STATE OF VERMONT
AGENCY OF TRANSPORTATION

Scoping Report

FOR

Fairfield BO 1448(46)

Town Highway 29, Bridge 49 over Black Creek

July 26, 2022

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I. Site Information

Bridge 49 is a locally owned bridge located on Paradee Rd (Town Highway 29) over the Black Creek about 0.7 miles east of the intersection with North Road (Junction C2 Town Highway 1). The existing conditions were gathered from a combination of a Site Visit, the Inspection Report, the Route Log, and the existing Survey. See correspondence in the Appendix for more detailed information.

Roadway Classification	Rural Local Road (Class 3)
Bridge Type	Pony Truss Steel Beam bridge
Bridge Length	48 feet
Year Built	1919, reconstructed in 1995
Ownership	Town of Fairfield

Need

Bridge 49 carries Paradee Rd across the Black Creek. The following is a list of deficiencies of Bridge 49 and Paradee Rd:

1. The bridge needed replacement since 2018 due to heavy deterioration along the beam ends from sediment buildup and open grid steel deck. In 2020 there were stringer beams added to compensate for the failed stringer ends at abutment 2. During the annual inspection, it was discovered that the lateral bracing has significant sections of loss throughout and some failed members, and the stringers still have section loss in the older stringer ends and large perforations remaining in the abutment 2 beam ends.

2. The shoulder width on Bridge 49 is substandard.

3. Bridge 49 does not span bank full width and has substandard freeboard.

Traffic

A traffic study of this site was performed by the Vermont Agency of Transportation. The traffic volumes are projected for the years 2025 and 2045.

TRAFFIC DATA	2025	2045
AADT	45	50
DHV	10	10
ADTT	5	5
%T	9.6	10.3
%D	56	56

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 50 and a design speed of 50 mph for a Local Road.

Design Criteria	Source	Existing Condition	Minimum Standard	Comment
Approach Lane and Shoulder Widths	VSS Table 6.3	8'/0' (16')	9'/2' (22')	Substandard
Bridge Lane and Shoulder Widths	VSS Section 6.6	2'-9'-2' (13.8' curb-to-curb)	9'/2' (22')	Substandard
Clear Zone Distance	VSS Table 6.5	No Issues Noted	12' fill / 8' cut	
Banking	VSS Section 6.12	NC over bridge	6% (max)	Non-paved rural local road
Speed		50 mph (assumed)	50 mph (design)	
Horizontal Alignment	AASHTO Green Book Table 3-10b	R = ∞ (over bridge) R=1930', 3820' (western and eastern approaches)	R_{min} = 8,150' (NC)	Substandard
Vertical Grade	VSS Table 6.6	10.8% max	6% for level terrain	
K Values for Vertical Curves	AASHTO Green Book Table 3-35	K_{sag} = 9, 23	84 crest / 96 sag	Substandard
Vertical Clearance	VSS Section 6.7	No Issues Noted	14'-3" (min)	
Stopping Sight Distance	AASHTO Green Book Table 3-35	244ft	425ft	Substandard
Bicycle/Pedestrian Criteria	VSS Table 6.7	1' shoulder provided on original truss		
Bridge Railing	Structures Design Manual Section 13	Box beam railing mounted to truss	TL-2	Substandard, mounted box railing not crash tested
Hydraulics	VTrans Hydraulics Section	• Passes Q_{25} storm event with 0.3' of freeboard • Clear span: 45'	• Pass Q_{25} storm event with 1.0' of freeboard • Minimum BFW: 55'	Substandard BFW and freeboard, overtopping in both EC and proposed for 1% AEP
Structural Capacity	SM, Ch. 3.4.1	Structurally Deficient	Design Live Load: HL-93	Substandard

Inspection Report Summary

Deck Rating	6 Satisfactory
Superstructure Rating	4 Poor
Substructure Rating	7 Good
Channel Rating	7 Good

11/4/2020 – Newly added stringer beams have been installed to compensate for the failed stringer ends at abutment 2, the structure is open, posted for 3 ton, and will be removed from the 12 month cycle. JW/MC

8/20/2018 – Superstructure has heavy deterioration along beam ends due to excessive amount of sediment build up and open grid steel deck. Gussets and top plates of top chord at abutment #1 have holes and heavy rust scaling and pitting present. SMP & AAL

8/5/2014 – The built-up gravel on the bridge seats should be removed to preserve the beam ends. New backwalls should be installed to prevent gravel from falling onto the bridge seats. Also, the open grid deck over the bridge seat areas should be concreted in to prevent gravel form the roadway falling on to these areas. JWW/JDM

8/15/2013 – The open grid deck has heavy bending in the downstream ends and there is a 1' by 1' section that has heavy cracking near mid span. The deck needs to be replaced or repairs made to the cracked sections. The abutment 2 embankment should have anti erosion protection added to prevent further sloping of the bank. JWW/JDM

08/08/2012 – Steel deck grating needs repairs where bars are cracked, bent and depressed. Areas along the deck surface may rupture suddenly anytime anywhere without warning or notice. End posts members where cracks occur on the vertical legs of the interior angle are in need of repairs. PLB

08/18/2010 – The open deck grating is in need of full replacement or repairs. Several members making up both trusses are in need of repairs. The floor beams are in need of repairs. PLB

Hydraulics

The existing bridge currently has about 0.3 feet of freeboard at the 4% AEP and no freeboard at the 1% AEP. This does not meet the hydraulic standard of passing the 25-year storm event (Q_{25}) with one foot of freeboard below the low beam elevation of the bridge. The existing structure has a clear span of 45-feet which constricts the natural channel width of 55-feet. There are several options outlined in the preliminary hydraulics report in Appendix D that would meet the minimum standard. The options are as follows:

- Existing Conditions: 45-foot Single Span Pony Truss Bridge
- 55-foot clear span bridge – Maintaining Existing Roadway Alignment

The bridge is not located in a floodplane and does not increase the 100-year base flood elevations.

Utilities

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

<u>Municipal Utilities</u>

- There are no municipal water or sewer facilities within the project area on either side of the river.

<u>Public Utilities</u>

<u>Underground:</u>

- There are no known (or apparent) underground utilities within the project area (on either side of the river).

<u>Aerial:</u>

- There are aerial facilities owned by Vermont Electric Cooperative and Consolidated Communications. These lines cross diagonally at the West end of the bridge and will likely require relocation.

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

Right-Of-Way

Paradee Road has a 3-rod Right-of-Way. All parts of the structure are located within the existing Right-of-Way. The acquisition of additional Right-of-Way may be needed depending on the proposed design and temporary space needed for construction.

Resources

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

Biological:

Wetlands/Watercourses

There are ANR Natural Resource Atlas mapped wetlands located within the investigated area, mainly to the southeastern quadrant and some areas in the northern quadrants as well. During the field review done by Arrowwood Environmental consulting there were multiple wetlands delineated both east and west of the bridge itself. Wetland A was located eastbound of the bridge along Paradee Rd and consists of a shallow marsh associated with the Black Creek and is located in an active cow pasture. Wetland B is westbound of the bridge and is classified as a shallow emergent marsh associated with the black creek. Both wetlands are dominated by reed canary grass and both are presumed to be class 2 wetlands.

The Black creek is the main watercourse associated with this project and flows north underneath the bridge. Black Creek is a perennial stream with an average bankfull channel width of 53' and a sand substrate in a plane bed morphology. There is a second watercourse that Arrowwood Environmental studied in this project area. Stream 2 flows in an east/west direction along the southern side of Paradee Road and into Black Creek just south of the bridge. The stream appears to have been historically straightened as it flows through Wetland A. The stream channel has an average bankfull width of 18" with a fine gravel substrate. All impacts below ordinary high water mark (OHW) will be regulated by the US Corps of Engineers and the VT ANR.

Wildlife Habitat

The consultant, Arrowwood Environmental, preformed both remote review of available digital maps for the study area and a field inventory component to determine wildlife habitat and connectivity. There are no mapped Vt. Fish and Wildlife deer winter habitats in the study area. Field investigation confirmed the absence of deer wintering areas within the study area. Vt. Fish and Wildlife identifies the study area as a Highest Priority surface water and riparian area and riparian wildlife connectivity area in the Vt. Conservation Design. The existing bridge abutments terminate on a steep sloped river bank which are not likely to support wildlife movement under the structure. Incorporating a shelf or bench parallel to the river under the structure, between the abutments and rivers edge, to provide off-road, sheltered, wildlife movement opportunity would enhance the riparian wildlife connectivity at the site. The agricultural land use in the study area does not offer significant amphibian habitat features in the vicinity.

Rare, Threatened and Endangered Species (R/T/E)

In reviewing the Wildlife Natural Heritage Inventory (NHI) Rare, Threatened and Endangered Species digital database there was one record of an S3-ranked uncommon species (*Elymus wiegandii*) approximately 0.25 miles to the north of the project study area. During the field visit in

June 2021 a single clump containing 17 stems of the invasive purple loosestrife (Lythrum salicaria) was documented in the study area.

The Northern Long Eared Bat (Myotis septentrionalis, MYSE) became a federally listed endangered species in May of 2015. The State of Vermont has determined that project clearing greater than 1% of the total forested area within a 1 square mile radius of a project triggers greater review for habitat loss for this endangered species. There are no mature trees in the area immediately surrounding the proposed project, and no trees meeting the criteria as potential bat roost trees were found within the study area. No other RTE animal species are documented nearby or are expected to be impacted by the proposed project.

<u>Agricultural Soils / Floodplains</u>
According to ANR Natural Resource Mapping, soils mapped in the project vicinity are both statewide significant and prime agricultural soils. The soils found around in and around the project area are listed below:

1. Raynham silt loam, 3 to 8 percent slopes (RaB) (Prime Agricultural (b))
2. Belgrade silt loam, 2 to 8 percent slopes (BeB) (Statewide)
3. Ondawa variant silt loam (Od) (Prime Agricultural (f))
4. Limerick silt loam (Le) (Statewide (b))
5. Enosburg loamy fine sand, 3 to 8 percent slopes (EnB) (Prime Agricultural (b))

Hazardous Materials:

According to the Vermont Agency of Natural Resources (VANR) Vermont Hazardous Sites List, the bridge is not located near any hazardous sites or within any areas of concern.

Historic:

On behalf of VTrans, WSP completed a historic architectural resource identification survey and assessment for bridge 49. WSP identified one property in the area of potential effect (APE) which had been previously surveyed and is a 45 year old or older. The bridge 49 is listed in the SRHP. No other architectural resources and no section 4(f) resources were in the APE. This bridge falls under Appendix B of the Historic Metal Truss Bridge Preservation Plan which states that truss bridges should be relocated and preserved for limited highway use or for alternative transportation use.

Archaeological:

On behalf of VTrans, WSP completed an archaeological resource assessment (ARA) for the proposed improvements to Bridge 49. The scope for the project has yet to be defined so WSP defined the area of potential effect (APE) to extend 30.5 meters (100 feet) from either end of the bridge to include all four quadrants of the bridge approaches. No previously recorded precontact or historic archaeological sites lie within the APE. No other archaeological sites were identified during the ARA. Because of the flat nature of the surrounding landscape, there is potential for archaeological sensitivity in all four quadrants around the bridge.

It is WSP's opinion that any future development carried out within the APE may have impacts on potentially archaeologically sensitive areas. Additional archaeological investigation of the APE may be necessary if staging area or a temporary bridge is proposed for any of the four quadrants around this bridge; in addition, should project activities be expanded and the APE changed, further investigation may be warranted.

Stormwater:

There are no stormwater concerns for this project. The need for stormwater treatment and/or permitting will be assessed as the project scope is further defined and will depend on how much earth disturbance and impervious area is involved in the eventual design.

II. Safety

There have been no recorded crashes within the project area in the last five-year period.

III. Local Concerns

A questionnaire was sent to the town but there was no response sent back. There is a copy of the questionnaire in the Appendix K.

IV. Maintenance of Traffic

The Vermont Agency of Transportation reviews each new project to determine suitability for the Accelerated Bridge Program, which focuses on faster delivery of construction plans, permitting, and Right of Way, as well as faster construction of projects in the field. One practice that will help in this endeavor is closing bridges for portions of the construction period, rather than providing temporary bridges. In addition to saving money, the intention is to minimize the closure period with faster construction techniques and incentives to contractors to complete projects sooner. The Agency will consider the closure option on most projects where rapid reconstruction or rehabilitation is feasible. The use of prefabricated elements in new bridges will also expedite construction schedules. This can apply to decks, superstructures, and substructures. Accelerated Construction should provide enhanced safety for the workers and the travelling public while maintaining project quality. The following options have been considered:

Option 1: Off-Site Detour
This option would close the bridge and reroute traffic onto an offsite detour. Since the bridge is located on a class 3 Town Highway, it would be the responsibility of the Town of Fairfield to choose the preferred detour route, and to sign it according to the MUTCD. If the preferred detour route goes through an adjacent town, it will be the responsibility of the Town of Fairfield to coordinate with that town.

The most likely detour route that the Town of Fairfield may want to choose has an end-to-end distance of 4.3 miles and adds 0.7 miles to the route. This route is as follows:

1. Head east on Paradee Rd, turn left onto Pumpkin Village Rd, turn left on North Rd, turn left onto Paradee Rd (4.3 miles end-to-end)

Communications with the large farms on either side of the bridge closure will be required. Accommodations for postal delivers, newspaper routes, trash services and/or other delivery services interrupted by the project or detour should be communicated with the proper contacts.

Advantages: By closing the road to traffic during construction, the local share is reduced by 50%. This option would eliminate the need for a temporary bridge, which would significantly decrease cost and time of construction. This option would not require the need to obtain rights from adjacent property owners for a temporary bridge. Also, this option would have minimal impacts to archaeological resources and natural resources located in all quadrants of the bridge and project area. 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. A similar detour was used when a bridge near this project was replaced in the past and this method of detour worked well for the town.

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

Option 2: Phased Construction
Phased construction is the maintenance of one-way alternating traffic on the existing bridge while building one lane at a time of the proposed structure. This allows keeping the road open during

construction, while having minimal impacts to adjacent property owners and environmental resources.

Due to horizontal constraints, this option is not being considered. In order to keep one lane open to traffic, approximately 12 feet of the existing bridge width needs to remain for Phase 1. The existing temporary bridge is 14 feet wide, which does not provide enough of a working width to make this method advantageous. In some circumstances, phased construction can be accomplished with a shift in alignment. Due to the type and condition of the existing bridge, this is not recommended. Additionally, this option would increase the design and construction costs.

Option 3: Temporary Bridge
A temporary bridge could be placed either on the upstream side or downstream side of the existing bridge from a constructability standpoint. A temporary bridge placed on the upstream (southern) or downstream (northern) sides could be placed next to the existing structure. A temporary bridge on the ether side would need to be placed off alignment due to the configuration of the stream to the bridge and road. A temporary bridge on the upstream side would potentially cost more, as it would need to be slightly longer than an downstream temporary structure. Either an upstream or downstream temporary bridge would require additional Right-of-Way to be placed.

Significant additional costs would be incurred to use a temporary bridge, including the cost of the bridge itself, installation and removal, restoration of the disturbed area, and the time and money associated with the temporary Right-of -Way.

A one-way temporary bridge would be sufficient based on the daily traffic volumes. Due to the length of the temporary bridge, a signal at both ends would be required. A two-way temporary bridge would also be acceptable. A layout of the temporary bridge can be seen in the scoping plan set in Appendix N.

Advantages: A temporary bridge will maintain traffic flow through the project corridor during construction.

Disadvantages: The costs to construct and signalize a temporary bridge would be high, as well as time consuming. A temporary bridge would have impacts to archaeologically sensitive areas and natural resources such as the vegetated riparian buffer. A temporary bridge on the downstream side of the bridge would also require an aerial utility relocation since the lines cross diagonally at the West end of the bridge.

V. Alternatives Discussion

No Action
This alternative is not recommended. The bridge is in need of repair and will continue to deteriorate if no action is taken. 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.

Alternative 1: Truss Rehabilitation
A truss rehabilitation would include repairs to the pony truss and abutments and replacement of the deck and floor system. The project would consist of the following:

- Removing the existing pony truss for cleaning, repair or replacement of deteriorated members, strengthening of members, and repainting. Containment of lead paint and environment protection would be required.

- Replacing the existing bridge seats and backwalls and placing the rehabbed truss on new bearings is recommended.

- Constructing a new floor system (floor beams, stringers, and lateral bracing), and deck.

The existing lane width and shoulders on the original bridge are 9-feet and about 2-foot wide with a total width of 13.8ft curb-to-curb. The rehabilitated pony truss would maintain the existing width to have one 10-foot lane with 2-foot shoulders for a 14-foot wide rail-to-rail bridge width. This does not meet the minimum standard of 22-feet as set forth by the Vermont State Standards.

It is assumed that with a new deck and floorbeams, along with needed truss repairs, the structure will have a remaining service life of 50 years. The existing substructures are in Good condition, and it is reasonable to assume that with the repairs listed above, the existing substructure and truss can safely carry anticipated traffic loads for an additional 50 years.

Advantages: This alternative would address the structural deficiencies of the existing bridge and extend the life of the existing structure an additional 50 years. The effects on adjacent properties, historic and archeological resources would be minimal.

Disadvantages: The current bridge does not meet the hydraulic bank full width of 55 feet, which this option does not improve. This option would require Right-of-Way acquisition. There would be long-term maintenance requirements for cleaning and painting the truss steel. Additionally, this option would not meet the minimum width requirements and would have a reduced loading capacity compared to a full bridge replacement.

Maintenance of Traffic: Either a temporary bridge, or an offsite detour could be utilized for traffic control for this alternative.

Alternative 2: Full Bridge Replacement with a New Parker Pony Truss
This alternative would replace the existing bridge with a new truss as well as a new substructure. The various considerations under this option include: the alignment, the bridge width and length, skew, superstructure type and substructure type.

a. Alignment

i. On-Alignment

The existing horizontal alignment of Paradee Rd crosses the Black Creek perpendicularly. Keeping the alignment the same with a new bridge constructed will most likely be the easiest, least impacting, and least expensive to go with. This is because there will be no additional right-of-way accruals needed and no additional disturbance to archeological sensitive areas.

ii. Off-Alignment

The existing horizontal alignment of Paradee Rd crosses the Black Creek perpendicularly. The off-alignment option shown in the scoping plan set shifts the western approach of the bridge approximately 25-feet south to cross the creek at an angle and reconnect with the eastern approach road. If an off-alignment option is preferred, the final alignment will be determined in the design phase.

There are extensive archaeologically sensitive lands in the project area, and an off-alignment bridge may have impacts to these resources. An off-alignment bridge would have more expensive roadway costs, as the project length would be extended to match back into the existing roadway. The off-alignment option would be more expensive, due to extended project limits, additional resource permitting and investigations, and more extensive Right-of-Way acquisition.

b. Bridge Width

The current rail-to-rail width of the original pony truss structure is 14'-0". This does not meet the minimum standard of 22-feet. Additionally, due to the location of the many family owned farms the bridge is used by a high percentage of larger vehicles and trucks. Due to the heavy truck volumes over the bridge, a wider typical section should be considered. Since a new 75+ year bridge is being proposed, the bridge geometry should meet the minimum State standards, Town needs, and match the corridor width. A minimum 22-foot width (rail-to-rail) bridge will be proposed.

c. Bridge Length and Skew

The existing bridge has a span of 45 feet and no skew. The preliminary hydraulics report states that the minimum bankfull width of the Black creek at this location is 55-feet. By lengthening the bridge to 55-feet, the water surface elevations at the 25-year flood event are slightly improved. As such, it is proposed that any new pony truss have no skew and a minimum span of 55-feet to improve hydraulics and meet the minimum bankfull width standards.

d. Superstructure Type

This option would provide a new parker pony truss, similar to the existing truss to mitigate any adverse effect to the historic resource. The truss should be constructed with galvanized steel for long term durability, and follow the stipulations set forth by the Division for Historic Preservation. The truss would have higher upfront costs compared to a conventional steel beam bridge and would require periodic maintenance for the cleaning and painting of steel members.

e. Substructure Type

No record plans were available; however, the existing substructures appear to be shallow gravity abutments. Preliminary borings have found that bedrock is located approximately 100 feet below the ground surface. The soil conditions found at the site are soft to very soft cohesive materials. Any new bridge would likely be an integral abutment bridge founded on piles. Additional borings should be drilled early in the design phase to verify the in-situ conditions and choose the most appropriate substructure type. The preliminary geotechnical report can be found in Appendix E.

f. Maintenance of Traffic:

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

Alternative 3: Full Bridge Replacement with a Conventional Steel Beam Bridge
This alternative would replace the existing bridge with a new economical superstructure as well as a new substructure at the existing location. This option would require Right-of-Way acquisition. The various considerations under this option include: the alignment, the bridge width and length, skew, superstructure type and substructure type.

a. Alignment

i. On-Alignment

The existing horizontal alignment of Paradee Rd crosses the Black Creek perpendicularly. Keeping the alignment the same with a new bridge constructed will most likely be the easiest, least impacting, and least expensive to go with. This is because there will be no additional right-of-way accruals needed and no additional disturbance to archeological sensitive areas.

ii. Off-Alignment

The existing horizontal alignment of Paradee Rd crosses the Black Creek perpendicularly. The off-alignment option shown in the scoping plan set shifts the western approach of the bridge approximately 25-feet south to cross the creek at an angle and reconnect with the eastern approach road. If an off-alignment option is preferred, the final alignment will be determined in the design phase.

There are extensive archaeologically sensitive lands in the project area, and an off-alignment bridge may have impacts to these resources. An off-alignment bridge would have more expensive roadway costs, as the project length would be extended to match back into the existing roadway. The off-alignment option would be more expensive, due to extended project limits, additional resource permitting and investigations, and more extensive Right-of-Way acquisition.

b. Bridge Width

The current rail-to-rail width of the original pony truss structure is 14’-0”. This does not meet the minimum standard of 22-feet. Additionally, due to the location of the many family owned farms the bridge is used by a high percentage of larger vehicles and trucks. Due to the heavy truck volumes over the bridge, a wider typical section should be considered. Since a new 75+ year bridge is being proposed, the bridge geometry should meet the minimum State standards, Town needs, and match the corridor width. A minimum 24-foot width (rail-to-rail) bridge will be proposed.

c. Bridge Length and Skew

The existing bridge has a span of 45 feet and no skew. The preliminary hydraulics report states that the minimum bankfull width of the black creek at this location is 55-feet. As such, it is proposed that any new bridge have no skew and a minimum span of 55-feet to meet the minimum hydraulic standards.

d. Superstructure Type

The most economical 55’ span length bridge types that are most commonly used in Vermont are a composite steel with concrete deck superstructure (either cast-in-place or precast PBU’s) or precast deck panels. These types of superstructures would require very little long-term maintenance. A cast-in-place superstructure would have lower construction costs than a precast structure.

e. Substructure Type

No record plans were available; however, the existing substructures appear to be shallow gravity abutments. Preliminary borings have found that bedrock is located approximately 100 feet below the ground surface. The soil conditions found at the site are soft to very soft cohesive materials. Any new bridge would likely be an integral abutment bridge founded on piles. Additional borings should be drilled early in the design phase to verify the in-situ conditions and choose the most appropriate substructure type. The preliminary geotechnical report can be found in Appendix E.

f. Maintenance of Traffic:

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

VI. Alternatives Summary

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

Alternative 1a: Truss Rehabilitation with Traffic Maintained on an Offsite Detour
Alternative 1b: Truss Rehabilitation with Traffic Maintained on a Temporary Bridge
Alternative 2a: Full Bridge Replacement On-Alignment with New Parker Pony Truss and Traffic Maintained on an Offsite Detour (22’ typical)
Alternative 2b: Full Bridge Replacement On-Alignment with New Parker Pony Truss and Traffic Maintained on a Temporary Bridge
Alternative 2c: Full Bridge Replacement Off-Alignment with New Parker Pony Truss and Traffic Maintained on an Offsite Detour
Alternative 2d: Full Bridge Replacement Off-Alignment with New Parker Pony Truss and Traffic Maintained on a Temporary Bridge
Alternative 3a: Full Bridge Replacement On-Alignment with New Steel Beam Bridge and Traffic Maintained on an Offsite Detour (22’ typical)
Alternative 3b: Full Bridge Replacement On-Alignment with New Steel Beam Bridge and Traffic Maintained on a Temporary Bridge
Alternative 3c: Full Bridge Replacement Off-Alignment with New Steel Beam Bridge and Traffic Maintained on an Offsite Detour
Alternative 3d: Full Bridge Replacement Off-Alignment with New Steel Beam Bridge and Traffic Maintained on a Temporary Bridge

VII. Cost Matrix[1]

Fairfield BO 1448(46)		Do Nothing	Alternative 1		Alternative 2				Alternative 3			
			Truss Rehabilitation		Full Bridge Replacement with New Parker Pony Truss				Full Bridge Replacement with New Steel Beam Bridge			
			On-Alignment		On-Alignment		Off-Alignment		On-Alignment		Off-Alignment	
			a. Off-site Detour	b. Temporary Bridge	a. Off-site Detour	b. Temporary Bridge	c. Off-site Detour	d. Temporary Bridge	a. Off-site Detour	b. Temporary Bridge	c. Off-site Detour	d. Temporary Bridge
COST	Bridge Cost	$0	$572,200	$572,200	$1,014,900	$1,014,900	$1,014,900	$1,014,900	$596,500	$596,500	$596,500	$596,500
	Removal of Structure	$0	$0	$0	$47,250	$47,250	$47,250	$47,250	$47,250	$47,250	$47,250	$47,250
	Roadway	$0	$100,000	$100,000	$148,000	$148,000	$599,000	$599,000	$156,000	$156,000	$462,000	$462,000
	Maintenance of Traffic	$0	$32,300	$640,217	$34,300	$642,217	$34,300	$642,217	$34,300	$642,217	$34,300	$642,217
	Construction Costs	$0	$704,500	$1,312,417	$1,244,450	$1,852,367	$1,695,450	$2,303,367	$834,050	$1,441,967	$1,140,050	$1,747,967
	Construction Engineering & Contingencies	$0	$211,350	$328,104	$286,224	$463,092	$389,954	$575,842	$191,832	$360,492	$262,212	$436,992
	Accelerated Premium	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	Total Construction Costs w CEC	$0	$915,850	$1,640,522	$1,530,674	$2,315,459	$2,085,404	$2,879,209	$1,025,882	$1,802,459	$1,402,262	$2,184,959
	Preliminary Engineering	$0	$300,000	$400,000	$350,000	$450,000	$350,000	$450,000	$350,000	$450,000	$350,000	$450,000
	Right of Way	$0	$0	$30,000	$0	$30,000	$0	$30,000	$0	$30,000	$0	$30,000
	Total Project Costs	$0	$1,127,200	$1,933,005	$1,717,341	$2,715,933	$2,339,721	$3,369,883	$1,192,692	$2,120,853	$1,573,269	$2,564,553
	Annualized Costs	$0	$22,544	$38,660	$22,898	$36,212	$31,196	$44,932	$15,903	$28,278	$20,977	$34,194
TOWN SHARE	*The construction phase of the projects will be funded at 100% federal per the Infrastructure Investment and Jobs Act (IIJA)*	N/A	$7,500	$21,500	$17,500	$48,000	$17,500	$48,000	$17,500	$48,000	$17,500	$48,000
TOWN %		N/A	2.5%	5%	5%	10%	5%	10%	5%	10%	5%	10%
SCHEDULEING	Project Development Duration	N/A	4 years	4 years	4 years	4 years	4 years	4 years	4 years	4 years	4 years	4 years
	Construction Duration	N/A	6 months	8 months	6 months	8 months	6 months	8 months	6 months	8 months	6 months	8 months
	Closure Duration (If Applicable)	N/A	Construction Season	NA	Construction Season	NA	Construction Season	NA	Construction Season	NA	Construction Season	NA
ENGINEERING	Typical Section - Roadway (feet)	16	16	16	22	22	22	22	22	22	22	22
	Typical Section - Bridge (feet)	14	14	14	22	22	22	22	22	22	22	22
	Geometric Design Criteria	Substandard Width	Substandard Width		Meets Minimum Standard		Meets Minimum Standard		Meets Minimum Standard		Meets Minimum Standard	
	Traffic Safety	No Change	Improved	Improved	Improved	Improved	Improved	Improved	Improved	Improved	Improved	Improved
	Alignment Change	No Change	No Change	No Change	No Change		Alignment shifted upstream		No Change		Alignment shifted upstream	
	Bicycle Access	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
	Pedestrian Access	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
	Hydraulics	Substandard BFW and freeboard	Substandard BFW and freeboard		Meets Minimum Standard		Meets Minimum Standard		Meets Minimum Standard		Meets Minimum Standard	
	Utilities	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change	No Change
OTHER	ROW Acquisition	No Change	No	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes
	Road Closure	No Change	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
	Design Life (years)	<10	50	50	75	75	75	75	75	75	75	75

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

VIII. Conclusion

We recommend **Alternative 3a**; a new 55-foot (minimum) span conventional steel bridge constructed on-alignment while maintaining traffic on an offsite detour during construction.

Structure:
The existing bridge is over 100 years old and has had multiple reconstructions and repairs along the years. Additionally, the original pony truss is narrow for the truck traffic present and does not meet the minimum road width or hydraulic standards.

The existing substructure is rated as being in Good condition, however, a full substructure replacement is warranted due to the substandard bankfull width and freeboard. A new conventional steel beam bridge lengthened to a minimum span of 55' is recommended to meet the minimum hydraulic standard and reduce water surface elevations during flood events.

By replacing the entire bridge, a wider structure can be constructed. The current rail-to-rail width of the structure is 14'-0". This does not meet the minimum standard of 22-feet. Additionally, due to the location of many private farmers in the area the bridge is used by a high percentage of large farm equipment and trucks. Due to the heavy truck volumes over the bridge, a wider typical section that meets the Paradee Road corridor should be considered. The width of the new bridge will be increased to provide 9-foot lanes and 2-foot shoulders at a minimum, resulting in a rail-to-rail width of 22-feet.

The new steel bridge will result in a brand new 75-year bridge, with minimal future maintenance requirements. The new pony truss alternative has higher material and labor costs compared to a new steel bridge. The new steel bridge is more cost effective overall and has lower annual costs.

Traffic Maintenance:
The recommended method of traffic control is to close the bridge for a construction season and maintain traffic on an offsite detour. The detour for this project location would add approximately 0.6 miles to the through route and has an end-to-end distance of 4.3 miles. The ADT on TH 29 is 50 vehicles per day, which is considered relatively low. The option to close the road is the least expensive and has the least impacts to surrounding properties. Additionally, by closing the road to traffic during construction, the local share for preliminary engineering and right-of-way is reduced by 50%.

Additional Considerations:
The construction of the new structure may require a US Corp of Engineers permit to work in the creek if there is any impact below ordinary high-water mark (OHW). Further coordination with VT ANR will be needed if there is any permanent impact to wetland areas from the proposed project.

IX. Appendices

Appendix A: Site Pictures
Appendix B: Town Map
Appendix C: Bridge Inspection Report
Appendix D: Preliminary Hydraulics Report
Appendix E: Preliminary Geotechnical Information
Appendix F: Natural Resources Memo
Appendix G: Natural Resources ID
Appendix H: Archeology Memo
Appendix I: Historic Memo
Appendix J: Hazardous Waste Map
Appendix K: Community Questionnaire – No Response from Town
Appendix L: Crash Data
Appendix M: Detour Routes
Appendix N: Plans

Appendix A: Site Pictures


Looking west over Bridge 49


Wearing surface


Looking Downstream


Downstream Fascia


Looking Upstream


Upstream Fascia


Soffit/Superstructure


Stringer ends abutment 1


Abutment 1


Abutment 2

2021 Inspection Finding photo at stringer ends abutment 1.

2020 Inspection Finding photo.

2020 Inspection Finding photo.

2020 Inspection Finding photo.

2020 Inspection Finding photo.

2020 Inspection Finding photo.

2020 Inspection Finding photo.

2020 Inspection Finding photo.

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2020 Inspection Finding photo.

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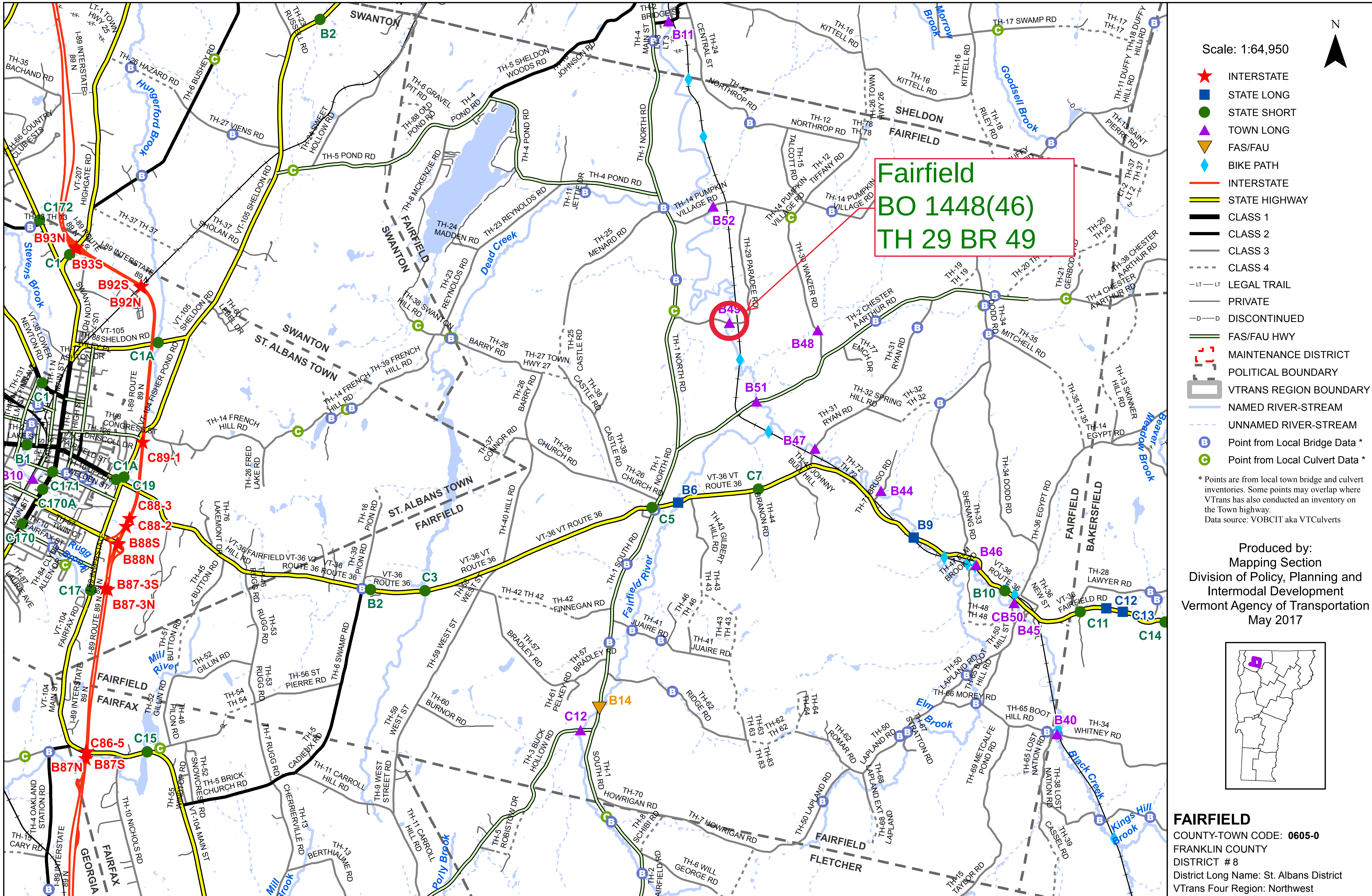
2020 Inspection Finding photo.

2020 Inspection Finding photo.

2018 Inspection Finding photo.

2018 Inspection Finding photo.

Appendix B: Town Map



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

STRUCTURE INSPECTION, INVENTORY and APPRAISAL SHEET

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

Inspection Report for : FAIRFIELD | Bridge No.: 00049 | District: 8
Located on: C3029 over BLACK CREEK | approximately 0.7 MI TO JCT C2 TH1 | Owner: TOWN-OWNED

CONDITION

Deck Rating: 6 SATISFACTORY
Superstructure Rating: 4 POOR
Substructure Rating: 7 GOOD
Channel Rating: 7 GOOD
Culvert Rating: N NOT APPLICABLE
Federal Str. Number: 100605004906051
Federal Sufficiency Rating: 24.9
Deficiency Status of Structure: SD

AGE and SERVICE

Year Built: 1919 Year Reconstructed: 1995
Service On: 1 HIGHWAY
Service Under: 5 WATERWAY
Lanes On the Structure: 01
Lanes Under the Structure: 00
Bypass, Detour Length (miles): 04
ADT: 000050 % Truck ADT: 02
Year of ADT: 2019

GEOMETRIC DATA

Length of Maximum Span (ft): 0045
Structure Length (ft): 000048
Lt Curb/Sidewalk Width (ft): 0
Rt Curb/Sidewalk Width (ft): 0
Bridge Rdwy Width Curb-to-Curb (ft): 13.8
Deck Width Out-to-Out (ft): 14
Appr. Roadway Width (ft): 016
Skew: 00
Bridge Median: 0 NO MEDIAN
Min Vertical Clr Over (ft): 99 FT 99 IN
Feature Under: FEATURE NOT A HIGHWAY OR RAILROAD
Min Vertical Underclr (ft): 00 FT 00 IN

STRUCTURE TYPE and MATERIALS

Bridge Type: PONYTRUSS/STEEL BM
Number of Approach Spans: 0000 Number of Main Spans: 001
Kind of Material and/or Design: 3 STEEL
Deck Structure Type: 3 OPEN GRATING
Type of Wearing Surface: 9 NONE
Type of Membrane: 0 NONE
Deck Protection: 0 NONE

APPRAISAL *AS COMPARED TO FEDERAL STANDARDS

Bridge Railings: 0 DOES NOT MEET CURRENT STANDARD
Transitions: 0 DOES NOT MEET CURRENT STANDARD
Approach Guardrail: 0 DOES NOT MEET CURRENT STANDARD
Approach Guardrail Ends: 0 DOES NOT MEET CURRENT STANDARD
Structural Evaluation: 2 INTOLERABLE REPLACEMENT NEEDED
Deck Geometry: 5 BETTER THAN MINIMUM TOLERABLE CRITERIA
Underclearances Vertical and Horizontal: N NOT APPLICABLE

Waterway Adequacy: 6 OCCASIONAL OVERTOPPING OF ROADWAY WITH INSIGNIFICANT TRAFFIC DELAYS
Approach Roadway Alignment: 8 EQUAL TO DESIRABLE CRITERIA

Scour Critical Bridges: 3 SCOUR CRITICAL

DESIGN VEHICLE, RATING and POSTING

Load Rating Method (Inv): 2 ALLOWABLE STRESS(AS)
Posting Status: P POSTED FOR LOAD
Bridge Posting: 4 POSTING REQUIRED
Load Posting: 02 BRIDGE IS LEGALLY LOAD POSTED AT BOTH ENDS
Posted Vehicle: 6 GROSS LOAD ONLY
Posted Weight (tons): 03
Design Load: 0 OTHER OR UNKNOWN

INSPECTION

Insp. Date: 082020 Insp. Freq. (months): 24
X-Ref. Route:
X-Ref. BrNum:

INSPECTION SUMMARY and NEEDS

11/4/2020 Newly added stringer beams have been installed to compensate for the failed stringer ends at abutment 2, the structure is open, posted for 3 ton, and will be removed from the 12 month cycle. JW/MC

8/11/2020 This structure should be considered for replacement in the near future as advanced deterioration in the abutment 2 stringer ends has begun to compromise the structure. JW/MC

8/20/2018 Superstructure is in need of replacement with heavy deterioration along beam ends due to excessive amount of sediment build up and open grid steel deck. Gussets and top plates of top chord at abutment #1 have holes and heavy rust scaling and pitting present. Both abutments *could use chinking to fill in voids between laid up stone. SMP & AAL*

8/9/2016 Sand and gravel should be cleaned off both abutments in the seat area. Structure should be cleaned and painted soon. Steel grid deck should be fill with concrete to help stop sand and gravel from setting on the abutments and the stringers. ~FRE/TJB

8/5/2014 The built up gravel on the bridge seats should be removed to preserve the beam ends. New backwalls should be installed to prevent gravel from falling onto the bridge seats. Also the open grid deck over the bridge seat areas should be concreted in to prevent gravel form the road way falling on to these areas. JWW/JDM

8/15/2013 The open grid deck has heavy bending in the downstream ends and there is a 1' by 1' section that has heavy cracking near mid span. The deck needs to be replaced or repairs made to the cracked sections. The abutment 2 embankment should have anti erosion protection added to prevent further sloping of the bank. JWW/JDM

08/08/2012 Steel deck grating is in need of repairs where bars are cracked, bent and depressed. Areas along the deck surface may rupture suddenly anytime anywhere without warning or notice. End posts members where cracks occur on the vertical legs of the interior angle are in need of repairs. Several vertical gusset plates along both trusses are in need of replacement or repairs. Other members that are bent are in need of straightening (i.e. end posts, verticals, diagonals, etc.) Please refer to Town Letter dated on 08/10/2012 for maintenance repairs. PLB

08/18/10 The open deck grating is in need of full replacement or repairs. Several members making up both trusses are in need of repairs. The floor beams are in need of repairs. PLB

Appendix D: Preliminary Hydraulics Memo

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

[phone] 802-595-6493

Agency of Transportation

TO: Laura Stone, Structures, Scoping Engineer

CC: Nick Wark, Hydraulics Engineer

FROM: Christian Boisvert, Hydraulics Project Engineer

DATE: January 25, 2022

SUBJECT: Fairfield BO 1448(46), pin#12J624
Fairfield, TH-29, Br49, Black Creek
Coordinates: 44.831961, -72.928473

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

On 11/3/21 ANR visited the site. In an email on 11/16/21, ANR indicated a minimum span of 55-feet should be used to span bankfull width (BFW).

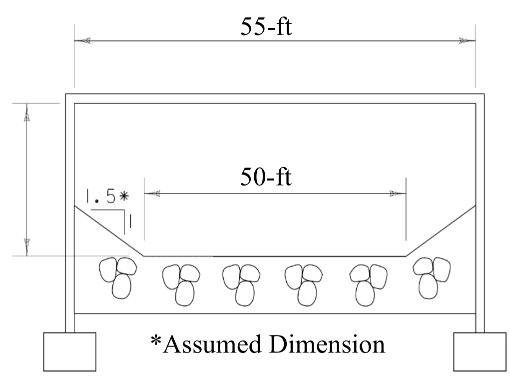
Bridge 49 is located within a FEMA Special Flood Hazard Area (SFHA) Zone A without Base Flood Elevations.

TH-29 is a local town road. Therefore, Design Storm Flow is 4% AEP (Q25).

The following was analyzed:

Existing Conditions: Single Span Pony Truss Bridge
- 45-foot hydraulic clear span with a low chord elevation of 357.7 feet
- There is approximately 0.3 feet of freeboard at the 4% AEP and no freeboard at the 1% AEP.
- Roadway overtopping occurs directly east of the structure before the 4% design AEP. There is approximately 400-ft of roadway flooding at a maximum depth of 1.7-ft.
- The existing structure does not meet current standards of the VTrans Hydraulic Manual nor does it meet state stream equilibrium standards for bankfull width.

Proposed Bridge Replacement: Single Span Bridge
- 55-foot hydraulic clear span with sloping stone fill
- A minimum required low beam elevation of 358.1 feet
- There is approximately 1.0 feet of freeboard at the 4% AEP and 0.2 feet of freeboard at the 1% AEP.
- **Roadway overtopping still occurs as described in the existing conditions above due to a low point in the road.**
- Does not increase the 100-year base flood elevations
- Assumes no changes to the existing structure alignment/skew



Stone Fill, Type III is to be used to protect any disturbed channel banks or roadway slopes at the structure's inlet and outlet. A final scour countermeasure design will be performed during final design. Additionally, we can help detail countermeasures to protect the roadbed in the case of overtopping if that is a concern.

Assuming a D50 of 0.2 mm (medium to fine sand), a preliminary scour analysis indicated 8.3- and 8.5-feet of scour at the design and check scour events. For preliminary design, the top and bottom elevations of the footing should be below the adjusted thalweg calculated from the scour design and check events, respectively. A final scour analysis will be performed during the final design phase. We recommend obtaining streambed grab samples at the following depths: 0-1 foot and 1-2 feet below the stream bed.

The existing bridge is rated scour critical on the bridge inspection report. Further justifying the need for a subsurface investigation of the streambed.

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, or to check substructure configuration scenarios.

Appendix E: Preliminary Geotechnical Memo

AGENCY OF TRANSPORTATION **OFFICE MEMORANDUM**

To: Laura Stone, P.E., P.I.I.T. Project Manager

END

From: Eric Denardo, P.E., Geotechnical Engineer

Date: September 24, 2021

Subject: Fairfield BO 1448(46) Preliminary Geotechnical Information

1.0 INTRODUCTION

As requested, we have completed our preliminary geotechnical investigation for Bridge No.49 on TH 29 (Paradee Rd.) the Black Creek as part of the Fairfield BO 1448(46) project. Bridge No. 49, a single span steel pony truss bridge with an open grating deck, is located approximately 0.7 miles east from the intersection of TH 29 and TH 1(North Rd) in the town of Fairfield, VT. This review included a subsurface investigation, the examination of well log data, hazardous site information on file at the Vermont Agency of Natural Resources (ANR), as well as published surficial and bedrock geologic maps. The subject 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 glaciolacustrine deposits of silt, silty clay, and clay (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 but may also be a phyllitic member of the Cheshire Formation (Ratliffe, et. al, 2011).

2.2 Water Well Logs

The Vermont ANR maintains a record of private and public wells drilled in their Atlas database. Published online, these logs may provide general characteristics of the soil strata and depth to bedrock in the area. The only well located within a half-mile radius of the project TAG 174/305A, was located approximately 1300 feet (ft) from the project site and reported bedrock at a depth of 105 ft.

2.3 Hazardous Materials and Underground Storage Tanks

The ANR Atlas also maintains a database of all known hazardous waste sites and underground storage tanks. According to their published data there are no sites located within a 0.5-mile radius of the project, and the location of the project is not on the Hazardous Site List. No impact from other hazardous waste sites is anticipated.

2.4 Record Plans

A review of historical record plans was also a part of this investigation; however, no record plans were available for this project.

3.0 FIELD INVESTIGATION

A field investigation was conducted between June 28, 2021, and July 1, 2021. Two standard penetration borings were advanced in the roadway at opposite corners of the bridge to evaluate the subsurface profile and aid in design and construction of a replacement structure. During drilling operations for B-101, split spoon samples and standard penetration tests (SPT) were taken at 5 ft intervals to a depth of 25 ft below ground surface (bgs) then at 10 ft intervals to a depth of 50 ft bgs then at 20 ft intervals to bedrock. For B-102, split spoon samples and SPTs were taken at 5 ft intervals to a depth of 35 ft bgs, at 10 ft intervals to a depth of 75 ft bgs, then at intervals of 15 ft to bedrock. When cohesive soils were encountered during drilling operations, undisturbed sampling was performed in accordance with AASHTO T207, *Thin Walled Tube Sampling of Soils,* in order to collect two 30-inch Shelby tubes. Bedrock was encountered at depths between 90 ft bgs and 108 ft bgs for boring B-101 and B-102, respectively. When bedrock was encountered, NX rock cores were taken 10 ft into rock to collect 5 ft core sample runs to confirm the presence of bedrock.

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.

4.0 SOIL PROFILE

The field investigation indicates that the soil strata of the project site generally consist of granular soils consisting primarily of sandy gravel and gravelly sand and transitions to a soft to very soft strata of clay and silty clay material after depths of approximately 5 to 10 ft bgs. No cobbles, boulders, or broken rock were noted in either of the borings.

5.0 RECOMMENDATIONS

Due to the soft to very soft cohesive materials and the other information, possible foundation options for bridge replacement include the following:

- Reinforced concrete abutments founded on piles
- Precast or steel arch bridge with spread footings founded on piles
- Concrete rigid frame supported on H-piles or micro-piles
- Integral Abutments supported on single row of H-piles

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.

6.0 CONCLUSION

If you have any questions, or you would like to discuss this report, please contact us via email. Typed boring logs are attached and are available in the CADD design files:
M:\Projects\12j624\MaterialsResearch

Attachments: Boring Layout
Boring Logs (4 pages)

7.0 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 6/18/21.

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

Z:\Highways\CMB\GeotechEngineering\Projects\Fairfield BO 1448(46)\REPORTS\Fairfield BO 1448(46) Preliminary Geotechnical Report.docx

Appendix F: Resource ID Completion Memo

OFFICE MEMORANDUM

AOT - PDB - ENVIRONMENTAL SECTION

RESOURCE IDENTIFICATION COMPLETION MEMO

TO: Laura Stone, Project Manager
FROM: Julie Ann Held, Environmental Specialist *Drafted by Solomon Lew, Environmental Specialist Technical Apprentice*
DATE: July 21, 2021
Project: FAIRFIELD BO 1448(46)

ENVIRONMENTAL RESOURCES:

	Yes	No	
Archaeological Resources:	X		See Archaeological Resource ID Memo
Historic Resources:	X		See Historic Resource ID Memo
Wetlands:	X		See Natural Resource ID Memo
Aquatic Organism Passage:	X		See Natural Resource ID Memo
Agricultural Soils:	X		See Natural Resource ID Memo
Wildlife Habitat:	X		See Natural Resource ID Memo
Endangered Species:	X		See Natural Resource ID Memo
Stormwater Considerations:		X	See Stormwater Resource ID Memo
6(f) Properties:		X	
Hazardous Waste:		X	
Urban Background Area:		X	
Wild Scenic Rivers:		X	
Act 250 Permits:		X	
FEMA Floodplains:		X	
Flood Hazard Area:		X	
River Corridor:	X		This project is located at Black Creek, depending on the scope of work, coordination with the River Management Engineer will be required for impacts to the stream and banks.
US Coast Guard:		X	
Lakes and Ponds:		X	
Other:		X	

cc:
Project File

Appendix G: Natural Resources ID

Natural Resources Assessment Report for Vermont Agency of Transportation Fairfield BO 1448(46)

Prepared by:

Arrowwood Environmental, LLC

June 16, 2021

ARROWWOOD ENVIRONMENTAL
950 BERT WHITE ROAD
HUNTINGTON, VT 05462
(802 434-7276 FAX: (802) 329-2253

Natural Resources Assessment Report for

Vermont Agency of Transportation

Fairfield BO 1448(46)

Table of Contents

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Natural Resources Assessment Report for

Vermont Agency of Transportation

Fairfield BO 1448(46)

I. Introduction and Project Description

Arrowwood Environmental, LLC (AE) was retained by the Vermont Agency of Transportation to perform a natural resources assessment for a proposed bridge replacement on Paradee Road in Fairfield, Vermont. The study area for the assessment is shown on the Resource Map in Appendix 2.

The assessment consisted of a remote landscape analysis of the study area as well as a field assessment. The field assessment was conducted on May 25 and June 10, 2021. This Natural Resource Assessment Report summarizes the results of the remote analysis and field assessment.

II. Site Characterization

Ecologically the site is within the Champlain Valley biophysical region of the state (Zaino, Thompson and Sorenson, 2019). The study area is located at approximately 120 feet above mean sea level according to U.S. Geologic Survey ("USGS") topographic data and is generally flat. The mapped bedrock that is underlying the site is phyllite from the Fairfield Pond Formation. (Ratcliffe et al. 2011). The soils are mapped as Belgrade silt loam to the west of the Black Creek and Limerick silt loam to the east of the Creek (NRCS Soil Survey). The surrounding landscape is dominated by agricultural lands.

The study area consists of road shoulder and actively managed agricultural fields. The pastures are dominated by bluegrass (*Poa pratensis*), burdock (*Arctium lappa*), reed canary grass (*Phalaris arundinacea*), Canada goldenrod (*Solidago canadensis*), and common thistle (*Cirsium vulgare*). The corn field is dominated by corn (*Zea mays*), horsetail (*Equisetum arvense*) and three-seeded-Mercury (*Acalypha rhomboidea*).

III. Wetlands

The wetland assessment involved both a remote review of available maps (including Vermont Significant Wetland Inventory Maps and the NRCS Soil Survey) and a field inventory component conducted on May 25, 2021. The protocols put forth in the USACE's *Corp of Engineers Wetlands Delineation Manual* (2009 Regional Supplement for the Northcentral and Northeast Region) were employed for delineating wetlands as is the standard practice in Vermont. Wetland delineation and function and values forms are included in Appendix 3 and 4, respectively. There are two wetlands within the study area. The VSWI indicates a mapped Class 2 wetland within an agricultural corn field adjacent to the study area, this resource was not present during this inventory.

Wetland A: Shallow emergent marsh associated with Black Creek, an unnamed tributary to the Creek flows through the wetland and appears to have been historically straightened. This wetland is indicated on the Wetland Advisory Layer and presumed to be Class 2. The wetland is located within an active cow pasture. The wetland vegetation is dominated by reed canary grass.

Wetland B: Shallow emergent marsh associated with Black Creek. There does not appear to be a stream channel within the wetland. The wetland vegetation is dominated by reed canary grass. The wetland is indicated on the Wetland Advisory Layer and presumed to be Class 2.

IV. Rare, Threatened and Endangered Species

The RTE species review involved both a remote review of available digital maps for the study area as well as a field survey. AE reviewed digital orthophotography, the NRCS Soil Survey, the 2011 Bedrock Geologic Map of Vermont and the Wildlife Natural Heritage Inventory (NHI) Rare, Threatened and Endangered Species digital database.

In reviewing the NHI digital database, there is one record of an S3-ranked uncommon species (*Elymus wiegandii*) approximately 0.25 miles to the north of the project study area.

Plant Species

An inventory for RTE and uncommon plant species was undertaken in the study area on June 10, 2021. A complete list of plants documented during that inventory is presented in Appendix 5.

A single clump containing 17 stems of the invasive purple loosestrife (*Lythrum salicaria*) was documented in the study area.

Animal Species

The Northern Long Eared Bat (*Myotis septentrionalis*, MYSE) became a federally listed endangered species in May of 2015. The State of Vermont has determined that project clearing greater than 1% of the total forested area within a 1 square mile radius of a project triggers greater review for habitat loss for this endangered species. There are no mature trees in the area immediately surrounding the proposed project, and no trees meeting the criteria as potential bat roost trees were found within the study area.

No other RTE animal species are documented nearby or are expected to be impacted by the proposed project.

V. Streams

The stream assessment involved both a remote review of the USGS topographic map, Vermont Hydrography Dataset (streams, rivers, and waterbodies), LiDAR derived elevation data, and field investigation on May 25, 2021. Two streams were mapped in the study area and are summarized below. Stream data summary forms are provided in Appendix 6.

<u>Stream S1:</u> Structure Fairfield BO 1448(46) is associated with Black Creek. Black Creek is a perennial stream with an average bankfull channel width of 53' and a sand substrate in a plane bed morphology.

Stream S2: Stream 2 flows in an east/west direction along the southern side of Paradee Road and into Black Creek just south of the bridge. The stream appears to have been historically straightened as it flows through Wetland A. The stream channel has an average bankfull width of 18" with a fine gravel substrate.

VI. Wildlife Habitat and Habitat Connectivity

The wildlife habitat assessment involved both a remote review of available digital maps for the study area and a field inventory component. A remote review of available digital databases was conducted to identify and map necessary wildlife habitat (including Vt. Fish and Wildlife's Deer Winter Area data layer) within the study area and within the vicinity of the study area.

There are no mapped Vt. Fish and Wildlife deer winter habitats in the study area. Field investigation confirmed the absence of deer wintering areas within the study area.

Vt. Fish and Wildlife identifies the study area as a Highest Priority surface water and riparian area and riparian wildlife connectivity area in the Vt. Conservation Design. Much of the surrounding landscape is agriculturally-impacted wetland, with clearing, cropping, and pasture maintenance extending all the way to the waters edge. Without any significant treed buffer the riparian connectivity function at this location is significantly diminished. The existing bridge abutments terminate on a steep sloped river bank which are not likely to support wildlife movement under the structure. Incorporating a shelf or bench parallel to the river under the structure, between the abutments and rivers edge, to provide off-road, sheltered, wildlife movement opportunity would enhance the riparian wildlife connectivity at the site.

Concentrated amphibian crossing areas occur when different amphibian habitat features are separated from each other by roads. The agricultural land use in the study area does not offer significant amphibian habitat features in the vicinity. Concentrated amphibian crossings in the study area are therefore not likely to occur.

Appendix 1

Photo Log

BO 1448(46)

June 25, 2021

Wetland A: Shallow Emergent Marsh

June 25, 2021

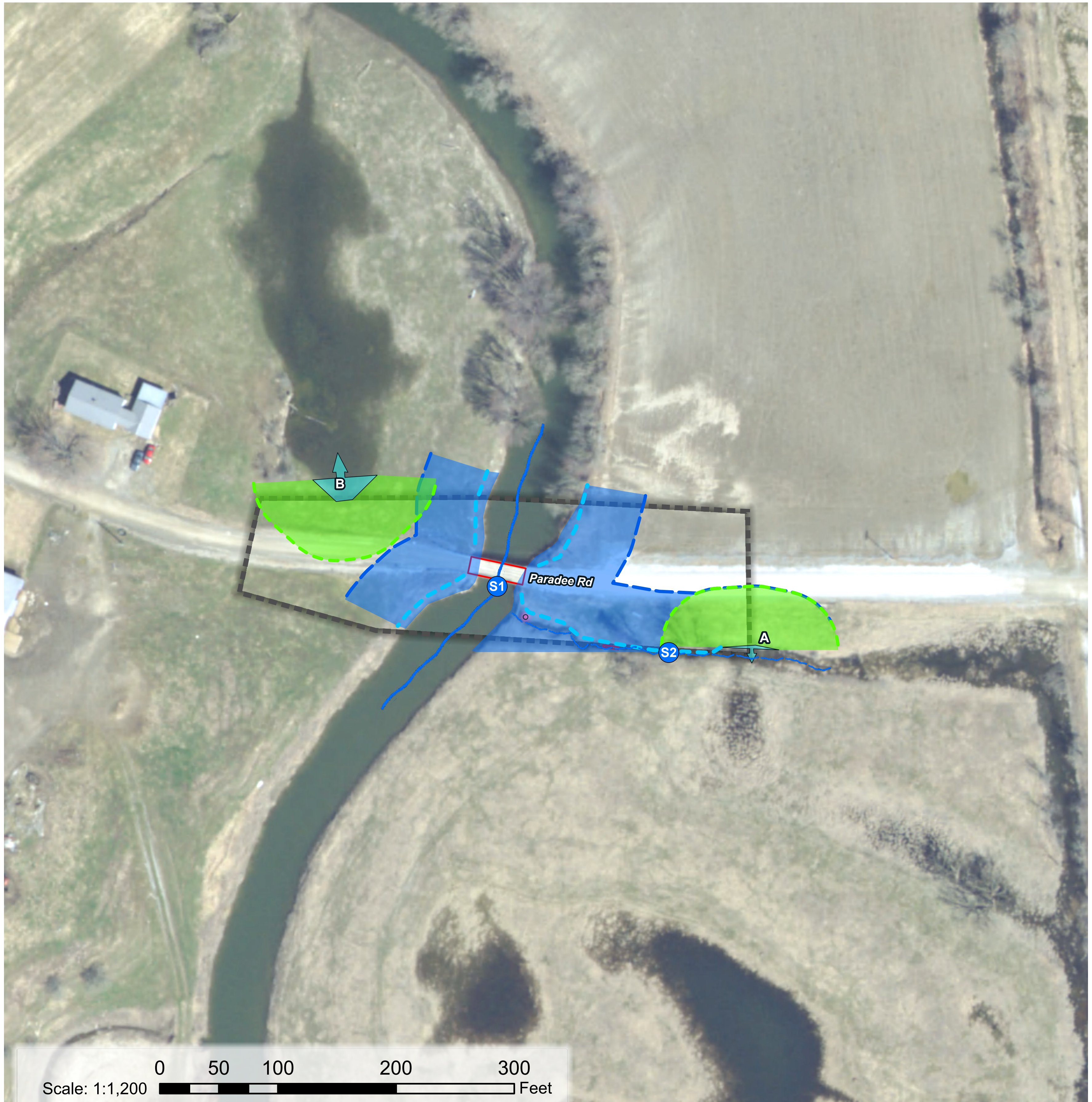
Wetland B: Shallow Emergent Marsh

June 25, 2021

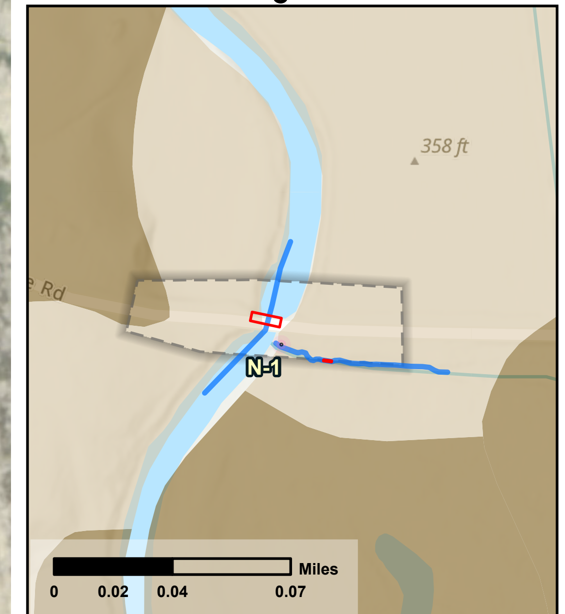
Area of VSWI mapped wetland

June 25, 2021

Appendix 2: Resource Map



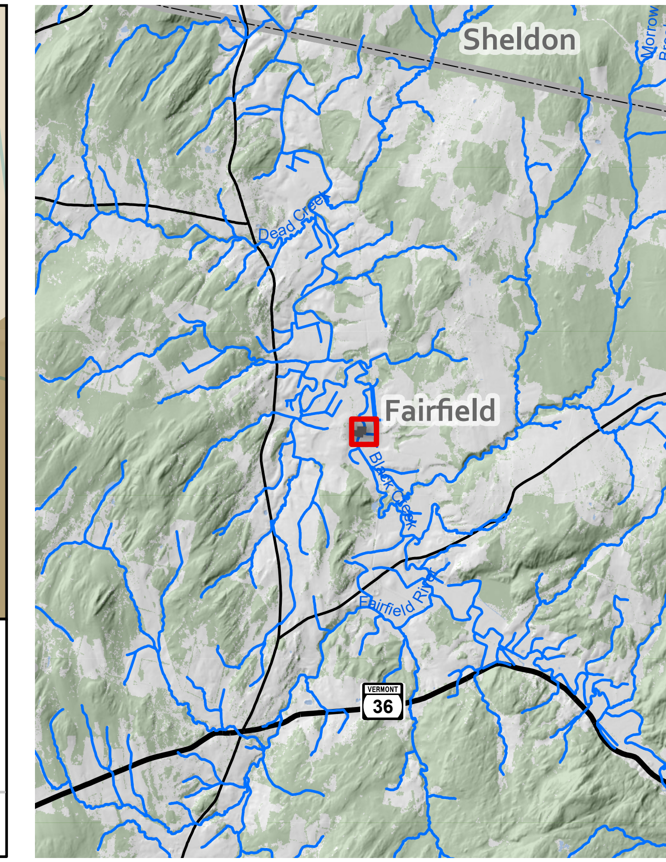
NNIS & Prime Ag. Soils



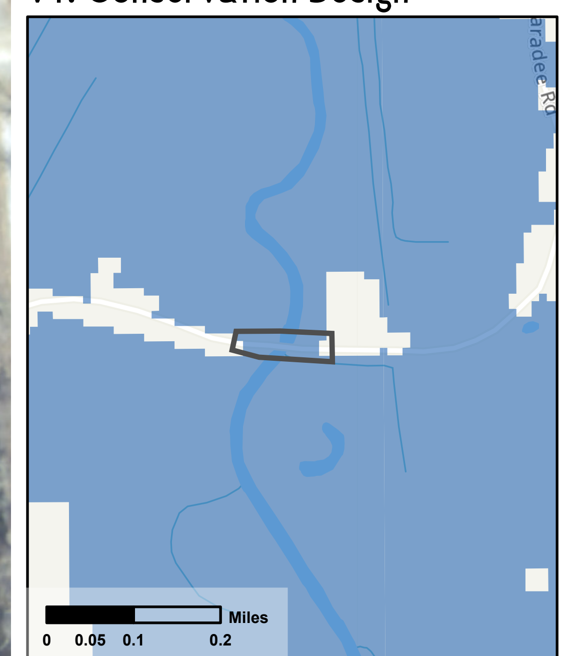
Non-native Invasive Species (NNIS)
Prime Ag Soils
Statewide Ag Soils

Label	NNIS Species	Comment
N-1	Lythrum salicaria	12 plants, in ditched channel

Locus



Vt. Conservation Design



Vt. Conservation Design Elements
- Highest Priority Interior Forest Blocks
- Highest Priority Surface Water & Riparian Areas
- Highest Priority Terrestrial Crossings
- Highest Priority Riparian Crossings

Combined Linkage Ratings
◄not impt. more impt.►

- Study Area
- Intermittant Stream
- Perennial Stream/River
- Top of bank/slope
- Riparian zone
- NNIS population
- Wetland
- 50' Wetland Buffer

Notes: Information provided based on remote and field assessment by Arrowwood Environmental, 2020. Wetlands field delineated,flagged and flags located with sub-meter grade GPS by Arrowwood Environmental. Streams, top-of bank, plant populations, wildlife features, and structure locations from sub meter grade GPS, fieldnotes, and analysis of aerial imagery and high-resolution LiDAR topographic data.

Other data from VCGI, Vt Agency of Natural Resources. Contour interval 1' derived from LiDAR-based elevation models provided by VCGI. Background imagery- VCGI 2018.

Vt. Agency of Transportation: Fairfield BO 1448(46) Statewide Natural Resource Services 2019

Friday, June 11, 2021 File: VtransFairfieldBO1448 Prepared By: A Worthley, Arrowwood Environmental Coordinate System: NAD 1983 StatePlane Vermont FIPS 4400 Feet

ARROWWOOD ENVIRONMENTAL
950 BERT WHITE ROAD
HUNTINGTON, VT 05462
(802 434-7276 FAX: (802) 329-2259

Appendix 3: Wetland Data Forms

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Vtrans Fairfield BO 1448 (46) City/County: Fairfield Sampling Date: 5/25/2021

Applicant/Owner: Vtrans State: VT Sampling Point: ____

Investigator(s): DB Section, Township, Range: --

Landform (hillside, terrace, etc.): Terrace Local relief (concave, convex, none): none Slope (%): 2

Subregion (LRR or MLRA): LRR R Lat: 44.831855 Long: 72.9276839 Datum: Upland

Soil Map Unit Name: Limerick silt loam NWI classification: 2

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

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

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.

	Yes	No
Hydrophytic Vegetation Present?		x
Hydric Soil Present?		x
Wetland Hydrology Present?		x

Is the Sampled Area within a Wetland? **Yes** ____ **No** x

If yes, optional Wetland Site ID: ____

Remarks: (Explain alternative procedures here or in a separate report.)
Open field/pasture

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:

	Yes	No	Depth (inches)
Surface Water Present?		x	
Water Table Present?		x	
Saturation Present? (includes capillary fringe)		x	

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: ____________

Tree Stratum (Plot size: 30' x 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2. *none present*			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		

Sapling/Shrub Stratum (Plot size: 15' x 15')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2. *none present*			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		

Herb Stratum (Plot size: 5' x 5')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2. *Taraxacum officinale*	5	No	FACU
3. *Galium mollugo*	3	No	UPL
4. *Poa annua*	5	No	FACU
5. *Solidago canadensis*	5	No	FACU
6. *anthoxanthum odoratum*	10	No	FACU
7. *Dactylis glomerata*	60	Yes	FACU
8. *sonchus arvensis*	2	No	UPL
9.			
10.			
11.			
12.			
	90 =Total Cover		

Woody Vine Stratum (Plot size: 30' x 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. *none present*			
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	85	x 4 =	340	
UPL species	5	x 5 =	25	
Column Totals:	90	(A)	365	(B)

Prevalence Index = B/A = 4.06

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ 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 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** _____

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

SOIL

Sampling Point: ____________

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12	10yr 4/4	100					Loamy/Clayey	dry/loose loam

[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) (**LRR R, MLRA 149B**)
___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
___ Loamy Mucky Mineral (F1) (**LRR K, L**)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

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**)
___ Dark Surface (S7) (**LRR K, L**)
___ 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 (TF2)
___ 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: none

Depth (inches): ____________

Hydric Soil Present? **Yes** ____ **No** x

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Vtrans Fairfield BO 1448 (46) City/County: Fairfield Sampling Date: 5/25/2021

Applicant/Owner: Vtrans State: VT Sampling Point: ____

Investigator(s): Dori Barton Section, Township, Range: none

Landform (hillside, terrace, etc.): Terrace Local relief (concave, convex, none): none Slope (%): 3

Subregion (LRR or MLRA): LRR R Lat: 44.8317621 Long: 72.9277958 Datum: Wetland

Soil Map Unit Name: Limerick Silt Loam NWI classification: 2 (advisory layer)

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

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

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: Wetland A

Remarks: (Explain alternative procedures here or in a separate report.)
Shallow emergent marsh/cow pasture

HYDROLOGY

Wetland Hydrology Indicators:

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

- x Surface Water (A1)
- x 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)
- ____ 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 x No ____	Depth (inches):	2
Water Table Present?	Yes x No ____	Depth (inches):	0
Saturation Present? (includes capillary fringe)	Yes x No ____	Depth (inches):	0

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

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

Remarks:
Ditched stream channel through wetland

VEGETATION – Use scientific names of plants.

Sampling Point: ____

Tree Stratum (Plot size: 30'x30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2. *none present*			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
Sapling/Shrub Stratum (Plot size: 15' x 15')			
1.			
2. *none present*			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
Herb Stratum (Plot size: 5' x 5')			
1.			
2. *Phalaris arundinacea*	95	Yes	FACW
3. *Carex sp.*	5	No	Facw
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	100 =Total Cover		
Woody Vine Stratum (Plot size: 30' x 30')			
1.			
2. *none present*			
3.			
4.			
	=Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (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	0	x 1 =	0
FACW species	100	x 2 =	200
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	100 (A)		200 (B)

Prevalence Index = B/A = 2.00

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

X Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ 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 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.)
Shallow emergent marsh

SOIL

Sampling Point: ____________

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-16	10yr 3/1	100					Muck	saturated

[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:

X 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) (**LRR R, MLRA 149B**)
___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
___ Loamy Mucky Mineral (F1) (**LRR K, L**)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

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**)
___ Dark Surface (S7) (**LRR K, L**)
___ 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 (TF2)
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: none

Depth (inches): none

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

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Vtrans Fairfield BO 1448 (46) City/County: Fairfield Sampling Date: 5/25/2021

Applicant/Owner: Vtrans State: VT Sampling Point: ____

Investigator(s): DB Section, Township, Range: none

Landform (hillside, terrace, etc.): Terrace Local relief (concave, convex, none): concave Slope (%): 2

Subregion (LRR or MLRA): LRR R Lat: 44.8321832 Long: 72.9289252 Datum: Wetland

Soil Map Unit Name: Belgrade silt loam NWI classification: 2 (advisory layer)

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

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

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: Wetland B

Remarks: (Explain alternative procedures here or in a separate report.)
Shallow emergent marsh/hay field

HYDROLOGY

Wetland Hydrology Indicators:

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

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

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)
- 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 ____	No x	Depth (inches): ____

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: ____________

Tree Stratum (Plot size: 30' x 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2. *none present*			
3.			
4.			
5.			
6.			
7.			
		=Total Cover	

Sapling/Shrub Stratum (Plot size: 15' x 15')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2. *none present*			
3.			
4.			
5.			
6.			
7.			
		=Total Cover	

Herb Stratum (Plot size: 5' x 5')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2. *Phalaris arundinacea*	85	Yes	FACW
3. *Carex sp*	10	No	FACW
4. *Ranunculus repens*	5	No	FAC
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	100	=Total Cover	

Woody Vine Stratum (Plot size: 30' x 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2. *none present*			
3.			
4.			
		=Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	1	(A)
Total Number of Dominant Species Across All Strata:	1	(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	0	x 1 =	0
FACW species	95	x 2 =	190
FAC species	5	x 3 =	15
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	100 (A)		205 (B)

Prevalence Index = B/A = 2.05

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation
X Dominance Test is >50%
X Prevalence Index is ≤3.0[1]
___ 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 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.)
Shallow emergent marsh

SOIL

Sampling Point: ____________

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
0-6	10yr 5/1	96	7.5yr 4/6	4	c	pl	Loamy/Clayey	Prominent redox concentrations

[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) (**LRR R, MLRA 149B**)
___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
___ 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)

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**)
___ Dark Surface (S7) (**LRR K, L**)
___ 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 (TF2)
___ 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: none

Depth (inches): ____________

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

Remarks:

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Vtrans Fairfield BO 1448 (46) City/County: Fairfield Sampling Date: 5/25/2021

Applicant/Owner: Vtrans State: VT Sampling Point: ____

Investigator(s): Dori Barton Section, Township, Range: none

Landform (hillside, terrace, etc.): Terrace Local relief (concave, convex, none): none Slope (%): 3

Subregion (LRR or MLRA): LRR R Lat: ____ Long: ____ Datum: ____

Soil Map Unit Name: ____ NWI classification: ____

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

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

Is the Sampled Area within a Wetland? **Yes** ____ **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)
- ____ 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)
- X FAC-Neutral Test (D5)

Field Observations:

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

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

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

Remarks:

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

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.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	=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: ________ (A)

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

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

Prevalence Index worksheet:

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

Prevalence Index = B/A = ________

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ 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 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** ____

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

SOIL

Sampling Point: ______

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

[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) (**LRR R, MLRA 149B**)
___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
___ Loamy Mucky Mineral (F1) (**LRR K, L**)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

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**)
___ Dark Surface (S7) (**LRR K, L**)
___ 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 (TF2)
___ 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** ___ **No** ___

Remarks:

Appendix 4: Wetland Functions and Values Forms

VERMONT WETLAND EVALUATION FORM

Project Name: *Vtrans Fairfield BO 1448(46)* Project #: *Wetland A*

Date: *May 25, 2021 5:03 PM* Investigator: *DB*

Comments:

Shallow emergent marsh in cow pasture

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

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

- [x] 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
    - [x] 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
    - [x] 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
    - [ ] 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
        - [ ] 1. Developed public or private property
        - [ ] 2. Stream banks susceptible to scouring and erosion
        - [ ] 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

- [x] 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
  - [x] 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
  - [x] 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

- [x] 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
  - [x] 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
  - [x] 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

- ☐ 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
- ☐ 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
- ☐ 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
  - ☐ 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
  - ☐ 6. One of the following
    - ☐ i. hydrologically connected to other wetlands of different dominant classes or open water within 1 mile
    - ☐ 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:

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

- [x] Function is present and likely to be significant: Any of the following physical and vegetative characteristics indicate the wetland provides this function
  - [x] 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
  - [x] 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

VERMONT WETLAND EVALUATION FORM

Project Name: *Vtrans Fairfield BO 1448(46)* Project #: *Wetland B*

Date: *May 25, 2021 5:03 PM* Investigator: *DB*

Comments:

Shallow emergent marsh

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

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
- ☐ 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
  - ☐ 1. Developed public or private property
  - ☐ 2. Stream banks susceptible to scouring and erosion
  - ☐ 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

- [x] 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
  - [x] 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
  - [x] 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

- ☐ 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
- ☐ 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
- ☐ 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
  - ☐ 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
  - ☐ 6. One of the following
    - ☐ i. hydrologically connected to other wetlands of different dominant classes or open water within 1 mile
    - ☐ 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:

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

Appendix 5: Plant Species List

Rare, Threatened and Endangered Plant Inventory

Report Date: 6/14/2021

Project Name Vtrans Fairfield BO 1448(46)

Botanist Michael Lew-Smith

Survey Date 6/10/2021

Description Site area consists of actively managed agriculatural fields

Plant List

note: plants with no listed S-Ranks are considered common in Vermont.

Plant Name	Common Name	S-Rank*	T/E	Plant Family
Chenopodium album	lamb's-quarters			Amaranthaceae
Angelica atropurpurea	great angelica			Apiaceae
Daucus carota	Queen Anne's lace			Apiaceae
Pastinaca sativa	parsnip			Apiaceae
Asclepias syriaca	common milkweed			Apocynaceae
Ambrosia artemisiifolia	common ragweed			Asteraceae
Arctium lappa	great burdock			Asteraceae
Artemisia vulgaris	common mugwort			Asteraceae
Bidens sp.	beggar's-ticks			Asteraceae
Cichorium intybus	chicory			Asteraceae
Cirsium vulgare	bull thistle			Asteraceae
Erigeron philadelphicus	Philadelphia fleabane			Asteraceae
Erigeron strigosus	daisy fleabane			Asteraceae
Eutrochium maculatum	common Joe-Pye weed			Asteraceae
Leucanthemum vulgare	common daisy			Asteraceae
Solidago canadensis	Canada goldenrod			Asteraceae
Taraxacum officinale	common dandelion			Asteraceae
Xanthium strumarium	clotbur			Asteraceae
Impatiens capensis	common jewelweed			Balsaminaceae
Myosotis scorpioides	common forget-me-not			Boraginaceae
Brassica nigra	black mustard			Brassicaceae
Capsella bursa-pastoris	Shepherd's purse			Brassicaceae
Cerastium fontanum	common mouse-ear chickweed			Caryophyllaceae
Silene vulgaris	common bladder campion			Caryophyllaceae
Stellaria graminea	common stitchwort			Caryophyllaceae
Calystegia sepium	hedge bindweed			Convolvulaceae
Cornus racemosa	gray dogwood			Cornaceae
Carex baileyi	Bailey's sedge			Cyperaceae
Carex vulpinoidea	fox sedge			Cyperaceae
Equisetum arvense	field horsetail			Equisetaceae

Plant Name	Common Name	S-Rank*	T/E	Plant Family
Equisetum fluviatile	water horsetail			Equisetaceae
Acalypha rhomboidea	common three-seeded mercury			Euphorbiaceae
Trifolium pratense	red clover			Fabaceae
Trifolium repens	white clover			Fabaceae
Vicia cracca	cow vetch			Fabaceae
Iris versicolor	blue flag			Iridaceae
Glechoma hederacea	gill-over-the-ground			Lamiaceae
Scutellaria cf galericulata	marsh skullcap			Lamiaceae
Lythrum salicaria	purple loosestrife			Lythraceae
Oenothera biennis	common evening primrose			Onagraceae
Matteuccia struthiopteris	ostrich fern			Onocleaceae
Onoclea sensibilis	sensitive fern			Onocleaceae
Oxalis montana	wood-sorrel			Oxalidaceae
Plantago lanceolata	buckhorn plantain			Plantaginaceae
Plantago major	plantain			Plantaginaceae
Veronica chamaedrys	germander speedwell			Plantaginaceae
Bromus inermis	Hungarian brome			Poaceae
Dactylis glomerata	orchard grass			Poaceae
Festuca ovina	sheep fescue			Poaceae
Leersia virginica	white grass			Poaceae
Phalaris arundinacea	reed canary grass			Poaceae
Phleum pratense	Herd’s grass			Poaceae
Poa annua	annual bluegrass			Poaceae
Poa compressa	Canada bluegrass			Poaceae
Poa palustris	fowl meadow grass			Poaceae
Poa pratensis	Kentucky bluegrass			Poaceae
Zea mays	Indian corn			Poaceae
Rumex crispus	curly dock			Polygonaceae
Clematis virginiana	virgin’s-bower			Ranunculaceae
Ranunculus acris	common buttercup			Ranunculaceae
Agrimonia sp.	agrimony			Rosaceae
Geum aleppicum	yellow avens			Rosaceae
Physocarpus opulifolius	common ninebark			Rosaceae
Rubus allegheniensis	common highbush blackberry			Rosaceae
Galium mollugo	common bedstraw			Rubiaceae
Galium cf tinctorium	southern three-lobed bedstraw			Rubiaceae
Populus deltoides	eastern cottonwood			Salicaceae

ARROWWOOD ENVIRONMENTAL

Rare, Threatened and Endangered Plant Inventory

Report Date: 6/14/2021

Plant Name	Common Name	S-Rank*	T/E	Plant Family
Salix alba × euxina	crack willow			Salicaceae
Acer negundo	box-elder			Sapindaceae
Acer rubrum	red maple			Sapindaceae
Verbascum thapsus	common mullein			Scrophulariaceae
Physalis heterophylla	clammy ground-cherry			Solanaceae
Ulmus americana	American elm			Ulmaceae
Laportea canadensis	wood nettle			Urticaceae
Urtica dioica ssp. gracilis	stinging nettle			Urticaceae
Parthenocissus quinquefolia	woodbine			Vitaceae

Appendix 6: Stream Existing Condition Summary Forms

ARROWWOOD ENVIRONMENTAL
950 BERT WHITE ROAD
HUNTINGTON, VT 05462
(802 434-7276 FAX: (802) 329-2259

Streams: Existing Condition Summary

June 11, 2021

Project:

Stream ID:	S1 Black Creek					
Date(s) Observed:	5/25/2021					
Survey Type:	Remote					
Field Observations						
Observation Location:	LAT	44.8319395°N	LONG	72.9284706°W		
Stream Type (typical):	Cascade☐ Step-Pool☐ Riffle-pool☐ Plane Bed☒ Ripple-dune☐ Braided☐					
Dominant Sediment Size:	Bedrock☐ Boulder☐ Cobble☐ C-Gravel☐ F-Gravel☐ Silt/Sand☒					
Average Bankfull Width:	Estimated☐ Measured☒	53’				
Flow Conditions:	Flowing☒ Pools☐ Damp☐ Dry☐	Prelim*	Perennial☒ Intermittent☐			
Slope/Confinement:						
Field Comments:	Stream information from 2008 Geomorphic Assessment- Vt ANR Black Creek Mouth Reach M03-B					
Other Data						
Watershed Size:	84.1 Square Miles					
Approx. Elevation:	350’					

**preliminary assessment of flow regime based on field observations and professional judgement*

Photos

Photo Date: 5/25/21

Photo Date: 5/25/21

Stream ID:	S2			
Date(s) Observed:	5/25/2021			
Survey Type:	Rapid			
Field Observations				
Observation Location:	LAT	44.8317646°N	LONG	72.9277802°W
Stream Type (typical):	Cascade☐ Step-Pool☐ Riffle-pool☐ Plane Bed☒ Ripple-dune☐ Braided☐			
Dominant Sediment Size:	Bedrock☐ Boulder☐ Cobble☐ C-Gravel☐ F-Gravel☒ Silt/Sand☐			
Average Bankfull Width:	Estimated☒ Measured☐	1.5''		
Flow Conditions:	Flowing☒ Pools☐ Damp☐ Dry☐	Prelim*	Perennial☐ Intermittent☒	
Slope/Confinement:				
Field Comments:	Flows through pasture/incised/ditched			
Other Data				
Watershed Size:	176.5 acres			
Approx. Elevation:	350'			

Photos	
	
Photo Date: 5/25/2021	Photo Date: 5/25/2021

Appendix H: Archeology Memo

Archaeological Resource Assessment
Fairfield Bridge No. 49, Town Highway 29
BO-1448(46)

Town of Fairfield, Franklin County, Vermont

Prepared for:

Vermont Agency of Transportation
219 North Main Street
Barre, Vermont 05641

Prepared by:

WSP USA Inc.
433 River Street, 7th Floor
Troy, New York 12180

July 16, 2021

Archaeological Resource Assessment Fairfield Bridge No. 49, Town Highway 29 BO-1448(46)

Town of Fairfield, Franklin County, Vermont

Prepared for:

Vermont Agency of Transportation
219 North Main Street
Barre, Vermont 05641

Prepared by:

Jessica Vavrasek and Marlis Muschal

WSP USA Inc.
433 River Street, 7th Floor
Troy, New York 12180

July 16, 2021

Abstract

On behalf of the Vermont Agency of Transportation (VTrans), WSP USA Inc. (WSP) of Troy, New York, completed an archaeological resource assessment (ARA) for the proposed improvements to Fairfield Bridge No. 49, Town Highway 29, Franklin County. The scope for the project has yet to be defined; WSP therefore conducted this survey and resource assessment to consider the potential effects of site access, temporary bridge construction, approach work, staging, and other potential project activities associated with improvements at the site of the bridge. The archaeological area of potential effect (APE) extends 30.5 meters (100 feet) from either end of the bridge to include all four quadrants of the bridge approaches.

The goal of the ARA was to survey the entire APE to determine if any archaeologically sensitive areas are present. The ARA consisted of background research as well as field inspection, which was conducted on April 8, 2021. The ARA determined the project APE's sensitivity for archaeological resources based on the potential for intact subsurface soils, the APE's relationship to nearby known archaeological sites and historic structures, and other criteria, including soils, topography, and proximity to water. WSP used the Vermont Division for Historic Preservation's *Environmental Predictive Model for Locating Precontact Archaeological Sites* and the Vermont Online Resource Center to inform its assessment.

Background research determined that no previously recorded precontact or historic archaeological sites are located within 1.6 kilometers (1 mile) of the APE. No precontact or historic sites were identified during the ARA. Because of the flat nature of the surrounding landscape, there is potential for archaeological sensitivity in all four quadrants around the bridge.

It is WSP's opinion that any future development carried out within the APE may have impacts on potentially significant archaeological resources. Additional archaeological investigation of the APE may be necessary if staging areas and/or a temporary bridge are proposed for any of the four quadrants around this bridge; in addition, should project activities be expanded and the APE changed, further investigation may be warranted.

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I. Introduction

A. Project Description

On behalf of the Vermont Agency of Transportation (VTrans), WSP USA Inc. (WSP) of Troy, New York, completed an archaeological resource assessment (ARA) for the proposed improvements to Fairfield Bridge No. 49, Town Highway (TH) 29, Franklin County (Figure 1). The scope for the project has yet to be defined; WSP therefore conducted this survey and resource assessment to consider the potential effects of site access, temporary bridge construction, approach work, staging, and other potential project activities associated with improvements at the site of the bridge. The archaeological area of potential effect (APE) extends 30.5 meters (100 feet) from either end of the bridge to include all four quadrants of the bridge approaches (Figure 2).

B. Scope of Services

The goal of the ARA was to survey the entire APE to determine if any archaeological sensitive areas are present. This will allow VTrans maximum flexibility in avoiding sites that are eligible for the National Register of Historic Places (NRHP). For the ARA, WSP conducted background research and a field inspection, and evaluated the location using the Vermont Department of Historic Preservation (VDHP) *Environmental Predictive Model for Locating Precontact Archaeological Sites* (VDHP 2015) (see Appendix A), the Vermont Online Resource Center (ORC) map tool (VDHP 2021), historical maps, and local histories (see Chapter IV.A).

All archaeological investigations were conducted in accordance with guidelines established by VTrans and the Programmatic Agreement (PA) among VTrans, the Federal Highway Administration, the VDHP, and the Advisory Council on Historic Preservation, which guides the administration and review process of archaeological projects. That PA and the accompanying *Manual of Standards and Guidelines* (VTrans 2000) provide the framework for the conduct of archaeological investigations for VTrans projects.

All cultural resource services were performed using the professional guidelines and standards in *Procedures for the Protection of Historic and Cultural Properties* (36 CFR 800) and *Procedures for Determining Site Eligibility for the National Register of Historic Places* (36 CFR 60 and 63). This investigation also conformed to the Secretary of the Interior's Standards for Archaeology and Historic Preservation (48 *Federal Register* 44716) (United States Department of the Interior 1983), and *Guidelines for Conducting Archaeology in Vermont* (VDHP 2002). The cultural resource specialists who performed this work satisfy the Secretary of the Interior's Professional Qualifications standards as specified in 36 CFR 66.3(6)(2).

This report has been organized into six chapters. After the introduction in Chapter I, Chapter II describes the environmental setting of the APE. Chapter III discusses the cultural context for the APE, briefly outlining the 11,000-year history of the region and summarizing previous archaeological investigations in the vicinity. Chapter IV presents the methods and results of the ARA, and Chapter V contains the conclusions. Chapter VI lists the references cited. The Environmental Predictive Model Checklists are provided in Appendix A.

This investigation was conducted under the direction and supervision of WSP Senior Vice President Hope Luhman, PhD (Register of Professional Archaeologists [RPA 10505]). WSP Historic Preservation Manager Camilla McDonald served as the project manager. Archaeologist Jessica Vavrasek, PhD (RPA 989768) conducted the field inspection. Dr. Vavrasek completed the background research and wrote the report with assistance from Archaeologist Marlis Muschal (RPA 34344474). Principal Draftsperson Jacqueline L. Horsford prepared the graphics. Principal Editor Anne Moiseev supervised the editing and production of the report.

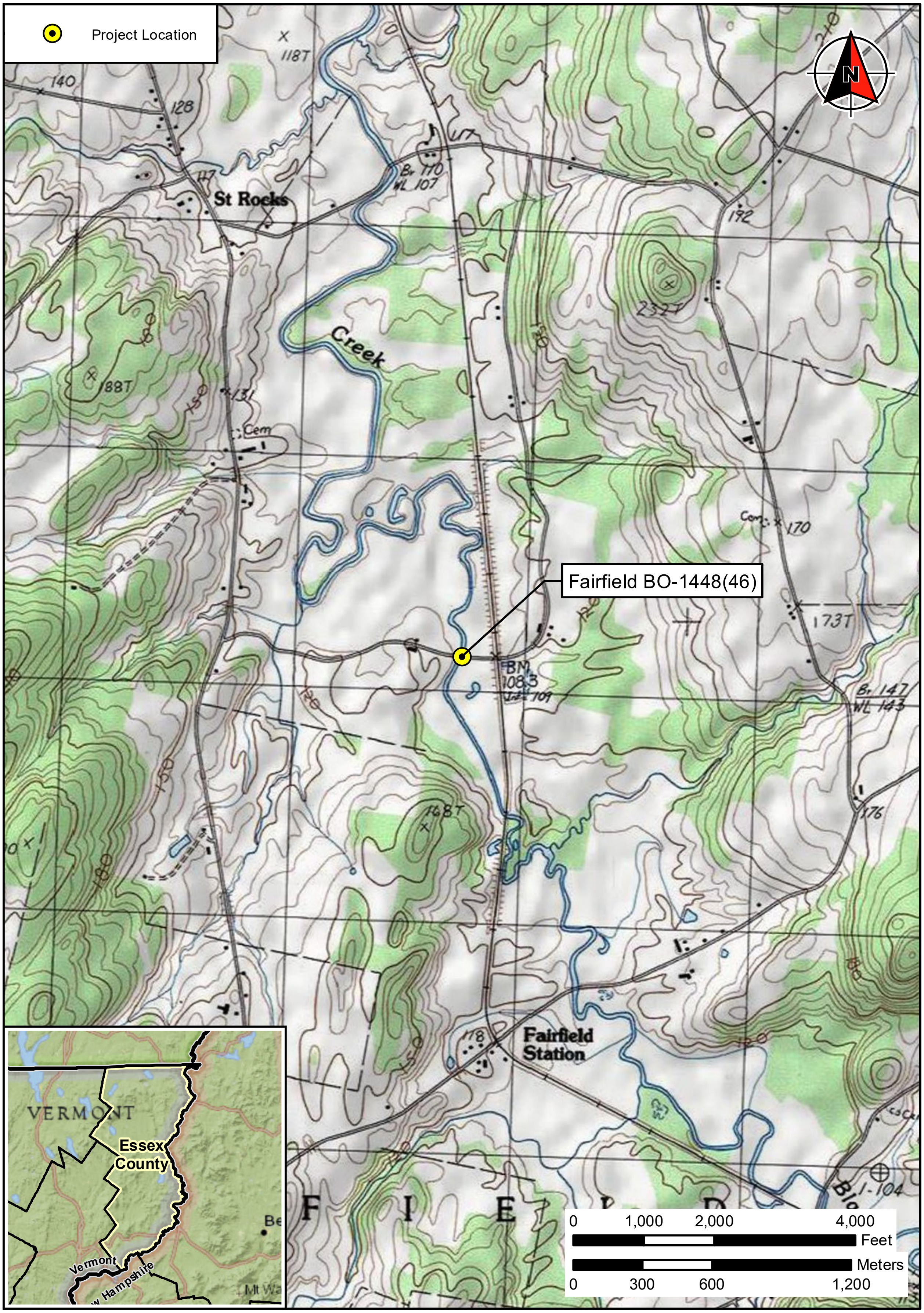

FIGURE 1: Location of Project BO-1448 (46) (ESRI USA Topo Maps 2019)

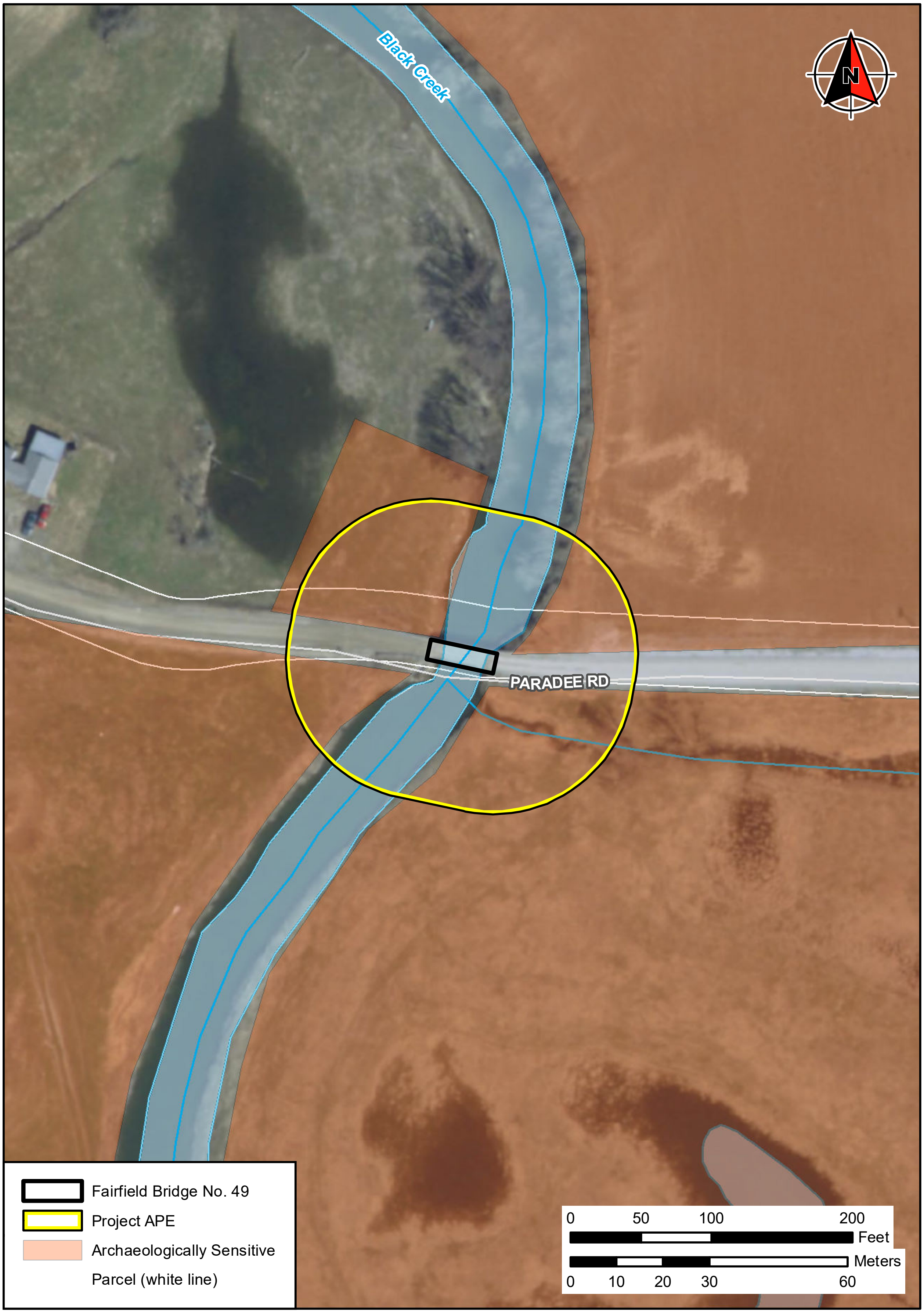

FIGURE 2: Project APE (VCGI 2018)

II. Environmental Setting

A. General Setting

The APE is located along TH 29/Paradee Road at the Black Creek crossing, approximately 3.7 kilometers (2.3 miles) north-northeast of Fairfield, Vermont (see Figure 2). The APE is located in the Green Mountains physiographic region of northwestern Vermont. The northern part of the Green Mountain physiographic region is characterized as an assortment of mountain peaks with deeply incised valleys carved by both the Winooski and Lamoille rivers. The mountains are 400 million years old. The glaciated terrain once reached elevations of as much as 2,438 meters (8,000 feet) in excess of the state's current highest elevation of 1,339 meters (4,393 feet) (Mount Mansfield). The landscape is not well suited for agriculture, and farmland is more often used as pasture. The area also receives a high amount of precipitation, partly because of its location relative to Lake Champlain (Vermont Fish & Wildlife Department 2018).

The dominant water source in the region is Lake Champlain. The major rivers of western Vermont drain the region, including Otter Creek and the Winooski, Lamoille, and Missisquoi rivers. The APE is located in the Black Creek watershed, which drains into the Missisquoi River (United States Geological Survey [USGS] 2018). Limestones, dolomites, and shales are found throughout the region, with sedimentary rocks in several places metamorphosed to quartzites, marbles, and slates. Rocks of Lower Cambrian and Lower Ordovician age lie throughout the Lowlands, which are part of a trough, or downfold, located between the Champlain and Hinesburg Thrusts (Ratcliffe et al. 2011).

The landscape in the APE includes a combination of agricultural land and roadside modifications, including drainage ditches and built-up road berms.

B. Soils in the APE

The APE contains two general soil types. Belgrade silt loam (2 to 8 percent slopes) is formed in glaciolacustrine material on terraces. Limerick silt loam (0 to 3 percent slopes) is formed in loamy alluvium on floodplains and consists of very deep, poorly drained soils (United States Department of Agriculture-Natural Resources Conservation Service [USDA-NRCS] 2021) (Figure 3; Table 1).

TABLE 1: SOILS IN PROJECT APE

SERIES NAME	SOIL HORIZON	DEPTH	COLOR	TEXTURE, INCLUSIONS	SLOPE	DRAINAGE	LANDFORM
Belgrade silt loam (BeB)	Ap Bwl C1 C2	0-23 cm (0-9 in) 23-51 cm (9-20 in) 51-76 cm (20-30 in) 76-165 cm (30-65 in)	Vr Dk Gy Br Yw Br Ol Br Gy	V Fi Sa Lo V Fi Sa Lo V Fi Sa Lo Lo Sa	BeB (2-8%)	Moderately Well Drained	Terraces
Limerick silt loam (Le)	Ap BCg1 BCg2 BCg3 Cg	0-20 cm (0-8 in) 20-50 cm (8-20 in) 50-91 cm (20-36 in) 91-137 cm (36-54 in) 137-165 cm (54-65 in)	Dk Gr Br Ol Gr Ol Gr Dk Gr Dk Grn Gr	Si Lo Si Lo Si Lo Si Lo Si Lo	Le (0-3%)	Poorly Drained	Floodplains

KEY: Shade: Lt – Light, Dk – Dark, V – Very, St – Strong
Color: *Brn – Brown, Blk – Black, Gry – Gray, GBrn – Grayish Brown, StrBrn – Strong Brown, RBrn – Reddish* Brown, YBrn – Yellowish Brown, OlBrn – Olive Brown, Wh – White, Ol – Olive, PlBrn-Pale Brown, Brn Yl-Brownish Yellow, YRd-Yellowish Red
Soils: Cl – Clay, Lo – Loam, Si – Silt, Sa – Sand
Other: / - Mottled, Grl – Gravel, Cbs – Cobbles, Pbs – Pebbles, Rts – Roots, C – Coarse, Ch - Channery, F – Fine, V-Very, E- Extremely, Dec OM – Decomposed organic matter, S- Stratified
USDA-NRCS 2021

FIGURE 3: Soils in Project APE (USDA-NRCS 2019; VCGI 2018)

C. Environmental History of Vermont

Paleoecologists have constructed the environmental history of Vermont from a variety of sources, including pollen cores, sedimentation histories, and faunal collections. The ruggedness of Vermont and the pronounced differences in elevation across its landscape have resulted in regional contrasts in vegetation, creating a "patchy" landscape. Today it is possible to find tundra at a few thousand feet on the highest peaks of the Green Mountains in contrast to the deciduous and coniferous vegetation in lowlands to the east and west (Thomas 1991).

Before 13,500 years before present (BP), most of present-day Vermont was covered with glacial ice. Within a thousand years the glaciers had moved north of the St. Lawrence lowland, and in their wake grew a landscape of moss, lichens, and stunted shrubs. A frigid arctic climate prevailed, leaving the ground frozen for most of year. By about 12,000 BP most of Vermont was within an herb-to-spruce zone, with higher elevations following suit about 500 to 1,000 years later. Fauna during that period likely included wooly mammoth, mastodon, moose, elk, caribou, and musk ox, as well as smaller arctic animals such as ptarmigan, arctic shrews, and lemmings. By 11,000 BP a subarctic climate dominated the region. Before the end of the eleventh millennium BP, the Champlain Sea had drained. This sea once covered an area about twice the size of present-day Vermont and may have provided Vermont's earliest human settlers with many resources.

With the close of the Pleistocene, an open park-like woodland of largely spruce, fir, and birch moved into Vermont's lowlands, and into the mountains by the following millennium. Evidence exists of larch and alder in wet lowlands and beech, oak, ash, and maple in the better drained bottomland and low hills of the Champlain and Connecticut valleys. These changes led to growth in the populations of many animals that today live in Vermont, including moose, beaver, lynx, porcupine, snowshoe rabbit, spruce grouse, mice, voles, and other animals that likely came in from the south.

Pollen cores indicate a sharp increase by 9000 BP in the amount of white pine, hemlock, oak, poplar, elm, ash, sweet gale, and ferns throughout Vermont. Pine pollen takes up 50 percent of pollen diagrams for that period. The presence of pine-dominated forests indicates a warming trend, and thin alluvial beds on floodplains from the period suggest low precipitation (Thomas and Dillon 1983). Pollen cores illustrate a drop in the rates of various pine pollen and a rise in the amount of oak, beech, birch, sugar maple, elm, and ash pollen within a thousand years, indicating the beginning of a Temperate Oak Forest (Thomas 1991:2-4).

Different strands of evidence from the Upper Midwest and the Northeast reveal that between 7500 and 5300 BP, precipitation was higher than today, and the climate was fairly warm. Evidence of rapid sedimentation and increased channel migration along the Missisquoi River between 6500 and 5400 BP indicates a higher level of rainfall. Other evidence of a wetter environment includes high rates of hemlock and beech pollen deposition, as well as beech, cedar, maple, and hemlock logs found along the Missisquoi floodplain and dating to that time period (Brakenridge 1988; COHMAP Members 1988; Thomas and Dillon 1983).

After 6500 BP the mixed deciduous-coniferous forest in the lowlands of eastern and western Vermont provided good habitat for deer, bear, wolf, raccoon, otter, fox, gray squirrel, wild turkey, and passenger pigeon. In the higher, mountainous elevations of central Vermont, spruce-fir-northern hardwood forests were home to moose, elk, and possibly small herds of woodland caribou (Thomas 1991:2-10).

After 5000 BP hemlock steeply declined and oak and hickory increased (Whitehead and Bentley 1963), possibly indicating the onset of drier conditions. Other evidence of drier conditions includes the entrenchment and infrequent river flooding in the upper Midwest (Thompson and Bettis 1982), a lack of substantial alluvial deposits along floodplains of the Missisquoi River (Brakenridge 1988; Thomas and Dillon 1983), and an apparent drop in the water table of Shelburne Pond in the Champlain Lowlands of Vermont (Carr et al. 1977). The climate was probably between 2 and 4 degrees centigrade warmer than today (Dincauze 1989). Chestnut appeared after about 2000 BP. Oak continues to dominate in Vermont's forests today.

Temperatures likely became cooler after about 2800 BP, and precipitation increased until about AD 270. These changes led to greater quantities of spruce and fir at higher elevations and a general increase in pine in the lowlands (Bernabo and Webb 1977; Whitehead and Bentley 1963). Warmer temperatures then returned during the first millennium AD, with a rise in precipitation after about AD 750 (Swain 1978). After AD 1050 drought conditions and higher temperatures prevailed. Evidence of lower water tables, a decrease in stream flow and frequency, and the duration of flooding demonstrate that the period between AD 1000 and 1200 may have been the warmest in Vermont in over 2,000 years. After AD 1550 cooler and moister conditions came with the beginning of the so-called "Little Ice Age" (Thomas 1991:2-9), extending into the mid-nineteenth century.

III. Cultural Context

A. Precontact Background

1. Paleoindian Period (11,000 to 10,000 BP)

The earliest known archaeological remains in Vermont date to the Paleoindian period. These sites were created by small groups of hunter-gatherers who colonized the recently deglaciated sections of the state and the surrounding region sometime before the eleventh millennium BP. Data on the specific nature of Paleoindian adaptations in Vermont remain limited. Although sites of this time period have been found in the state (Loring 1980; Ritchie 1953), none have been subject to excavation. Nevertheless, some aspects of Paleoindian adaptations can be inferred by reference to investigated Paleoindian sites in the neighboring areas of New York State, New England, and the Canadian Maritimes (e.g., Deller and Ellis 1992; Ellis and Deller 2000; Ellis and Lothrop 1989; Lothrop 1989; Meltzer 1984; Stork 1997, 2004).

Assemblages from these sites indicate three consistent attributes of Paleoindian technology that were probably also true for groups in Vermont. First, in addition to fluted points, the stone technologies of these groups consisted of a flake-based toolkit with general categories of wide- and narrow-bit unifacial tools, unifacial gravers, utilized flakes, bipolar artifacts, and large bifaces. Second, people during the Paleoindian period in the Northeast probably preferred bedrock lithic sources as opposed to secondary cobble, and lithic procurement strategy may have been driven, in part, by the design requirements of their transported stone toolkits. Finally, locations of raw material sources for Paleoindian stone toolkits are often many kilometers distant from the sites where these tools are recovered. These distances indicate that people in the Northeast traveled far to collect stone for toolmaking, either during their seasonal movements or as part of trips made specifically to gather new supplies of lithic materials (Seeman 1994).

Disagreement exists over whether people at the end of the Pleistocene in the Northeast were specialists following herds of caribou, or generalists living off a diverse environment, collecting and hunting a wide range of resources (Dincauze and Curran 1983; Pelletier and Robinson 2005). More than likely, the reality varied over time and across space, and was a question not of specialist versus generalist but rather of degree and scale (Thomas 1991:3-7). As specialists, people likely gathered in larger, multifamily settlements at key times of year along strategic intercept points to hunt caribou. These larger aggregations then split up into smaller groups and moved widely across the landscape. As generalists, the people of the Paleoindian period may have moved in small family-sized groups, mapping their movements to the availability of resources.

Archaeologists know of substantial Paleoindian sites south of the present APE in the Connecticut River Valley, including the Whipple Site just off the Ashuelot River in New Hampshire (Curran 1984), the DEDIC Site on the Connecticut River in Deerfield, Massachusetts (Chilton et al. 2005), and the Turner’s Falls Site on the Connecticut River in Turner’s Falls, Massachusetts (Binzen 2005). In northwestern Vermont Loring (1980) documented the recovery of fluted points on and below Champlain Sea beach deposits from adjacent interior lowlands and from higher-elevation settings in the western foothills of the Green Mountains. Several sites in northwestern Vermont with evidence of Paleoindian occupations have been found in the Champlain Basin (Robinson et al. 2017).

2. Archaic Period (10,000 to 3000 BP)

Archaeologists call the period beginning 10,000 years ago following the end of the Pleistocene and the beginning of the Holocene, the Archaic period. They further subdivide the Archaic into at least three subperiods, the Early (10,000 to 7500 BP), Middle (7500 to 6000 BP), and Late Archaic (6000 to 3000 BP). These subperiods are largely demarcated by changes in projectile point styles.

Earlier archaeologists generalized the environment of the early Holocene (Early and Middle Archaic) in the Northeast as closed woodlands dominated by conifers (Dincauze and Mulholland 1977; Fitting 1968; Ritchie 1980). Since a low carrying capacity characterizes such an environment, they hypothesized that there was a low population until about 6,000 years ago, which resulted in low site density for the period. More recently, archaeologists have questioned this understanding. Nicholas (1991a, 1991b, 1998) cites evidence that the landscape in the early Holocene was far more diverse, supporting a broader resource base than that characterized by a closed conifer forest environment. According to Nicholas's "glacial lake basin mosaic model" (Nicholas 1991a, 1991b, 1998), people took advantage of a highly productive ecosystem that contained a complex system of lakes, ponds, and wetlands. Robinson and Petersen (1993) cite the problems encountered with trying to attach changing demographics to known frequencies of temporally diagnostic projectile points. Since earlier archaeologists did not find many sites with temporally diagnostic points in early Holocene contexts, they assumed that the region was fairly uninhabited. Robinson and Petersen (1993), however, write that the lithic technology recovered from known early Holocene components is typically very expedient, resulting in the production of few temporally diagnostic formal artifacts such as projectile points. Rather, assemblages from these sites consist mostly of flake assemblages, and therefore many of the components dating to this time period have likely gone unrecognized. Furthermore, it is possible that many sites from the Early and Middle Archaic now lie deep beneath river floodplains (Thomas 1991:5-1).

In southern Vermont the transition to the Early Archaic was contemporaneous with the continued warming trend in the early Holocene and the replacement of spruce and fir by pine as the dominant tree species (Carr et al. 1977) (see Chapter II.C). The combination of environmental and technological changes during the transition to the Early Archaic may indicate an increase in the importance of plant foods and shifts in the exploitation of certain terrestrial fauna, such as the hunting of deer rather than caribou. As opposed to Paleoindian use of high-quality cherts brought long distances before discard, evidence from early Holocene sites indicates a switch to the use of local chert, quartzite, and quartz during the Early Archaic. The change is likely the result of people living in far more restricted areas than their Paleoindian ancestors as well as a lack of widespread external contacts (Thomas 1991:5-6). Archaeologists have long thought that people remained within these territories, spending portions of the year in larger base camps and then moving to smaller, more task-specific camps in the surrounding area (Snow 1980:171).

The number of known sites and diagnostic artifact types and projectile points dating to the Late Archaic (6000 to 3000 BP) is far greater throughout the Northeast and Vermont than for any of the preceding periods. There is also evidence of the development of mortuary ceremonialism. Archaeologists have traditionally characterized the Late Archaic in the Northeast and Vermont into three basic traditions based on these numerous changing artifact types. The Laurentian tradition is thought to date to between about 5600 and 4400 BP and is known from sites in western Vermont as well as elsewhere throughout the Northeast, including New York, southern Ontario, southern Quebec, and northern New England. The Narrow Point tradition follows the Laurentian and dates roughly between 4400 and 3600 BP. Archaeologists have found artifacts associated with this tradition up and down the East Coast from as far south as North Carolina and as far north as the Upper St. Lawrence River. The Susquehanna tradition is later, dating to between about 3800 and 1800 BP. Traits associated with this tradition are thought to have moved north from the Southeastern Piedmont to as far north as Maine and the Upper St. Lawrence.

These traditions differ from each other based largely on changing artifact traits; however, Dean Snow (1980) and others (e.g., Braun and Braun 1994) geographically split the Northeast during the Late Archaic into three very general sections. They base these divisions on broad generalizations about adaptations to major regional environments. The Maritime Archaic lay in the coastal regions of northern New England

and the Canadian Maritimes and is defined as an adaptation based on the resources of the ocean. The Lake Forest Archaic stretched from the Eastern Great Lakes across northern New England. Snow (1980) believes the people of the Lake Forest Archaic lived around the many lakes and rivers found in the region. The Mast Forest Archaic ran from the coastal plains of southern New England into the oak forests of the interior. Here people are thought to have made use of the abundant nut-bearing deciduous trees in the region. Although these models are useful in a very general sense, they are also problematic because they are so general and mask much of the potential for variation across the Northeast.

Our understanding of the lives people led in the Northeast is largely shaped by where the vast majority of archaeologists have worked along the great rivers of the region, including the Connecticut, the Hudson, and the Merrimack. Thousands of years ago people migrated to these rivers each spring to take advantage of the abundant annual migrations of anadromous fish. Each spring around April these fish swam far up the rivers and their tributaries to spawn until stopped by falls. They created a plentiful food resource for people at the leanest time of year when the winter stocks were empty. These large groups likely stayed together throughout much of the warm-weather months, splintering off periodically to hunt, gather different food, and collect other needed resources. There is ample archaeological evidence along the floodplains of large rivers in much of the Northeast of these large gatherings at so-called “base camps.” With the onset of the cold weather, people are thought to have splintered into smaller groups, likely extended families, and moved inland away from the rivers. This pattern of small groups of hunter-gatherers aggregating during the spring and then splintering in the fall has been defined as the “central-based wandering pattern” (Ritchie and Funk 1973:340).

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The problem with applying these interpretations to northwester Vermont is the lack of anadromous fish coming up the Connecticut River beyond Bellows Falls. Ohl (1994:55) comments on the lack of known sites dating to the Middle Archaic north of the falls, although sites dating to this period are known south of the falls up the West River and Ashuelot River in New Hampshire. Site VT-WD-0003 lies just south of the confluence of the West and Connecticut rivers and may have been the location of a large, warm-weather group aggregation. Elsewhere in Vermont, however, since the major impetus for large gatherings appears to have been absent north of Bellows Falls, the lives people lived in this region were likely very different from elsewhere in the Northeast.

3. Woodland Period (3000 BP to AD 1600)

The Woodland period is marked by the introduction of ceramic technology about 3,000 years ago. This new technology allowed the production of containers that could withstand cooking with direct heat. This new capability likely affected nutrition and therefore population dynamics. Ceramics also enhanced the capability to store food, which by offsetting seasonal changes in the availability of different foods made it possible for people to become more sedentary. Despite the possibilities presented by this new technology, there is little evidence of any profound changes in life across Vermont. In addition, the elaborate ceremonialism represented by the rich grave-good assemblages found at Early Woodland (3000 to 2000 BP) and Middle Woodland (2000 to 1000 BP) sites, such as Swanton, Boucher, East Creek, and Bennett (Loring 1985; Thomas 1991:9-9), indicate continuity with the burial ceremonialism of the Late Archaic.

There is little archaeological evidence of the Early Woodland in much of Vermont, and much of what we know about the Early to Middle Woodland comes from sites located in the Connecticut Valley. Two notable sites are the Canaan Site (VT-ES-2) in Canaan, Vermont, and the Skitchewaug Site (VT-WN-41) in southeastern Vermont (Bolian and Gengras 1994; Heckenberger et al. 1992). Middle Woodland sites in western Vermont, such as the Winooski (Power et al. 1980) and McNeil Generating Station sites (Thomas 1980), illustrate the use of areas along the lower reaches of rivers flowing into Lake Champlain. These sites indicate the presence of large gatherings of people who fished, harvested nuts, and hunted.

At Middle Woodland sites like Winooski and McNeil, lithic artifacts are mostly made of non-local cherts. By the Late Woodland (AD 1000 to 1600), however, people were using local cherts, perhaps suggesting changes in and an end to the long-distance trade and political relationships that had existed during the Middle and perhaps Early Woodland periods (Haviland and Power 1982:132-133; Thomas 1991:9-9). The ceramics at Winooski are "related to ceramics from the Lake Forest Middle Woodland 'cultural complex' of the Great Lakes-St. Lawrence drainage" (Petersen and Power 1983:142), whereas later ceramic assemblages "seem more clearly related to other local assemblages within the Lake Champlain drainage basin" (Petersen and Power 1983:143). Ceramics recovered from the Canaan and Skitchewaug sites are consistent with contemporaneous types found elsewhere in Vermont.

Throughout the Northeast the Late Woodland period is associated with the introduction of horticulture, particularly the importation of domesticated maize; however, it is more than likely that maize did not appear in New England until after about AD 1300 (Chilton 2006), several centuries after the Iroquois to the west had adopted it. In New York maize became a key component in the development of large permanent villages. Although maize was adopted throughout New England, there is little evidence of the development of large sedentary villages based on maize horticulture (c.f., Petersen and Cowie 2002). Rather, archaeological evidence indicates that people remained mobile hunter-gatherers who only used maize as a dietary supplement. These people therefore become what Elizabeth Chilton (2002) has called mobile farmers because although they planted, they did not become sedentary farmers like the Iroquois.

4. Contact Period (ca. AD 1600 to 1750)

At the time of European contact in the seventeenth century, the descendants of Late Woodland groups inhabiting the Connecticut Valley of Vermont included the Western Abenaki. By that time sedentary village life was a major aspect of their adaptation. The Western Abenaki were organized into several major bands or organizations, each occupying its own village site. Subsistence strategies alternated between the village setting, where crops were grown and surplus foodstuffs stored, and periodic dispersion into smaller groups that traveled to other locations, primarily to hunt (Haviland and Power 1982).

The coming of Europeans to New England in the seventeenth century brought immense and catastrophic changes to the Native peoples of the region—changes that we are only beginning to understand today. The Native inhabitants of Vermont, the Abenaki, experienced severe population loss to European diseases. Their traditional lifeways were forever changed by Europeans who took their lands, refugee populations of American Indians who moved in from elsewhere in New England, and involvement in European wars and European demand for trade goods, such as beaver pelts. The Abenaki, who call their homeland Ndakinna, meaning "our land," received tribal recognition from the State of Vermont in 2006. They are still seeking federal recognition and are referred to as the St. Francis/Sokoki Band of the Abenaki Nation of Missisquoi (Abenaki Nation 2010). Today, the St. Francis/Sokoki Band of the Abenaki Nation of Missisquoi live in northwestern Vermont (Abenaki Nation 2010).

B. Historical Overview

1. Historic Context for Northern Vermont

The first Euro-Americans to venture into the region that would become Vermont were trappers and hunters in the eighteenth century. Access to much of this area was impeded by mountains, and colonization was slow because the political situation was unsettled. Recurring hostilities between the British and French authorities initially inhibited settlers from making Vermont their home; however, even before the final surrender of the French to the British at Quebec in 1760, applications for land grants were being made by many parties.

The colony of Connecticut made the first land grants within what is now Vermont in the early eighteenth century, after Massachusetts, which had erroneously granted its own citizens 436 square kilometers (172 square miles) within the borders of Connecticut, transferred these land grants (the "equivalent lands") to Connecticut. Connecticut immediately sold these lands to people from both Connecticut and Massachusetts, who in turn sold the land to prospective settlers at a profit. After the final resolution of the Massachusetts-New Hampshire territorial disputes in 1740, these lands became New Hampshire territory. Nevertheless, most of the region's settlers continued to come from Connecticut and Massachusetts (Tosi 1948:48-49). European settlement was slow in all parts of today's Vermont until 1761, when Benning Wentworth, governor of New Hampshire, claimed the lands for New Hampshire and began establishing illegal land grants. These territories became the State of Vermont in 1791.

Prior to 1830, subsistence farming was the dominant economic activity. The earliest economic activity outside the household was the sale of potash and lumber obtained from land clearing. Potash, owing to its high market value and use in the production of glass, became the only inspected product in Vermont at that time (Elliott 1977:18). Small manufacturers, including gristmills and sawmills, sprang up throughout the region to process locally grown materials. Distilleries (using rye and corn) and starch factories (using potatoes) also developed. Taverns and general stores opened to cater to the local populace in nearly every town. By 1830 the region's agricultural economy was concentrated on the cultivation of potatoes and grains, some of which was shipped to Eastern and Southern markets. Wheat was initially an important crop, so much so that it was used as money by the earliest settlers. As transportation increased to wider markets, farmers focused more on a smaller number of specialized products.

Apple growing in particular became an important part of the Vermont economy. John McIntosh, born in 1776, eventually began selling his apple seedlings to settlers, and the McIntosh apple became the dominant apple in Vermont because of its acclimation to cool nights and warm, sunny days. In 1899 Vermont boasted 1,675,131 apple trees and produced 1,176,822 bushels of apples. Commercial apple production in Vermont continued into the twentieth century but declined owing to the lack of modernized facilities. The introduction of the automobile boosted apple production again; in 1955 Vermont produced over 1,100,000 bushels, and in the 1980s roughly 79 commercial growers on 3,500 bearing acres of land produced roughly 1.25 million bushels annually (VDHP 1990).

By the late eighteenth century some industry had begun to develop in Vermont. Lumbering in the oak forests brought much-needed money into the state and cleared land for farming (Stratton 1980:250). Large fallen trees were ideal for making masts for ships and were usually shipped to Quebec. Production of hats was also an early trade, which used local wool and beaver hides from trappers. Other early businesses included blacksmithing, brick making, and dyeing.

The developing livestock industry rapidly took over in Vermont as both cattle and horses thrived on the local grasslands and climate (Bearse 1968; Tosi 1948:58-59; VDHP 1990). During the early nineteenth century the Spanish Merino sheep, an outstanding wool producer easily adapted to rugged terrain and climate, arrived in Vermont. The self-sufficiency of the Vermont farmers diminished considerably as many turned to sheep farming for an alternative source of income almost to the complete exclusion of other agricultural products. The improved machinery and larger wool mills that were introduced around 1830 permitted Vermont farmers to produce more wool, and 33 wool factories were built in Vermont during that period. In addition to wool, raw cotton was imported into Vermont mills for processing (Meeks 1986; Tosi 1948:62).

Although some textile production occurred in fulling and cleansing mills, and later also carding mills, the production of textiles remained a household activity until about 1820. After about 1820 factories took over the production of textiles, and the number of fulling and carding mills increased by 200 percent (from 136 to 273) and 275 percent (from 87 to 234), respectively. By 1830 the home manufacture of textiles was almost non-existent. Since a typical textile mill required the labor of about nine or so workers, the mills typically sprang up where the workers lived. In many cases the wool factories were an outgrowth of earlier textile mills as the mills became suppliers for developing wool factories (Meeks 1986; Steponaitis 1975:43-50).

The breeding of wool sheep reached its peak in Vermont in the early 1840s, but by the end of the decade, the industry had begun to decline, partly the result of lower protective tariffs on imported wool and partly the result of competition from the West with its larger pastures, less costly grain, and better transportation following the opening of the Ohio and Pennsylvania canal systems (Tosi 1948:59-60; VDHP 1989b). The number of wool factories in Vermont decreased from 97 in the mid-1840s to 89 a decade later. In addition, the number of textile concerns in Vermont began to drop as the industry consolidated into fewer, larger firms using more efficient machinery and located along more traveled transportation routes. The number of mills fell from a peak of over 400 in the 1820s to only 75 in the early 1850s. The sheep industry revived briefly in the 1860s and immediately afterward, as the Civil War prompted a greater demand and higher prices for wool products because of the low availability of Southern cotton as well as the imposition of higher tariffs (Steponaitis 1975:60-67).

With the initial decline of the sheep and wool industry in the late 1840s, many farmers returned to breeding cattle, although not before mutton sheep slowly infiltrated many farms formerly devoted to wool-bearing sheep (VDHP 1989a:2). Dairy farming in Vermont and elsewhere in New England had been introduced by the 1840s (Barron 1980; Russell 1982). Dairying proved to be a protection against the fluctuating price of wool and allowed farmers to take advantage of expanding urban markets to the south. The introduction of dairy breeds to replace beef cattle was a slow and intermittent process. Barron (1980) believes that one reason farmers in Vermont were slow to switch from wool to dairy was problems with labor. The young of Vermont were moving out West and to the big cities, depopulating the countryside during the second half of the nineteenth century (discussed further below). Because sheep farming was far less labor-intensive, it remained a more efficient use of resources during this period even as prices for wool dropped. Dairy farming, on the other hand, was becoming more labor-intensive, and Barron (1980:333) estimates that because of technological changes, the labor demand for cows grew by 68 percent per cow between 1850 and 1910. As a result, since the available pool of labor was declining after the mid-nineteenth century, farmers were hesitant to make the switch from wool to dairy even though the wool market was unstable. It was not until the market for wool completely collapsed at the end of the century that the switch from sheep to cows became complete.

Up until the 1850s, only private dairying took place. As the industry became more widespread, cheese factories, and later creameries, were built to service entire dairying communities. The three staple crops for the mid-nineteenth century Vermont farmer became wool, butter, and maple sugar, and dairy farming dominated the agriculture of eastern Vermont after the Civil War (Bremer 1929:587; Tosi 1948:63). Butter and cheese were manufactured in centrally located factories, although up until 1900 almost 40 percent of manufactured dairy products were produced privately in the home for sale to a private clientele. The number of dairy cows in some Vermont counties reached a peak in 1900. By the close of the nineteenth century, however, the Vermont dairy farmer faced direct competition from the dairy industries of Ohio and Wisconsin, for whom the transport of perishable goods did not pose as great an obstacle after development of the railroads connected these states with the East. Dairying declined slowly until 1920, then rose sharply until 1930 (Tosi 1948:62-64). By the end of the twentieth century, however, the need for expensive equipment had put many small hill-country farmers out of business (VDHP 1989a).

The wool industry in Vermont changed in the late nineteenth century with the emergence of large town-based manufacturing firms (those employing more than 100 employees) in places such as Bennington, Winooski, Rutland, Johnson, and Fair Haven. Vermont still enjoyed prominence in the manufacture of wool and knit goods during the 1880s; however, the state's industry declined steadily through the first half of the twentieth century despite a brief rise during the World War II years (Steponaitis 1975:118; VDHP 1991:10-11). Mills gradually closed after the end of the nineteenth century as they became unable to compete with mills and factories in the South (Barron 1980:326).

The population decline during the second half of the nineteenth century produced one of the greatest historical effects on the landscape. As the United States expanded, new opportunities arose and young people moved to the West. Many of the Vermont's rural youth left for jobs in the growing big cities, although Barron (1980) describes contemporary writing of abandoned farms as "hyperbole," writing that agriculture in New England did not collapse after the Civil War but only experienced stagnation. He points out that throughout Vermont two-thirds of male household heads remained farmers/farm laborers throughout the second half of the nineteenth century, 90 percent of farms were family-owned, and two-thirds of the land remained agricultural land. In short, the number, size, and location of farms throughout Vermont remained stable. In addition, the output of wool, butter, and maple sugar from these farms remained constant into the late 1890s. The number of tradesmen also remained constant, although a number of mills and factories were replaced because they could not compete with those in the South (Barron 1980:326). Vermont farmers may have been able to survive the slow attrition of labor throughout the second half of the nineteenth century, but the lack of available labor ultimately prevented them from adapting to more economically advantageous forms of farming.

2. Historic Context for Franklin County

a. County Formation

The APE is in the center of Franklin County, which is located in the northwestern portion of the state. The land that comprises Franklin County was formally a component of New Hampshire and in 1774 had also been claimed by New York. Franklin County was officially organized in 1792, after it was removed from Chittenden County (Aldrich 1891; Child 1883; Doane 1938:4, Newberry Library 2021). Several towns had been settled within the county boundaries prior to its creation, including St. Albans, Fairfax, Fairfield, Georgia, Highgate, Hungerford, Smithfield, and Swanton. As the northernmost county bordering Lake Champlain, Franklin County played an important role in the War of 1812 against British Canadian and Indian forces to the north. The town of St. Albans was attacked during the Civil War, and Franklin County was also the site of the Fenian Raid of 1866, connected to an effort of Irish soldiers to overthrow British rule in Canada (Aldrich 1891).

Railroading became an important industry for Franklin County starting in the mid-nineteenth century. The St. Johnsbury and Lake Champlain Railroad in particular is noted for its role in transporting the first load of Swanton Falls marble, which was used for the floors of the State Department building in Washington, D.C (Child 1883).

b. Town of Fairfield

The Town of Fairfield, in the central portion of Franklin County, was chartered in 1763 and named for Fairfield, Connecticut, the home of the original grantees. Settlement in Fairfield was slow; the first documented resident, Joseph Wheeler, arrived in 1787 (Aldrich 1891:502). The earliest settlers came mostly from Connecticut. Land was cleared for farming, and the manufacture of potash, sugar, starch, and leather were among the new and growing industries.

As was customary in New England, the town was laid out around a common lot, with some lots around it reserved for religious congregations and a school (Doane 1938:7). By the early nineteenth century the town had several gristmills, a sawmill, a blacksmith, and a tannery (Aldrich 1891:506). New roads, in addition to those already laid out by the proprietors, were built, and the division of the town into school districts in 1795 prepared the way for the establishment of common school. In 1842 the school registered 900 pupils (Aldrich 1891:507).

After the War of 1812, many natives of Fairfield moved west to the Great Lakes region, leaving behind cheap farmland. In the 1830s and 1840s, many Irish settlers came to Fairfield, often by way of Canada (Feeney 2006:103). Soon after, the first Catholic church was established in the town (Doane 1938:12).

Dairying was the main agricultural pursuit, and maple sugaring was common in late winter (Doane 1938:13). Today, Fairfield is home to approximately 1,800 residents (United States Census Bureau 2010). Figure 4 shows the town in 1871.

C. Historical Map Review

The earliest map of Franklin County dates to 1857 (Walling 1857) (Figure 5). An unnamed road with a similar alignment to TH 29/Paradee Road is located in the APE's vicinity. Black Creek appears to have been named Fairfield River at that time. Settlement in the region was sparse, and no structures or development are located in or near the APE (Walling 1857).

The Franklin County atlases from the 1870s show the Lamoille Valley Railroad running north-south east of Black Creek and the APE (see Figure 4). No other significant changes to properties or development are evident from the maps (Beers 1871; Burgett 1876).

Topographic maps from 1922 onward show no development in the APE vicinity. The railroad had been renamed the St. Johnsbury and Lake Champlain Railroad by the 1880s (Child 1883). The railroad is not shown on topographic maps after 1986 (Nationwide Environmental Title Research [NETR] 2021).

D. Previous Cultural Resource Management Projects and Known Sites

1. Previous Cultural Resource Management Studies in Vicinity of APE

WSP's background research included examination of the VDHP's ORC files to identify known sites and the results of previously conducted cultural resource management surveys in the vicinity. No cultural resource surveys have been conducted within 1.6 kilometers (1 mile) of the APE.

2. Precontact Archaeological Sites in the APE Vicinity

No precontact archaeological sites have been previously recorded within 1.6 kilometers (1 mile) of the APE. The closest archaeological site, VT-FR-0166, is located (2.6 kilometers) 1.6 miles to the northwest and consists of a precontact surface scatter.

FIGURE 4: Map of Fairfield, 1871 (Beers 1871)

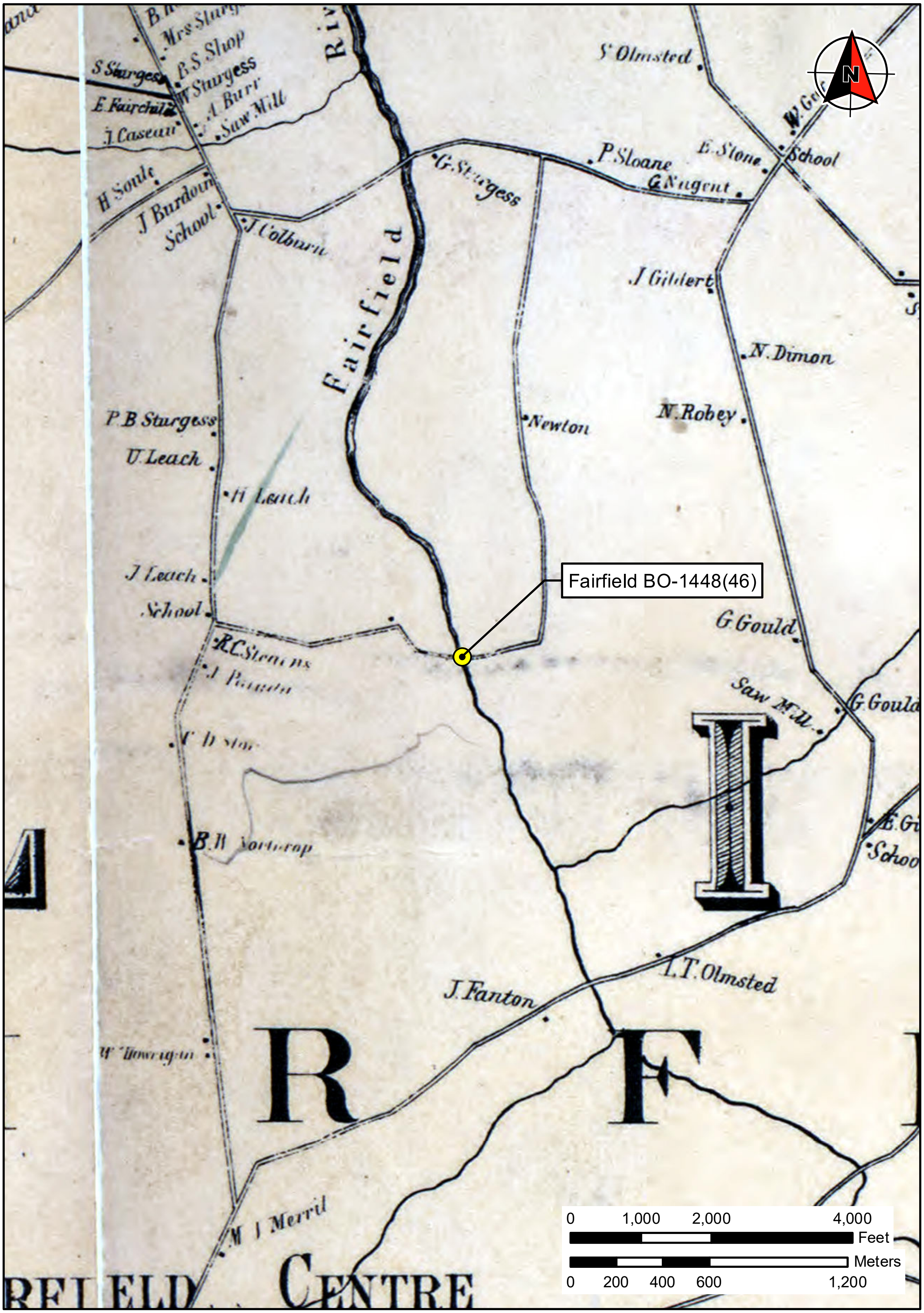

FIGURE 5: Project APE in 1857 (Walling 1857)

3. Historic Archaeological Sites in Vicinity of APE

No historic archaeological sites have been previously recorded within 1.6 kilometers (1 mile) of the APE. The closest archaeological site, VT-FR-0170, is located 5.3 kilometers (3.3 miles) to the west-southwest and consists of a historic stone foundation.

IV. Archaeological Assessment

A. Methods

WSP's goal for the ARA was to assess and survey the entire APE to identify archaeologically sensitive areas. This will allow VTrans maximum flexibility in avoiding sites that are eligible for the NRHP. To derive this assessment, WSP conducted background research, field inspection, and analysis of the APE using the *Environmental Predictive Model for Locating Precontact Archaeological Sites* (VDHP 2015).

1. Background Research

The background research included use of the Vermont ORC map tool (VDHP 2021), a review of site files from sites located within 1.6 kilometers (1 miles) of the APE, reports from projects conducted within the Town of Fairfield, historical maps, and local histories.

2. Determination of Archaeologically Sensitive Areas

WSP's archaeological assessment followed several stages. WSP first reviewed the APE using the VDHP ORC online map tool (2021) and *Environmental Predictive Model for Locating Precontact Archaeological Sites* (VDHP 2015; see Appendix A) to identify the distribution of key environmental criteria possibly affecting the location of precontact archaeological sites. The environmental criteria listed in these two predictive tools are summarized below.

Proximity to a:

- Permanent Stream/River
- Waterbody
- Wetlands
- Stream/Waterbody Confluence
- Head of Drainage
- Stream Confluence
- Waterfalls

The presence of:

- Glacial Lake Shore Line
- Glacial Outwash and Kame Terrace
- Floodplain Soils
- Level Terrain
- Significantly Sloped Terrain

For the seven criteria defined by proximity, the radius of proximity defined as significant is typically 180 meters (590 feet). The value attached to proximity was refined according to the Environmental Predictive Model, with a higher significance and greater score given to areas within 90 meters (295 feet) of a particular environmental criterion, versus a lower significance and half the score given to locations between 90 and 180 meters (295 and 590 feet) of the same criterion. The other five criteria are based on presence/absence (i.e., presence on level terrain versus presence on significantly sloped terrain) and not on varying levels of proximity. The Environmental Predictive Model attaches scores to each of these criteria as well as other criteria, including the presence of burials and known archaeological sites.

WSP determined sensitivity for the possibility of historic archaeological sites through an analysis of historical maps (see Figures 4 and 5) of the APE as well as regional histories. These historical maps are useful sources of information about old roads as well as the location of historic-era structures and other features. WSP also researched the VDHP site and report files available through the ORC as well as in-house resources to identify known sites and the results of previously conducted cultural resource management surveys surrounding the project, as described in Chapter III. Familiarity with known sites is useful both for understanding where sites might be located and for interpreting what is found and assessing its potential significance.

WSP consulted the Historic Front Yards study (Louis Berger 2005) to provide a context for identification of archaeological sensitivity in areas of historic building-road space. That study provides a guideline for assessing archaeological sensitivity and making recommendations for additional work. This includes identification of historic building-road spaces, eliminating historic building-road spaces that have been obviously and significantly disturbed, evaluating the archaeological sensitivity of each historic building-road space, and determining the setting and context of the space. The space and context setting variables are summarized below.

Space Setting

- Age of adjoining road compared to the adjoining historic building.
- Historical function of the building or building complex adjoining space and type of associated below-grade infrastructure to support the functions of the associated building.
- Overall general historical setting of the space.
- Distance of the historic building from the road and evidence of changing distance since the building was originally erected.
- Known previous buildings erected nearby or in the location of the historic building.
- Historical orientation of the historic building relative to the space.
- Historical functions of the historic building-road space.
- Evidence of archaeological features or deposits.

Context Setting

- Ability to pose research issues that might be investigated on the property where the historic building-road space is located, based on documentary research and field reconnaissance.
- Presence of pertinent historical themes or associations that the property might illustrate.
- The potential for the historic building-road space to contribute substantively to the possible overall significance of the property.

B. Results

1. Field Inspection

The results from the field inspection, in combination with the background research, indicate that the APE contains areas of archaeological concern within all four quadrants of the bridge (see Figure 2). The bridge is set on what appears to be the natural ground surface (Plates 1 and 2), with a slight rise in the road to accommodate the bridge's height. Evidence on both sides of the bridge shows that the area immediately surrounding the bridge itself has been disturbed. A drainage ditch runs along one side of the road and empties into the river (Plate 3). On the other side is a standpipe for the fire department (Plate 4). Both installations have disturbed the ground surface near the bridge.

The area south and north of the bridge do hold potential to contain intact cultural soils (Plates 5 and 6). If the bridge alterations are only conducted within the assumed APE, then no further work is recommended. If a temporary bridge or a staging area is proposed outside the APE, a secondary survey of this location should be undertaken.

PLATE 1: Very Gentle Grade of Road Leading up to Bridge, View East

PLATE 2: Very Gentle Grade of Road Leading up to Bridge,
View West

PLATE 3: Ditch Emptying into River, View East

PLATE 4: Fire Department Water Access Pipe, View North

PLATE 5: Flatter Potentially Undisturbed Land South of Bridge, View East

PLATE 6: Flatter Potentially Undisturbed Land South of Bridge, View West

2. Analysis

The VDHP (2015) predictive model for precontact archaeological sites relies mainly on ecological variables, including distance to water, particular types of landforms, and slope, as well as possible archival or oral traditions and the known presence of sites and burials. Scoring according to this model is not meant to be taken rigidly, but rather as a guide to review possible environmental variables. The primary environmental variable related to precontact sites that applies to the APE is water sources. Elevated landforms are located too far from water sources to yield cumulative scores of 32 on the predictive model. The previous bridge and road construction operations have also resulted in surface and limited subsurface disturbances, that when combined with a lack of suitable intact landforms such as alluvial or outwash deposits, results in a negative score. Given the lack of positive environmental factors, the existing disturbance, and the generally low-density distribution of precontact sites in the vicinity, the APE is considered to have a low to very low sensitivity for precontact archaeological resources. Based on the predictive model, no portion of the APE scored 32 or higher, with a minimum score of 32 required to indicate archaeological sensitivity.

Application of criteria in Louis Berger's (2005) Historic Front Yards study showed that there is a low historic archaeological sensitivity in the APE. Although historical maps of the area depicted some historical activities in the general area of the APE, none fell directly adjacent to the bridge itself. In addition, the roadway leading up to the bridge shows evidence of having been repaved several times since its installation, causing changes to the historic road space of the APE. However, the flatter areas south and north of the bridge do hold potential to contain intact cultural soils.

V. Conclusions

On behalf of VTrans, WSP completed an ARA for the proposed improvements to Fairfield Bridge No. 49, Town Highway 29, Franklin County, Vermont. The scope for the project has yet to be defined; WSP therefore conducted this survey and resource assessment to consider the potential effects of site access, temporary bridge construction, approach work, staging, and other potential project activities associated with improvements at the site of the bridge. The APE extends 30.5 meters (100 feet) from either end of the bridge to include all four quadrants of the bridge approaches. The goal of the survey was to survey the entire APE to determine if archaeologically sensitive areas are present. The survey included background research, field inspection conducted on April 8, 2021, and application of the predictive model.

No previously recorded precontact or historic archaeological sites lie within the APE. No precontact or historic archaeological sites have been recorded within 1.6 kilometers (1 mile) of the APE. No other archaeological sites were identified during the ARA. Because of the flat nature of the surrounding landscape, there is potential for archaeological sensitivity in all four quadrants around the bridge.

It is WSP's opinion that any future development carried out within the APE may have impacts on potentially archaeologically sensitive areas. Additional archaeological investigation of the APE may be necessary if a staging area or a temporary bridge is proposed for any of the four quadrants around this bridge; in addition, should project activities be expanded and the APE changed, further investigation may be warranted.

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Appendix A: Environmental Predictive Model Checklist

VERMONT DIVISION FOR HISTORIC PRESERVATION

Environmental Predictive Model for Locating Pre-contact Archaeological Sites

Project Name VTrans TO7 HRM Rich-Bolt **County** Franklin **Town** Fairfield
DHP No. **Map No.** **Staff Init.** JV **Date** 4/9/2021

Additional Information Fairfield BO 1448(46)

Environmental Variable	Proximity	Value	Assigned Score
A. RIVERS and STREAMS (EXISTING or RELICT):			
1) Distance to River or Permanent Stream (measured from top of bank)	0- 90 m 90- 180 m	12 6	12
2) Distance to Intermittent Stream	0- 90 m 90-180 m	8 4	
3) Confluence of River/River or River/Stream	0-90 m 90 –180 m	12 6	12
4) Confluence of Intermittent Streams	0 – 90 m 90 – 180 m	8 4	
5) Falls or Rapids	0 – 90 m 90 – 180 m	8 4	
6) Head of Draw	0 – 90 m 90 – 180 m	8 4	
7) Major Floodplain/Alluvial Terrace		32	
8) Knoll or swamp island		32	
9) Stable Riverine Island		32	
B. LAKES and PONDS (EXISTING or RELICT):			
10) Distance to Pond or Lake	0- 90 m 90 -180 m	12 6	
11) Confluence of River or Stream	0-90 m 90 –180 m	12 6	
12) Lake Cove/Peninsula/Head of Bay		12	
C. WETLANDS:			
13) Distance to Wetland (wetland > one acre in size)	0- 90 m 90 -180 m	12 6	
14) Knoll or swamp island		32	
D. VALLEY EDGE and GLACIAL LAND FORMS:			
15) High elevated landform such as Knoll Top/Ridge Crest/ Promontory		12	
16) Valley edge features such as Kame/Outwash Terrace**		12	

17) Marine/Lake Delta Complex** 18) Champlain Sea or Glacial Lake Shore Line**		12 32	
E. OTHER ENVIRONMENTAL FACTORS: 19) Caves /Rockshelters 20) ☐ Natural Travel Corridor ☐ Sole or important access to another drainage ☐ Drainage divide 21) Existing or Relict Spring 22) Potential or Apparent Prehistoric Quarry for stone procurement 23)) Special Environmental or Natural Area, such as Milton acquifer, mountain top, etc. (these may be historic or prehistoric sacred or traditional site locations and prehistoric site types as well)	 0 – 90 m 90 – 180 m 0 – 180 m	32 12 8 4 32 32	
F. OTHER HIGH SENSITIVITY FACTORS: 24) High Likelihood of Burials 25) High Recorded Site Density 26) High likelihood of containing significant site based on recorded or archival data or oral tradition		32 32 32	
G. NEGATIVE FACTORS: 27) Excessive Slope (>15%) or Steep Erosional Slope (>20) 28) Previously disturbed land as evaluated by a qualified archeological professional or engineer based on coring, earlier as-built plans, or obvious surface evidence (such as a gravel pit)		- 32 - 32	 -32

**** refer to 1970 Surficial Geological Map of Vermont**

Total Score: -8

Other Comments :

Area immediately around the bridge is disturbed. There is pasture land surrounding it. This area has potential to hold intact cultural remnants but it is to far outside of the APE, unless a temporary bridge will be placed, in this event it will need to examined.

0- 31 = Archeologically Non- Sensitive
32+ = Archeologically Sensitive

Appendix I: Historic Memo

VERMONT

Vermont Agency of Transportation
Project Delivery Bureau - Environmental Section
219 North Main Street
Barre, VT 05641

To: JulieAnn Held, Environmental Specialist

From: Judith Williams Ehrlich, VTrans Historic Preservation Officer

Date: July 9, 2021

Subject: Historic Resource Identification for Fairfield BO 1448(46)

I have completed a resource identification (ID) for Fairfield BO 1448(46). At this time, the project is expected to include repairs to the existing Bridge No. 49, but the full scope of the project has not been determined.

This Resource Identification effort is being undertaken to provide information to the VTrans designers working on a proposed improvement project. Toward that end, VTrans Cultural Resources staff have identified potential resources within a broad preliminary Area of Potential Effect to ensure the designers are aware of all cultural resources that could possibly be affected by a project. Once the project is defined at the Conceptual Design phase, Cultural Resources staff will be able to determine a formal Area of Potential Effect for purposes of Section 106 and 22 VSA § 14.

I requested WSP USA Inc. complete a Resource Identification of Bridge No. 49 on Town Highway 29 in Fairfield. The consultant recommended that the bridge is historic, and I concur with this recommendation. The bridge is already listed on the Vermont State Register of Historic Places and is eligible for listing on the National Register. WSP did not identify any other buildings or structures in the project area.

Please see the report titled, "Architectural Resource Identification Survey Fairfield Bridge No. 49, VT 100, BF 029-2(15)" and dated June 11, 2021.

Appendix J: Hazardous Waste Map

Hazardous Waste Urban Soils Map

Vermont Agency of Natural Resources

vermont.gov

1: 4,870

June 10, 2021

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

Roads
- Interstate
- US Highway; 1
- State Highway
- Town Highway (Class 1)
- Town Highway (Class 2,3)
- Town Highway (Class 4)
- State Forest Trail
- National Forest Trail

247.0 | 0 | 124.00 | 247.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere | 1" = 406 Ft. | 1cm = 49 Meters

THIS MAP IS NOT TO BE USED FOR NAVIGATION

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

NOTES

Map created using ANR's Natural Resources Atlas

Appendix K: Local Questionnaire Survey – No Response from Town

Project Summary

This project, BO 1448(46), focuses on Bridge 49 on TH 29 in Fairfield, Vermont. The bridge is deteriorating and needs either a major maintenance action or replacement. Potential options being considered for this project include a superstructure and/or deck replacement, or a new bridge to be placed on the existing alignment or an improved alignment. 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 bridge 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.

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

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 bridge, one-way traffic, or lane closures and provide contact information (names, address, email addresses, and phone numbers.

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?

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?

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

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 bridges, etc), including those that may be or go into other towns.

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.

9. Are there any public transit services or stops that use the bridge or transit routes in the vicinity that may be affected if they become the detour route?

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)?

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

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

Pedestrians and Bicyclists

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

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 bridge?

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 bridge? Please provide any planning documents demonstrating this (scoping study, master plan, corridor study, town or regional plan).

6. In the vicinity of the bridge, 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 bridge? For example, if the bridge is located on a curve, has this created any problems that we should be aware of?

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

3. Are there any special aesthetic considerations we should be aware of?

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

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?

Land Use & Zoning

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

2. Are there any existing, pending or planned development proposal that would impact future transportation patterns near the bridge? 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.

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?

Appendix L: Crash Data

Vermont Agency of Transportation

General Yearly Summaries - Town Highway Crash Listing: Non-Federal Aid Highways-Local

WHERE Year of Crash >= 2014 AND Year of Crash <= 2018

Reporting Agency/ Incident No.	County	Town	Route	Crash Date	Time	Weather	Contributing Circumstances	Direction of Collision	Number Of Injuries	Number Of Fatalities	Number Of Untimely Deaths	Location
VTVSP0700/17A204823	Franklin	Fairfax	T0049	10/03/2017	17:15	[No Weather]		[No Direction of Collision]	0	0	0	21-27 School St at Main St
VTVSP0700/18A201350	Franklin	Fairfax	T0049	03/14/2018	07:19	Snow	Failure to keep in proper lane	No Turns, Thru moves only, Broadside ^<	0	0	0	School Strret at Main Street
VTVSP0700/16A205504	Franklin	Fairfax	T0051	11/11/2016	09:25	Rain	Fatigued, asleep	Single Vehicle Crash	1	0	0	River Road at # 135
VTVSP0700/14A200992	Franklin	Fairfax	T0078	03/14/2014	16:21	Clear	No improper driving	Other - Explain in Narrative	2	0	0	119 Sam Webb Road at Vt 014
VTVSP0700/15A202529	Franklin	Fairfield	0000	06/05/2015	05:04	Clear	Under the influence of medication/drugs/alcohol, Failure to keep in proper lane	Single Vehicle Crash	0	0	0	157 Swizler's Point at Pond Road
VTVSP0700/14A201136	Franklin	Fairfield	S0790	03/22/2014	21:00	[No Weather]		[No Direction of Collision]	0	0	0	Min. C 0790 Pond Rd. at North Rd.
VTVSP0700/14A203955	Franklin	Fairfield	S0790	09/07/2014	16:41	Clear	No improper driving, Driving too fast for conditions	Rear End	2	0	0	Pond Rd. at Pond Rd. / Sheldon Woods Rd.
VTVSP0700/15A204496	Franklin	Fairfield	S0790	09/19/2015	19:34	[No Weather]		[No Direction of Collision]	0	0	0	Min. C 0790 POND RD at AT THE POND
VTVSP0700/15A206013	Franklin	Fairfield	S0790	12/21/2015	01:08	[No Weather]		[No Direction of Collision]	0	0	0	Min. C 0790 Pond Rd. at Cottage Loop
VTVSP0700/16A200614	Franklin	Fairfield	S0790	02/12/2016	00:18	[No Weather]		[No Direction of Collision]	0	0	0	POND ROAD ; FAIRFIELD POND
VTVSP0700/16A202019	Franklin	Fairfield	S0790	05/03/2016	17:58	Cloudy	Operating defective equipment	Single Vehicle Crash	2	0	0	3634 Pond Road at Residence #3634
VTVSP0700/16A203290	Franklin	Fairfield	S0790	07/06/2016	21:03	[No Weather]		[No Direction of Collision]	0	0	0	FAIRFIELD POND
VTVSP0700/16A206003	Franklin	Fairfield	S0790	12/03/2016	06:40	[No Weather]		[No Direction of Collision]	0	0	0	1700 Block POND RD
VTVSP0700/17A205323	Franklin	Fairfield	S0790	10/30/2017	22:44	[No Weather]		[No Direction of Collision]	0	0	0	POND RD
VTVSP0700/14A200991	Franklin	Fairfield	S0792	03/14/2014	16:17	[No Weather]		[No Direction of Collision]	0	0	0	Min. C 0792 Chester A. Arthur Rd.
VTVSP0700/15A200740	Franklin	Fairfield	S0792	02/16/2015	12:43	Clear	No improper driving, Failed to yield right of way, Driving too fast for conditions	Other - Explain in Narrative	1	0	0	750 Chester Arthur Road at North Road
VTVSP0700/15A200795	Franklin	Fairfield	S0792	02/19/2015	18:41	[No Weather]		[No Direction of Collision]	0	0	0	Min. C 0792 CHESTER A ARTHUR RD. at NORTH RD.
VTVSP0700/15A205173	Franklin	Fairfield	S0792	10/31/2015	01:00	Clear	Exceeded authorized speed limit, Manually Operating an Electronic Communications Device (texting, typing, dialing)	Single Vehicle Crash	3	0	0	3761 Chester A Arthur Road at Dodd Road
VTVSP0000/15A200216	Franklin	Fairfield	T0005	01/16/2015	06:49	Snow	Driving too fast for conditions, Failure to keep in proper lane	Single Vehicle Crash	1	0	0	1423 Sheldon Woods at Johnson Rd.
VTVSP0700/15A206169	Franklin	Fairfield	T0005	12/31/2015	12:12	[No Weather]		[No Direction of Collision]	0	0	0	TH-5 SHELDON WOODS RD. at POND RD.
VTVSP0700/15A205299	Franklin	Fairfield	T0006	11/07/2015	23:37	[No Weather]		[No Direction of Collision]	0	0	0	TH-6 (330 SWAMP RD)
VTVSP0700/17A205934	Franklin	Fairfield	T0006	12/02/2017	22:52	[No Weather]		[No Direction of Collision]	0	0	0	600 Block SWAMP RD
VTVSP0700/18A200767	Franklin	Fairfield	T0006	02/07/2018	19:07	Snow	Swerving or avoiding due to wind, slippery surface, vehicle, object, non-motorist in roadway etc	Single Vehicle Crash	0	0	0	526 Swamp Road at Vermont 36

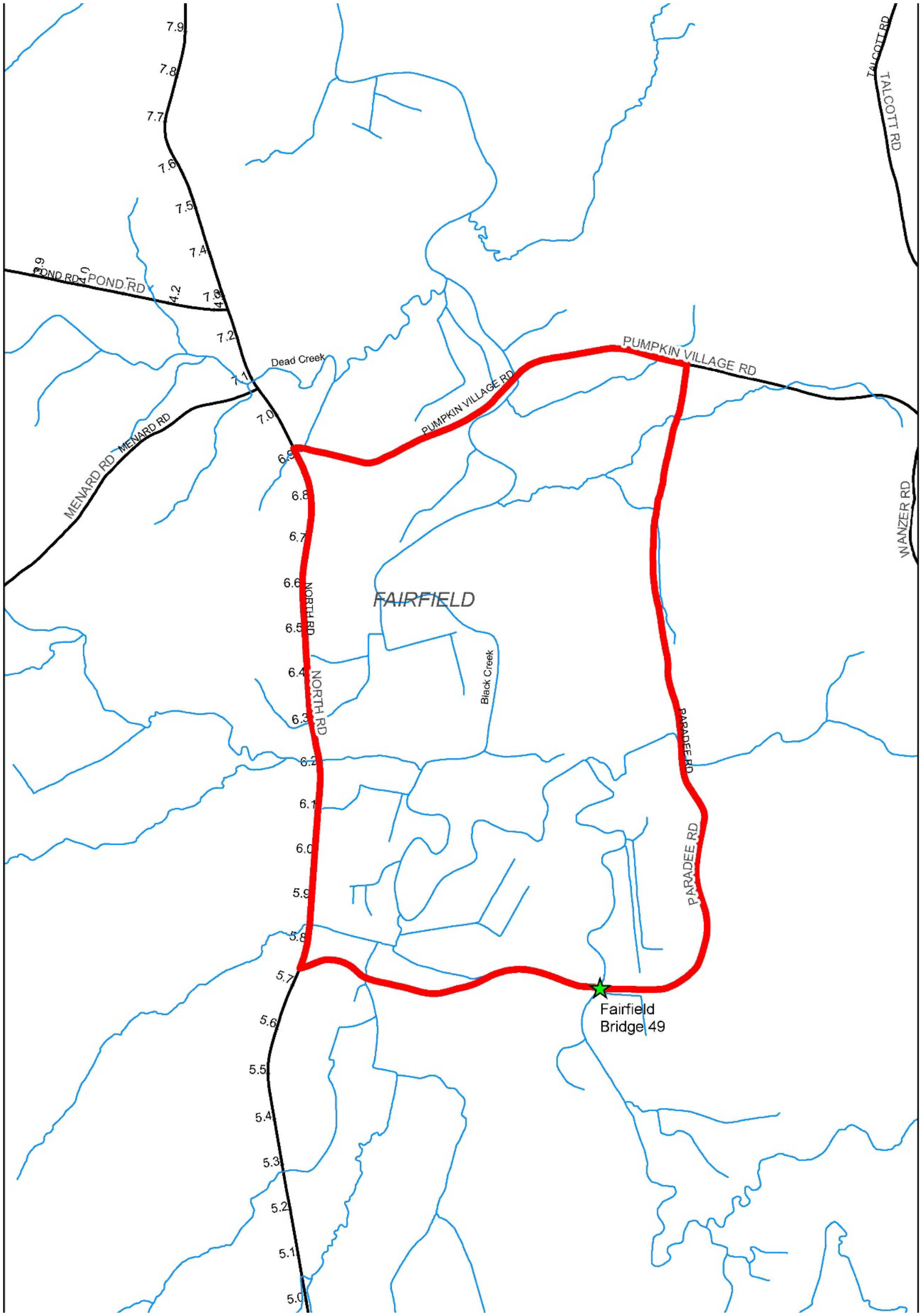
Fairfield TH-29 Br 49 is 0.7 miles from TH-1

General Yearly Summaries - Town Highway Crash Listing: Non-Federal Aid Highways-Local

WHERE Year of Crash >= 2014 AND Year of Crash <= 2018

Reporting Agency/ Incident No.	County	Town	Route	Crash Date	Time	Weather	Contributing Circumstances	Direction of Collision	Number Of Injuries	Number Of Fatalities	Number Of Untimely Deaths	Location
VTVSP0700/17A203899	Franklin	Fairfield	T0013	08/13/2017	11:19	[No Weather]		Single Vehicle Crash	1	0	0	472 Cherrierville Rd at Residence #472
VTVSP0700/16A203013	Franklin	Fairfield	T0014	06/22/2016	22:00	Clear	Other improper action	Single Vehicle Crash	0	1	0	Pumpkin Village Road at Tiffany Road
VTVSP0700/18A201513	Franklin	Fairfield	T0014	03/23/2018	16:22	Clear	Failure to keep in proper lane	Single Vehicle Crash	0	0	0	Pumpkin Village Rd at North Rd
VTVSP0700/17A203725	Franklin	Fairfield	T0023	08/05/2017	11:48	Rain	Failure to keep in proper lane, No improper driving	Opp Direction Sideswipe	2	0	0	1733 Reynolds Rd at Residence #1733
VTVSP0700/18A200541	Franklin	Fairfield	T0023	01/28/2018	09:04	Clear		Head On	0	0	0	1228-1736 Reynolds Rd at Madden Rd
VTVSP0700/15A202882	Franklin	Fairfield	T0026	06/23/2015	04:17	Cloudy	Failure to keep in proper lane	Single Vehicle Crash	1	0	0	Barry Road at Castle Road
VTVSP0700/14A205439	Franklin	Fairfield	T0030	12/08/2014	21:22	Clear	No improper driving	Single Vehicle Crash	0	0	0	Wanzer Road at Pumpkin Village Road
VTVSP0700/16A204068	Franklin	Fairfield	T0033	08/14/2016	20:27	[No Weather]		[No Direction of Collision]	0	0	0	SHENANG RD at VT ROUTE 36
VTVSP0700/16A203780	Franklin	Fairfield	T0034	07/30/2016	15:51	Clear	Failure to keep in proper lane	Single Vehicle Crash	0	1	0	1766 Dodd Road at Residence 2024
VTVSP0700/16A206207	Franklin	Fairfield	T0039	12/14/2016	02:21	[No Weather]		[No Direction of Collision]	0	0	0	PION RD at VT ROUTE 36
VTVSP0700/17A200200	Franklin	Fairfield	T0039	01/13/2017	16:12	[No Weather]		[No Direction of Collision]	0	0	0	1 Block PION RD
VTVSP0700/14A200636	Franklin	Fairfield	T0040	02/15/2014	11:12	[No Weather]		[No Direction of Collision]	0	0	0	TH-40 Hill Rd.
VT0060100/18SA001835	Franklin	Fairfield	T0046	03/09/2018	07:07	Snow	Driving too fast for conditions	[No Direction of Collision]	1	0	0	91 Rugg Rd at Fairfield Hill Rd
VTVSP0700/17A206143	Franklin	Fairfield	T0049	12/14/2017	12:46	[No Weather]		[No Direction of Collision]	0	0	0	BRIDGE ST
VTVSP0700/15A202910	Franklin	Fairfield	T0053	06/24/2015	15:53	Clear	No improper driving, Failed to yield right of way	No Turns, Thru moves only, Broadside ^<	0	0	0	Rugg Road at Gillin Road
VTVSP0700/16A200769	Franklin	Fairfield	T0053	02/22/2016	22:40	[No Weather]		[No Direction of Collision]	0	0	0	RUGG RD at PIERRE
VTVSP0700/17A205365	Franklin	Fairfield	T0053	11/02/2017	06:58	[No Weather]		[No Direction of Collision]	0	0	0	1200 Block RUGG RD
VTVSP0700/15A203664	Franklin	Fairfield	T0056	08/04/2015	13:05	Clear	Other Activity, Electronic Device, Failure to keep in proper lane	Single Vehicle Crash	1	0	0	614 St Pierre Rd at Rugg Road
VTVSP0700/16A200883	Franklin	Fairfield	T0057	03/01/2016	00:10	[No Weather]		[No Direction of Collision]	0	0	0	1036 BRADLEY RD
VTVSP0700/17A206150	Franklin	Fairfield	T0057	12/15/2017	08:03	[No Weather]		[No Direction of Collision]	0	0	0	BRADLEY HILL RD at ROUTE 36
VTVSP0700/14A202454	Franklin	Fairfield	T0059	06/09/2014	23:05	Clear	Failure to keep in proper lane, Under the influence of medication/drugs/alcohol	Single Vehicle Crash	0	0	0	766 West Street
VTVSP0700/15A201391	Franklin	Fairfield	T0059	03/26/2015	20:23	[No Weather]		[No Direction of Collision]	0	0	0	TH-50 (709 West. St.)
VTVSP0700/15A201392	Franklin	Fairfield	T0059	03/26/2015	22:41	[No Weather]		[No Direction of Collision]	0	0	0	TH-59 (1508 West St.) at Just prior to
VTVSP0700/17A200274	Franklin	Fairfield	T0069	01/17/2017	20:58	[No Weather]		[No Direction of Collision]	0	0	0	1500 Block METCALFE POND RD
VTVSP0700/18A200621	Franklin	Fairfield	T0075	02/02/2018	09:21	Cloudy		Single Vehicle Crash	0	0	0	57 Park Street at Fairfield School

Appendix M: Detour Route(s)



Detour Route: Paradee Road to Pumpkin Village Road, and North Road, back to Paradee Road

End-to-End Distance: 4.3 miles
Through Distance: 2.3 miles
Detour Distance: 2.1 miles
Added Distance: 0.6 miles

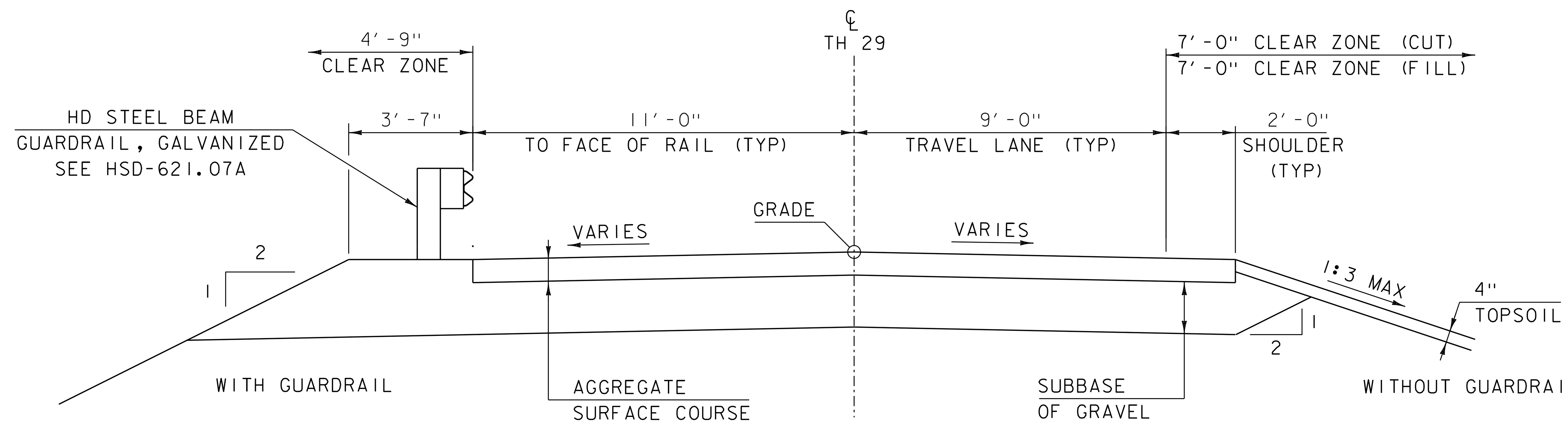
Appendix N: Plans

EXISTING BRIDGE INFORMATION
BUILT 1919, RECONSTRUCTED 1995
SINGLE SPAN PONY TRUSS
STEEL BEAM REINFORCING
OPEN GRATING DECK.
45' MAX SPAN,
6 TON LOAD LIMIT

PROJECT NAME: FAIRFIELD
PROJECT NUMBER: BO 1448(46)

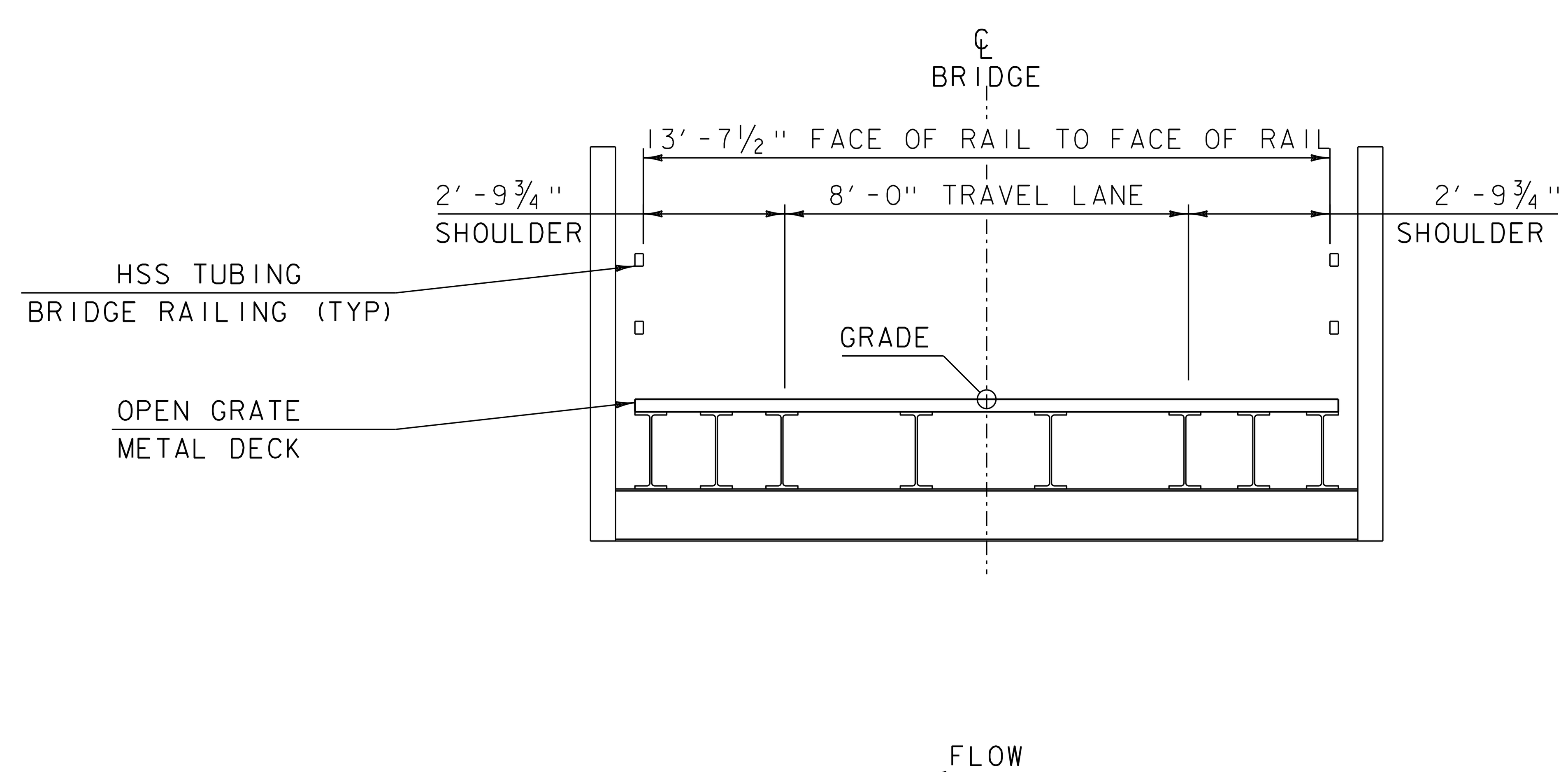
FILE NAME: s12j624BDR_Existing.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
EXISTING CONDITIONS

PLOT DATE: 22-MAR-2022
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 1 OF 13



PROPOSED TH 29 (PARADEE ROAD) TYPICAL SECTION

SCALE ⅜" = 1'-0"



EXISTING BRIDGE TYPICAL SECTION

SCALE ⅜" = 1'-0"

MATERIAL TOLERANCES

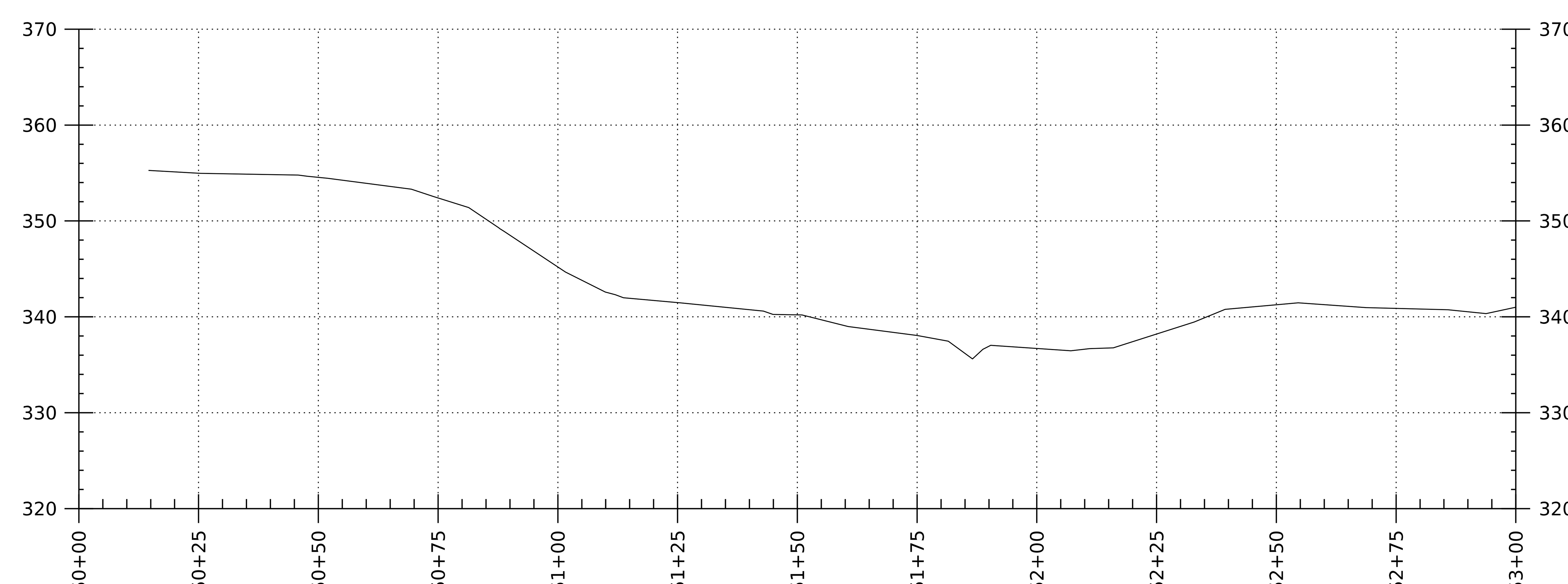
(IF USED ON PROJECT)

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

PROJECT NAME: FAIRFIELD	
PROJECT NUMBER: BO 1448(46)	
FILE NAME: 12j624\sl2j624typ.dgn	PLOT DATE: 22-MAR-2022
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: -------------	CHECKED BY: ------
EXISTING TYPICAL SECTIONS	SHEET 2 OF 13

TOWN HIGHWAY 29 PROFILE

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



BLACK CREEK CHANNEL PROFILE

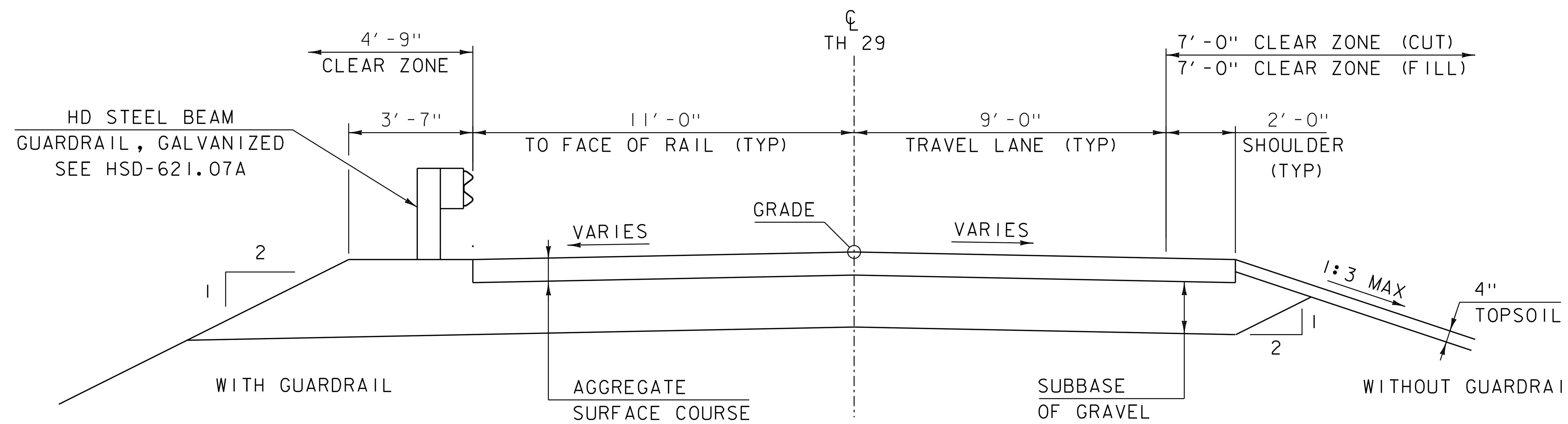
SCALE: HORIZONTAL 1"=20'-0"
VERTICAL 1"=10'-0"

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

PROJECT NAME: FAIRFIELD
PROJECT NUMBER: BO 1448(46)

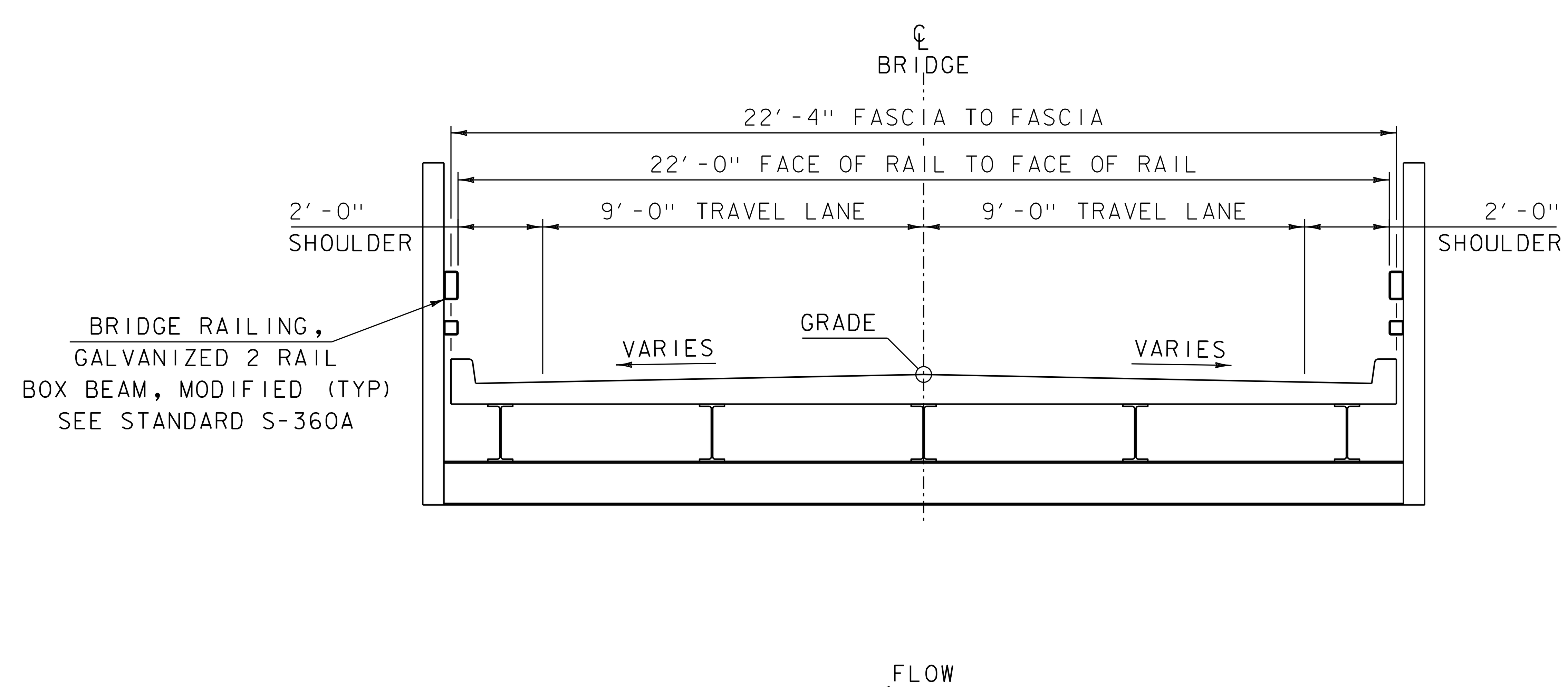
FILE NAME: s12j624profile.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
PROFILE SHEET

PLOT DATE: 22-MAR-2022
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 3 OF 13



PROPOSED TH 29 (PARADEE ROAD) TYPICAL SECTION

SCALE ⅜" = 1'-0"



PROPOSED TRUSS BRIDGE TYPICAL SECTION

SCALE ⅜" = 1'-0"

MATERIAL TOLERANCES

(IF USED ON PROJECT)

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

PROJECT NAME: FAIRFIELD

PROJECT NUMBER: BO 1448(46)

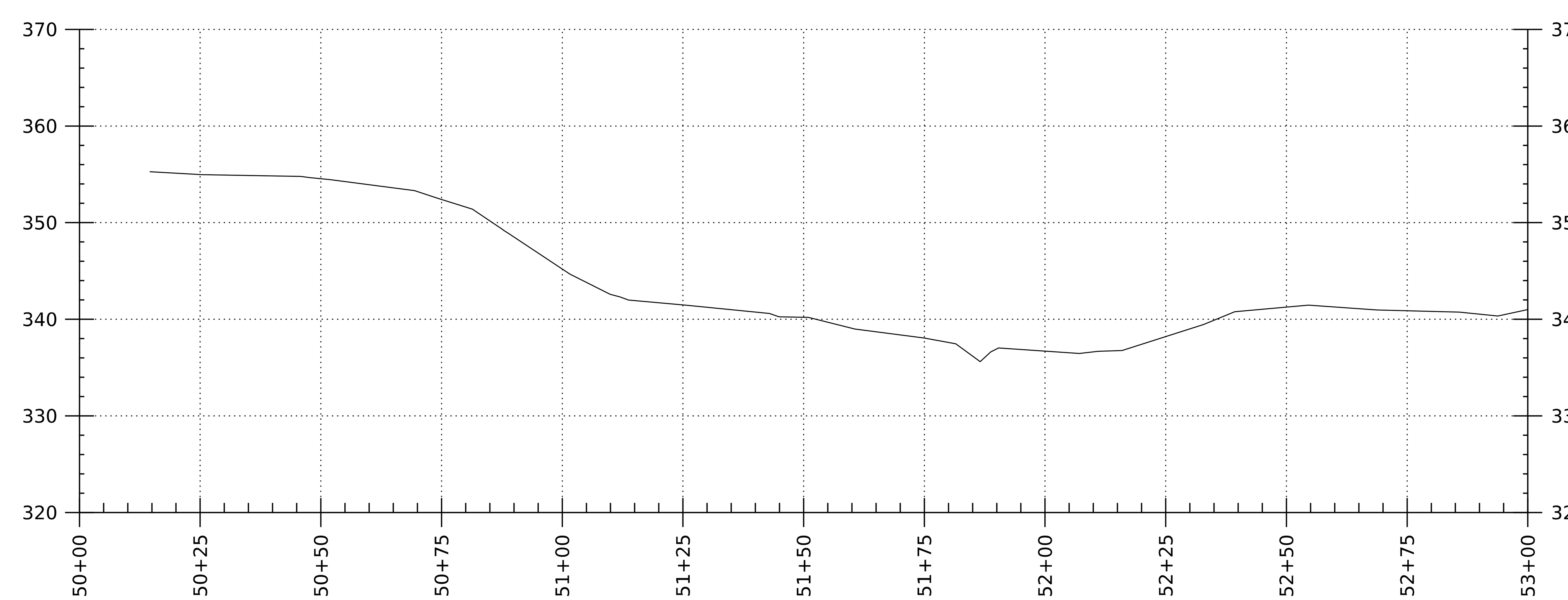
FILE NAME: 12j624\sl2j624typ.dgn	PLOT DATE: 22-MAR-2022
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: -------------	CHECKED BY: ------
PROPOSED TRUSS TYPICAL SECTIONS	SHEET 4 OF 13

EXISTING BRIDGE INFORMATION
BUILT 1919, RECONSTRUCTED 1995
SINGLE SPAN PONY TRUSS
STEEL BEAM REINFORCING
OPEN GRATING DECK.
45' MAX SPAN,
6 TON LOAD LIMIT

PROJECT NAME: FAIRFIELD	
PROJECT NUMBER: BO 1448(46)	
FILE NAME: s12j624BDR_Prop Truss.dgn	PLOT DATE: 22-MAR-2022
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
PROPOSED NEW TRUSS BRIDGE LAYOUT	SHEET 5 OF 13

TOWN HIGHWAY 29 NEW TRUSS PROFILE

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



BLACK CREEK CHANNEL PROFILE

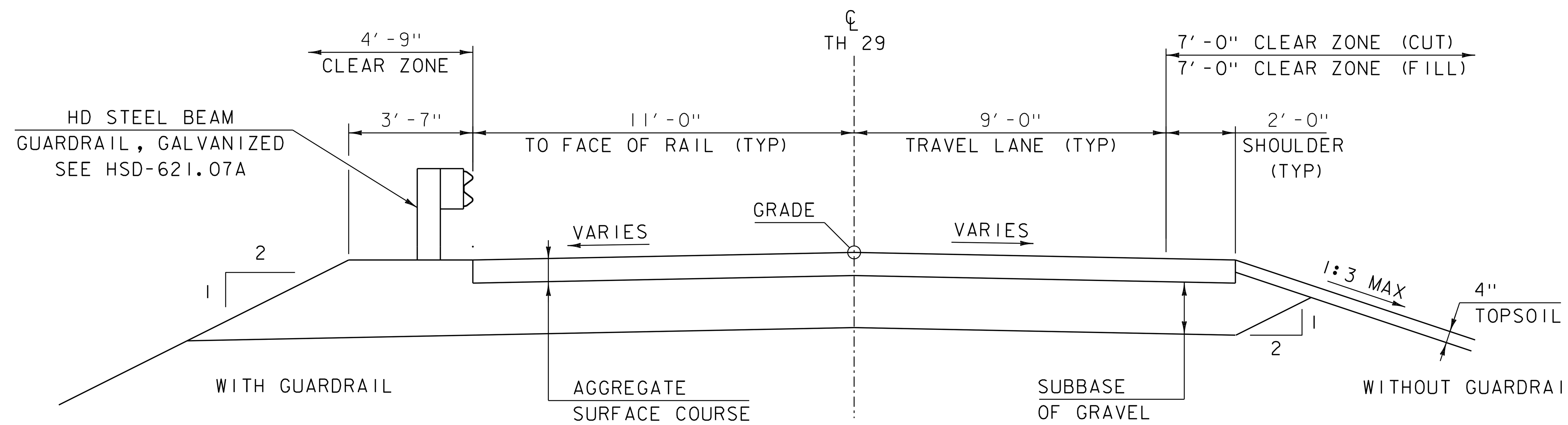
SCALE: HORIZONTAL 1"=20'-0"
VERTICAL 1"=10'-0"

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

PROJECT NAME: FAIRFIELD
PROJECT NUMBER: BO 1448(46)

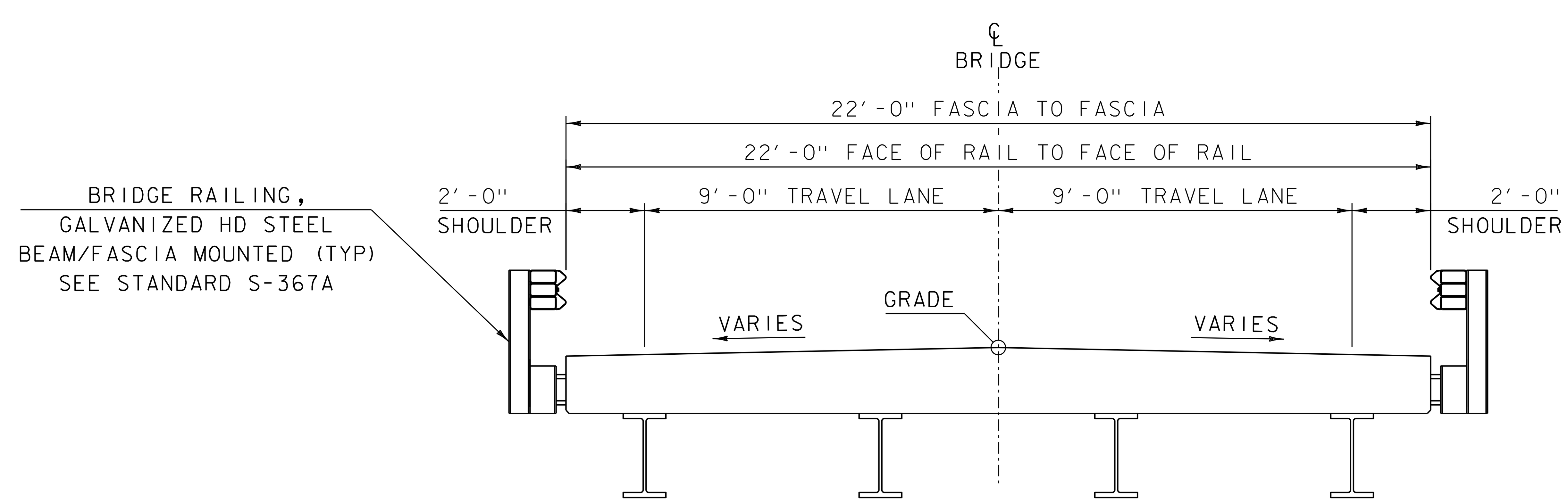
FILE NAME: s12j624profile.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
NEW TRUSS PROFILE SHEET

PLOT DATE: 22-MAR-2022
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 6 OF 13



PROPOSED TH 29 (PARADEE ROAD) TYPICAL SECTION

SCALE 3/8" = 1'-0"



PROPOSED BRIDGE TYPICAL SECTION

SCALE 3/8" = 1'-0"

MATERIAL TOLERANCES (IF USED ON PROJECT)	
SURFACE	
- PAVEMENT (TOTAL THICKNESS)	+/- 1/4"
- AGGREGATE SURFACE COURSE	+/- 1/2"
SUBBASE	+/- 1"
SAND BORROW	+/- 1"

PROJECT NAME: FAIRFIELD
PROJECT NUMBER: BO 1448(46)

FILE NAME: 12j624\sl2j624typ.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: -------------
PROPOSED TYPICAL SECTIONS

PLOT DATE: 22-MAR-2022
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 7 OF 13

CURVE (x)
DELTA = 19°41'12"
D = 12°43'57"
R = 450.00'
T = 78.08'
L = 154.62'
e = 6.72'

CURVE (x)
DELTA = 09°27'14"
D = 14°19'26"
R = 400.00'
T = 33.08'
L = 66.00'
e = 1.37'

CURVE (x)
DELTA = 12°00'28"
D = 22°55'06"
R = 250.00'
T = 26.29'
L = 52.39'
e = 1.38'

EXISTING BRIDGE INFORMATION
BUILT 1919, RECONSTRUCTED 1995
SINGLE SPAN PONY TRUSS
STEEL BEAM REINFORCING
OPEN GRATING DECK.
45' MAX SPAN,
6 TON LOAD LIMIT

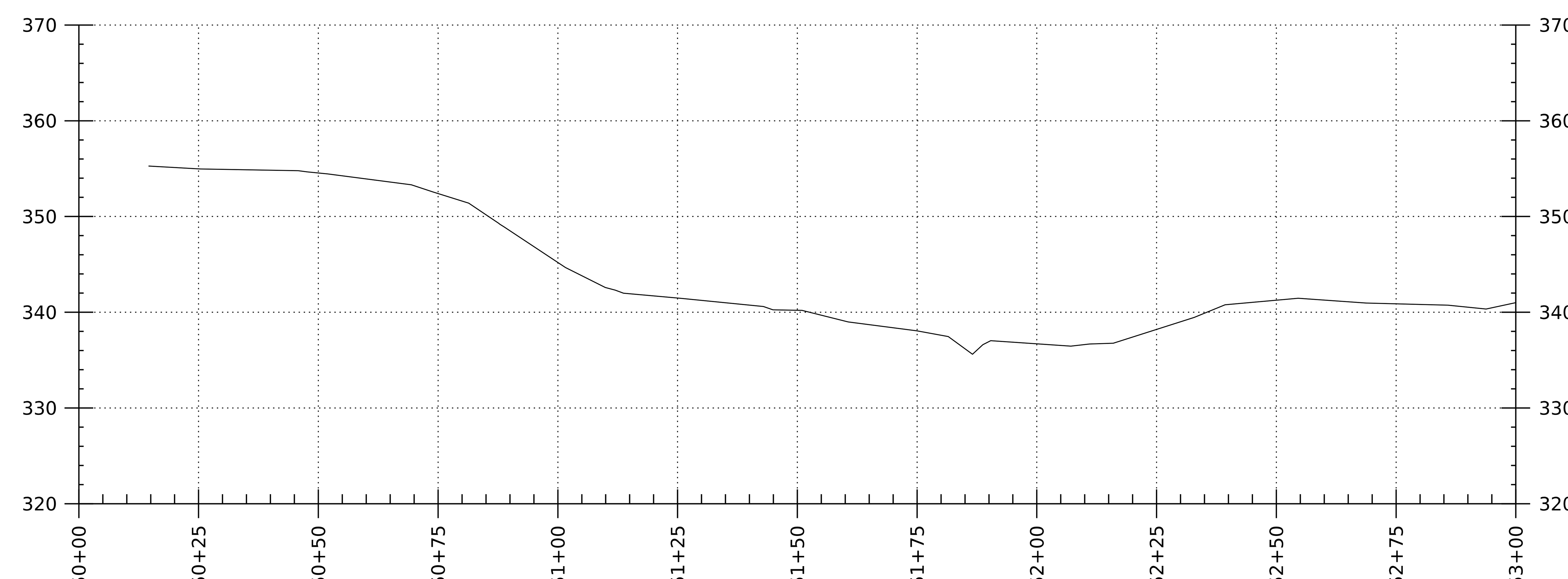
PROJECT NAME: FAIRFIELD
PROJECT NUMBER: BO 1448(46)

FILE NAME: s12j624BDR_Prop Bridge.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
PROPOSED NEW BRIDGE LAYOUT

PLOT DATE: 22-MAR-2022
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 8 OF 13

TOWN HIGHWAY 29 NEW BRIDGE PROFILE

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



BLACK CREEK 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: FAIRFIELD
PROJECT NUMBER: BO 1448(46)

FILE NAME: s12j624profile.dgn	PLOT DATE: 22-MAR-2022
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
NEW BRIDGE PROFILE SHEET	SHEET 9 OF 13

CURVE (x)
DELTA = 22°14'26"
D = 13°13'56"
R = 433.00'
T = 85.11'
L = 168.08'
e = 8.29'

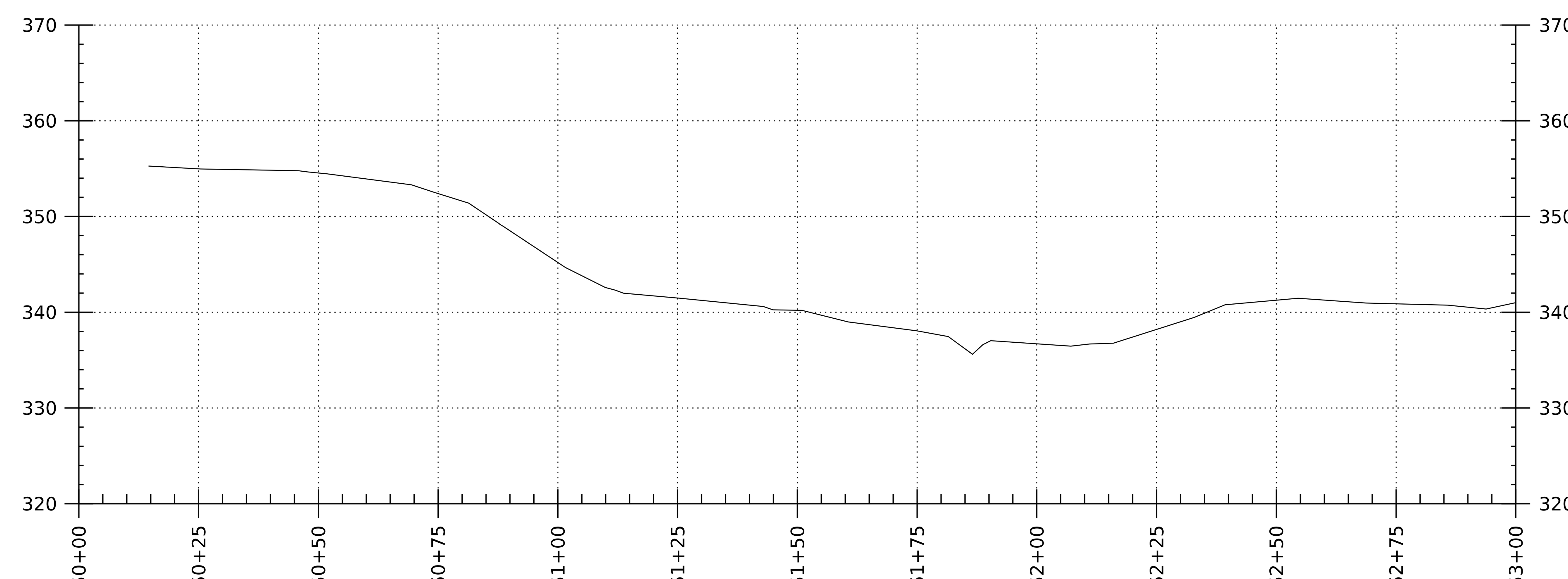
EXISTING BRIDGE INFORMATION
BUILT 1919, RECONSTRUCTED 1995
SINGLE SPAN PONY TRUSS
STEEL BEAM REINFORCING
OPEN GRATING DECK.
45' MAX SPAN,
6 TON LOAD LIMIT

PROJECT NAME: FAIRFIELD
PROJECT NUMBER: BO 1448(46)

FILE NAME: s12j624BDR_Prop Bridge Off.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
NEW BRIDGE OFF ALIGNMENT LAYOUT
PLOT DATE: 22-MAR-2022
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 10 OF 13

TOWN HIGHWAY 29 NEW BRIDGE OFF ALIGNMENT PROFILE

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



BLACK CREEK 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: FAIRFIELD	
PROJECT NUMBER: BO 1448(46)	
FILE NAME: s12j624profile.dgn	PLOT DATE: 22-MAR-2022
PROJECT LEADER: L.J.STONE	DRAWN BY: D.D.BEARD
DESIGNED BY: ------	CHECKED BY: ------
OFF-ALIGNMENT PROFILE SHEET	SHEET 11 OF 13

CURVE (x)
DELTA = 09°27'14"
D = 14°19'26"
R = 400.00'
T = 33.08'
L = 66.00'
e = 1.37'

CURVE (x)
DELTA = 19°41'12"
D = 12°43'57"
R = 450.00'
T = 78.08'
L = 154.62'
e = 6.72'

CURVE (x)
DELTA = 12°00'28"
D = 22°55'06"
R = 250.00'
T = 26.29'
L = 52.39'
e = 1.38'

EXISTING BRIDGE INFORMATION
BUILT 1919, RECONSTRUCTED 1995
SINGLE SPAN PONY TRUSS
STEEL BEAM REINFORCING
OPEN GRATING DECK.
45' MAX SPAN,
6 TON LOAD LIMIT

PROJECT NAME: FAIRFIELD
PROJECT NUMBER: BO 1448(46)

FILE NAME: s12j624BDR_Upstream Temp.dgn PLOT DATE: 22-MAR-2022
PROJECT LEADER: L.J.STONE DRAWN BY: D.D.BEARD
DESIGNED BY: ------ CHECKED BY: ------
UPSTREAM TEMPORARY BRIDGE SHEET 12 OF 13

EXISTING BRIDGE INFORMATION
BUILT 1919, RECONSTRUCTED 1995
SINGLE SPAN PONY TRUSS
STEEL BEAM REINFORCING
OPEN GRATING DECK.
45' MAX SPAN,
6 TON LOAD LIMIT

PROJECT NAME: FAIRFIELD
PROJECT NUMBER: BO 1448(46)

FILE NAME: s12j624BDR_Downstream Temp.dgn
PROJECT LEADER: L.J.STONE
DESIGNED BY: ------
DOWNSTREAM TEMPORARY BRIDGE

PLOT DATE: 22-MAR-2022
DRAWN BY: D.D.BEARD
CHECKED BY: ------
SHEET 13 OF 13