie and Will,

I thought I would follow up on your request for AOP at the VT 289 site. I wondered if you had seen this site in the field, and what your thoughts were regarding a new structure or the possibility of retrofitting the existing one.

I've attached a map of the site. The culvert is more than 500 feet in length. There was flow coming out of the culvert when I was there in July, but the channel above the inlet had very little water (photo 5431) and offered minimal habitat. The outlet drop is substantial (Photo 5438), and the distance the trib flows to Alder Brook under low flow conditions is only 15 to 20 feet (Photo 5432).

Without doing any sort of modeling, it would seem that a AOP retrofit would not work. Because Alder Brook is so close to the mouth of the trib, it would be impossible to address the outlet drop without raising Alder Brook. It also seems like baffles would be needed throughout the 500 foot structure to address the velocity barrier.

Although a new structure could potentially provide AOP, it seems like it would be an expensive project due to distance and the highway.

I would be interested in your thoughts and suggestions.

Thanks,

Mary

From: mary@bearcreekenvironmental.com <mary@bearcreekenvironmental.com>
Sent: Monday, August 22, 2022 1:41 PM
To: 'Eldridge, William' <William.Eldridge@vermont.gov>
Cc: 'Simard, Lee' <Lee.Simard@vermont.gov>; 'Pientka, Bernie' <Bernie.Pientka@vermont.gov>
Subject: RE: VTrans Northwest CULV (90) - stream crossings

Thanks Will

Yes, the VT-15 BR 6A site is a bridge in a gorge. The four stream crossings were part of the same project. I'm sorry if my request for AOP requirements was confusing. I should have noted it was a bridge when I sent you my request.

Thanks for the input from the District Biologists.

Mary

From: Eldridge, William <William.Eldridge@vermont.gov>
Sent: Monday, August 22, 2022 1:26 PM
To: mary@bearcreekenvironmental.com
Cc: Simard, Lee <Lee.Simard@vermont.gov>; Pientka, Bernie <Bernie.Pientka@vermont.gov>
Subject: RE: VTrans Northwest CULV (90) - stream crossings

Hi Mary,

Here's the feedback I got from the District Biologists.

VT-15 BR 6A: A little confused by the AOP request here as it's a bridge. It's a cascade/gorge area, that I'd assume is impassable (Bernie would you agree? I haven't spent a lot of time staring at it), so maybe that is part of it. But it's a bridge??

VT-289 BR 17-A: This a trib to Alder Brook which has many fish species present (DEC sampling station just downstream). Watershed size = 0.2835 square miles. AOP required.

VT-15 BR 2 (Bernie's area): Indian Brook, 3.63 square miles. AOP required

VT-2A BR 11 (Bernie's area): watershed = 0.786 square miles. AOP required

Let me know if you need more information.

Thanks,

Will

Will Eldridge | Aquatic Habitat Biologist
Vermont Fish and Wildlife Department
3902 Roxbury Road | Roxbury, VT 05669
802-585-4499 cell
https://vtfishandwildlife.com/vthabitatstamp

From: mary@bearcreekenvironmental.com <mary@bearcreekenvironmental.com>
Sent: Thursday, August 18, 2022 9:31 AM
To: Eldridge, William <William.Eldridge@vermont.gov>
Subject: RE: VTrans Northwest CULV (90) - stream crossings

Hi Will,

I'm writing to check in with you regarding the email I sent last week. Please let me know if you would like me to provide additional information for you to make a determination regarding AOP requirements for the three stream crossing locations in Essex.

Feel free to give me a call if you have questions (802-223-5140).

Thanks,

Mary

From: mary@bearcreekenvironmental.com <mary@bearcreekenvironmental.com>
Sent: Tuesday, August 9, 2022 5:00 PM
To: 'Eldridge, William' <William.Eldridge@vermont.gov>
Subject: VTrans Northwest CULV (90) - stream crossings

Good Afternoon Will,

The Bear Creek Environmental Natural Resources Services Team has been retained by VTrans to conduct a scoping level study of four stream crossing projects. I have attached a topo map showing the four locations.

Glenn Gingras has asked me to reach out to you and inquire if AOP will be required for these sites. I'm happy to send along Ecological maps of each site, if that would be helpful. I also have some photographs of the structures and the channels in the vicinity of the structures, if you would like that information.

I appreciate any input you may have.

Best regards,

Mary

Mary Nealon
Principal / River Scientist
Professional in Erosion and Sediment Control
Certified Floodplain Manager

Bear Creek Environmental

131 Elm Street, Suite 1
Montpelier, Vermont 05602
Phone: (802) 223-5140
Email: Mary@BearCreekEnvironmental.com
Website: http://www.bearcreekenvironmental.com

From: Simard, Lee
To: Mary Nealon
Cc: Eldridge, William; Pientka, Bernie
Subject: RE: Recommendations for Culvert on Route 15 in Jericho near Essex town line
Date: Wednesday, February 1, 2023 2:03:57 PM

Hi Mary,

Thanks for reaching out about AOP requirements for this structure in Jericho.

Given the small watershed size on this structure, requiring AOP would be dependent on observing fish within this stream either upstream of the culvert or in the proximity of the structure downstream. While the watershed size and your pictures suggest fish are less likely to be present, we have observed fish in very small or even intermittent streams so it is possible. However, with the deep snow and cold temperatures, now is not the time of year to confidently make that determination as electrosampling is not practical. Ideally, I would wait to get out this spring or early summer to sample.

If you have evidence (i.e., pictures with a rough measurement) of large impassable drops at or near this structure though, I could use that as justification as well for not requiring AOP.

Let me know if you have any questions or would like to discuss further.
Thanks,
Lee

VERMONT

Lee Simard | Fisheries Biologist
Vermont Fish and Wildlife Department
Fisheries Division
111 West Street | Essex Junction, VT 05452
802-879-5697 office | 802-622-4017 cell | 802-879-5649 fax
www.vtfishandwildlife.com

The Agency of Natural Resources supports telework, and there are times when I may be working from another office location. I am available to connect by phone and email. I am also available to connect in-person upon request.

From: mary@bearcreekenvironmental.com <mary@bearcreekenvironmental.com>
Sent: Wednesday, February 1, 2023 9:15 AM
To: Simard, Lee <Lee.Simard@vermont.gov>
Cc: Eldridge, William <William.Eldridge@vermont.gov>; Pientka, Bernie <Bernie.Pientka@vermont.gov>
Subject: Recommendations for Culvert on Route 15 in Jericho near Essex town line

Good Morning Lee,

I hope your winter has been going well.

I am doing some remote sensing for a culvert in Jericho on Route 15 (44.50284,-73.00461). The site is located near Mountain View Drive in Jericho near the Jericho/Essex town line. Please see the attached site location maps.

I'm attaching a couple of photos that VTrans has provided and a report that provides some additional photos and information.

The drainage is quite small and is not included in the Vermont Hydrography Dataset (VHD). I used a hydrology model in ArcGIS to determine the drainage area. The hydrology model uses a Digital Elevation Model (DEM) and flow direction and accumulation. Based on the hydrology model, the drainage area at the inlet of the culvert is 0.009 sq. mi. The drainage area is shown on the site location map "VTrans_Jericho VT-15 BR 6A_StudyArea_Rev1".

Would you be willing to provide recommendations regarding AOP? I am hoping to get all my remote sensing information and your recommendations to VTrans by early next week. Would you have availability to get back to me by Monday or Tuesday?

Thanks,

Mary

Mary Nealon
Principal / River Scientist
Professional in Erosion and Sediment Control
Certified Floodplain Manager

Bear Creek Environmental

131 Elm Street, Suite 1
Montpelier, Vermont 05602
Phone: (802) 223-5140
Email: Mary@BearCreekEnvironmental.com
Website: http://www.bearcreekenvironmental.com

Appendix H: Archeology Memo

VERMONT

Brennan Gauthier
VTrans Senior Archaeologist
Vermont Agency of Transportation
Project Delivery Bureau
Environmental Section
tel. 802-279-1460
Brennan.Gauthier@Vermont.gov

To: Julie Ann Held, VTrans Environmental Specialist

From: Brennan Gauthier, VTrans Senior Archaeologist

Date: 12/14/2022

Subject: Statewide Northwest STP CULV(90) Archaeological Resource Identification

Dear Julie Ann,

I have completed my background research and field inspection of the four separate locations requested as part of this resource ID request in the northwest part of the state. I will explain each in an individual section below and add any areas of archaeological sensitivity into the archaeology geodatabase for inclusion in future plan sets.

Bridge No.11, VT-2A, Essex, Chittenden County, Vermont

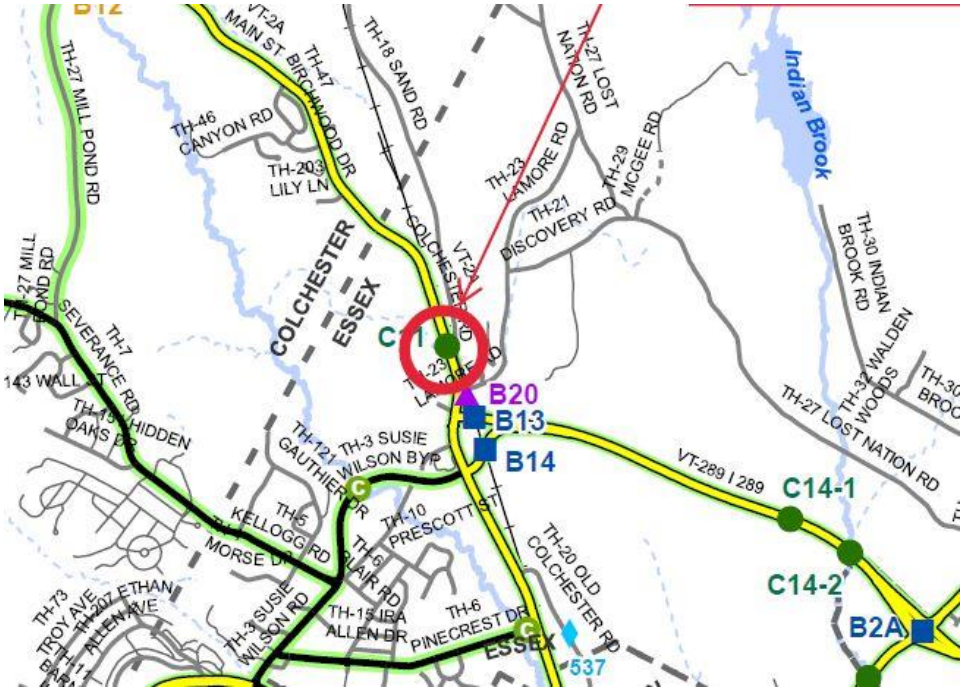


Figure 1: Bridge Location.

A review of known archaeological sites in the VAI database shows several known VAI archaeological sites within a half kilometer of the project site. These sites are Native American in origin and were discovered during the 1990s Circumferential Highway archaeological survey. Both sites, VT-CH-0613 and VT-CH-0622, are located on a sandy outwash plain directly to the south of Bridge No. 11. Due to the close proximity and being situated near/on the same geologic feature, any undisturbed areas outside of the culvert, roadway and railroad prism are considered sensitive for precontact archaeological site presence. Additionally, the median between the rail and the roadway appears to be disturbed.

Figure 2: Project Location.

A review of the Beers and Walling map series show no industrial activity at the bridge location, but there may be older sites not represented. However, the archaeological sensitivity mapped for precontact sites covers the potential for historics. See ***Figure 4*** below for a view of the sensitive areas as mapped using LiDAR hillshade.

Figure 3: Project LiDAR View and VAI Site Location.

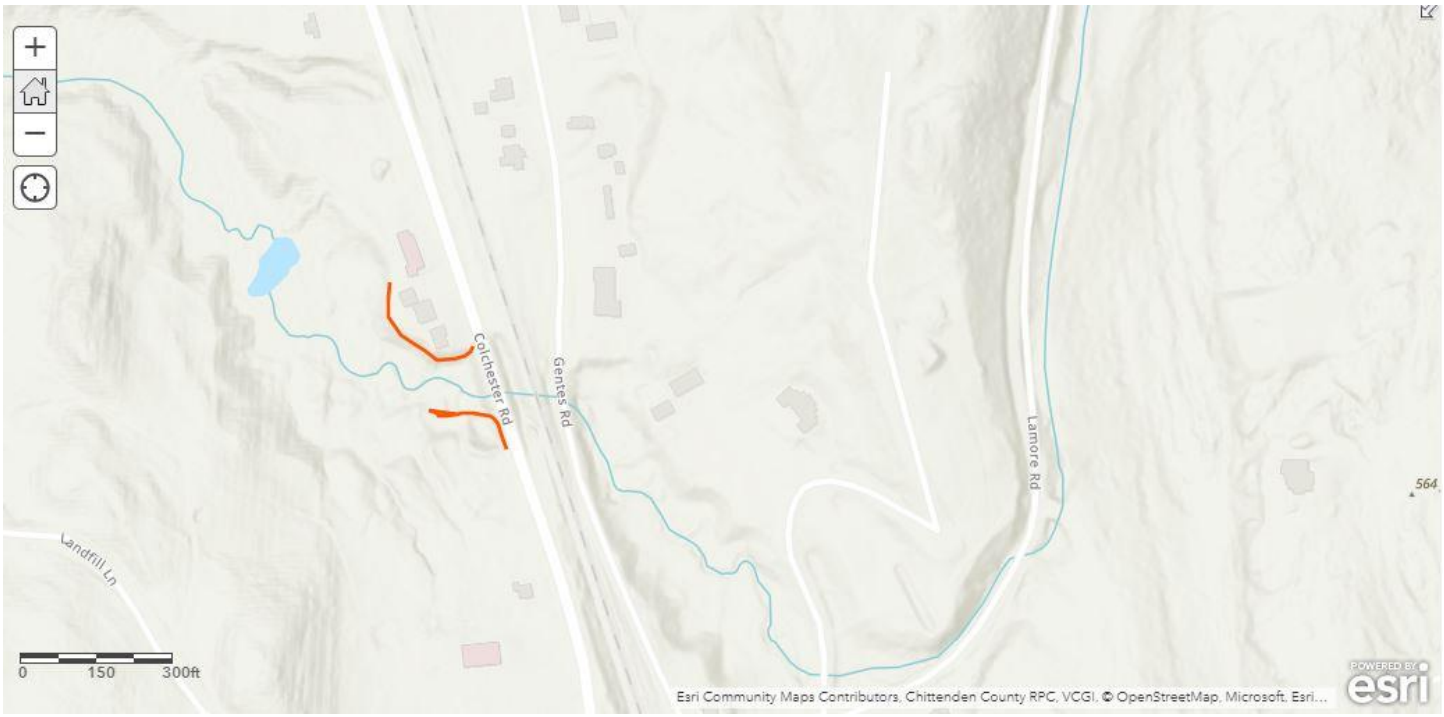


Figure 4: Arch Sensitive Areas.

In conclusion, there are two mappable archaeologically sensitive areas related to rehabilitation of Bridge No. 11 that have been added to the archaeology geodatabase for inclusion in future plans.

Bridge No. 2, VT-15, Essex, Chittenden County, Vermont

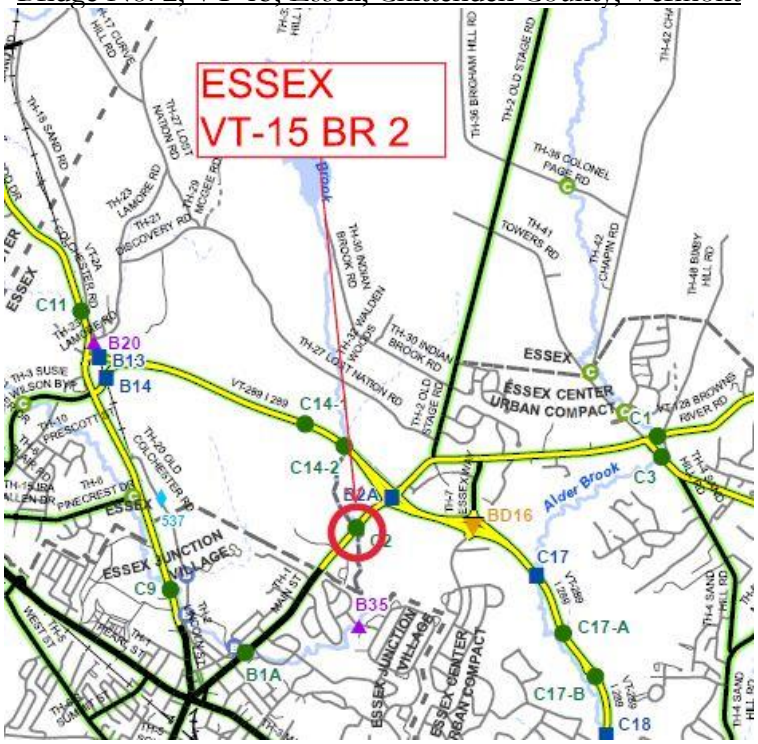


Figure 5: Bridge Location.

A review of known archaeological sites in the VAI database shows one known VAI archaeological site (VT-CH-9191) within a half kilometer of Bridge No. 2 over Indian Brook on Vermont Route 15 in Essex. This site is Native American in origin and were discovered during a field walkover of the farm to the east of the project location. Due to the close proximity of the site to the bridge, it is advisable to mark all undisturbed areas as archaeologically sensitive. Roadway prism disturbance is obvious at this location, so any area outside of the prism and/or utilities is deemed archaeologically sensitive. A field review was conducted during the 2022 field season and the areas of sensitivity were drawn using LiDAR hillshade. Please refer to ***Figure 7*** for a visual representation of the archaeologically sensitive areas.

Figure 6: Bridge Location.

Figure 7: Archaeologically Sensitive Areas.

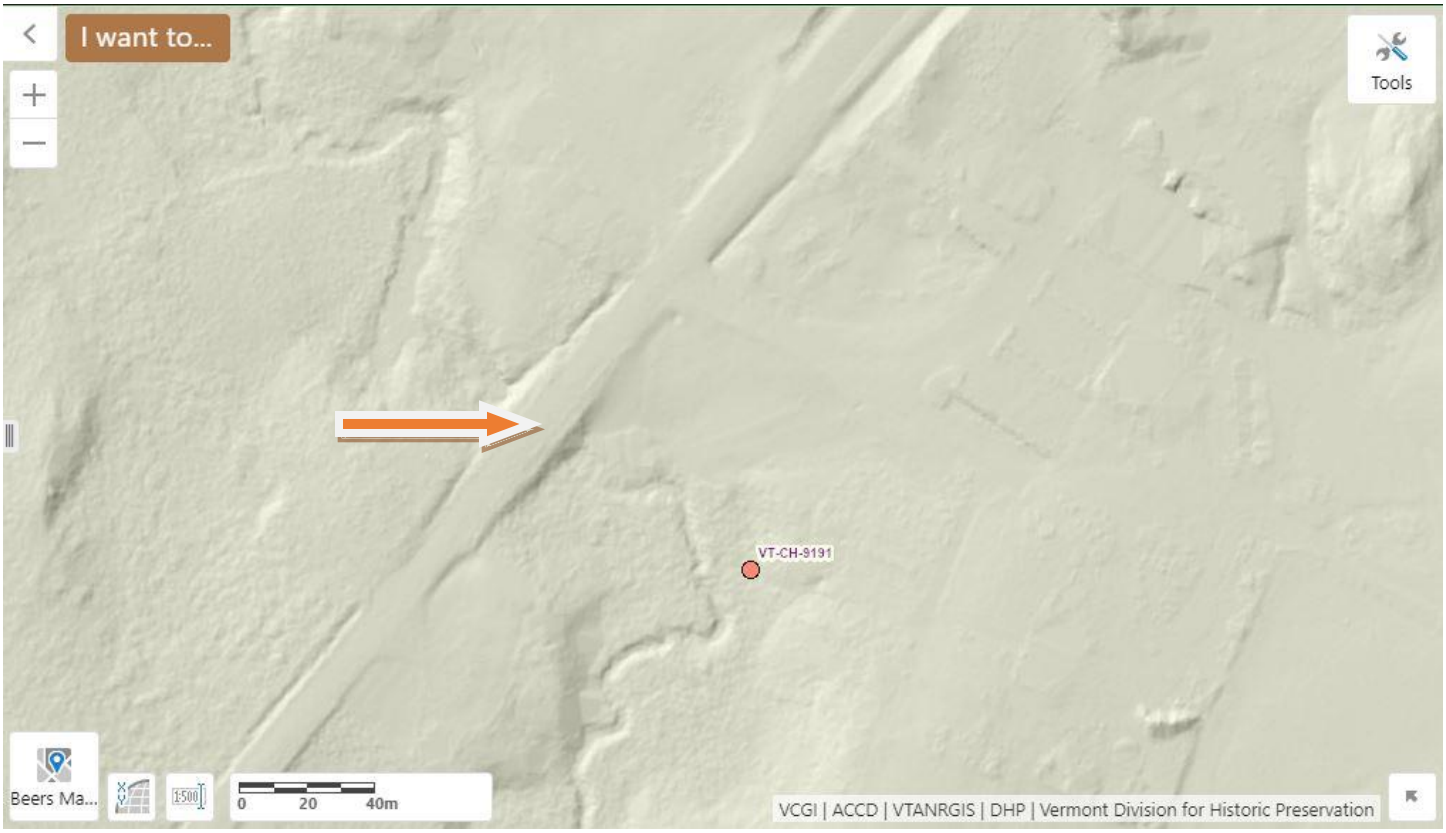


Figure 8: LiDAR View of Project Location.

Bridge No.17A, Vermont Route 289, Essex, Chittenden County, Vermont

Figure 9: Project Location.

A review of known archaeological sites in the VAI database shows one known VAI archaeological site (VT-CH-0207) within a half kilometer of Bridge No.17A on Vermont Route 289 in Essex. This site is Native American in origin and were discovered during review work for the Circumferential Highway in the 1980s. Although located in a general location to Bridge No. 17A, the site is located well outside any work likely to take place during project construction. Additionally, the bridge (really a small culvert) is located completely within the previously disturbed roadway prism of Vermont Route 289. There are no archaeologically sensitive areas to map as part of this project.

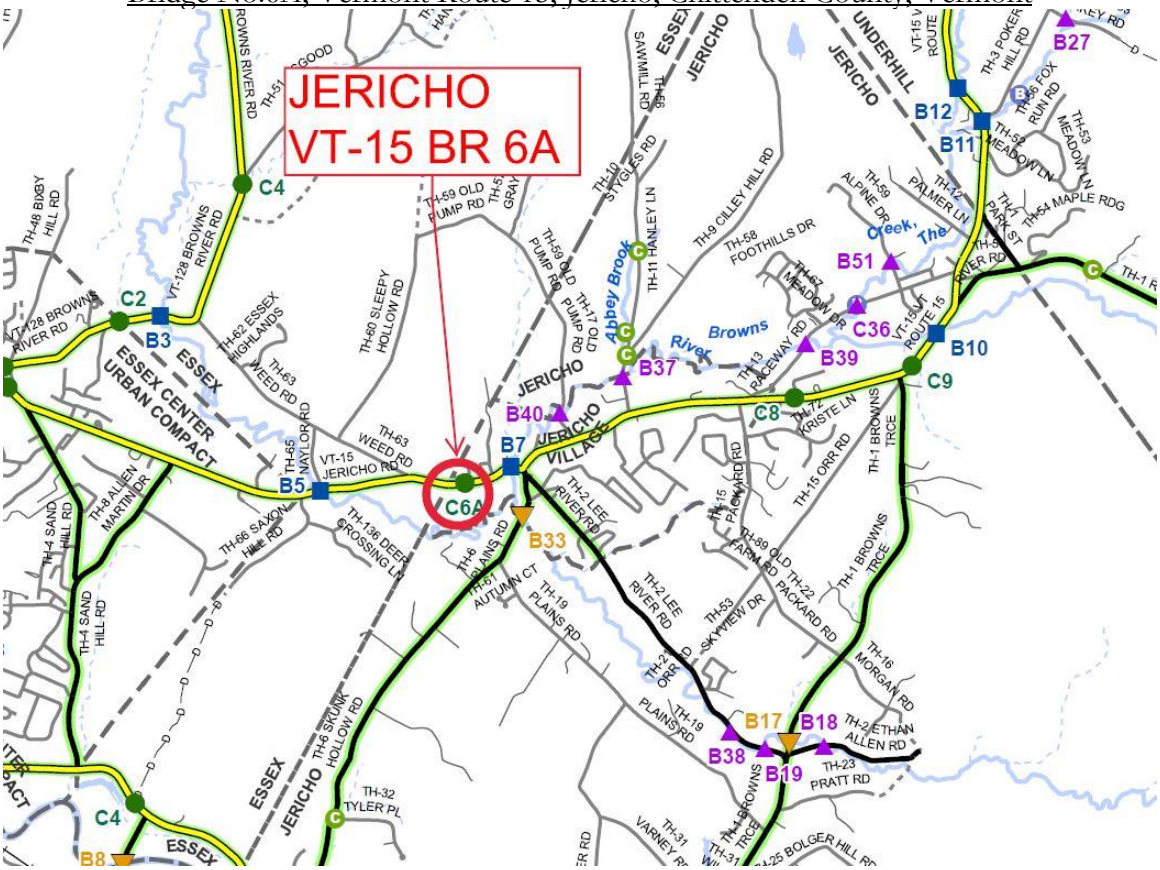


Figure 10: Project Location.

A review of known archaeological sites in the VAI database shows no known archaeological sites within a half kilometer of Bridge No.6A on Vermont Route 15 in Jericho. A site visit conducted in the summer of 2022 was adequate to identify the area to the south as archaeologically sensitive based on its location on an outwash plain above a floodplain of the Winooski River. This area seems as though it could be easily avoided during construction and has been added to the archaeological geodatabase (***Figure 13***) for inclusion in project plans.

Figure 11: Project View.

Figure 12: LiDAR View.

Figure 13: Archaeological Sensitivity.

Appendix I: Historic Memo

Kyle Obenauer
Senior Architectural Historian

Vermont Agency of Transportation

Project Delivery Bureau - Environmental Section
219 N. Main Street
Barre, VT 05641

kyle.obenauer@vermont.gov
(802) 279-7040
www.vtrans.vermont.gov

Re: Statewide STP CULV(90) – Above Ground Resource ID

Date: 05/26/2022

This Resource Identification effort is being undertaken to identify cultural resources within broad preliminary survey areas that could be potentially impacted by future culvert projects at the locations below in Essex and Jericho, Chittenden County, Vermont. Once a project has been defined at the conceptual design phase, VTrans Cultural Resources staff will be able to determine a formal Area of Potential Effect (APE) for purposes of Section 106 and 22 VSA § 14, as well as more conclusively determine potential impacts to protected property types, including Section 4(f) properties.

Culvert locations:

Essex

- Bridge No. 11, Vermont Route 2A
    - Although an early concrete culvert (c. 1930s), this structure does not appear to possess the historic significance necessary for inclusion in the National Register of Historic Places (NRHP). If work is confined to the existing ROW, there will likely be no other buildings, structures, or objects within a project APE.

- Bridge No. 2, Vermont Route 15/Upper Main Street
    - **Historic property - see below**

- Bridge No. 17A, Vermont Route 289
    - This structure is a common CMP from the 1990s that is not historically significant. No other buildings, structures, or objects within a likely APE.

Jericho

- Bridge No. 6A, Vermont Route 15A
    - This structure is also a common CMP that is not historically significant. If work is confined to the existing ROW, there will likely be no other buildings, structures, or objects within a project APE.

Historic Property Identified

Of the four culvert locations above, a potentially NRHP-eligible property within a likely APE was identified at 38 Upper Main Street in Essex, at the northeastern quadrant of Bridge No. 2 (*Figures 1;3*). This vernacular Greek Revival-style two story eaves front brick house is listed in the Vermont State Register of Historic Places (Survey 0405-123; listed 1980; *Figure 2*). Although it's fenestration has been altered and associated outbuildings modified and/or removed, the NRHP-eligibility of the former Abbott House should be considered further since this building and the former Lang Farmhouse directly across the road (to the south) are two increasingly rare examples of mid-19th century brick architecture on the fringes of Essex.

The building at 38 Upper Main Street in Essex should also be considered a Section 4(f) property type.

Impacts to the former Abbott House at 38 Upper Main Street will most likely be avoided if work associated with replacing Bridge No. 2 is confined to the existing right of way.

Please, let me know if there are any questions.

Images and Illustrations

Figure 1. 38 Upper Main Street at northeastern corner of Bridge No. 2 in Essex.

Figure 2. 38 Upper Main Street, photographed in 1980s.

Figure 3. 38 Upper Main Street at northeastern quadrant showing adjacent parcel boundaries, with Bridge No. 2 at arrow.

Figure 4. Bridge No. 11, Essex

Figure 5. Bridge No. 17A, Essex

Figure 6. Bridge No. 6A, Jericho

Appendix J: Environmental Specialist Resource ID

VERMONT

State of Vermont
Highways-PDB-Environmental
219 N. Main Street
www.aot.state.vt.us

Agency of Transportation

Date: September 12, 2022
Project: **Statewide – Northwest STP CULV(90)**

6(f) Properties:
There aren't any 6(f) Properties within the project area.

Hazardous Waste:
There aren't any Hazardous Wastes Sites identified within the project area.

Contaminated Soils:
There aren't any Contaminated Soils within the project area.

Contaminated Soils/ Urban Background Soils general language
-Sections of the proposed project are located within Urban Background Soils areas as mapped on the ANR Atlas. Proposed project limits will determine if impacts are anticipated, and if coordination with the Hazard Waste Coordinator is required. Disturbed soils within this project should be expected to be kept on site, or follow Notice to bidders guidance.

Wild Scenic Rivers:
There aren't any designated Wild Scenic Rivers within the project area.

Act 250 Permits:
There are adjacent parcels that have Act 250 Permits and may need to be amended if impacted.

FEMA Floodplains:
There are FEMA Floodplains mapped within the project area and a Flood Hazard Area/ River Corridor Permit may be required if there are impacts.

River Corridor:
There are River Corridors mapped within the project area and a Flood Hazard Area/ River Corridor Permit may be required if there are impacts.

Protected Lands:
There aren't any Protected Lands within the project area.

US Coast Guard:
There aren't any US Coast Guard navigable waterways within the project area.

Lakes and Ponds:
There aren't any lakes or ponds within the project area.

Scenic Highway/ Byway:
There aren't any Scenic Highway/ Byways within the project area.

Environmental Justice:
There are no EJ populations present within the study area, therefore there is no potential to have a disproportionately high and adverse effect.

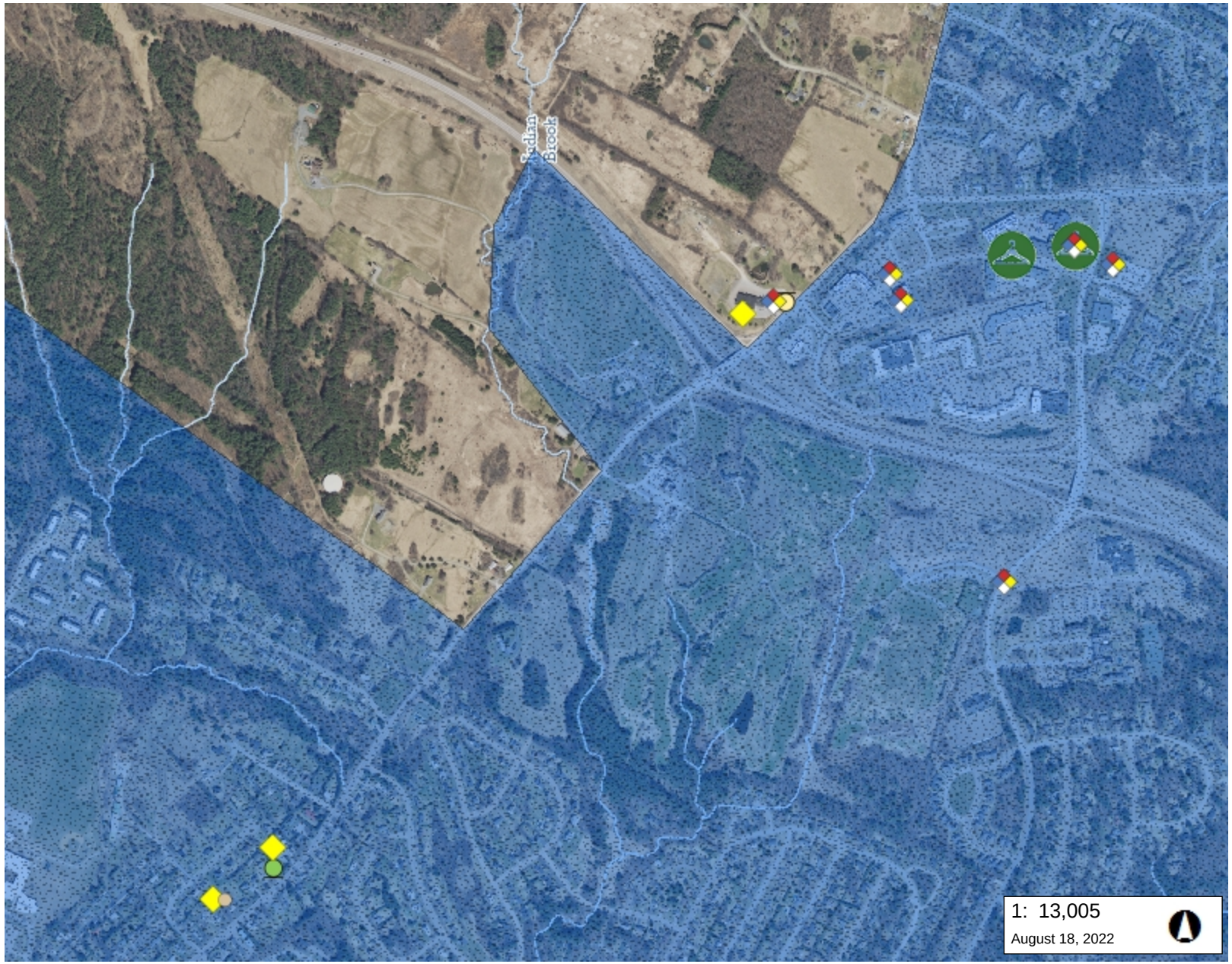
Other:
There aren't any other resources within the project area.

Appendix K: Hazardous Sites Map

Natural Resources Atlas

Vermont Agency of Natural Resources

vermont.gov



LEGEND

- Landfills
  - OPERATING
  - CLOSED
- Land Use Restrictions
  - Class IV GW Reclass
  - Class VI GW Reclass
  - Deed Restriction
  - Easement
  - Land Record Notice
  - Other
- Hazardous Site
- Hazardous Waste Generators
- Brownfields
- Salvage Yard
- Aboveground Storage Tank
- Underground Storage Tank (w
- Dry Cleaner
- Urban Soil Background Areas
- Stream/River
  - Stream
  - Intermittent Stream

NOTES

Map created using ANR's Natural Resources Atlas

661.0 0 330.00 661.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 1084 Ft. 1cm = 130 Meters

THIS MAP IS NOT TO BE USED FOR NAVIGATION

Appendix L: Stormwater Resource ID

VERMONT

State of Vermont
Environmental Section
219 North Main Street
Barre, Vermont 05641
Vtrans.vermont.gov

Agency of Transportation

[phone] 802-498-5787

To: Julie Ann Held, VTrans Environmental Specialist
From: Heather Voisin, VTrans Green Infrastructure Engineer
Date: August 18, 2022
Subject: Statewide – Northwest STP CULV(90) - Stormwater Resource ID Review

Project Description: I have reviewed the project area for Statewide – Northwest STP CULV(90) for stormwater related regulatory and water quality concerns. The project will involve repair or replacement to 4 different culverts in locations as follows:

- Essex VT-15 Br2
- Essex VT-2A Br 11
- Essex VT-289 Br 17
- Jericho VT-15 Br 6
-

My evaluation has included the review of existing imagery and mapping (ANR Natural Resource Atlas, VTrans Operational Stormwater Permits) to capture existing stormwater features and existing drainage.

Regulatory Considerations
Depending on how much impervious surface area is associated with repairing these culverts, an Operational Stormwater may be required, and, if any of the project work areas require greater than 1 acre of earth disturbance, the culverts would need to follow the GAP procedure considering opportunities for post-construction stormwater treatment.

For the Essex VT Route 15 culvert, several of the adjacent properties have existing operational stormwater permits, however it is not anticipated that repair or replacement of the culverts would impact those permits. This culvert conveys Indian Brook and is located within the Indian Brook watershed, which is considered impaired due to stormwater-related issues and is listed on EPA's 303(d) list. This designation is unlikely to affect the culvert projects, but it does elevate the need for a design that is sensitive to this context, as noted in the design considerations below.

The Essex VT Route 2A culvert carries an unnamed tributary of Indian Brook under the roadway and is located just outside of the stormwater-impaired portion of the Indian Brook watershed.

The culvert under VT Route 289 in Essex conveys an unnamed tributary of Alder Brook and is not located within a stormwater-impaired watershed. This location is within the limits of the historical stormwater permit that was obtained for VT Route 289. That permit is no longer in existence; however, the treatment features remain, including a grass swale running along the eastern side of the road at the culvert location.

For the Jericho culvert on VT Route 15, there do not appear to be any existing stormwater permits immediately adjacent to the project site and there are no noteworthy stormwater regulatory concerns at this time.

Design Considerations
It is strongly encouraged that drainage work associated with this project, particularly around any ditching and culvert work, be aligned with the VTrans Phosphorus Control Highway Drainage Management Standards, as this may allow future credit toward achieving phosphorus reduction goals required by the Agency's TS4 permit.

VERMONT

Appendix M: Landscape Clearance Resource ID

State of Vermont | Agency of Transportation
Environmental Section
219 North Main
Barre, VT 05641
Vtrans.vermont.gov

To: Project File
From: Bonnie Kirn Donahue, *VTrans Landscape Architect*
Date: July 21, 2022
Project: **STATEWIDE – NORTHWEST IM CULV(90) 22B044**
Subject: Landscape (LA) Clearance for Resource ID

SUMMARY

I have reviewed the locations for **STATEWIDE – NORTHWEST IM CULV(90) 22B044** dated 4/18/2022, and have determined that there are potentially minor riparian buffer impacts occurring as a result of the proposed work:

- This project includes 4 culverts:
  - Essex VT-2A Br 11
  - Essex VT-15 Br 2
  - Essex VT-289 Br 17-A
  - Jericho VT-15 Br 6A

DESCRIPTION OF IMPACT

The repair or replacement of culverts may require construction impacts to the riparian buffer and/or tree clearing.

Riparian Buffer:

Riparian and wetland buffers serve an important purpose for the health of Vermont's water quality and wildlife. They prevent erosion on steep embankments, provide shade, food sources and woody debris for healthy aquatic habitat, and provide wildlife corridors along wetlands and streams. With a vegetated riparian buffer, sediment and pollutants like phosphorus are prevented from entering water bodies, keeping our rivers, ponds and lakes clear from algae and cool for fish and other aquatic species to thrive. Revegetating areas where riparian and wetland buffers are impacted establishes a connection between the newly completed project with the existing conditions. Selecting native plants that complement the character of the area will make projects more visually appealing and merge the transportation asset with its surroundings.

Using native trees and shrubs in addition to a seed mix speeds up natural succession, establishing an effective riparian buffer more quickly than using seed alone. Selecting plants that have already started to grow will also have a better chance of establishing before invasive plants have a chance to fill in.

Tree Clearing

Trees and forests play a critical role in maintaining a healthy planet. Trees convert carbon dioxide to oxygen, filtering pollutants from the air and providing clean air to breathe. Roots and leaves work together to prevent soil erosion and control movement of sediment. Roots hold soil in place and soak up water, while leaves catch and slow down rainwater. Providing shade and performing evapotranspiration, trees also cool air and surface temperatures. Additionally, trees provide habitat, food and shelter for countless species, including insects, birds, and mammals.

Clearing of trees and forested areas can result in a loss of these benefits. Minimizing tree clearing, and replanting after construction are excellent ways to maintaining these benefits and support a healthy ecosystem.

RECOMMENDATIONS

1. I recommend re-vegetating the area with native trees and shrubs for river buffers, willow fascines or live stakes (depending on soil conditions at the waters' edge) and a diverse pollinator seed mix.
    a. See the *2022 VTrans Riparian Planting Toolkit* for design guidelines and species (link).

NOTES

1. I would be glad to assist with a plant list and plan (bonnie.donahue@vermont.gov).

Appendix N: Local Input Questionnaire

Project Summary

This project, PROJ #, focuses on Bridge BR-2 on Route 15 in Essex, Vermont. The culvert is deteriorating and is in need of either a major maintenance action or replacement. Potential options being considered for this project include a new liner applied to the interior of the existing culvert pipe, removal of the existing pipe and replacement with a new culvert placed in the same location, or removal of the existing pipe and replacement in a new location. It is possible that VTrans will recommend a road closure and detour traffic away from the project site for the duration of the work. Efforts will be made to limit the detour to State roads.

Community Considerations

1. Are there regularly scheduled public events in the community that will generate increased traffic (e.g. vehicular, bicycles and/or pedestrians), or may be difficult to stage if the culvert is closed during construction? Examples include annual bike races, festivals, parades, cultural events, weekly farmers market, concerts, etc. that could be impacted? If yes, please provide approximate date, location and event organizers' contact info.

   Yes, weekly events take place at the Essex Experience/Outlets and at the Barns at Lang Farm from late May/early June through Sept. There are farmer's markets and outdoor concert series at the Essex Experience and the Lang Barn regularly hosts parties and weddings.
   https://www.essexexperience.com/events - contact number is 802-878-4200
   https://langbarn.com/contact-us/

2. Is there a "slow season" or period of time from May through October where traffic is less or no events are scheduled?

   More events are scheduled during the summer season than throughout the rest of the year, but school is out during this time, so there is less overall traffic.

3. Please describe the location of the Town garage, emergency responders (fire, police, ambulance) and emergency response routes that might be affected by the closure of the culvert, one-way traffic, or lane closures and provide contact information (names, address, email addresses, and phone numbers.

   Yes, closure of this route will impact emergency response routes.

   a. Please coordinate with the following:

      i. Essex Police: 145 Maple Street, primary contact Chief Ron Hoague, rhoague@essex.org, dispatch #: 802-878-8331

ii. Town Fire: 188 Sand Hill Road, primary contact Chief Charlie Cole, ccole@essex.org, cell: 802-578-5302, office: 802-229-7170

iii. Essex Rescue: 1 Educational Drive, primary contact Colleen Nesto, cnesto@essexrescue.org, 802-878-4859 ext 2

b. Town Public Works Garage is located at 190 Sand Hill Road. Primary contact will be the Administration Office at 802-878-1344. Operations at the garage will not be affected by the closure. Highway crew can use alternate routes.

4. Are there businesses (including agricultural operations and industrial parks) or delivery services (fuel or goods) that would be adversely impacted either by a detour or due to work zone proximity?

   Yes - State Farm Insurance Agency, Essex Family Fun & Entertainment Center (driving range and mini golf course), and the Barns at Lang Farm

5. Are there important public buildings (town hall, community center, senior center, library) or community facilities (recreational fields, town green, etc.) close to the project?

   The closest community facility would be the green space at the Essex Experience. The Town has 3 municipal buildings on Route 15, but all are located approximately 1-2 miles away.

6. What other municipal operations could be adversely affected by a road/culvert closure or detour?

   No municipal operations would be adversely affected by a road closure.

7. Are there any town highways that might be adversely impacted by traffic bypassing the construction on other local roads? Please indicate which roads may be affected and their condition (paved/unpaved, narrow, weight-limited culverts, etc), including those that may be or go into other towns.

   No town highways would be adversely impacted by traffic bypassing the construction on other local roads.

8. Is there a local business association, chamber of commerce, regional development corporation, or other downtown group that we should be working with? If known, please provide name, organization, email, and phone number.

    a. No such organization exists for the Town; the Community Development Department supports the Town's Economic Development Commission and will coordinate with them.

9. Are there any public transit services or stops that use the culvert or transit routes in the vicinity that may be affected if they become the detour route?
    a. Town Senior Van Services - https://www.essexvt.org/263/Senior-Van, phone contact: 802-878-6940
    b. Green Mountain Transit – Williston Essex Combo Line, https://ridegmt.com/

Schools

1. Where are the schools in your community and what are their yearly schedules (example: first week in September to third week in June)?

    a. Essex Westford School District; school is in session from first week in September to third week in June, but there are also many summer programs in schools and parks.

        i. Essex High School – located at 2 Educational Drive

        ii. Essex Elementary School – located at 1 Bixby Hill Road

        iii. Essex Middle School – located at 60 Founders Road

2. Is this project on specific routes that school buses or students use to walk to and from school?

    Yes, buses utilize this route, but students do not walk to school in this area. Contact Essex Westford school district for more information on the bus routes.

3. Are there recreational facilities associated with the schools nearby (other than at the school)?

    No, there aren't any recreational facilities associated with the schools nearby.

Pedestrians and Bicyclists

1. What is the current level of bicycle and pedestrian use on the culvert?

2. Are the current lane and shoulder widths adequate for pedestrian and bicycle use?

3. Does the community feel there is a need for a sidewalk or bike lane over the culvert?

4. Is pedestrian and bicycle traffic heavy enough that it should be accommodated during construction?

5. Does the Town have plans to construct either pedestrian or bicycle facilities leading up to the culvert? Please provide any planning documents demonstrating this (scoping study, master plan, corridor study, town or regional plan).

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

Design Considerations

1. Are there any concerns with the alignment of the existing culvert? For example, if the culvert is located on a curve, has this created any problems that we should be aware of?
   No, there are no concerns with the alignment of the existing culvert.
2. Are there any concerns with the width of the existing culvert?
   No, the existing width is sufficient. If the State plans to upsize this culvert, there could be flood impacts downstream.
3. Are there any special aesthetic considerations we should be aware of?
   No, there aren't any special aesthetic considerations to be aware of.
4. Does the location have a history of flooding? If yes, please explain.
   No, there is no history of flooding.
5. Are there any known Hazardous Material Sites near the project site?
6. Are there any known historic, archeological and/or other environmental resource issues near the project site?
7. Are there any existing, pending, or planned municipal utility projects (communications, lighting, drainage, water, wastewater, etc.) near the project that should be considered?
8. Are there any other issues that are important for us to understand and consider?
   No, there are no other issues to consider.

Land Use & Zoning

1. Please provide a copy of your existing and future land use map or zoning map, if applicable. See attached.

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

3. Is there any planned expansion of public transit or intercity transit service in the project area? Please provide the name and contact information for the relevant public transit provider.

Communications

1. Please identify any local communication outlets that are available for us to use in communicating with the local population. Include weekly or daily newspapers, blogs, radio, public access TV, Facebook, Front Page Forum, etc. Also include any unconventional means such as local low-power FM.
    a. Essex Reporter
    b. Essex ReTorter
    c. Town Meeting TV
    d. Front Porch Forum
    e. Town of Essex Facebook page (contact Tammy Getchell, tgetchell@essex.org, (802) 876-5773)

2. Other than people/organizations already referenced in this questionnaire, are there any others who should be kept in the loop as the project moves forward?
    Town of Essex Community Development Department
    a. Katherine Sonnick, Director of Community Development – ksonnick@essex.org
    b. Darren Schibler, Town Planner, dschibler@essex.org

Appendix O: Operations Input Questionnaire (blank)

Bridge Scoping Project PROJ#(##)
Operations Input Questionnaire

The Structures Section has begun the scoping process for PROJ#(##), ROUTE ##, Bridge ##, over the FEATURE. This is a BRIDGE TYPE bridge constructed in YEAR. The Structure Inspection, Inventory, and Appraisal Sheet (attached) rates the deck as # (RATING), the superstructure as # (RATING), and the substructure as # (RATING). We are interested in hearing your thoughts regarding the items listed below. Leave it blank if you don't wish to comment on a particular item.

1. What are your thoughts on the general condition of this culvert and the general maintenance effort required to keep it in service?

2. What are your comments on the current geometry and alignment of the road overt the culvert (curve, sag, banking, sight distance)?

3. Do you feel that the posted speed limit is appropriate?

4. Is the current roadway width adequate for winter maintenance including snow plowing?

5. Are the railings constantly in need of repair or replacement? What type of railing works best for your district?

6. Are you aware of any unpermitted driveways within close proximity to the culvert? We frequently encounter driveways that prevent us from meeting railing and safety standards.

7. Are you aware of abutting property owners that are likely to need special attention during the planning and construction phases? These could be people with disabilities, elderly, or simply folks who feel they have been unfairly treated in the past.

8. Do you find that extra effort is required to keep the slopes and river banks around the culvert in a stable condition? Is there frequent flood damage that requires repair?

9. Does this culvert seem to catch an unusual amount of debris from the waterway?

10. Are you familiar with traffic volumes in the area of this project?

11. Do you think a closure with off-site detour and accelerated construction would be appropriate? Do you have any opinion about a possible detour route, assuming that we use State route for State projects and any route for Town projects? Are there locations on a potential detour that are already congested that we should consider avoiding?

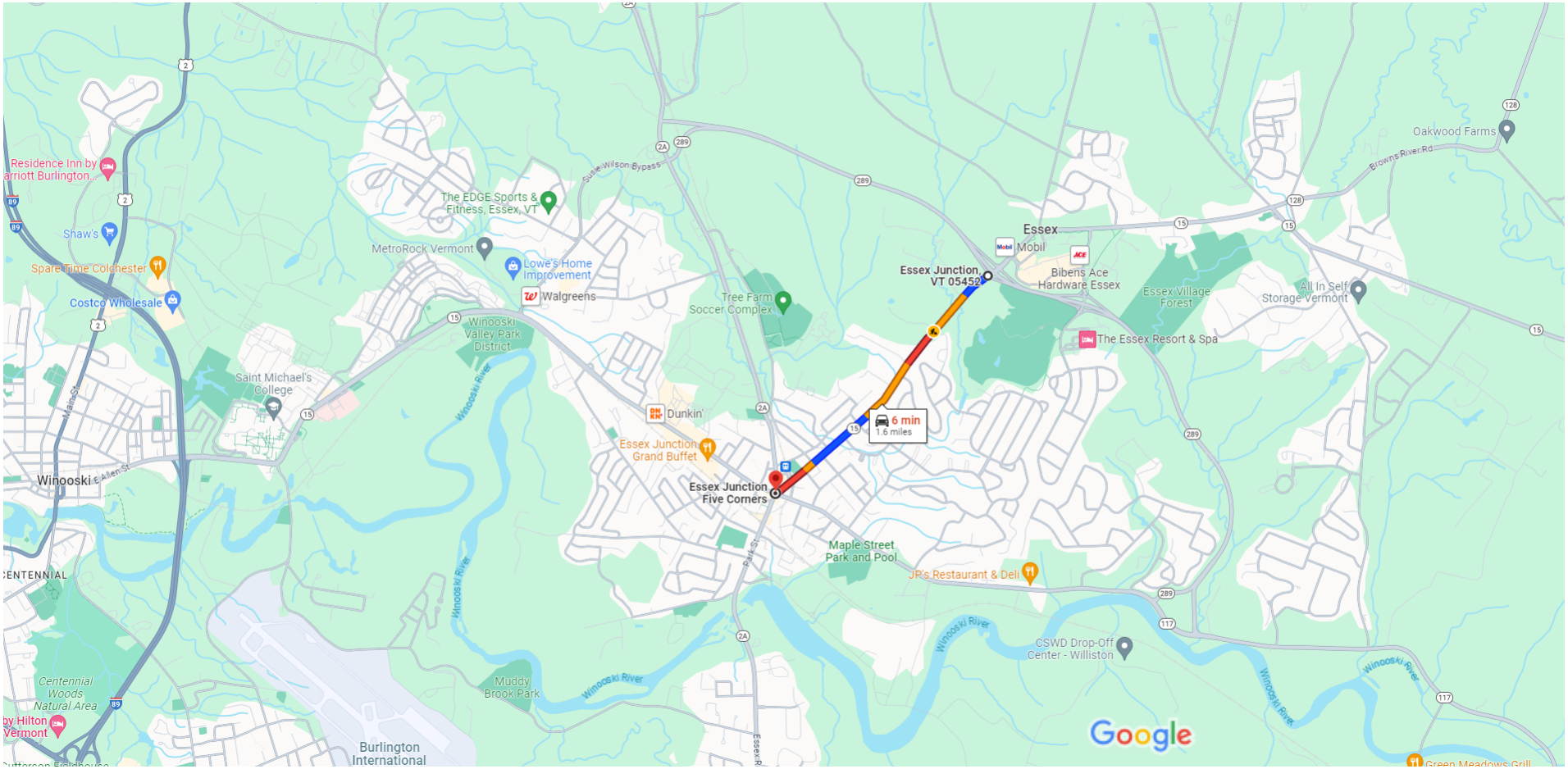
12. Please describe any larger projects that you have completed that may not be reflected on the attached Appraisal sheet, such as deck patches, paving patches, railing replacement with new type, steel coating, etc.

13. Are there any drainage issues that we should address on this project?

14. Are you aware of any complaints that the public has about issues that we can address on this project?

15. Is there anything else we should be aware of?

Appendix P: Detour Maps



Map data ©2023 Google 2000 ft

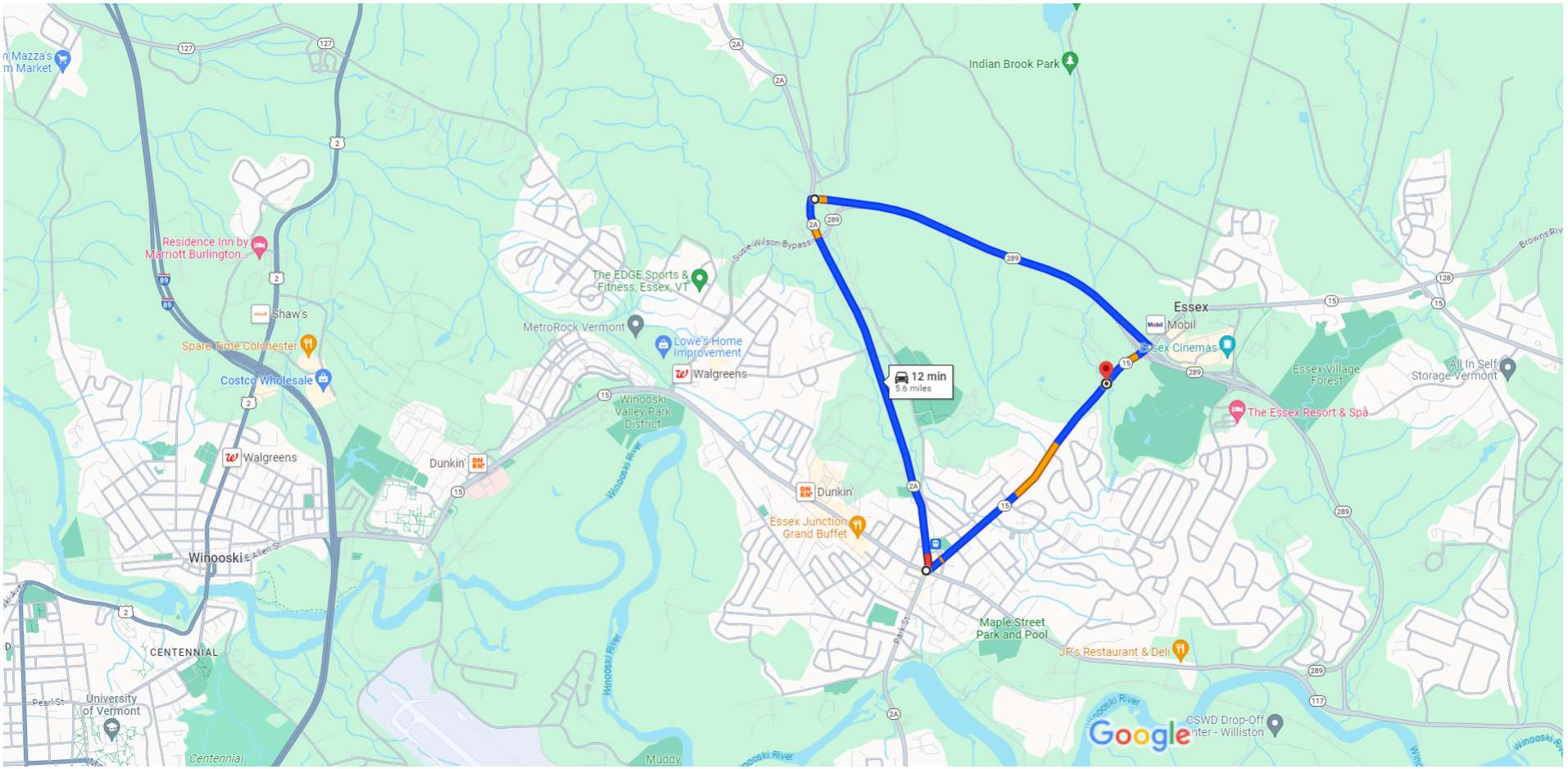
Essex Town

Essex Junction, VT 05452

1. Head southwest on VT-15 W

1.6 mi

Google Maps Essex VT15 BR2 Regional Detour #1 Distance Detour Distance = 5.6 miles, Total Travel Time = 12 min



Map data ©2023 Google 2000 ft

Chittenden County
Vermont 05452

1. Head northeast on VT-15 E
0.3 mi
2. Turn left to merge onto VT-289 W
2.0 mi

3. Turn left onto VT-2A S

2.0 mi

4. Sharp left onto VT-15 E/Main St

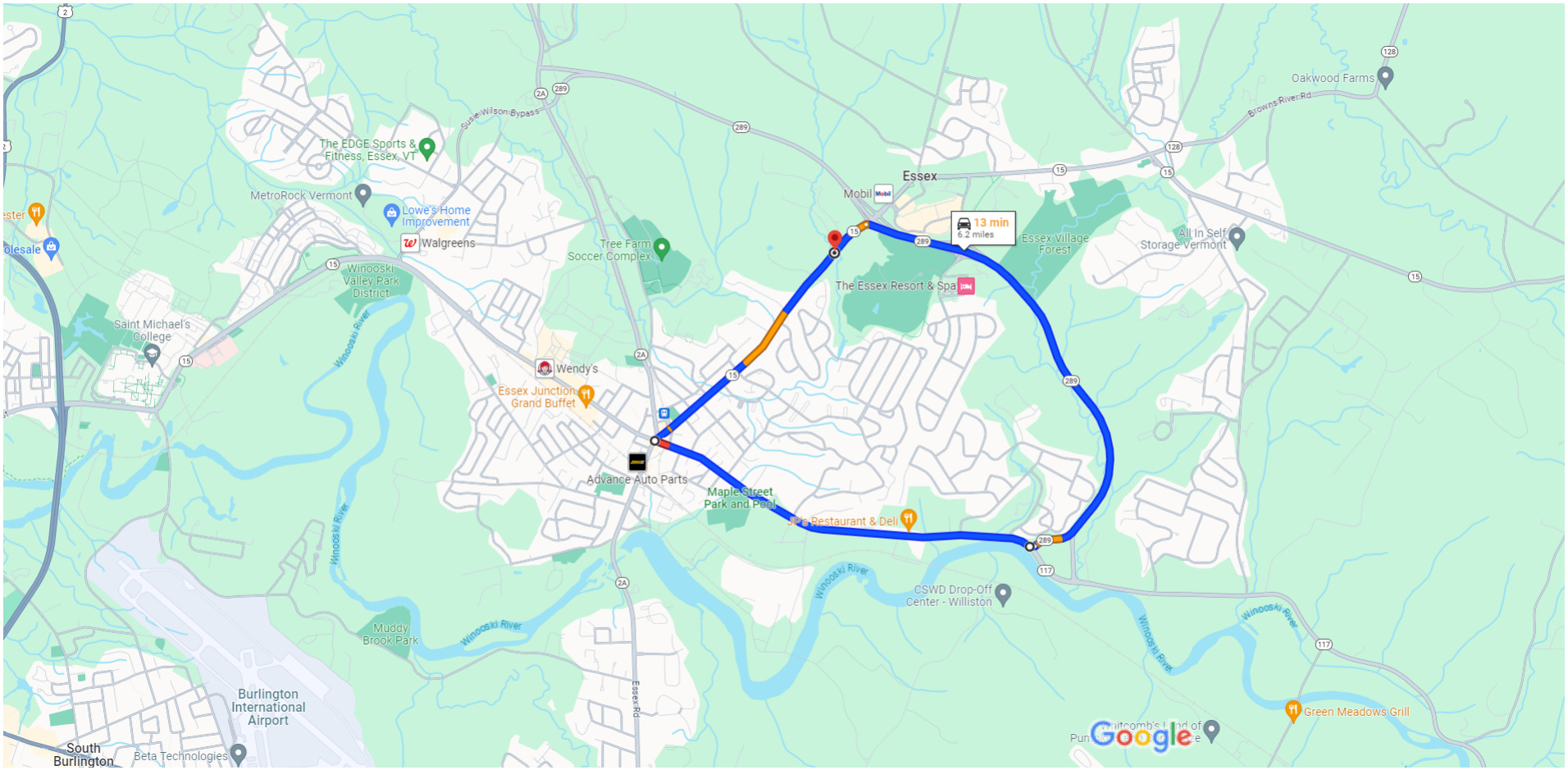
Continue to follow VT-15 E

1.4 mi

Chittenden County
Vermont 05452

Google Maps Essex VT15 BR2 Regional Detour #2 Distance

Detour Distance = 6.2 miles, Total Travel Time = 13 min



Map data ©2023 Google 2000 ft

Chittenden County
Vermont 05452

1. Head northeast on VT-15 E
   0.2 mi
2. Take the ramp onto VT-289 E
   2.5 mi

3. Turn right onto Vermont Rte 117 W

2.1 mi

4. Sharp right onto VT-15 E/Main St

Continue to follow VT-15 E

1.3 mi

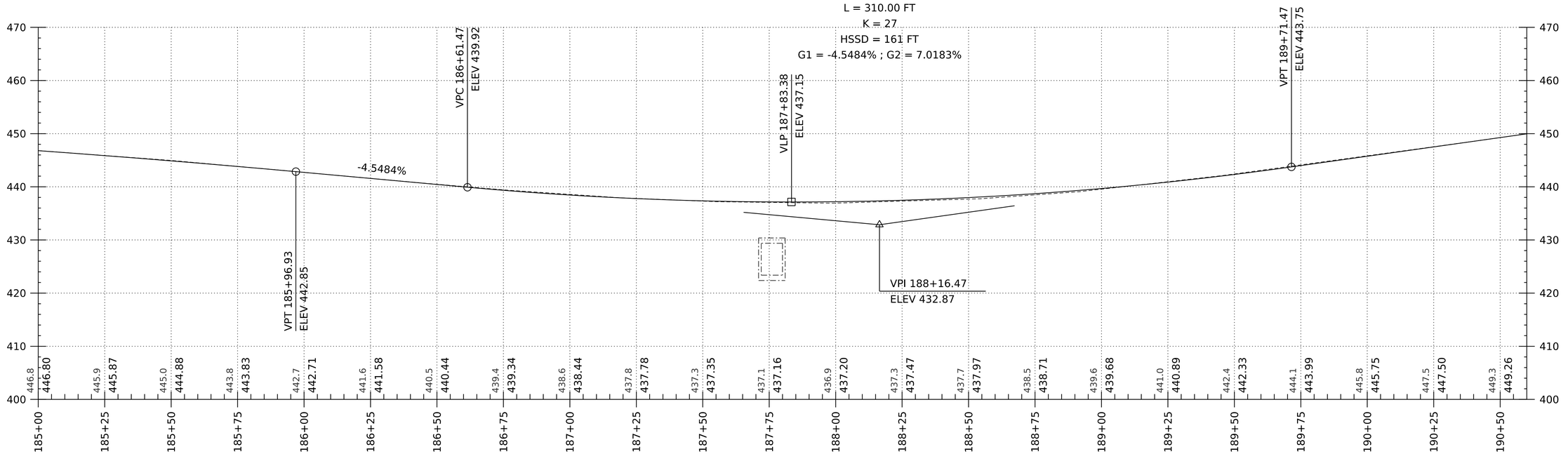
Chittenden County
Vermont 05452

Appendix Q: Plans

EXISTING BRIDGE INFORMATION
8'X6' REINFORCED CONCRETE BOX
54' LONG, BUILT 1919.
5' AVERAGE COVER.
56 SQFT WATERWAY AREA.

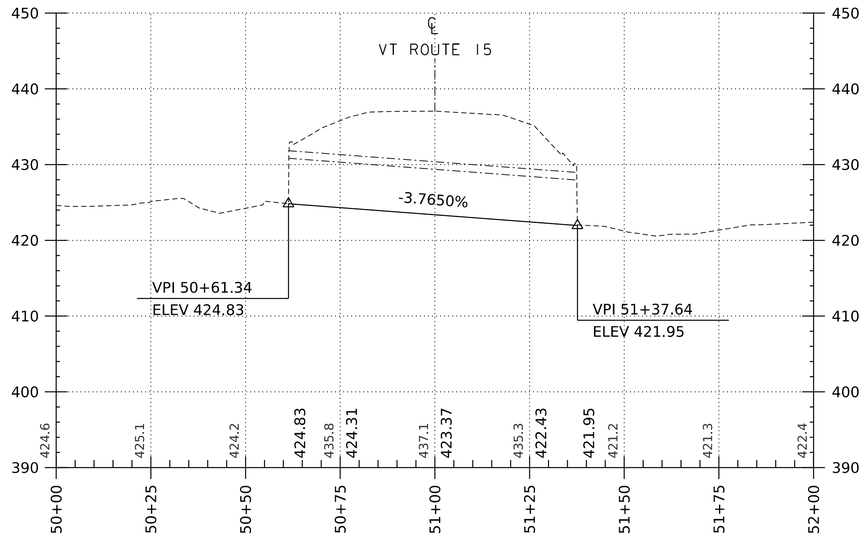
PROJECT NAME: STATEWIDE - NORTHWEST
PROJECT NUMBER: STP CULV(90)

FILE NAME: s22b044_Essex VT 15 Br 2_BRD ExistingDgn PLOT DATE: 25-SEP-2023
PROJECT LEADER: L.J.STONE DRAWN BY: D.D.BEARD
DESIGNED BY: ------ CHECKED BY: ------
EXISTING CONDITIONS LAYOUT SHEET 1 OF 20



VT ROUTE 15 PROFILE

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

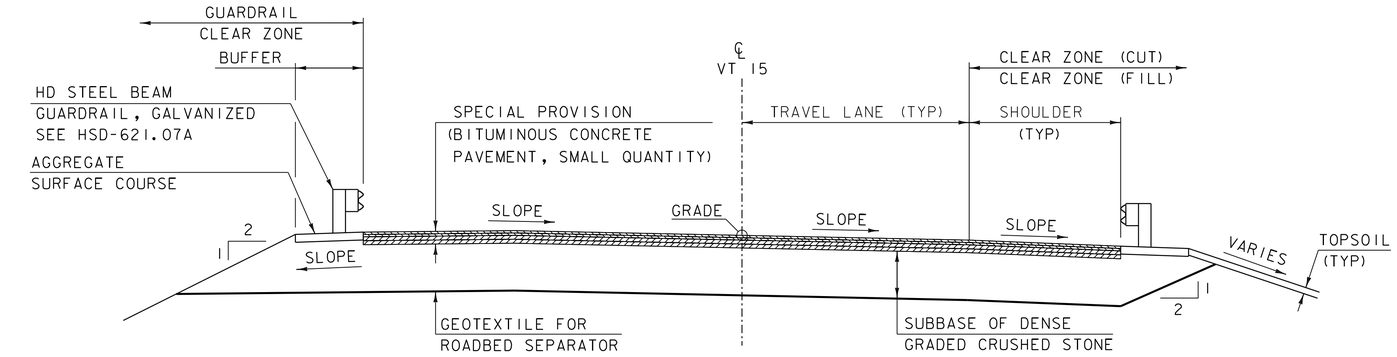


CHANNEL PROFILE

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

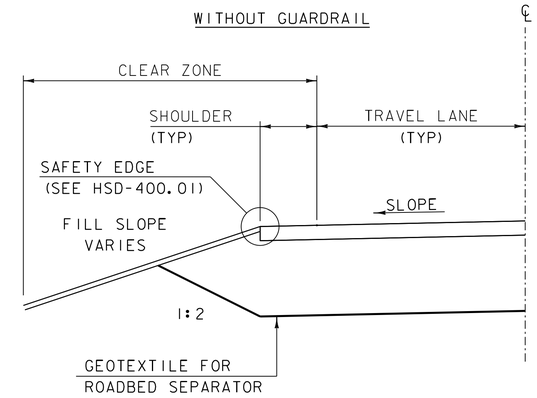
NOTE:
GRADES SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG ℄
GRADES SHOWN TO THE NEAREST HUNDREDTH ARE FINISH GRADE ALONG ℄

PROJECT NAME:	STATEWIDE - NORTHWEST
PROJECT NUMBER:	STP CULV(90)
FILE NAME: s22b044_Essex VT 15 Br 2_profile.dgn	PLOT DATE: 25-SEP-2023
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
PROFILE SHEET	SHEET 2 OF 20



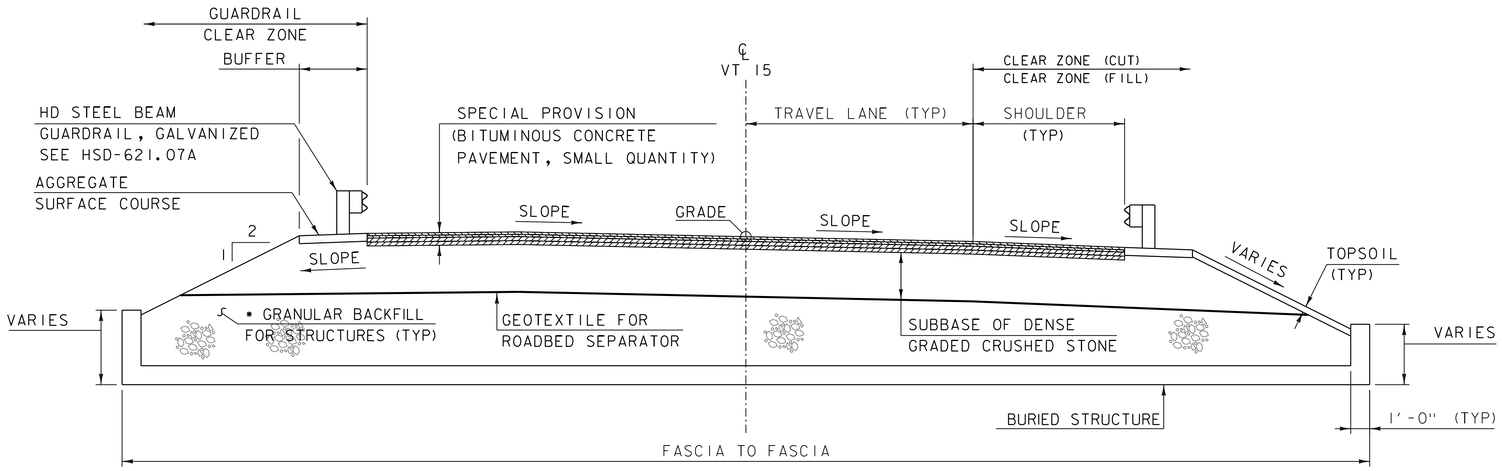
VT ROUTE 15 TYPICAL SECTION

SCALE: 1/4" = 1'-0"



ROADWAY TYPICAL SECTION

NOT TO SCALE



VT ROUTE 15 BURIED STRUCTURE TYPICAL SECTION

SCALE: 1/4" = 1'-0"

ROAD TYPICAL INFORMATION

	LEFT		RIGHT	
	WIDTH	SLOPE	WIDTH	SLOPE
TRAVEL LANE	11'-0"	VARIES	11'-0"	VARIES
SHOULDER	8'-0"	VARIES	8'-0"	VARIES
BUFFER	3'-7"	-0.060	3'-7"	-0.060
FILL SLOPE	---	VARIES	---	VARIES
CLEAR ZONE (CUT)	14'-0"	---	14'-0"	---
CLEAR ZONE (FILL)	16'-0"	---	16'-0"	---
CLEAR ZONE (GUARDRAIL)	4'-9"	---	4'-9"	---

MATERIAL INFORMATION

	THICKNESS	TYPE
WEARING COURSE	1½"	SPECIAL PROVISION (BITUMINOUS CONCRETE PAVEMENT, SMALL QUANTITY) (TYPE IVS)
BINDER COURSE	1½"	SPECIAL PROVISION (BITUMINOUS CONCRETE PAVEMENT, SMALL QUANTITY) (TYPE IVS)
BASE COURSE #2	2½"	SPECIAL PROVISION (BITUMINOUS CONCRETE PAVEMENT, SMALL QUANTITY) (TYPE IIS)
BASE COURSE #1	2½"	SPECIAL PROVISION (BITUMINOUS CONCRETE PAVEMENT, SMALL QUANTITY) (TYPE IIS)
BUFFER	8"	AGGREGATE SURFACE COURSE
SUBBASE	XX"	SUBBASE OF DENSE GRADED CRUSHED STONE
TOPSOIL	4"	TOPSOIL

TACK COAT: EMULSIFIED ASPHALT IS TO BE APPLIED AT A RATE OF 0.025 GAL/SY BETWEEN SUCCESSIVE COURSES OF PAVEMENT AND 0.080 GAL/SY ON COLD PLANED SURFACES AS DIRECTED BY THE ENGINEER.

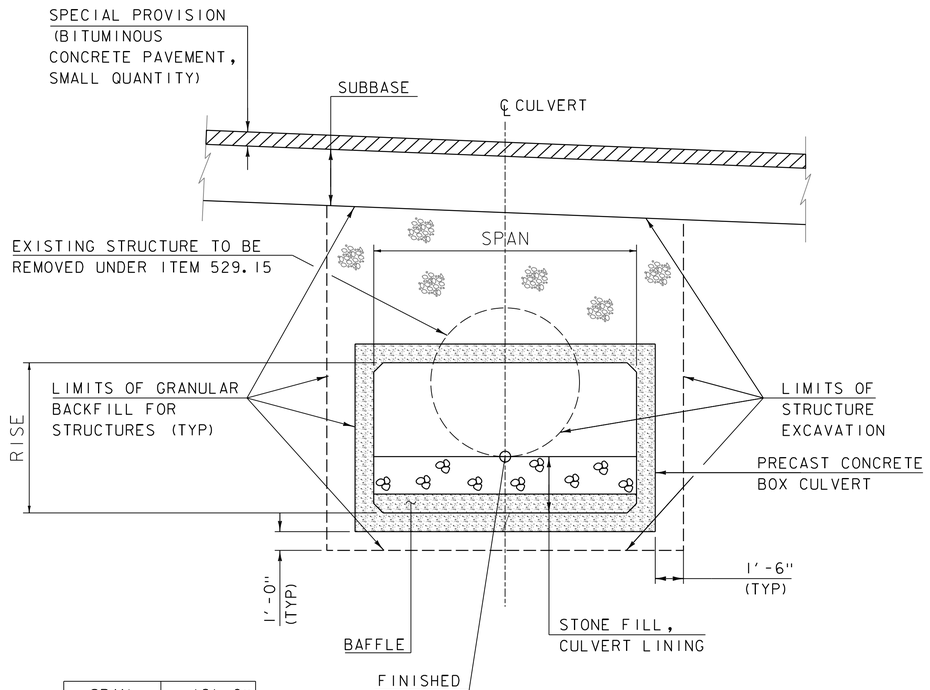
MATERIAL TOLERANCES

(IF USED ON PROJECT)

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

PROJECT NAME: STATEWIDE - NORTHWEST
PROJECT NUMBER: STP CULV(90)

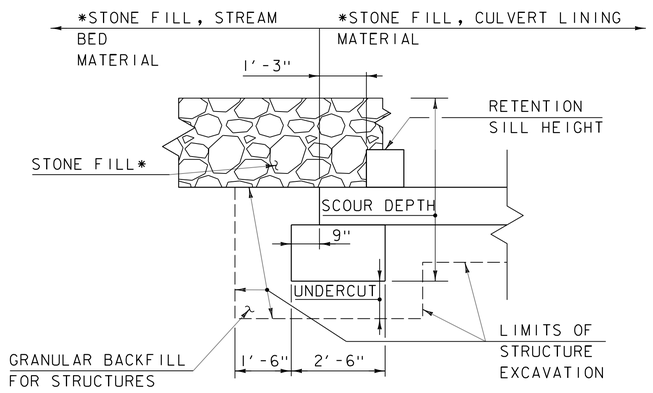
FILE NAME: 22b044/Essex VT 15 Br 2_typ.dgn
PLOT DATE: 25-SEP-2023
PROJECT LEADER: L.J.STONE
DRAWN BY: D.D.BEARD
DESIGNED BY: ------
CHECKED BY: ------
ROADWAY TYPICAL SECTION
SHEET 3 OF 20



SPAN	12'-0"
RISE	8'-0"
LENGTH	75'-0"

CULVERT TYPICAL SECTION

NOT TO SCALE



CUTOFF WALL TYPICAL SECTION

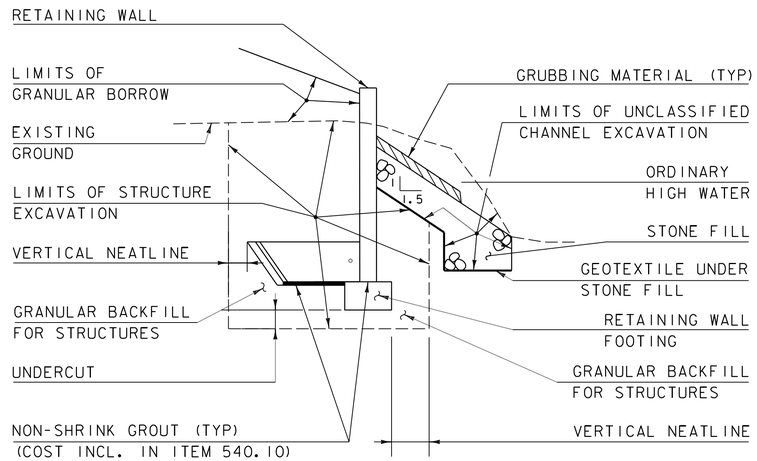
NOTE:

NOT TO SCALE

THE CUTOFF WALL MAY BE OMITTED IF THE DEPTH OF CULVERT LINING MATERIAL PLUS THE THICKNESS TO THE BOTTOM OF THE BOX MEETS OR EXCEEDS THE LISTED SCOUR DEPTH.

CUTOFF WALL - CRITICAL DIMENSIONS

	DIMENSION
SCOUR DEPTH	4'-0"
RETENTION SILL HEIGHT	1'-0"
UNDERCUT	1'-0"

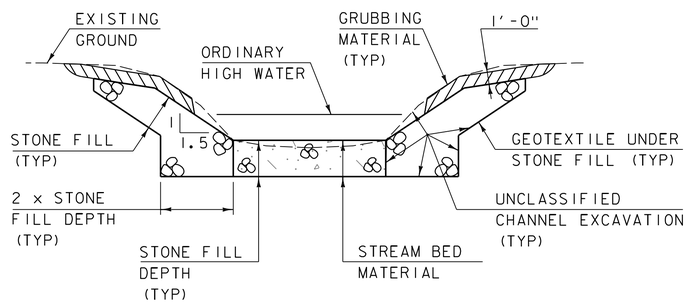


RETAINING WALL EARTHWORK TYPICAL SECTION

NOT TO SCALE

NOTE:

TOP OF RETAINING WALL FOOTING SHALL BE AT OR BELOW BOTTOM OF BOX CULVERT.



TYPICAL CHANNEL SECTION

(NOT TO SCALE)

1) WHENEVER CHANNEL SLOPE INTERSECTS ROADWAY SUBBASE, GRUBBING MATERIAL SHALL BEGIN AT THE BOTTOM OF SUBBASE.

2) THE CONTRACTOR SHALL CREATE A LOW FLOW CHANNEL IN THE STREAM BED MATERIAL AS DIRECTED BY THE ENGINEER.

3) GRUBBING MATERIAL SHALL BE PLACED UNDERNEATH STRUCTURES WHERE THERE IS MORE THAN 6 FEET VERTICALLY FROM ORDINARY HIGH WATER (OHW) TO THE BOTTOM OF SUPERSTRUCTURE AND MORE THAN 6 FEET HORIZONTALLY FROM OHW LINE TO FRONT FACE OF ABUTMENT. THIS MATERIAL SHALL START JUST ABOVE THE OHW ELEVATION AND TERMINATE 3 FEET HORIZONTALLY FROM THE FRONT FACE OF THE ABUTMENT. THIS MATERIAL SHALL NOT BE PLACED UNDERNEATH DOWNSPOUTS. SEE THE CHANNEL SECTIONS FOR ADDITIONAL DETAILING.

MATERIAL INFORMATION

	THICKNESS	TYPE
STONE FILL	2'-0"	TYPE II
STONE FILL, CULVERT LINING	2'-0"	E-STONE TYPE II
STONE FILL, STREAM BED MATERIAL	2'-0"	E-STONE TYPE II

RETAINING WALL - ASSUMED DIMENSIONS

LEVELING PAD	
	DIMENSION
WIDTH	2'-6"
TOE	0'-9"
HEEL	0'-9"
THICKNESS	1'-0"
UNDERCUT	1'-0"
WALL	
THICKNESS	1'-0"
HEIGHT	VARIES
EXCAVATION LIMITS	
VERTICAL NEATLINE	1'-6"
UNDERCUT	1'-0"

PROJECT NAME: STATEWIDE - NORTHWEST
PROJECT NUMBER: STP CULV(90)

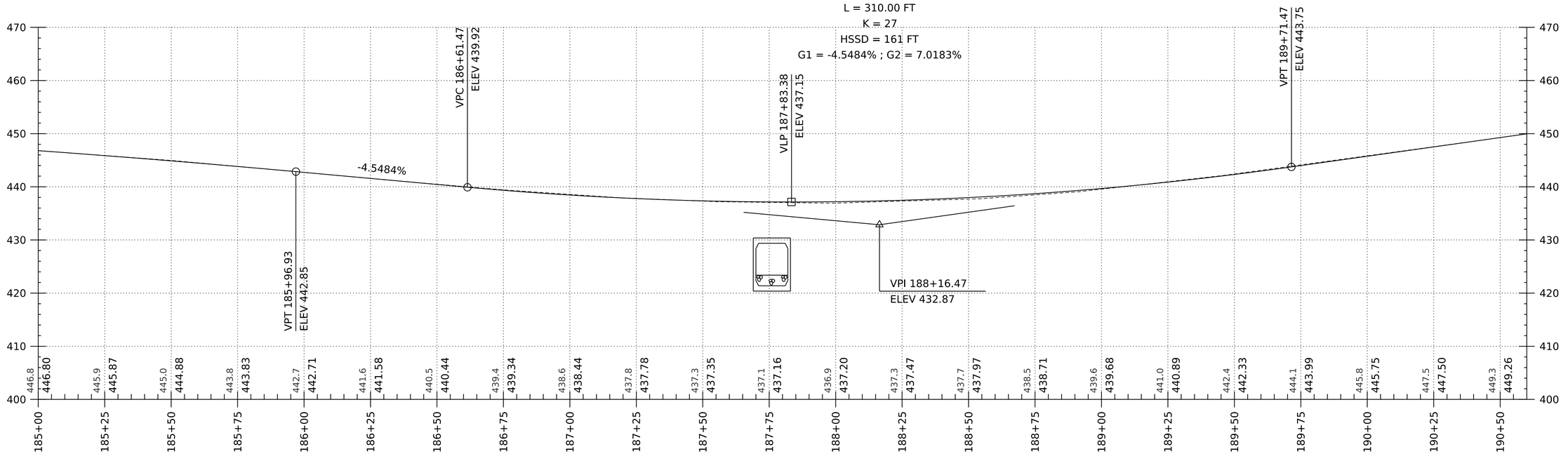
FILE NAME: 22b044/Essex VT 15 Br 2_typ.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
PRECAST CULVERT TYPICAL SECTION

PLOT DATE: 25-SEP-2023
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 4 OF 20

EXISTING BRIDGE INFORMATION
8′X6′ REINFORCED CONCRETE BOX
54′ LONG, BUILT 1919.
5′ AVERAGE COVER.
56 SQFT WATERWAY AREA.

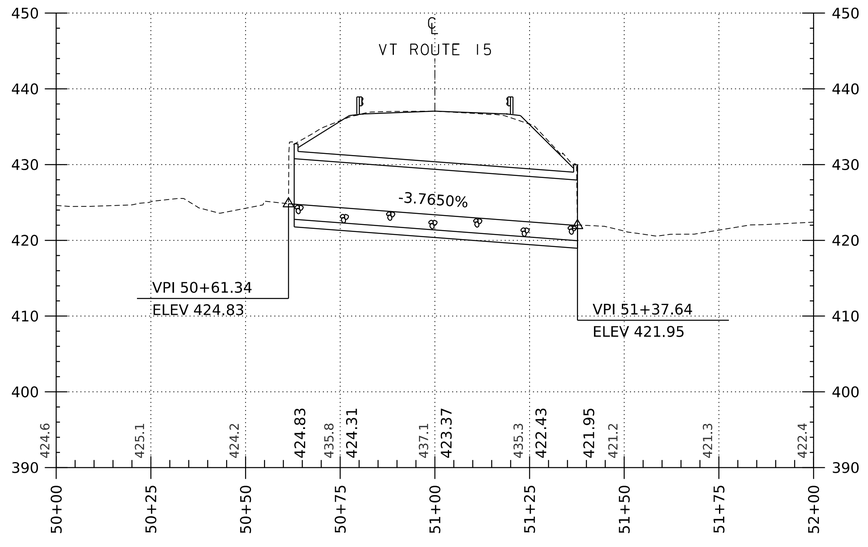
PROJECT NAME:	STATEWIDE - NORTHWEST
PROJECT NUMBER:	STP CULV(90)

FILE NAME: s22b044_Essex VT 15 Br 2_BDR New Box Culvert.dgn	PLOT DATE: 25-SEP-2023
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
NEW BOX CULVERT LAYOUT	SHEET 5 OF 20



VT ROUTE 15 PROFILE

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

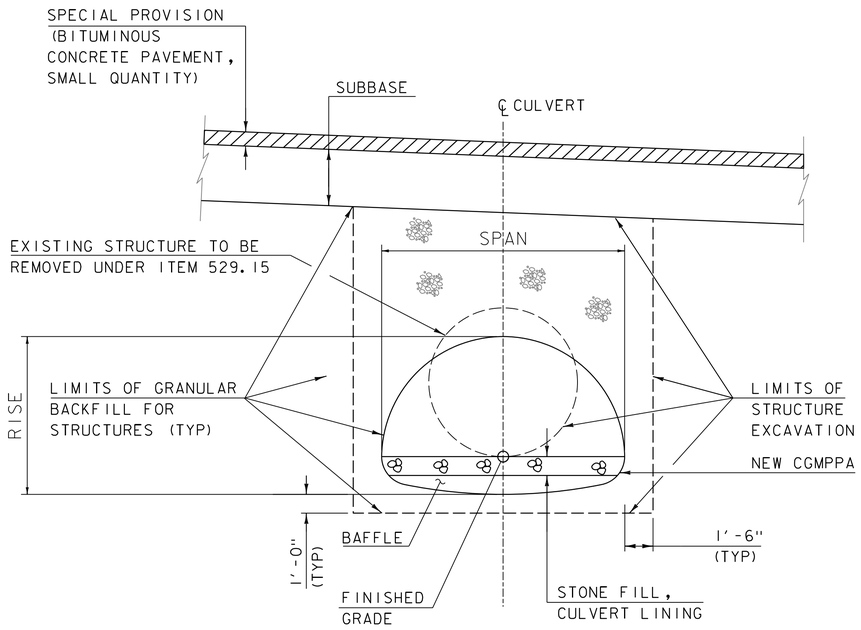


CHANNEL PROFILE

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

NOTE:
GRADES SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG ℄
GRADES SHOWN TO THE NEAREST HUNDREDTH ARE FINISH GRADE ALONG ℄

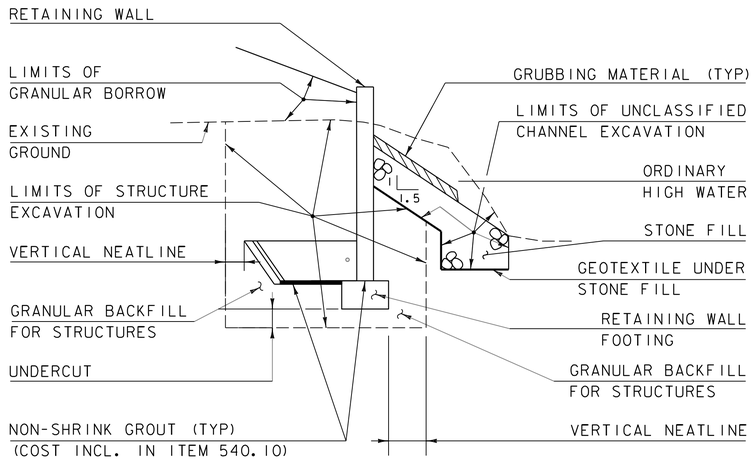
PROJECT NAME:	STATEWIDE - NORTHWEST
PROJECT NUMBER:	STP CULV(90)
FILE NAME: s22b044_Essex VT 15 Br 2_profile.dgn	PLOT DATE: 25-SEP-2023
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
NEW PRECAST CULVERT PROFILE SHEET	SHEET 6 OF 20



SPAN	12'-10"
RISE	8'-4"
LENGTH	75'-0"

CULVERT TYPICAL SECTION

NOT TO SCALE



RETAINING WALL EARTHWORK TYPICAL SECTION

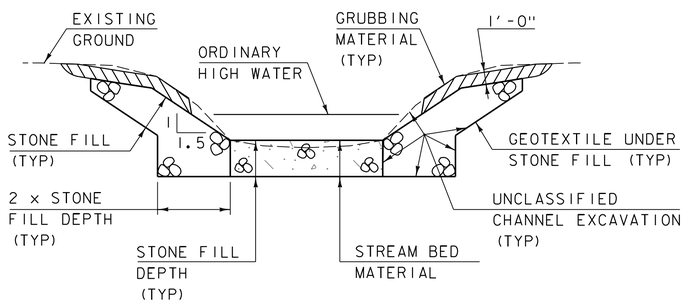
NOT TO SCALE

NOTE:

TOP OF RETAINING WALL FOOTING SHALL BE AT OR BELOW BOTTOM OF BOX CULVERT.

RETAINING WALL - ASSUMED DIMENSIONS

LEVELING PAD	
	DIMENSION
WIDTH	2'-6"
TOE	0'-9"
HEEL	0'-9"
THICKNESS	1'-0"
UNDERCUT	1'-0"
WALL	
THICKNESS	1'-0"
HEIGHT	VARIES
EXCAVATION LIMITS	
VERTICAL NEATLINE	1'-6"
UNDERCUT	1'-0"



TYPICAL CHANNEL SECTION

(NOT TO SCALE)

1) WHENEVER CHANNEL SLOPE INTERSECTS ROADWAY SUBBASE, GRUBBING MATERIAL SHALL BEGIN AT THE BOTTOM OF SUBBASE.

2) THE CONTRACTOR SHALL CREATE A LOW FLOW CHANNEL IN THE STREAM BED MATERIAL AS DIRECTED BY THE ENGINEER.

3) GRUBBING MATERIAL SHALL BE PLACED UNDERNEATH STRUCTURES WHERE THERE IS MORE THAN 6 FEET VERTICALLY FROM ORDINARY HIGH WATER (OHW) TO THE BOTTOM OF SUPERSTRUCTURE AND MORE THAN 6 FEET HORIZONTALLY FROM OHW LINE TO FRONT FACE OF ABUTMENT. THIS MATERIAL SHALL START JUST ABOVE THE OHW ELEVATION AND TERMINATE 3 FEET HORIZONTALLY FROM THE FRONT FACE OF THE ABUTMENT. THIS MATERIAL SHALL NOT BE PLACED UNDERNEATH DOWNSPOUTS. SEE THE CHANNEL SECTIONS FOR ADDITIONAL DETAILING.

MATERIAL INFORMATION

	THICKNESS	TYPE
STONE FILL	2'-0"	TYPE II
STONE FILL, CULVERT LINING	2'-0"	E-STONE TYPE II
STONE FILL, STREAM BED MATERIAL	2'-0"	E-STONE TYPE II

PROJECT NAME: STATEWIDE - NORTHWEST
PROJECT NUMBER: STP CULV(90)

FILE NAME: 22b044/Essex VT 15 Br 2_typ.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
METAL PIPE ARCH TYPICAL SECTION

PLOT DATE: 25-SEP-2023
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 7 OF 20

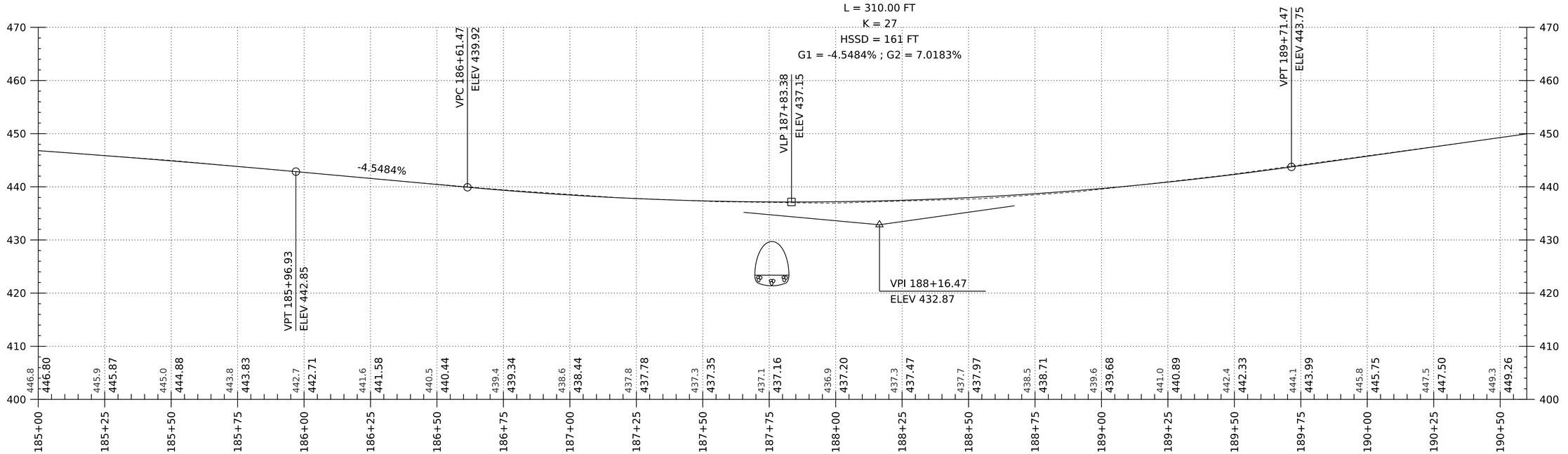
NEW PIPE ARCH CULVERT

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

EXISTING BRIDGE INFORMATION
8'X6' REINFORCED CONCRETE BOX
54' LONG, BUILT 1919.
5' AVERAGE COVER.
56 SQFT WATERWAY AREA.

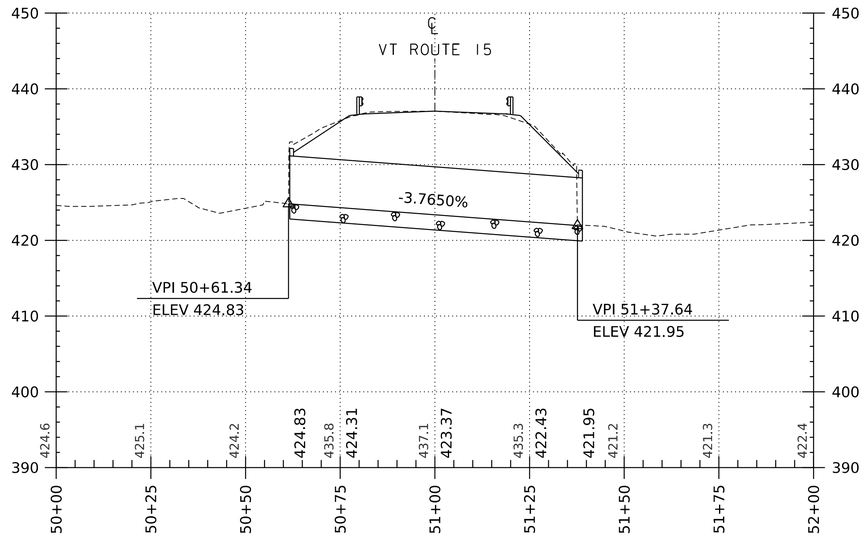
PROJECT NAME: STATEWIDE - NORTHWEST
PROJECT NUMBER: STP CULV(90)

FILE NAME: s22b044_Essex VT 15 Br 2_BDR New Culvert.dgn
PLOT DATE: 25-SEP-2023
PROJECT LEADER: L.J.STONE
DRAWN BY: D.D.BEARD
DESIGNED BY: ------
CHECKED BY: ------
NEW PIPE ARCH LAYOUT
SHEET 8 OF 20



VT ROUTE 15 PROFILE

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



CHANNEL PROFILE

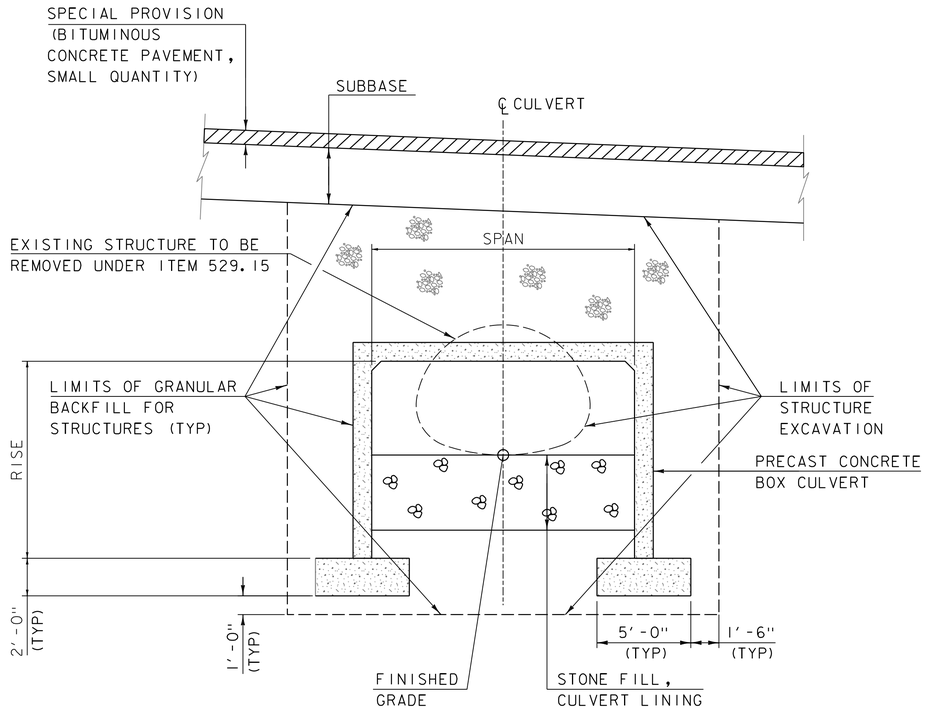
SCALE: HORIZONTAL 1"=20'-0"
VERTICAL 1"=10'-0"

NOTE:
GRADES SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG ℄
GRADES SHOWN TO THE NEAREST HUNDREDTH ARE FINISH GRADE ALONG ℄

PROJECT NAME: STATEWIDE - NORTHWEST
PROJECT NUMBER: STP CULV(90)

FILE NAME: s22b044_Essex VT 15 Br 2_profile.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
NEW PIPE ARCH PROFILE SHEET

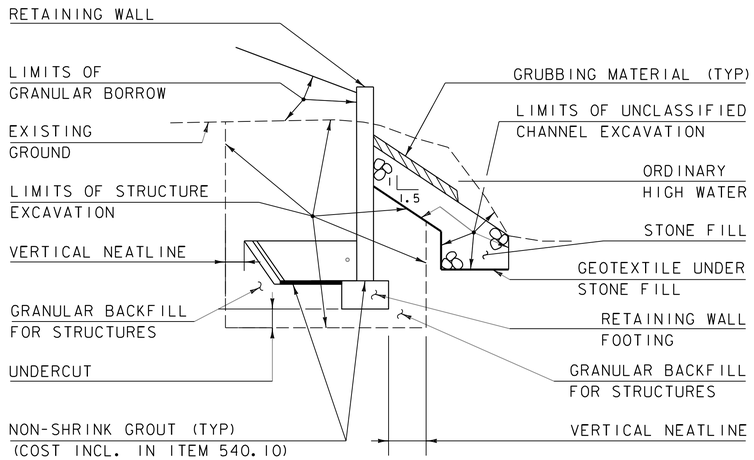
PLOT DATE: 25-SEP-2023
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 9 OF 20



SPAN	12'-0"
RISE	12'-0"
LENGTH	75'-0"

CULVERT TYPICAL SECTION

NOT TO SCALE



RETAINING WALL EARTHWORK TYPICAL SECTION

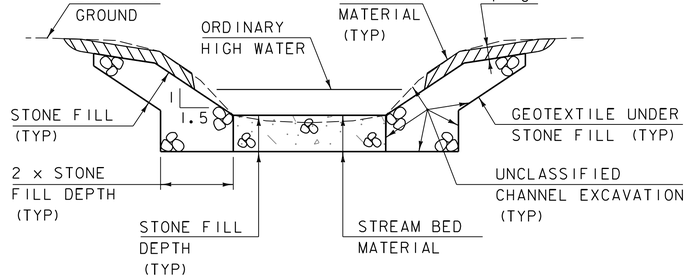
NOT TO SCALE

NOTE:

TOP OF RETAINING WALL FOOTING SHALL BE AT OR BELOW BOTTOM OF BOX CULVERT.

RETAINING WALL - ASSUMED DIMENSIONS

LEVELING PAD	
	DIMENSION
WIDTH	2'-6"
TOE	0'-9"
HEEL	0'-9"
THICKNESS	1'-0"
UNDERCUT	1'-0"
WALL	
THICKNESS	1'-0"
HEIGHT	VARIES
EXCAVATION LIMITS	
VERTICAL NEATLINE	1'-6"
UNDERCUT	1'-0"



TYPICAL CHANNEL SECTION

(NOT TO SCALE)

1) WHENEVER CHANNEL SLOPE INTERSECTS ROADWAY SUBBASE, GRUBBING MATERIAL SHALL BEGIN AT THE BOTTOM OF SUBBASE.

2) THE CONTRACTOR SHALL CREATE A LOW FLOW CHANNEL IN THE STREAM BED MATERIAL AS DIRECTED BY THE ENGINEER.

3) GRUBBING MATERIAL SHALL BE PLACED UNDERNEATH STRUCTURES WHERE THERE IS MORE THAN 6 FEET VERTICALLY FROM ORDINARY HIGH WATER (OHW) TO THE BOTTOM OF SUPERSTRUCTURE AND MORE THAN 6 FEET HORIZONTALLY FROM OHW LINE TO FRONT FACE OF ABUTMENT. THIS MATERIAL SHALL START JUST ABOVE THE OHW ELEVATION AND TERMINATE 3 FEET HORIZONTALLY FROM THE FRONT FACE OF THE ABUTMENT. THIS MATERIAL SHALL NOT BE PLACED UNDERNEATH DOWNSPOUTS. SEE THE CHANNEL SECTIONS FOR ADDITIONAL DETAILING.

MATERIAL INFORMATION

	THICKNESS	TYPE
STONE FILL	2'-0"	TYPE II
STONE FILL, CULVERT LINING	2'-0"	E-STONE TYPE II
STONE FILL, STREAM BED MATERIAL	2'-0"	E-STONE TYPE II

PROJECT NAME: STATEWIDE - NORTHWEST
PROJECT NUMBER: STP CULV(90)

FILE NAME: 22b044/Essex VT 15 Br 2_typ.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
3-SIDED FRAME TYPICAL SECTION

PLOT DATE: 25-SEP-2023
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 10 OF 20

INDIAN BROOK
FLOW

HVCTRL 112

ARCH

POB 50+00.00
HVCTRL 111

50+00

STA 187+76.00=
CHAN 51+00.00
Δ=90° 18' 00"RT

APPROX. EXISTING R.O.W.

FIELD DRIVE

COMB P50 99927 DI

COMB P51 24014

SIGN VD-442

COMB P52 24015

GUY WIRE

COMB P53 FB49

PIPE FLOW

GRAVEL DRIVE

MAILBOXES #38&#40

MILEMARKER VD-700 (015 0406 0360)

COMB 50 50 SUBE

APPROX. EXISTING R.O.W.

ECT

VT ROUTE 15
TO 5 CORNERS

N39°38'57.58"E

185+00 186+00 187+00 188+00 189+00 190+00

VT ROUTE 15
TO VT ROUTE 289

18" CPEP FLOW

WATER GATE VALVE
HVCTRL 5

SIGN M3-2 MI-5 (VT 15)

SIGN VD-701 (BRIDGE VT 15)

BOX CULVERT

HVCTRL 104

PAVED DRIVE

HYDRANT

SIGN (WARNING GAS PIPELINE)

ARCH

BENCHMARK
TOP OF BOLT
ON HYDRANT
ELEV.=441.90

SIGN (WARNING GAS PIPELINE)

30" CGMP FLOW

APPROX. EXISTING R.O.W.

HVCTRL 110

PAVED DRIVE

SIGN (THE BARNS AT LONG FARM)

PC 53+28.99

RISER W/ OUTLET

53+00

POE 52+00.00

EXISTING BRIDGE INFORMATION
8'X6' REINFORCED CONCRETE BOX
54' LONG, BUILT 1919.
5' AVERAGE COVER.
56 SQFT WATERWAY AREA.

N

VT STATE PLANE GRID

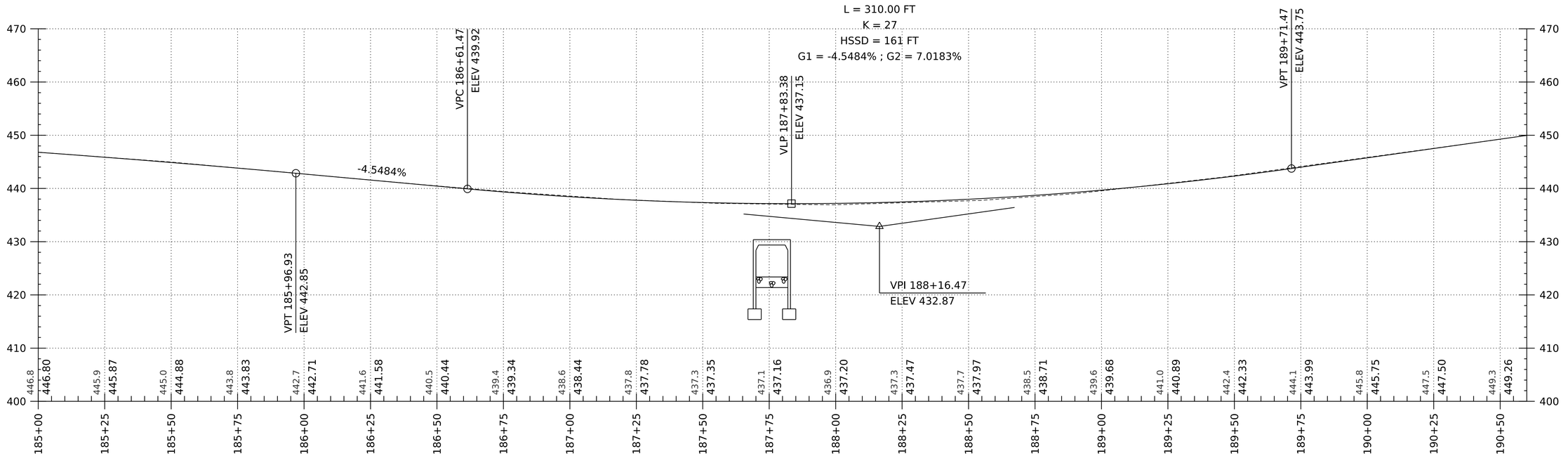
NEW 3-SIDED FRAME

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

PROJECT NAME: STATEWIDE - NORTHWEST
PROJECT NUMBER: STP CULV(90)

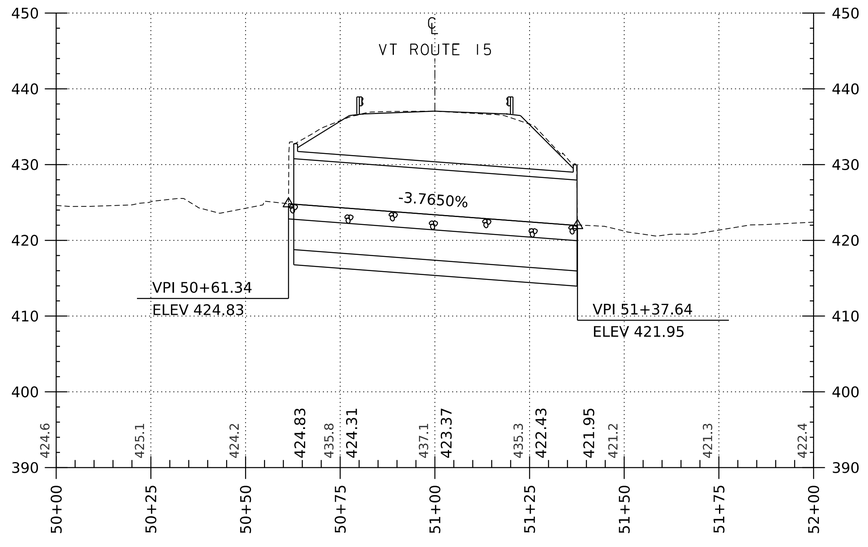
FILE NAME: s22b044_Essex VT 15 Br 2_BDR_NEW 3SIDED.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
NEW 3-SIDED FRAME LAYOUT

PLOT DATE: 25-SEP-2023
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 11 OF 20



VT ROUTE 15 PROFILE

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



CHANNEL PROFILE

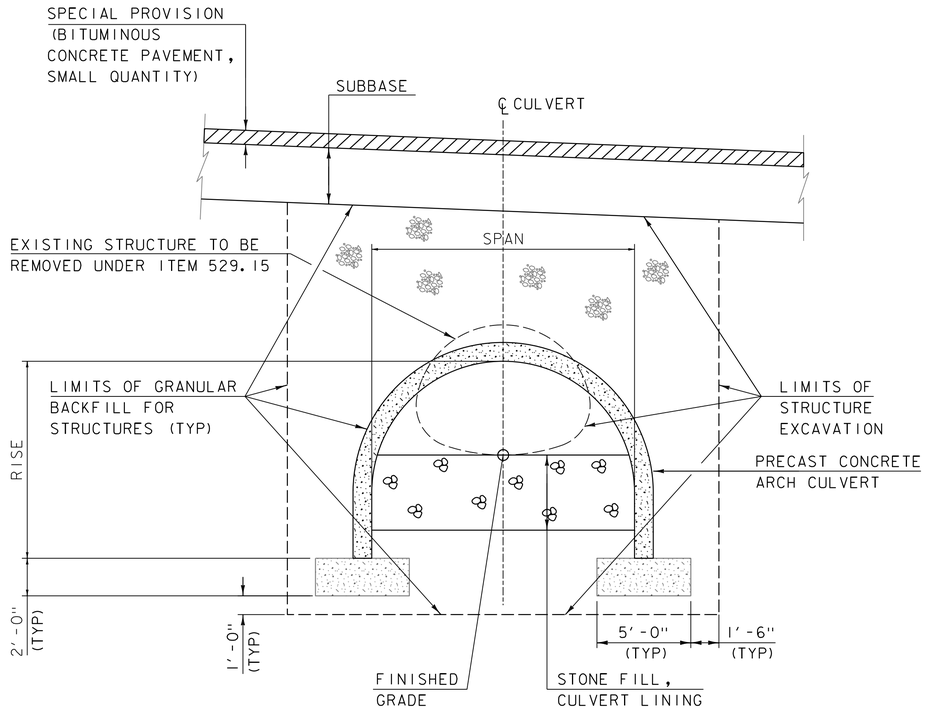
SCALE: HORIZONTAL 1"=20'-0"
VERTICAL 1"=10'-0"

NOTE:
GRADES SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG ℄
GRADES SHOWN TO THE NEAREST HUNDREDTH ARE FINISH GRADE ALONG ℄

PROJECT NAME: STATEWIDE - NORTHWEST
PROJECT NUMBER: STP CULV(90)

FILE NAME: s22b044_Essex VT 15 Br 2_profile.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
3-SIDED FRAME PROFILE SHEET

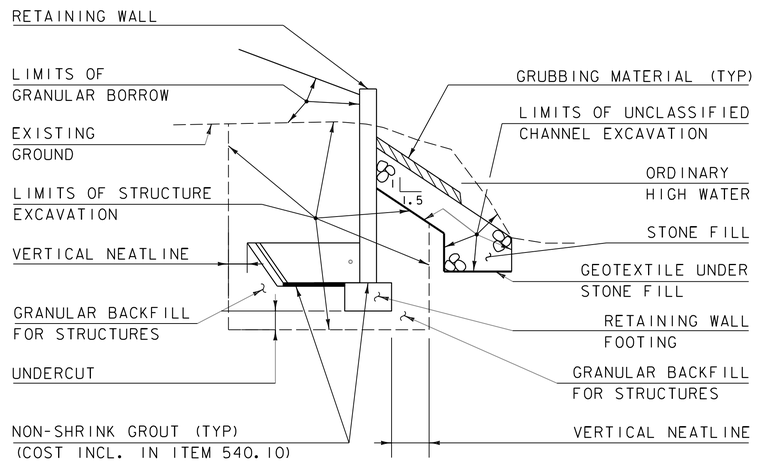
PLOT DATE: 25-SEP-2023
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 12 OF 20



SPAN	13'-0"
RISE	12'-10"
LENGTH	75'-0"

CULVERT TYPICAL SECTION

NOT TO SCALE

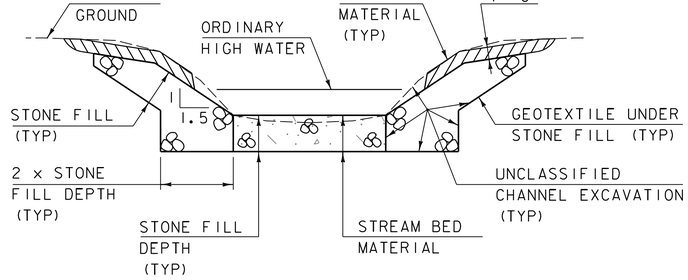


RETAINING WALL EARTHWORK TYPICAL SECTION

NOT TO SCALE

NOTE:

TOP OF RETAINING WALL FOOTING SHALL BE AT OR BELOW BOTTOM OF BOX CULVERT.



TYPICAL CHANNEL SECTION

(NOT TO SCALE)

1) WHENEVER CHANNEL SLOPE INTERSECTS ROADWAY SUBBASE, GRUBBING MATERIAL SHALL BEGIN AT THE BOTTOM OF SUBBASE.

2) THE CONTRACTOR SHALL CREATE A LOW FLOW CHANNEL IN THE STREAM BED MATERIAL AS DIRECTED BY THE ENGINEER.

3) GRUBBING MATERIAL SHALL BE PLACED UNDERNEATH STRUCTURES WHERE THERE IS MORE THAN 6 FEET VERTICALLY FROM ORDINARY HIGH WATER (OHW) TO THE BOTTOM OF SUPERSTRUCTURE AND MORE THAN 6 FEET HORIZONTALLY FROM OHW LINE TO FRONT FACE OF ABUTMENT. THIS MATERIAL SHALL START JUST ABOVE THE OHW ELEVATION AND TERMINATE 3 FEET HORIZONTALLY FROM THE FRONT FACE OF THE ABUTMENT. THIS MATERIAL SHALL NOT BE PLACED UNDERNEATH DOWNSPOUTS. SEE THE CHANNEL SECTIONS FOR ADDITIONAL DETAILING.

RETAINING WALL - ASSUMED DIMENSIONS

LEVELING PAD	
	DIMENSION
WIDTH	2'-6"
TOE	0'-9"
HEEL	0'-9"
THICKNESS	1'-0"
UNDERCUT	1'-0"
WALL	
THICKNESS	1'-0"
HEIGHT	VARIES
EXCAVATION LIMITS	
VERTICAL NEATLINE	1'-6"
UNDERCUT	1'-0"

MATERIAL INFORMATION

	THICKNESS	TYPE
STONE FILL	2'-0"	TYPE II
STONE FILL, CULVERT LINING	2'-0"	E-STONE TYPE II
STONE FILL, STREAM BED MATERIAL	2'-0"	E-STONE TYPE II

PROJECT NAME: STATEWIDE - NORTHWEST
PROJECT NUMBER: STP CULV(90)

FILE NAME: 22b044/Essex VT 15 Br 2_typ.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
OPEN BOTTOM ARCH TYPICAL SECTION

PLOT DATE: 25-SEP-2023
DRAWN BY: D.D.BEARD
CHECKED BY: ------

NEW CONCRETE ARCH CULVERT

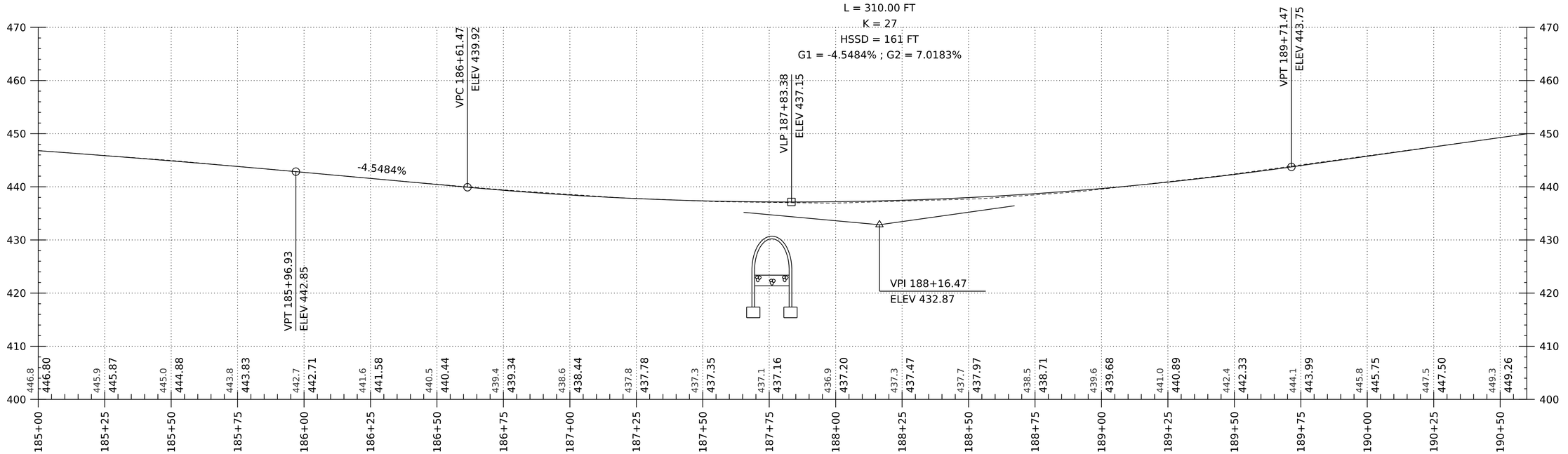
SCALE 1" = 20'-0"

20 0 20

EXISTING BRIDGE INFORMATION
8'X6' REINFORCED CONCRETE BOX
54' LONG, BUILT 1919.
5' AVERAGE COVER.
56 SQFT WATERWAY AREA.

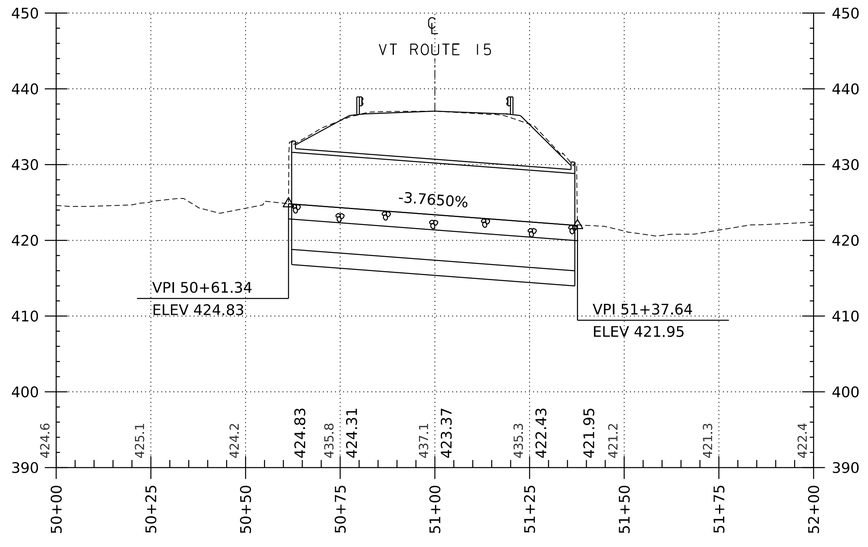
PROJECT NAME: STATEWIDE - NORTHWEST
PROJECT NUMBER: STP CULV(90)

FILE NAME: s22b044_Essex VT 15 Br 2_BDR
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
NEW CONCRETE ARCH CULVERT LAYOUT
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 14 OF 20



VT ROUTE 15 PROFILE

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



CHANNEL PROFILE

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

NOTE:
GRADES SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG ℄
GRADES SHOWN TO THE NEAREST HUNDREDTH ARE FINISH GRADE ALONG ℄

PROJECT NAME: STATEWIDE - NORTHWEST
PROJECT NUMBER: STP CULV(90)

FILE NAME: s22b044_Essex VT 15 Br 2_profile.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
PRECAST ARCH PROFILE SHEET

PLOT DATE: 25-SEP-2023
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 15 OF 20

UPSTREAM TEMPORARY BRIDGE

SCALE 1" = 20'-0"

20 0 20

EXISTING BRIDGE INFORMATION
8'X6' REINFORCED CONCRETE BOX
54' LONG, BUILT 1919.
5' AVERAGE COVER.
56 SQFT WATERWAY AREA.

PROJECT NAME: STATEWIDE - NORTHWEST
PROJECT NUMBER: STP CULV(90)

FILE NAME: s22b044_Essex VT 15 Br 2_BDR UpstreamTempBridge.dgn
PLOT DATE: 25-SEP-2023
PROJECT LEADER: L.J.STONE
DRAWN BY: D.D.BEARD
DESIGNED BY: ------
CHECKED BY: ------
UPSTREAM TEMPORARY BRIDGE LAYOUT
SHEET 16 OF 20

DOWNSTREAM TEMPORARY BRIDGE

SCALE 1" = 20′-0"

20 0 20

EXISTING BRIDGE INFORMATION
8′X6′ REINFORCED CONCRETE BOX
54′ LONG, BUILT 1919.
5′ AVERAGE COVER.
56 SQFT WATERWAY AREA.

PROJECT NAME: STATEWIDE - NORTHWEST
PROJECT NUMBER: STP CULV(90)

FILE NAME: s22b044_Essex VT 15 Br 2_BDR DownstrTemp Bridge.dgn PLOT DATE: 25-SEP-2023
PROJECT LEADER: L.J.STONE DRAWN BY: D.D.BEARD
DESIGNED BY: ------ CHECKED BY: ------
DOWNSTREAM TEMPORARY BRIDGE LAYOUT SHEET 17 OF 20

INDIAN BROOK
FLOW

HVCTRL 112

ARCH

POB 50+00.00
HVCTRL 111

50+00

STA 187+76.00=
CHAN 51+00.00
Δ=90° 18' 00"RT

APPROX. EXISTING R.O.W.

FIELD DRIVE

COMB P50 99927 DI

COMB P51 24014

SIGN VD-442

COMB P52 24015

HVCTRL 100

50' BOX CULVERT

COMB P53 FB49

GUY WIRE

PIPE FLOW

GRAVEL DRIVE

MAILBOXES #38&#40

MILEMARKER VD-700 (015 0406 0360)

COMB 50 50 SUBE

APPROX. EXISTING R.O.W.

VT ROUTE 15
TO 5 CORNERS

185+00 186+00 187+00 188+00 189+00 190+00

VT ROUTE 15
TO VT ROUTE 289

N39°38'57.58"E

18" CPEP FLOW

WATER GATE VALVE

HVCTRL 5

SIGN M3-2 M1-5 (VT 15)

SIGN VD-701 (BRIDGE VT 15)

HVCTRL 104

HVCTRL 102

PAVED DRIVE

ECT

SIGN (WARNING GAS PIPELINE)

HYDRANT

ARCH

BENCHMARK
TOP OF BOLT
ON HYDRANT
ELEV.=441.90

SIGN (WARNING GAS PIPELINE)

30" CGMP FLOW

APPROX. EXISTING R.O.W.

HVCTRL 110

PC 189+28.99

RISER W/ OUTLET

PAVED DRIVE

SIGN (THE BARNS AT LONG FARM)

52+00

POE 52+00.00

EXISTING BRIDGE INFORMATION
8'X6' REINFORCED CONCRETE BOX
54' LONG, BUILT 1919.
5' AVERAGE COVER.
56 SQFT WATERWAY AREA.

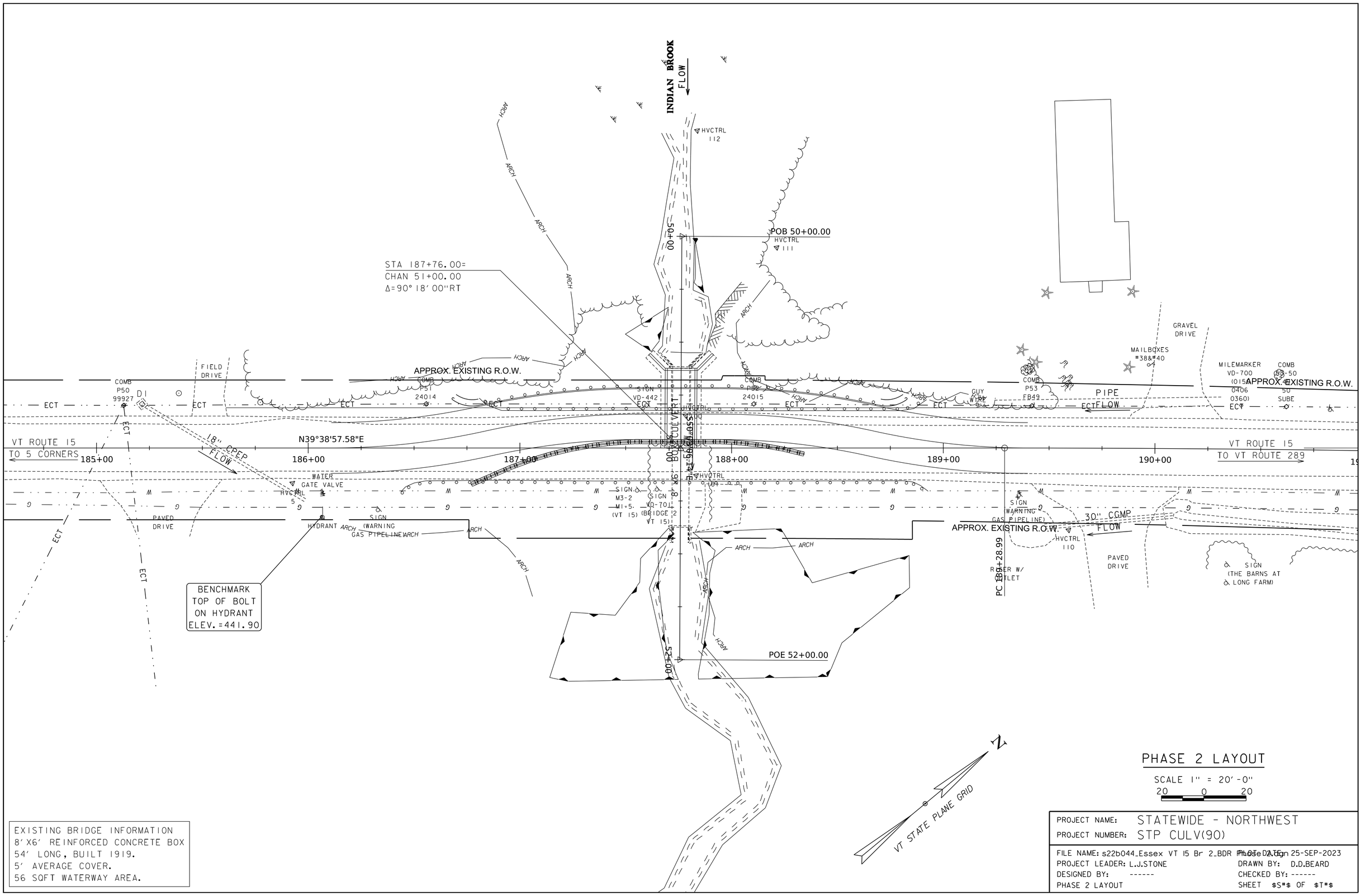
N

VT STATE PLANE GRID

PHASE I LAYOUT

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

PROJECT NAME:	STATEWIDE - NORTHWEST
PROJECT NUMBER:	STP CULV(90)
FILE NAME: s22b044_Essex VT 15 Br 2_BDR Phase1.dgn	PLOT DATE: 25-SEP-2023
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
PHASE I LAYOUT	SHEET $S#$ OF $T#$

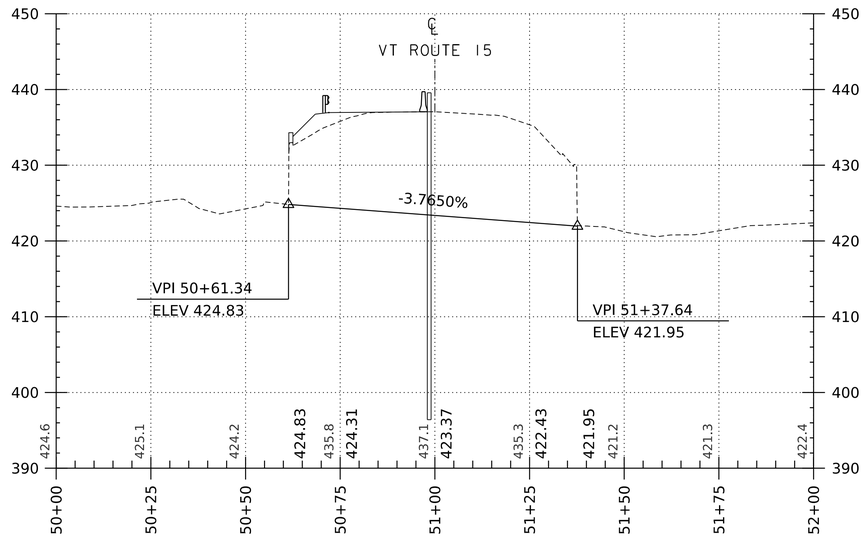


PHASE 2 LAYOUT

SCALE 1" = 20'-0"

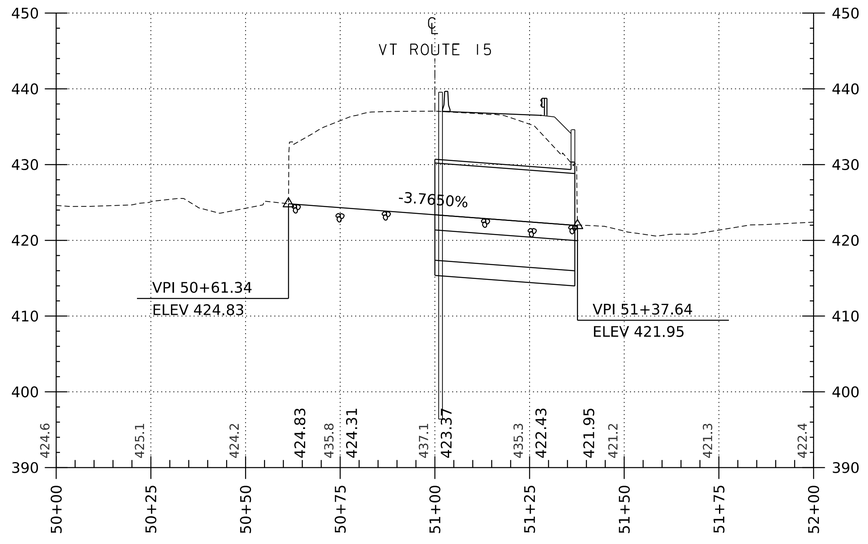
20 0 20

PROJECT NAME:	STATEWIDE - NORTHWEST
PROJECT NUMBER:	STP CULV(90)
FILE NAME: s22b044_Essex VT 15 Br 2_BDR Phase 2.dgn	PLOT DATE: 25-SEP-2023
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
PHASE 2 LAYOUT	SHEET $S#$ OF $T#$



PHASE 1 CHANNEL PROFILE

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



PHASE 2 CHANNEL PROFILE

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

NOTE:
GRADES SHOWN TO THE NEAREST TENTH ARE EXISTING GROUND ALONG ℄
GRADES SHOWN TO THE NEAREST HUNDREDTH ARE FINISH GRADE ALONG ℄

PROJECT NAME:	STATEWIDE - NORTHWEST
PROJECT NUMBER:	STP CULV(90)
FILE NAME: s22b044_Essex VT 15 Br 2_profile.dgn	PLOT DATE: 25-SEP-2023
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
PHASING PROFILE SHEET	SHEET $S#$ OF $T#$