Town of Richmond, Vermont

Bridge Street Bicycle & Pedestrian Feasibility Study

Final Report

Submitted by:

Broadreach Planning & Design

In conjunction with

Lamoureux & Dickinson Consulting Engineers, Inc

Heritage Landscapes LLC.

University of Vermont Consulting Archeological Program

April 26, 2010

ACKNOWLEDGEMENTS

The Town of Richmond developed this report with financial assistance from the Chittenden County Metropolitan Planning Organization.

A Project Steering Committee provided invaluable assistance to the project team during the process of completing this report. The Project Steering Committee consisted of:

- Cathleen Gent, Richmond Town Planner (Richmond Project Manager)
- Gary Bressor, property owner
- Mark Fausel, Richmond Planning Commission
- Jon Kart, Richmond Selectboard/property owner
- Joe Miller, Richmond Police Department
- Dan Renaud, Richmond Planning Commission
- Martha Turner, Richmond Historical Society
- Michael Weisel, Richmond Town Engineer

The Richmond citizens and business owners also provided important input during the series of public work sessions and interviews the project team conducted during the course of the project.

The project Team consisted included:

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INTRODUCTION

The Town of Richmond received a "Bridge Street Bicycle & Pedestrian Feasibility Study" Transportation Action Grant (TAG) from the Chittenden County Metropolitan Planning Organization. The purpose of this study was to develop streetscape design recommendations for improving pedestrian and bicycle circulation along the study area considering the following factors: safety, connectivity between village areas, utility infrastructure, existing community resources, economic development, character of the village, and natural resources along Bridge Street between Depot Street and Bridge Street's southern end, and along Huntington Road between Bridge Street and Farr Street. The Study Area was generally along the roadways, but it extended off the roadways in certain areas, as **Map 1** shows. The Town of Richmond began this project in August of 2009 with the assistance of Broadreach Planning & Design; teamed with Lamoureux & Dickinson Consulting Engineers, Inc: Heritage Landscapes LLC; and the Consulting Archeological Program at UVM (BRPD collectively).

This report is formatted for double sided printing.

EXISTING CONDITIONS

Maps 2a and 2b provide an overview of the existing conditions. **Appendix A** includes a more complete description of existing conditions.

The Bridge Street and Huntington Road right-of-ways within the Study Area are 3 rods wide, ±49 feet. Specific survey data shows that the road is not always centered in the right-of-way, especially for the portion of Bridge Street between the railroad and the entrance to the Volunteers Green, just north of the bridge over the Winooski River.

Esplanade Street and Church Street are public roads that intersect with Bridge Street north of the Bridge Street bridge over the Winooski River (the bridge). Railroad Street and Jolina Court are two other roads that also intersect with Bridge Street just south of the railroad right-of-way. The Town possesses an easement for the right-of-way for Railroad Street over private land, but Jolina Court is a private road.

Bridge Street is approximately 24 feet wide between the railroad and Church Street with two 12-foot wide travel lanes between asphalt curbs. The southbound lane of Bridge Street widens by approximately 3 feet between Church Street and Esplanade Street so that the total roadway is approximately 27 feet wide with a 15-foot wide southbound lane and a 12-foot wide northbound lane. South of Esplanade Street to the Bridge Street bridge over the Winooski River, the road still maintains approximately a 26-foot width, but a variable-width gravel shoulder makes the road appear wider. The bridge itself is approximately 18 feet wide

with two 9-foot lanes. South of the bridge, the roadway is again approximately 24 feet wide with two twelve-foot travel lanes with a curb along the southbound lane.

The right-of-way width for Railroad Street, which runs west from Bridge Street, is twenty-five feet. The stakes indicating the right-of-way have been placed and the exact location of the right-of way will have more definition as the development of a new market store on the northwest corner of Railroad Street and Bridge Street is completed. This work will include the installation of curbs and parking at least along the northern side of Railroad Street.
Church Street runs west from Bridge Street and currently has a sidewalk along the northern edge of the pavement. Other than the church at the corner of Church Street and Bridge Street, it is lined by residences. Esplanade Street also runs west from Bridge Street, but does not have a sidewalk along either side of the roadway, except for a small remnant of an old sidewalk that can still be seen in front of two houses. Esplanade Street is lined with residences, but also provides access to the Town sewage treatment plant.

Huntington Road west of the Bridge Street intersection is approximately 24 feet wide with two 12-foot travel lanes and a curb on the north side of the road.

The northwest corner of the Bridge Street/Huntington Road/Thompson Road/Cochran Road intersection has been widened to facilitate turns at higher speeds from Bridge Street to Huntington Road. The widening has taken the edges of the road out of the right-of-way as seen in **Map 2b**.

There is a continuous sidewalk along almost the entire length of the west side of Bridge Street in the Study Area. There is a break that extends from the northern end of the railroad right-of-way to the southern edge of Railroad Street. The sidewalk continues around the widened corner at Huntington Road west approximately 180 feet. There is no sidewalk on the south side of Huntington Road.

Overhead utility lines and poles line the west side of Bridge Street for most of the Study Area north of the Winooski River. Between Esplanade Street and Church Street, the utility poles are located in the street, adjacent to the west side curb. Sewer and water lines lie under the roadway mostly within the Bridge Street and Huntington Road rights-of-way. There are stormwater drains under the roadway.

Portions of the Study Area close to the Winooski River are located within the 100-year flood plain.

There are street trees on both sides of Bridge Street, but most of them lie along the east side.

The western portions of Volunteers Green and the property on the east side of the road across from Volunteers Green adjacent to the river are sensitive for archeological resources. South of the River, the open field north of the Round Church, Round Church Green, the lawn at the northeast corner of Bridge Street and Huntington Road, and the open/lawn area

on the north side of Huntington Road across from Farr Road are also sensitive for archeological resources.

Lighting along Bridge Street and Huntington Road is supplied by cobra head lights attached to the utility poles. The spacing of the lighting is not consistent, as can be seen on **Map 2a**. Pedestrian scale lighting has been added to the end of Church Street and around the Town Center parking area, but the fixtures do not shield the light source or provide any degree of light cutoff that most lighting regulations now require.

There are a variety of regulatory and advisory signs along Bridge Street, including crosswalk warning signs located at each crosswalk for both directions of traffic on Bridge Street or Huntington Road.

There is considerable pedestrian traffic that uses the sidewalk on both sides of the Winooski River bridge, especially the north side. Many bicyclists, including children, ride on the sidewalk, which often creates conflicts between bicyclists and pedestrians, especially on the bridge and its approaches. When they have a destination, pedestrians and bicyclists are headed most often for:

- Volunteers Green;
- The adjacent bakery;
- Town Center, including the Town Library, Town Offices and Post Office;
- The Round Church;
- The businesses further north on Bridge Street; and
- The schools further to the north on Jericho Road.

Research included reviews of previous studies, with the most emphasis on:

- *RICHMOND PEDESTRIAN FACILITY FEASIBILITY STUDY*, Erik Sandblom, PC (ESPC) and Kathleen Ryan, Landscape Architect, January 2009

- *RICHMOND VILLAGE PARKING STUDY,* Resource Systems Group, Inc., 2007

- *RICHMOND DOWNTOWN STREETSCAPE*, Kathleen Ryan, Landscape Architect with Arnold and Scangas Architects and Julie Campoli, landscape Architects, September 1998

RECOMMENDATIONS

OVERVIEW

BRPD analyzed numerous alternate methods of improving bicycle and pedestrian circulation along Bridge Street and other portions of the Study Area. The study team developed, examined, and refined these alternatives into a set of recommendations after:

- Discussions at several Project Steering Committee meetings,
- Three public stakeholders' sessions,
- Meetings with individual business and property owners in the Study Area,
- A meeting with the Richmond Area Business Association (RABA) Main Street Committee, and
- A planning *charrette* with the project team and other professionals.

From this, BRPD assembled a set of recommendations for final consideration by the community. These recommendations are presented below for review and consideration. **Maps 3a** and **3b** show the general location of the recommendations. **Table 1** includes a summary of the relative costs and benefits of the recommendations. **Appendix B** includes a description of all of the initial alternatives considered for this project. **Table 1a** in **Appendix B** contains a summary of the relative costs and benefits for all of the initial alternatives. **Appendix C** contains an initial estimate of the probable construction costs associated with specific recommendations. By intent, this report does not offer comment regarding the specific costs associated with recommended alternatives, since public policy and budgeting decisions are best left to the elected officials and town administration for the Town of Richmond.

In addition to the recommendations described below, BRPD has prepared a list of improvements which should be developed within the corridor no matter which recommended improvements are finally developed, including:

- New crosswalks added on all side streets;
- A new sidewalk on the north side of Railroad Street installed as part of the new market development;
- Adequate pedestrian access and other improvements to the new Town-owned parking lot on a parcel on Depot Street, north of the railroad; and
- Four new crosswalks at the Bridge Street/Railroad Street/Jolina Court intersection.

After reviewing previous studies and current conditions, BRPD also recommends that there be no new on-street parallel parking along Bridge Street south of Jolina Court, as recommended in the 2007 Parking Study.

It appears that the current location of the roadway within the right-of-way allows for implementation of the recommendations involving new sidewalks and widened roadway without the need to acquire right-of-way from individual property owners.

Several participants in the alternative development and analysis process suggested the idea of burying the overhead utilities along Bridge Street between Church Street and Esplanade Street, but the cost of such work is most likely beyond the means of the Town, which would need to cover 100 percent of the cost. Past estimates of the cost to place overhead utilities underground have been approximately $1,000,000 per mile, or approximately $190 per foot. (I'm still working to get more information from GMP.)

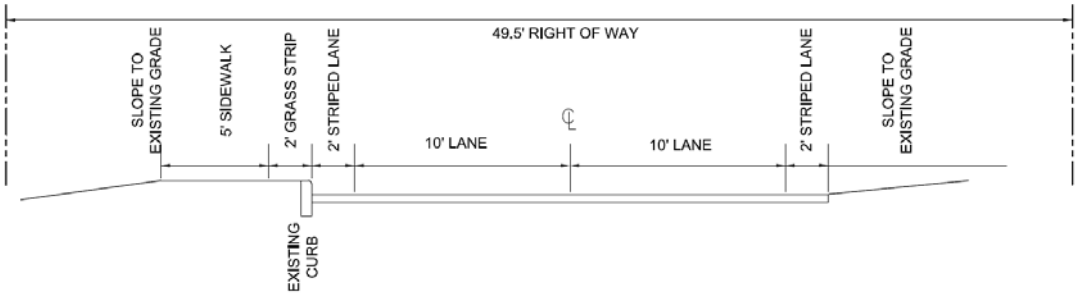
When more than one recommendation is appropriate for a particular portion of the Study Area, each is identified as either Phase 1 or Phase 2. Phase 1 recommendations should occur ideally within one year, with the Phase 2 and other recommendations occurring in the future as construction funding becomes available and conditions are right to proceed with them. Other than the Phase 1 recommendations, the Town can proceed with the implementation of the recommendations in whatever order makes the most sense in the future.

Most descriptions include an initial estimate of probable construction costs for the recommendation, or in some cases a group of recommendations. **Appendix C** includes details as to how these initial estimates were calculated. Each of the estimates assumes that engineering plans are prepared prior to the work being completed. These costs could be less if the work were to be completed by Town crews.

BRIDGE STREET (NORTH OF THE BRIDGE TO NORTH DEPOT STREET)

Recommendation #1: Phase 1 – Restripe the existing 24-foot roadway surface to create two ten-foot travel lanes and, at a minimum, a two-foot wide paved shoulder on each side. Reclaim the green space between the sidewalk and the roadway for the section of road between Church Street and Esplanade Street. Repave the existing west side sidewalk with asphalt. Add additional street trees as appropriate. **Figure 1** shows the cross section for this recommendation. Initial estimate of probable construction cost: $51,000 with approximately $600 for just the restriping.

Figure 1: Recommendation #1 Cross Section



Recommendation #2: Phase 2 – Add two feet of additional pavement to the east side of the road and repave/reclaim the roadway and/or restripe the road to create two ten-foot-travel lanes with a three-foot paved shoulder on each side of the pavement. Reclaim the green space between the sidewalk and the roadway for the section of road between Church Street and Esplanade Street. Add a sidewalk along the east side of the road between Pleasant Street and the Town Center, with the sidewalk adjacent to the curb north of the railroad and with a two-foot green strip between the curb and the sidewalk south of Railroad Street. Place the sidewalk behind a curb in front of Sonoma Station and remove direct access from Bridge Street to the off street parking once the intersection becomes busier and/or Jolina Court serves as an access to developed property. Use two retaining walls, one between Pleasant Street and the Railroad as needed up to approximately five feet high, and a smaller, dry laid stone retaining wall approximately one foot high along the edge of the cemetery. Reconstruct the existing sidewalk on the west side of the roadway with concrete. Add additional street trees as appropriate. **Figure 2** shows the cross section for this recommendation. **Figure 3** provides a suggestion of how the improvements would fit into the existing condition. Initial estimate of probable construction cost: $80,000.

Figure 2: Recommendation #2 Cross Section

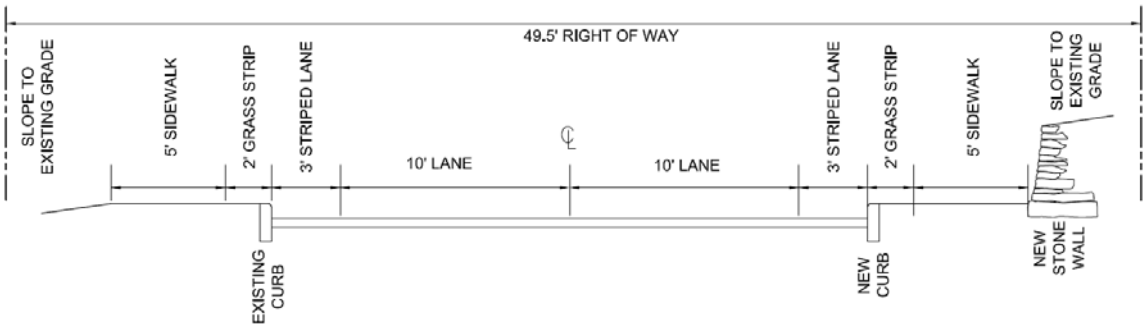
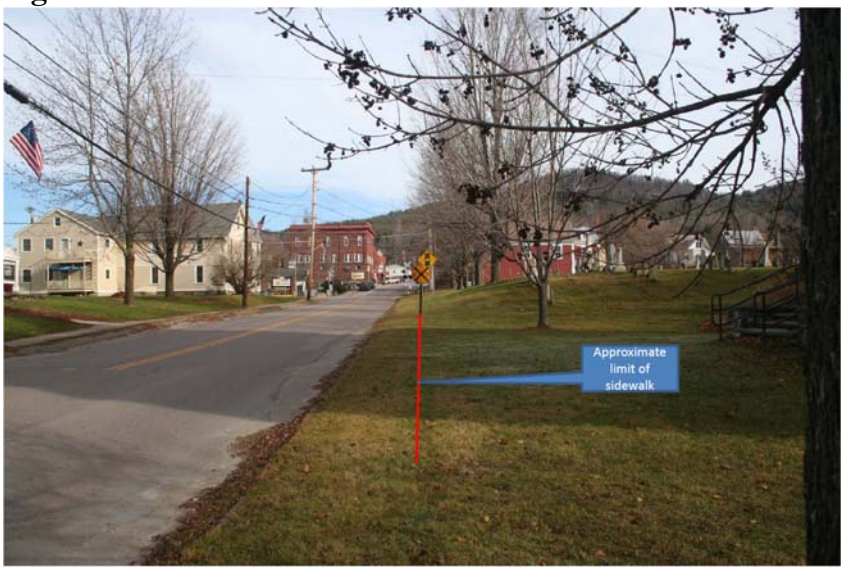


Figure 3: Recommendation #2



BRIDGE STREET (RAILROAD STREET TO RAILROAD)

Recommendation #3 – Add a curb at the appropriate location and back with a seven-foot concrete sidewalk. **Figure 4** shows the cross section for this recommendation. **Figure 5** provides a suggestion of how the improvements would fit into the existing condition. Initial estimate of probable construction cost: $20,000.

Figure 4: Recommendation #3 Cross Section

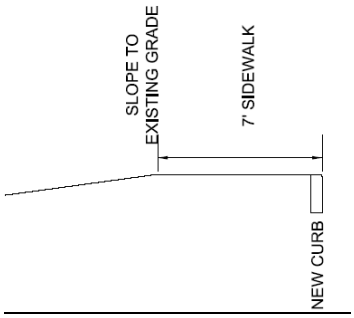
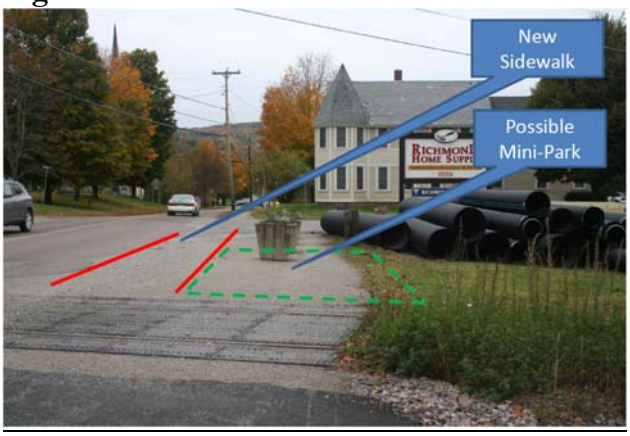


Figure 5: Recommendations #3 & #4



Recommendation #4 – Develop a small pedestrian seating area south of the railroad tracks on the west side of Bridge Street in front of the new market to take advantage of the views east towards Camels Hump. **Figure 5** shows the approximate location of the proposed mini-park. Initial estimate of probable construction cost: $25,000 lump sum.

ESPLANADE STREET

Recommendation #5: Phase 2 – Extend the existing concrete sidewalk on the south side of the east end of Esplanade Street approximately 20 feet further west to the bakery access drive/entrance walk. Add a crosswalk diagonally across the street to the north side. Reconstruct the existing concrete sidewalk with a four-foot wide sidewalk to the west end of the street. As possible, reclaim the former sidewalk on the north side of the street between the new crosswalk by the bakery and Bridge Street, so that there are sidewalks on both sides of the street to the bakery. **Figure 6** provides a suggestion of how the improvements would

fit into the existing condition. Initial estimate of probable construction cost, excluding the north side sidewalk connecting the crosswalk to Bridge Street: $90,000.

Figure 6: Recommendation #5

BRIDGE STREET (BY VOLUNTEERS GREEN)

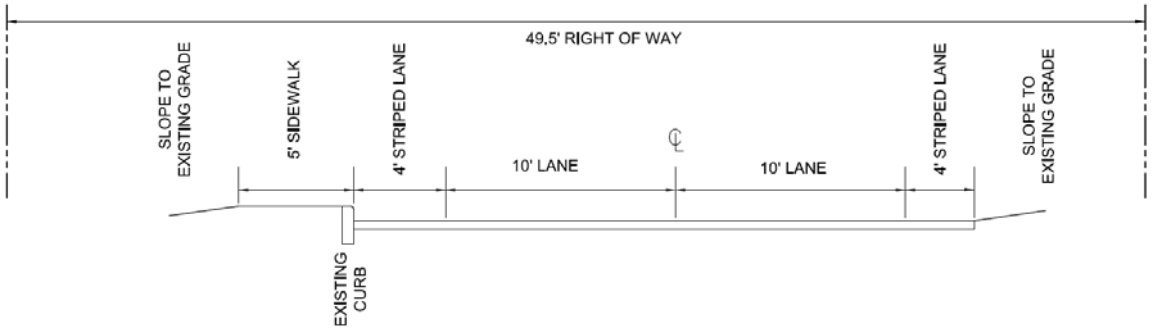
Recommendation #6 – Link the existing sidewalks on either side of the parking lot entrance with a new raised concrete sidewalk. Also, in a manner that conforms with FEMA and Richmond zoning regulations, regrade and pave the Town-owned parking area to gradually rise and fall to meet the grade of the new sidewalk to keep gravel and debris from flooding into the roadway during a rainstorm and add a new storm drain in the parking area to eliminate potential ponding that the regrading could cause. Initial estimate of probable construction cost: $8,000.

Recommendation #6a – Develop a parking lot plan, with striping for the front lot. Should parking continue to be an issue in the park, consider the potential expansion of the rear lot and the addition of parking along the access road in a manner that conforms with FEMA and Richmond zoning regulations, to minimize parking on Esplanade Street. Consider slightly widening the park access road, also in line with the floodplain regulations, and providing continual road maintenance to encourage the use of the park access road rather than Esplanade Street to reach the rear parking area. Add a wooden railing along the sewage treatment driveway, if allowed under the floodplain regulations, to minimize the ability to use it to access the rear parking area in Volunteers Green.

BRIDGE STREET (SOUTH OF THE BRIDGE)

Recommendation #7: Phase 1 – Restripe the existing 28-foot side roadway to create two ten-foot lanes with a four-foot shoulder on each side. Add new street trees as possible. **Figure 7** shows the cross section for this recommendation. Initial estimate of probable construction cost: $1,600.

Figure #7 Cross Section Recommendation 7:



Recommendation #8: Phase 2 – Create a new curb four feet to the east of the existing west side curb from the bridge to approximately the crosswalk to the Round Church Green to create a four-foot green space between the existing sidewalk and new curb. Add two feet of pavement and a curb on the east side of the roadway and restripe the road to create two ten-foot travel lanes and two three-foot paved shoulders. Install a new storm drain on the east side of the road at the low point between the bridge and Round Church Road. If needed, reclaim the road to shift the center crown to coincide with the new center line of the roadway. Relocate the two utility poles on the east side of the road to the west side in the newly created green strip. Add new street trees as possible. **Figure 8** shows the cross section for this Recommendation. **Figure 9** provides a suggestion of how the improvements would fit into the existing condition. Initial estimate of probable construction cost for Recommendations #8 and #9 together: $100,000.

Figure 8: Recommendation #8 Cross Section

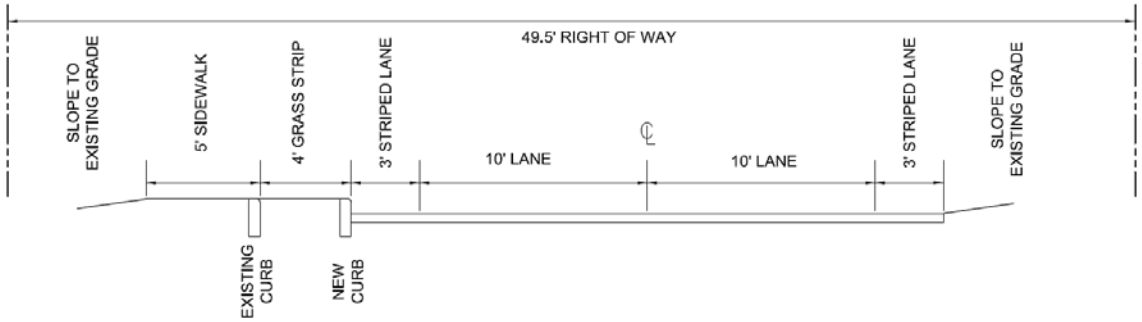


Figure 9: Recommendation #8

Recommendation #9: Phase 2 – Create a new curb two feet to the east of the existing west side curb from approximately the crosswalk to the Round Church Green to the intersection with Huntington Road to create a two-foot green space between the existing sidewalk and new curb. Add a 20-foot long transition from the four foot green strip to the north to the two foot green strip. Restripe the road to create two ten-foot travel lanes and two three-foot paved shoulders. Add new street trees as possible. **Figure 10** shows the cross section for this Recommendation. **Figure 11** provides a suggestion of how the improvements would fit into the existing condition. Initial estimate of probable construction cost for Recommendations #8 and #9 together: $100,000.

Figure 10: Recommendation #9 Cross Section

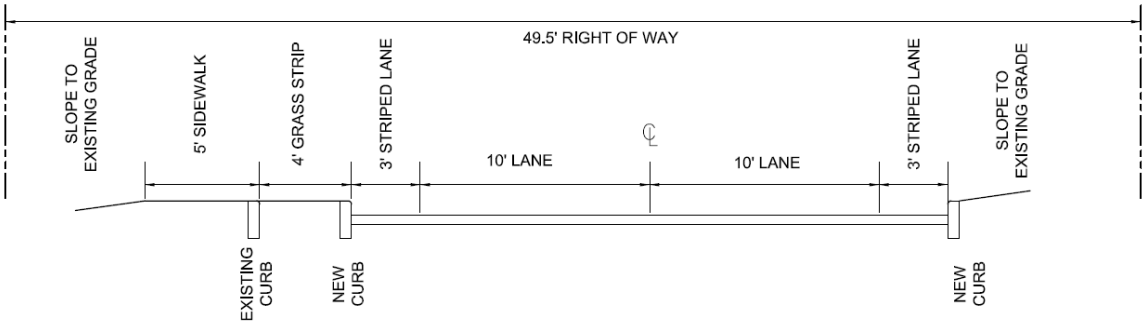
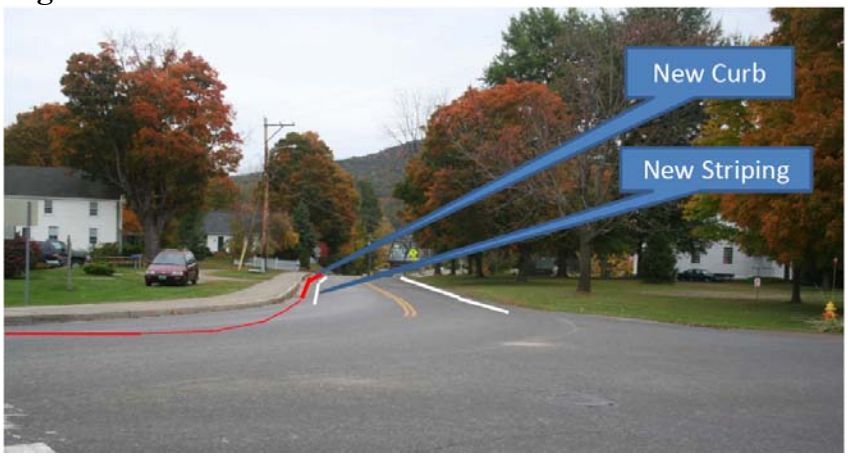


Figure 11: Recommendation #9



BRIDGE STREET/HUNTINGTON ROAD INTERSECTION

Recommendation #10 - Add street trees along the northwest corner of the intersection to begin to close in the intersection. Initial estimate of probable construction: $3,500.

Recommendation #11 – Reduce the turning radius of the turn from Cochran Road to Bridge Street at the southwest corner of the Round Church Green to be more of a standard intersection as described in the Richmond Public Works Specifications. This will reduce the overall amount of pavement in the intersection which leads to slower vehicular traffic and allows drivers more time to notice and react to pedestrians in and around the intersection. It will also induce more drivers heading west on Cochran Road to actually stop at the stop sign. Figure 15 provides a suggestion of how the improvements would fit into the existing condition. Initial estimate of probable construction cost for Recommendations #11 and #12 together: $10,000.

Figure 12: Recommendation #11

Recommendation #12 – Reduce the turning radius of the turn from Bridge Street to Huntington Road on the northwest corner of the intersection. This could bring the edge of the roadway back into the existing right-of-way and make it more difficult to make the turn at speed higher than the posted speed limit of 25 mph. **Figure 13** provides a suggestion of how the improvements would fit into the existing condition. Initial estimate of probable construction cost for Recommendations #11 and #12 together: $10,000.

Figure 13: Recommendation #12

HUNTINGTON ROAD

Recommendation #13: Phase 1 – Restripe the roadway to create two ten-foot lanes with a two-foot wide paved shoulder on either side. Extend the existing sidewalk on the north side of the street approximately 70 feet to the existing postboxes, which will need to be relocated further west. Add a crosswalk on Huntington Road at the end of the sidewalk, cutting through the existing curbed parking island for the small shopping area. Close the center access point to this shopping area with a new curbing, leaving just the eastern and western access points open. Add street trees as possible. **Figure 14** shows the cross section for this Recommendation. **Figure 15** provides a suggestion of how the improvements would fit into the existing condition. Initial estimate of probable construction cost for Recommendation 13: $15,000 with approximately $650 for just the restriping.

Figure 14: Recommendation #13 Cross Section

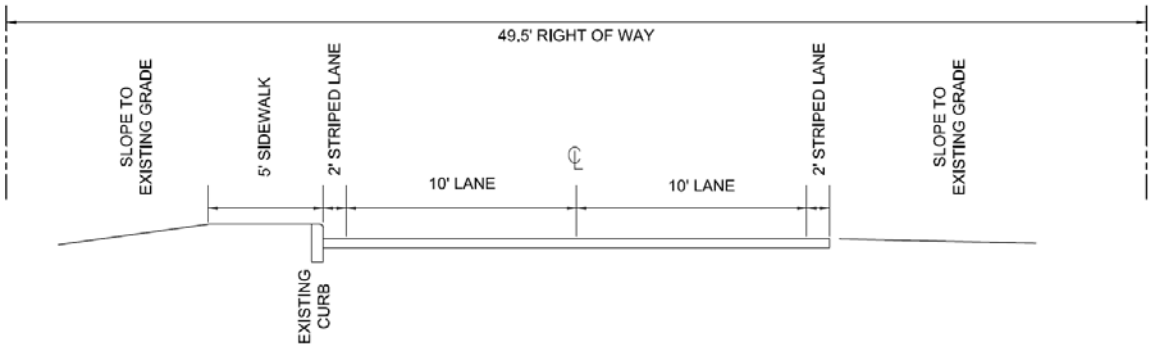


Figure 15: Recommendation #13

Recommendation #14: Phase 2 – Add two feet of pavement to the south side of the roadway and restripe to create two ten-foot travel lanes with a three-foot wide paved shoulder on each side. Add a curb on the south side of the road with an adjacent, five-foot sidewalk. The existing mailbox will need to be moved. Extend the sidewalk west to the edge of the existing commercial parking area. Continue the pedestrian way via striping through the parking area west to Farr Road. Add street trees as possible. **Figure 16** shows the cross section for this Recommendation. **Figure 17** provides a suggestion of how the improvements would fit into the existing condition. Initial estimate of probable construction cost for Recommendations #14: $46,000.

Figure 16: Recommendation #14 Cross Section

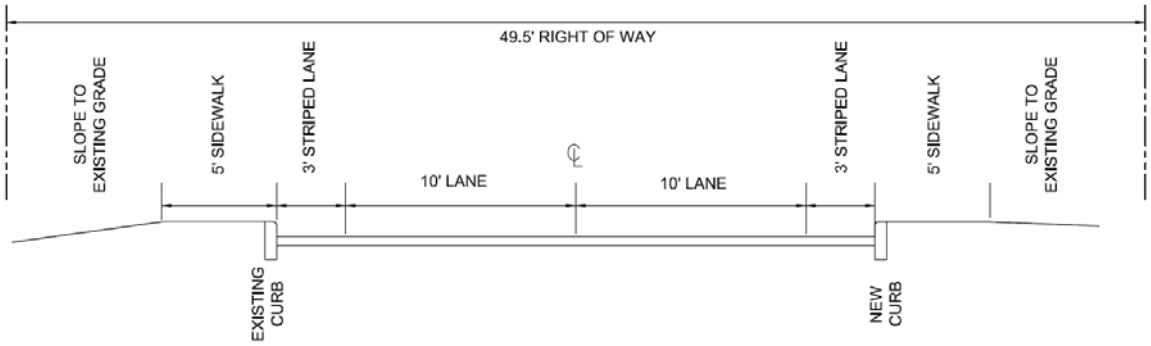
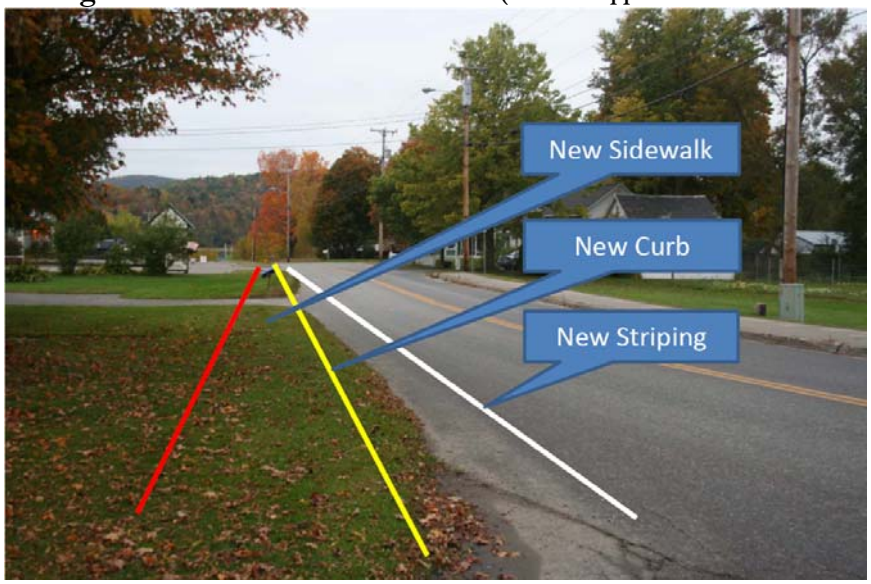


Figure 17: Recommendation #14 (Views is opposite of the Cross Section)



LIGHTING

Recommendation #15 – Replace the existing cobra head light fixtures with a more pedestrian scale light fixture mounted on the existing utility poles to create a more even yet lower height light level along the length of Bridge Street. The new fixtures should match the general look of the light fixtures used on Church Street and in the Town Center but should meet today's efficiency and light pollution standards.

RAILROAD STREET

Because the Town of Richmond has a 24-foot wide easement for a street right-of-way only on Railroad Street, no recommendations are offered in this report for improving circulation for bicyclists or pedestrians. The development of the new grocery market includes provisions for a sidewalk generally along the store on the north side of Railroad Street. After this sidewalk has been installed for a period, the Town may wish to review the desirability of adding a new sidewalk to the south side of Railroad Street. If the review finds that a

sidewalk would be appropriate, the Town would need to work with private landowners on the south side of Railroad Street since the public 24-foot right-of-way will not accommodate such a sidewalk within the right-of-way.

RIVER CROSSING

The current bridge across the Winooski River is approximately 18 feet wide, with nine-foot wide travel lanes in each direction. A five-foot wide sidewalk is cantilevered from the west side of the bridge. Bicycle access is poor across the bridge. For those comfortable doing it, one of the best ways to cross the road on a bicycle is to move to the center of the lane you are in and ride across the bridge - "taking the lane" and preventing motor vehicles from passing the bicycle on the bridge. The other way is to dismount, move to the sidewalk, and walk the bicycle across the bridge. The most common way of crossing the bridge on bicycle appears to be riding on the sidewalk.

Few, if any, alternatives for crossing the river appear to be viable. To date, the following alternatives have been offered:

- Widening the sidewalk to six or eight feet wide;
- Constructing a new prefabricated, single span bicycle/pedestrian bridge to the west of the existing bridge; and
- Instigating a permanent pedestrian/bicycle ferry.

Each of these options appears to have at least one insurmountable obstacle that would keep it from being a feasible solution. However, there could be some unrealized potential in any of them, so they should be at least considered and discussed before being eliminated.

One last option, which is possible, is to provide "share the road" signs on the approaches to the bridge and/or other notices to bicyclists to dismount and use the sidewalk.

IMPLEMENTATION

Based on this study and the ESPC study completed in 2009, the Town of Richmond intends to prepare a village streetscape plan that will include a set of final designs for sidewalk and street improvements on the entire length of Bridge Street, Jericho Road, and East Main Street. Future sidewalk and road construction will be based on those final designs. The final engineering work and construction for new or replacement sidewalks and bicycle facility improvements will need to be coordinated with the work being done on its sewer, stormwater, and water lines. The plans for the sewer, stormwater, and water lines projects should take into account the final Selectboard decisions for bicycle and pedestrian improvements. They should also consider ways to maximize the sustainable construction practices and techniques, including the following suggestions:

- Design and construct Phase 1 improvements or other roadway upgrades for easy implementation of future phases of improvements.
- Combine implementation of recommendations with other work being done in the right-of-way or Study Area to minimize duplication of work and maximize the benefits of public spending.
- Recycle the existing asphalt in the roadway, as possible, for repaving work.
- Use demolition material, such as that generated by the removal of the additional pavement between Church Street and Esplanade Street, as fill and base course material for other nearby projects.
- Use native plants that require no additional watering once established for street tree and green space plantings.
- Reuse existing signs as appropriate after improvements are implemented.
- Contract with local businesses that can supply as many goods as possible that are produced locally.

DESIGN STANDARDS

The roadway widening should be done in accordance to the current Town Public Works Specifications.

Current Town Public Works Specifications call for a minimum of a 30 foot radius at heavily traveled streets. This can serve as a guide as to the radius to use when reconstructing the Bridge Street/Huntington Road and Bridge Street/Cochran Road intersections.

The Town Public Works Specifications call for street trees to be planted outside of the right-of-way. To maximize the traffic calming affects of street trees, BRPD recommends consideration of allowing street trees to be planted within the right-of-way in certain situations.

It appears the Public Work Specifications also only allow concrete sidewalks. The Town may need to verify that it is acceptable to replace the existing asphalt sidewalk on Bridge Street with another asphalt sidewalk for the Phase 1 or whether a concrete sidewalk will be required.

INITIAL ESTIMATES OF PROBABLE CONSTRUCTION COSTS

Table 2 provides a summary of the projects costs for each of the recommendations. **Appendix C** provides more details on the initial estimates of probable construction costs.

Table 2 does not provide a cost estimate for Recommendation #15, upgraded lighting because the specific number of light fixtures is not certain at this time. Recent research for light fixtures that meet the requirements outlined in Recommendation #15 shows:

- An LED light fixture would be approximately $1,000.
- A wall bracket light fixture to mount on a pole would be approximately $250.
- A cast iron 12-foot lamp post to match those currently in place would be approximately $2,000.
- Each fixture mounted on a pole would cost approximately $1,250, excluding the labor and wiring.
- A free standing light fixture would cost approximately $3,000, excluding labor and wiring, which would most likely be much more that the pole mounted fixture because it would be new buried wiring.

Table 1: Comparison of Recommendations

Recommendation	Positive Aspects	Negative Aspects	Relative Costs
Bridge Street North			
#1 - 10' travel lane & 2' paved shoulder	Minimal Construction; no cemetery impact	Minimal improvements for less experienced bicyclists; requires additional bicylce facility improvements	$
#2 - 10' travel lane and 3' paved shoulder, new east side sidewalk to Town Offices.	Better pedestrian access south of railroad with full link to Town offices; links two sides of railroad; new stone wall sets off cemetery	Requires pavement overlay; impacts to edge of cemetery	$$$
#3 - Curb & 7' sidewalk	Improves pedestrian circulation; creates a wider space for pedestrians adjcent to the road; defines corner and truck turning radius for Railroad Street; links two sides of the railroad	Ties this section of Bridge Street more to the commercial block to the north with no separation between the sidewalk and the curb rather than the residential block to the south with a green space between the curb and the sidewalk.	$$
#4 - Mini Park	Creates pedestrian destination on south side of railroad tracks; allows enjoyment of eastern views down railroad corridor to Camels Hump	Requires use of private land; view from avaialble location partially blocked by railroad signals	
Esplanade Street			
#5 New Sidewalk	Improves pedestrian circulation	Potentially changes character of street; uses lawn space for sidewalks; Floodplain permit requirements	
Bridge Street South			
#7- 10' travel lane and 4' paved shoulders	Improves conditions for bicyclists; minimal costs		$
#8 - New 4' green space & 10' travel lane and 3' paved shoulders	Separates sidewalk from roadway; improves bicycle conditions; enhances views of Round Church	Extends roadway 2 feet to the east; requires pavement overlay; minimal potential for impacts to Round Church Green and archeological resources	$$$
#9 - New 2' green space & 10' travel lane and 3' paved shoulders	Separates sidewalk from roadway; improves bicycle conditions	Maintains existing roadway width to the east; may require pavement overlay;	$$
Intersection Alternatives			
#10 - Add Street Trees	Will eventually slow traffic	Could place street trees in public right-of-way, contrary to public works specifications	$
#11 - Lessen Cochran Road Turn	Will slow traffic; provides easier turning for bicyclists	Could create slight vehicular back ups	$
#12 - Lessen Huntington Road Curve	Assists pedestrian crossings: will slow traffic to speeds closer to posted speed limit ; provides easier turning for bicyclists	Could create slight vehicular back ups on Bridge Street	$
Huntington Road			
#13- 10' travel lane and 2' paved shoulder with sidewalk extension	Minimal costs; Maintains existing road cross section	Minimal improvements for less experieinced bicyclists; slight improvements for pedestrians.	$
#14 - 10' travel lanes and 3' paved shoulders & add curb and 5' sidewalk	Improves conditions for bicyclists; Improves conditions for pedestrians	Removes 7 feet of grass; requires pavement overlay	$$$$
Lighting Alternatives			
#15	Create pedestrian scale lighting; add to village character		$$

Table 2: Summary of Initial Estimates of Probable Construction Costs

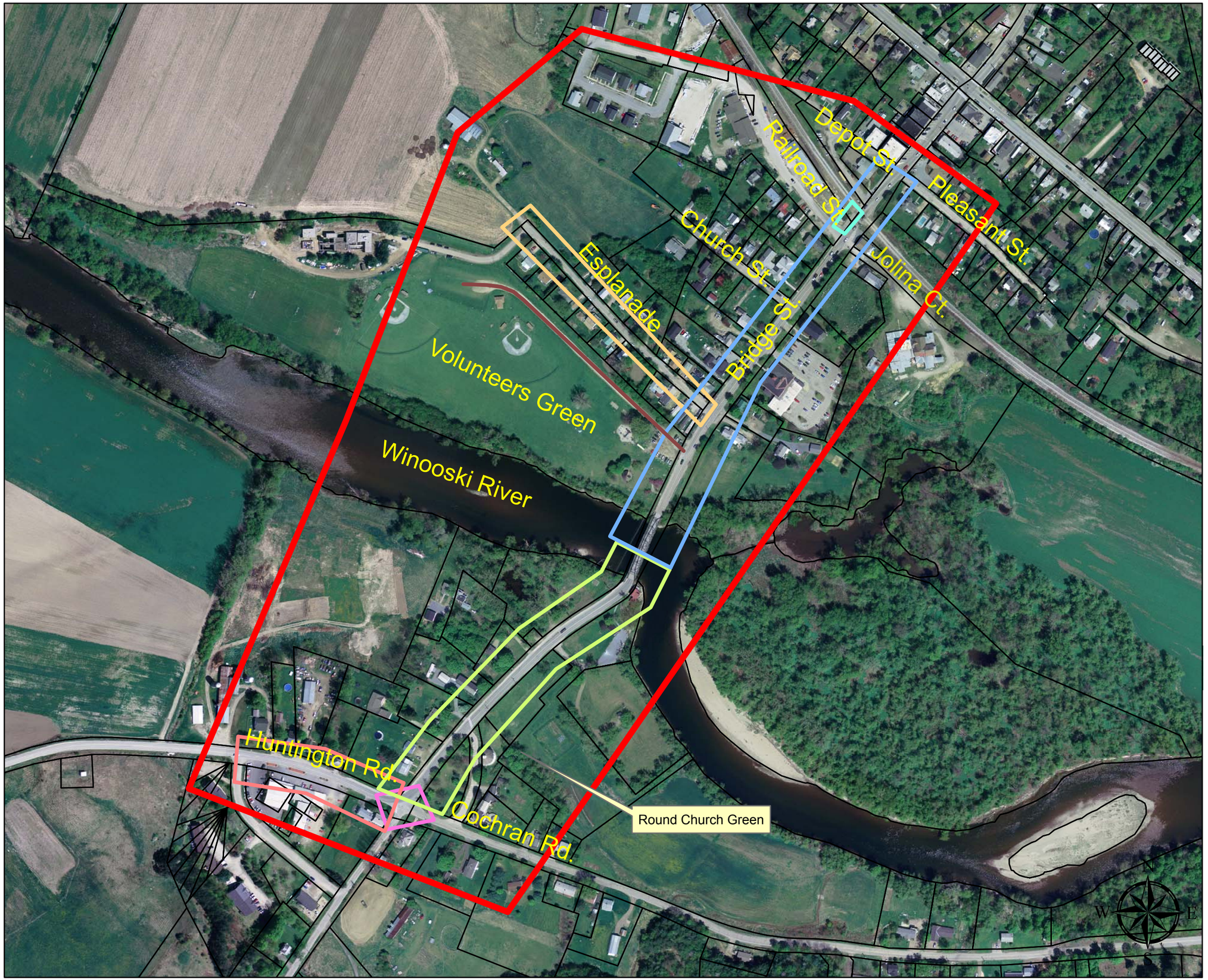
Recommendation	Initial Estimate of Probable Construction Cost
#1 - 10' travel lane & 2' paved shoulder	$51,000
#2 - 10' travel lane and 3' paved shoulder, new east side sidewalk to Town Offices.	$80,000
#3 - Curb & 7' sidewalk	$20,000
#4 - Mini Park	$20,000
#5 New Sidewalk on Esplanade Street	$90,000
#6 - Raised Sidewalk at Volunteers Green	$8,000
#7- 10' travel lane and 4' paved shoulders	$1,600
#8/#9 - New 4' or 2' green space & 10' travel lane and 3' paved shoulders	$92,000
#10/#11/#12 - Street Trees & reduce turning radii	$10,000
#13- 10' travel lane and 2' paved shoulder with sidewalk extension	$14,000
#14 - 10' travel lanes and 3' paved shoulders & add curb and 5' sidewalk	$46,000
Total	**$432,600**

Bridge Street Bicycle & Pedestrian Feasibility Study

Richmond, Vermont

Study Area and Analysis Sections

Map 1



Legend

- Study Area
- Bridge Street North
- Bridge Street South
- Bridge Street Railroad
- Huntington Road
- Intersection
- Esplanade
- Volunteers Green Road
- Property Lines

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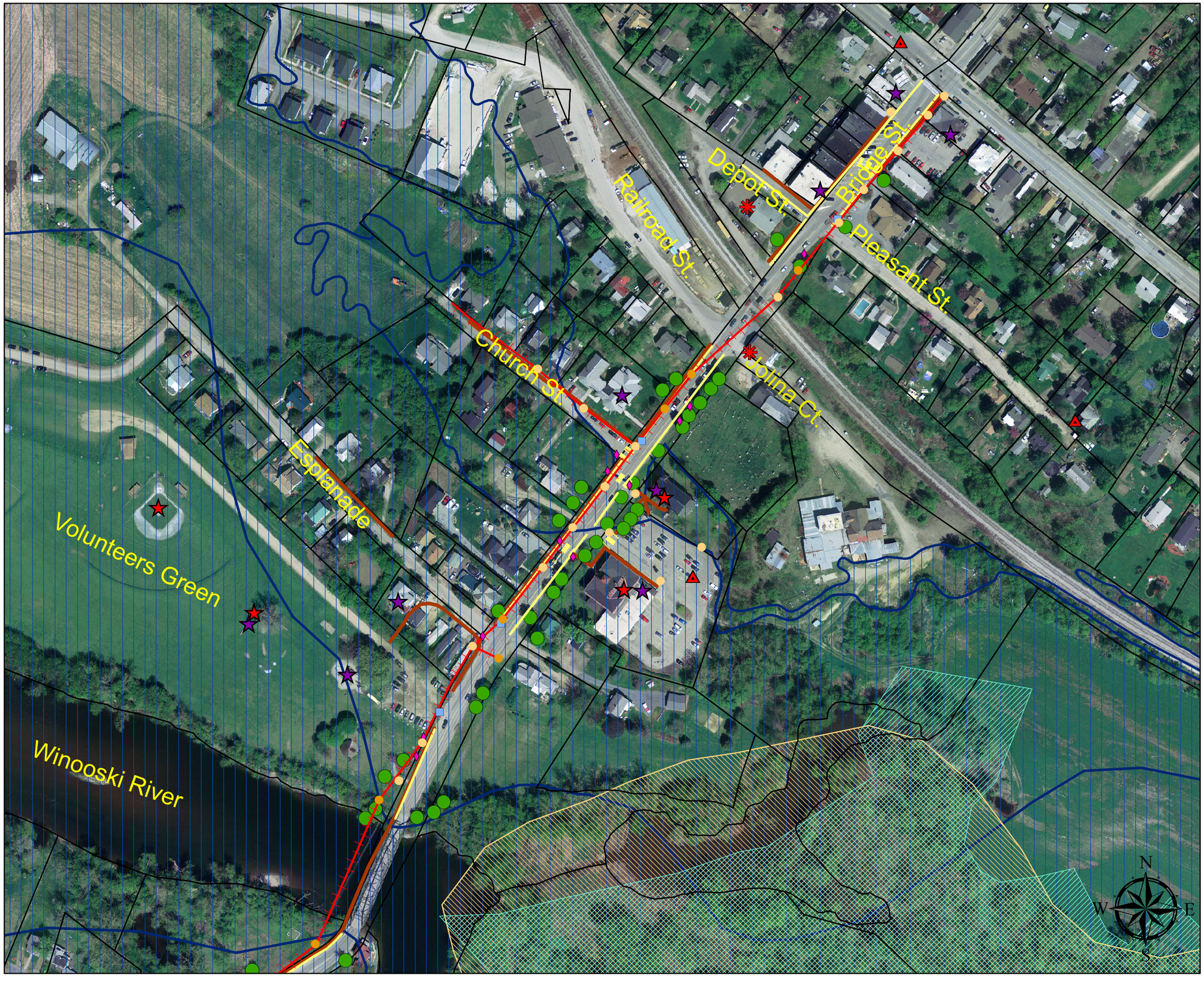
Heritage Landscapes LLC
Consulting Archeological Program

Bridge Street Bicycle & Pedestrian Feasibility Study

Richmond, Vermont

Existing Conditions North Section

Map 2a



Legend

- Bicycle Activity Center
- Pedestrian Activity Center
- Utility Pole
- Light Fixtures
- Signs
- Storm Drain Inlet
- Overhead Utility Line
- Curbs
- Crosswalks
- Street Trees
- Sidewalks
- Hazardous Waste Site
- Underground Storage Tank
- Property Lines
- Vermont State Wetlands
- Significant Natural Comm.
- 100/500 Year Flood Plain

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Bridge Street Bicycle & Pedestrian Feasibility Study

Richmond, Vermont

Existing Condtions South Section

Map 2b

Legend

- Bicycle Activity Center
- Pedestrian Activity Center
- Utility Pole
- Light Fixtures
- Signs
- Storm Drain Inlet
- Overhead Utility Line
- Curbs
- Crosswalks
- Street Trees
- Sidewalks
- Hazardous Waste Site
- Underground Storage Tank
- 100/500 Year Flood Plain
- Vermont State Wetlands
- Significant Natural Comm.
- Property Lines

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Bridge Street Bicycle & Pedestrian Feasibility Study

Richmond, Vermont

Recommendations North Section

Map 3a

Legend

- New Crosswalks
- Recommendation #1
- Recommendation #2
- Recommendation #3
- Recommendation #4
- Recommendation #5
- Recommendation #6
- New Street Trees
- Existing Crosswalks
- Existing Street Trees
- Existing Sidewalks
- Property Lines

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Bridge Street Bicycle & Pedestrian Feasibility Study

Richmond, Vermont

Recommendations South Section

Map 3b

Volunteers Green

Winooski River

Bridge St.

Huntington Rd.

Cochran Rd.

Round Church Green

N

W

E

S

Legend

- New Crosswalks
- Recommendation #7
- Recommendation #8
- Recommendation #11
- Recommendation #12
- Recommendation #13
- Recommendation #14
- New Street Trees
- Existing Crosswalks
- Existing Sidewalks
- Existing Street Trees
- Property Lines

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Appendix A
Existing Conditions

Town of Richmond, Vermont

Bridge Street Bicycle & Pedestrian Feasibility Study

Appendix A: Resource Identification/ Existing Conditions

Submitted by:

Broadreach Planning & Design

In conjunction with

Lamoureux & Dickinson Consulting Engineers, Inc

Heritage Landscapes LLC.

University of Vermont Consulting Archeological Program

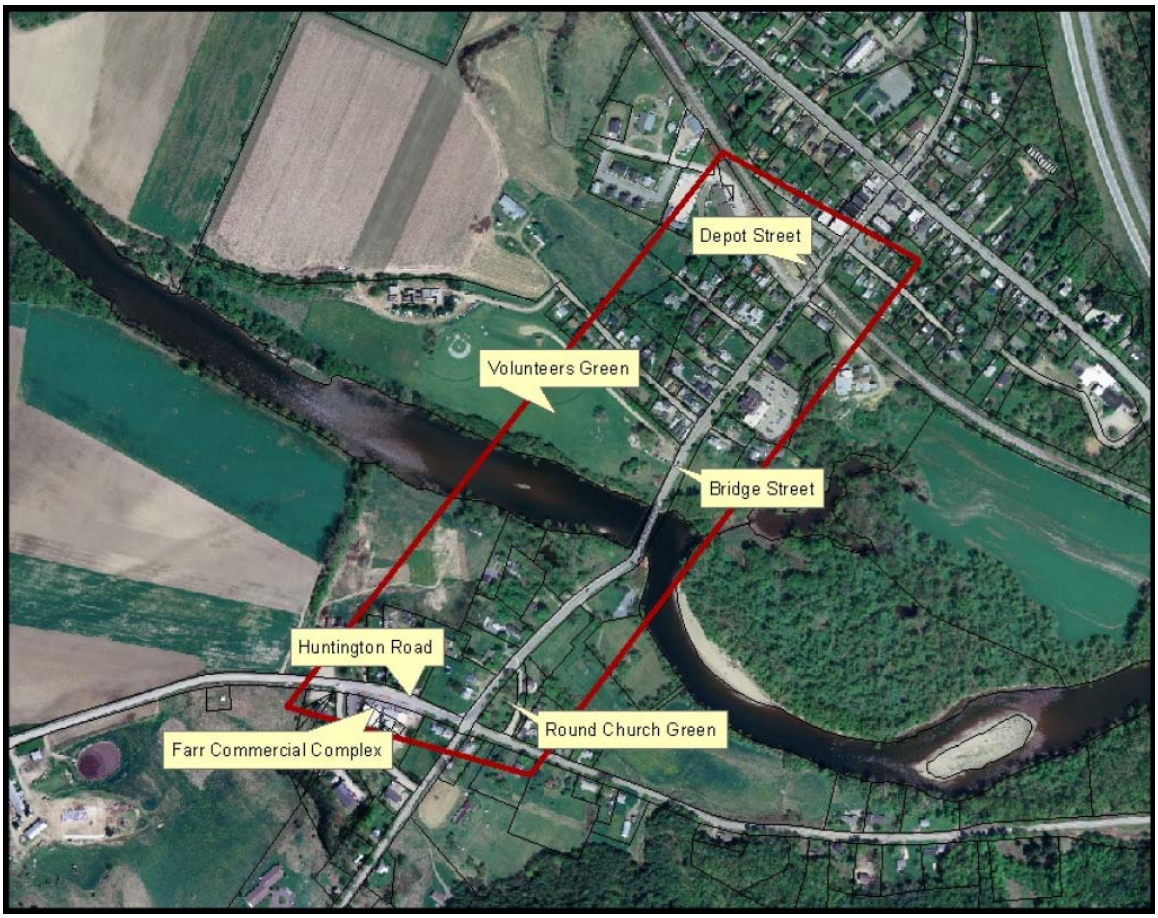
February 2010

INTRODUCTION

This review provides an overview of the existing conditions and resources along Bridge Street between Depot Street and its southern end, and along Huntington Road between Bridge Street and Farr Street. This is the general limits of the Study Area along the roadways, but it extends off the roadways a bit, as **Figure 3-1** shows.

This report is formatted for double sided printing.

Figure 3-1: Study Area



After this introduction, the report consists of nine additional sections addressing:

- The right-of-way and roadway geometry,
- Land use,
- Utilities,
- Natural Resources,
- Historic and Archeological Resources,
- Hazardous areas,
- Lighting,
- Signage, and
- Bicycle and pedestrian patterns.

RIGHT-OF-WAY AND ROADWAY GEOMETRY

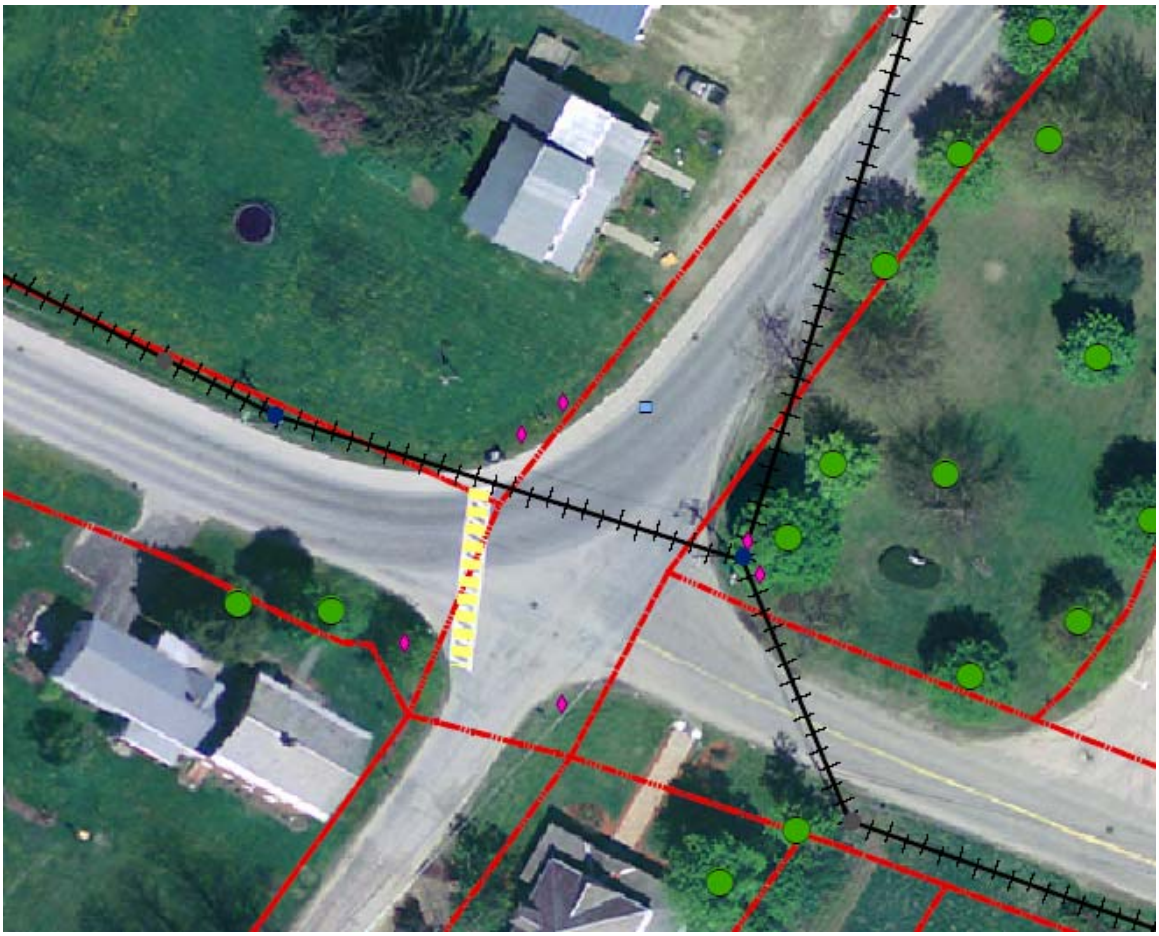
The Bridge Street and Huntington Road right-of-way within the Study Area are 3 rods wide – ±49 feet. The road is off-centered in the right-of-way. **Map 2a** and **2b** provide an overview of the existing information that is available to date. (These figures are collectively referenced as **Map 2** for the rest of this memo.)

The roadway is approximately 24-feet wide between the railroad and Church Street with two 12-foot wide travel lanes between asphalt curbs. The southbound lane of Bridge Street widens by approximately 3 feet between Church Street and Esplanade so that the total roadway is approximately 27 feet wide with a 15-foot wide southbound lane and a 12-foot wide northbound lane. South of Esplanade to the bridge, the road still maintains approximately a 26-foot width, but a variable width gravel shoulder makes the road appear wider. The bridge itself is approximately 18 feet wide with two 9-foot lanes. South of the bridge, the roadway is again approximately 24 feet wide with two twelve-foot travel lanes with a curb along the southbound lane.

Huntington Road west of the Bridge Street intersection is approximately 24 feet wide with two 12-foot travel lanes and a curb on the north side of the road. A curb defines the entrances to the Farr Shopping Area parking, but the curb line ends at the western end of the corner property on the north side of the roadway.

The northwest corner of the Bridge Street/Huntington Road/Thompson Road/Cochran Road intersection has been widened to facilitate turns at higher speeds from Bridge Street to Huntington Road and from Cochran Road to Bridge Street. The widening has taken the edges of the road out of the right-of-way as shown in **Figure 3-3**.

Figure 3-3: Huntington Road/Bridge Street Corner Detail



There is a continuous sidewalk along almost the entire length of the west side of Bridge Street in the Study Area. There is a break that extends from the northern end of the railroad right of way to the southern edge of Railroad Street. The sidewalk continues around the widened corner at Huntington Road and continues west approximately 180 feet, ending close to the western end of the corner property. There is no sidewalk on the east side of the street adjacent to the roadway, but there is a sidewalk set back from the roadway between the Town Offices and the Town Library.

Three crosswalks traverse Bridge Street, one in front of the Town Office, one in front of the Library, and one at the northern end of the Round Church Drive which crosses the road at an angle. There is one crosswalk on Huntington Road where it ends at Bridge Street. There is also a crosswalk on Church Street at the intersection with Bridge Street.

LAND USE

The land use along Bridge Street north of the Railroad is clearly commercial in nature. South of the railroad, the land use has a village residential feel, even though there are some businesses and institutional uses intermixed. The residential feel continues on the south side of the Winooski River, although the areas close to the River itself appear to be agricultural. The only other real commercial land use within the Study Area is located on the south side of Huntington Road east of Farr Street.

UTILITIES

OVERHEAD LINES

Overhead utility lines and poles line the west side of Bridge Street for most of the Study Area north of the Winooski River. Between Esplanade and Church Street, the utility poles are actually located in the street, adjacent to the west side curb. Between Church Street and Railroad Avenue, the utility poles are located in the small green space separating the sidewalk from the curb. The overhead utility lines cross over to the east side of the road north of the railroad. South of the Winooski River, the utility lines cross the roadway several times, ending on the north side of the roadway at the intersection with Huntington Road. The overhead utility lines line the north side of Huntington Road but lie along the south side of Cochran Road. **Map 2** shows the location of the utility poles and overhead wires.

SEWER & WATER

Sewer and water lines lie under the roadway mostly within the Bridge Street and Huntington Road rights-of-way. The specific location of these utilities has been surveyed as part of another study and will be included with the final utility information for this project if it is finalized and available.

STORM SEWER

There are stormwater drains under the roadway, but the specific direction and linkages between the few storm inlets on the north side of the Winooski are not now known. South of the River, the stormwater system was installed approximately ten years ago when the sidewalk was added to the west side of the road. This system empties into the Winooski River. This information is also being gathered by others and will be added to our data base when available. **Map 2** shows the location of existing storm inlets

NATURAL RESOURCES

WETLANDS

The most prominent natural resource within the Study Area is the Winooski River and associated wetlands. The most important mapped wetlands, which includes a State-identified Significant Natural Community, lies to the east of Bridge Street. **Map 2** highlights the specific location.
No other significant wetlands or critical wildlife habitat areas are located in the Study Area.

FLOODPLAINS

Portions of the Study Area close to the Winooski River are located within the 100 year flood plain. **Map 2** shows the location of the updated floodplain information, which is anticipated to be adopted in 2010. This information is used for this study because it is assumed that it will be officially in place when recommendations from this study may be implemented.

STEEP SLOPES

There are no significant slopes in the Study Area outside of those adjacent to the River. The slopes adjacent to the east side of Bridge Street north of the railroad are steep but only extend up a maximum of approximately 10 feet and are fully vegetated at this time. There are slight slopes along the sidewalk on both approaches to the bridge, as well as south of the bridge heading towards the Round Church Green.

STREET TREES

Most of the street trees along Bridge Street lie along the east side, most likely due to the presence of utility lines along much of the west side of the road. **Map 2** shows the location of existing street trees and other trees that are located close to the roadway.

SOILS

Attachment A contains a complete soils analysis of the Study Area. The soils report indicates that the area within the flood plain of the Winooski River is not well suited for the construction of roads due to the high water table. The soils data also indicates that there is a slight risk of off-road erosion hazards. Much of the study area is also not limited or only slightly limited for the construction of off-road trails.

HISTORIC AND ARCHEOLOGICAL RESOURCES

Heritage Landscapes conducted a review of the Study Area to assess potential historic resources in the project area. The focus of this review was the immediate areas along Bridge Street, including features in the right-of-way and the adjacent portions of abutting properties. The goal of the review

was to identify existing historic resources along the Bridge Street corridor that could potentially be affected by bicycle and pedestrian improvements. The Bridge Street Bridge and Round Church are both listed on the National Register of Historic Places, and additional structures are listed on the State Register of Historic Places.

The Village Cemetery, located on the east side of Bridge Street, represents an intact historic resource. The Village Cemetery has retained its current size and location at least since 1869, when it appeared on the Beers Atlas for Richmond, and its historic integrity remains high. At the periphery, the Village Cemetery is visually contained by tree plantings; the trees along Bridge Street provide separation between the busy street and the historic cemetery landscape. Too great an encroachment on the Village Cemetery would diminish the visual separation between the street and the cemetery, and undermine the Village Cemetery's character as an intact, contained, historic resource.

South of the Winooski River, the Round Church Green is an important historic resource, though the integrity of the Green has diminished slightly over time due to the loss of a portion of the landscape. The Round Church was built in 1812-1814 as a meetinghouse and place of worship, and the adjacent Green historically served as an important public landscape at the core of the community. Today, open lawn and trees both lining the street and scattered throughout the landscape characterize the Round Church Green. The original western section of the Green, across Bridge Street from the Green core, is no longer legible as part of the common, though it is still town-owned. Impacts to the core Green on the east side of the street should be avoided.

Retaining walls are positioned in several locations in the project area. South of the bridge, two retaining walls lie on the west side of the street. The more northerly wall appears to be historic and should be preserved as possible.

Attachment B includes a copy of the preliminary Historic Resource Assessment.

The archeological analysis of the site found that north of the Winooski River, the western portions of Volunteers Green and the property on the east side of the road across from Volunteers Green adjacent to the River are sensitive for archeological resources. South of the River, the open field north of the Round Church, Round Church Green, the lawn at the northeast corner of Bridge Street and Huntington Road, and the open/lawn area on the north side of Huntington Road across from Farr Road are also sensitive for archeological resources. One additional area, the large field at the western end of Old Brooklyn Court, is sensitive for archeological resources.

These areas should be examined in more detail if new bicycle or pedestrian facilities are proposed for these areas.

Attachment C includes a complete copy of the draft Archeological Resources Assessment.

HAZARDOUS AREAS

There are two sites within the Study Area listed on the States Hazardous Waste Database:

- The Sonoma Station parcel, and
- The Richmond Dentistry parcel.

The specific forms of contamination should not be affected by surface disturbances that may occur as part of the installation of bicycle or pedestrian improvements.

LIGHTING

Cobra head lights attached to the utility poles supply the lighting along Bridge Street and Huntington Road. **Map 2** shows the location of the utility poles that hold cobra light fixtures. The spacing of the lighting is not consistent, which results in an inconsistent light level along the road with lit sections separated by dark areas of unlit sections of variable length. Pedestrians and drivers typically have a few moments of reduced vision, which varies from person to person, as they pass from lighter to darker areas and their eyes adjust to the different lighting levels.

The cobra fixtures are the standard light fixture used by many communities. They are relatively inexpensive to install and maintain. They are not considered to be aesthetically pleasing nor scaled to pedestrian needs. When properly spaced, they do provide a consistent, acceptable light level for village streets.

There are also smaller, pedestrian scale light poles within the Town Center, with two close to the roadway.

SIGNAGE

There are a variety of regulatory and advisory signs along Bridge Street. Of special note are the crosswalk warning signs located on at each crosswalk for both directions of traffic on Bridge Street or Huntington Road, although there are not pre-warning signs for the crosswalks. **Map 2** shows the location and type of each sign along the roadway.

BICYCLE AND PEDESTRIAN PATTERNS

There is considerable pedestrian traffic that uses the sidewalk north of the Winooski River bridge. The levels are a bit less for the sidewalk south of the bridge. In general, pedestrian activity appears to be slightly higher than other Vermont Villages of similar scale, but there are not actual pedestrian counts to verify this observation.

More experienced bicyclists are currently using Huntington Road and Bridge Street, taking command of the travel lane when it is narrow, such as the bridge itself. The narrow width of the travel lane however, creates problems for most casual bicyclists, especially adjacent to the cemetery where curbs on both sides of the 12-foot lanes make them feel even smaller. Many less experienced bicyclists, including children, ride on the sidewalk. This often creates conflicts between bicyclists and pedestrians, especially on the bridge and its approaches.

When they have a destination, pedestrians and bicyclists are headed most often for:

- Volunteers Green;
- The adjacent bakery;
- The Town Library, Town Offices and Post Office;
- The Round Church;
- The businesses further north of Bridge Street, and
- The schools further to the north on Jericho Road.

Much of the pedestrian and bicycle traffic is more recreational in nature. People are just out to take a walk or a run or to ride their bicycles without having a real need to get to one destination or another.

PREVIOUS STUDIES

RICHMOND PEDESTRIAN FACILITY FEASIBILITY STUDY, Erik Sandblom, PC (ESPC) and Kathleen Ryan, Landscape Architect, January 2009

At the beginning of 2009, prior to undertaking this study, the Town of Richmond completed a study of pedestrian facility needs within the Village center. The relevant portion of the ESPC study for this project is the northern portion of Bridge Street between Main Street and Depot Street. This study overlaps with the Study Area of this project for portion of Bridge Street between Depot Street and the Railroad. The ESPC study's preferred alternative includes extending the existing sidewalk on the east side of Bridge Street close to Main Street south to the railroad track. There is no real discussion of how much it will need to cut into the hillside south of Pleasant Street. The preferred alternative also includes replacing the west sidewalk south of Depot Street with a newer five-foot wide concrete sidewalk, and the addition of a three foot shoulder on the northbound side of the roadway between the Railroad and Pleasant Street.

Crosswalks are also included across Pleasant Street, Depot Street, and the access drive north of the railroad, as well as on Bridge Street on the north side of the Depot/Pleasant Streets intersection. The curb is also recommended to be extended into the roadway on the west side of the street at this cross walk to minimize the distance pedestrian need to travel across the roadway.

The base plans for this study used to show the preferred alternative indicate that the sidewalk on the west side of the street south of Depot Street is mostly outside of the Bridge Street Right of way. It also shows Bridge Street south of the railroad track, near the bottom limit of the image, positioned

far to the west within the right-of-way and that the sidewalk is completely outside of the right-of-way.

RICHMOND VILLAGE PARKING STUDY, Resource Systems Group, Inc., 2007

The parking study covered the main roads in the village area. The recommendations relevant to this project include:

- The installation of bike racks in the village area,
- The addition of an extra parallel parking space and a loading space on the north side of Depot Street,
- The addition of parallel parking spaces along the east side of Bridge Street from Pleasant Street to the Town offices as well as a five-foot side concrete sidewalk directly adjacent to the parking spaces, and
- The addition of formalized parking on the Depot Street lot recently purchased by the Town.

RICHMOND DOWNTOWN STREETSCAPE, Kathleen Ryan, Landscape Architect with Arnold and Scangas Architects and Julie Campoli, landscape Architects, September 1998

This study recommends streetscape improvements for the main roads in the village, including Bridge Street from Main Street to the Railroad Street. The study recommends the addition of street trees on the slope on the east side of Bridge Street between Pleasant Street and the railroad. It also recommends a sidewalk extending south from the end of the existing sidewalk on the west side of Bridge Street north of the railroad across the railroad tracks to Railroad Street.

ATTACHMENT A
Soils Report

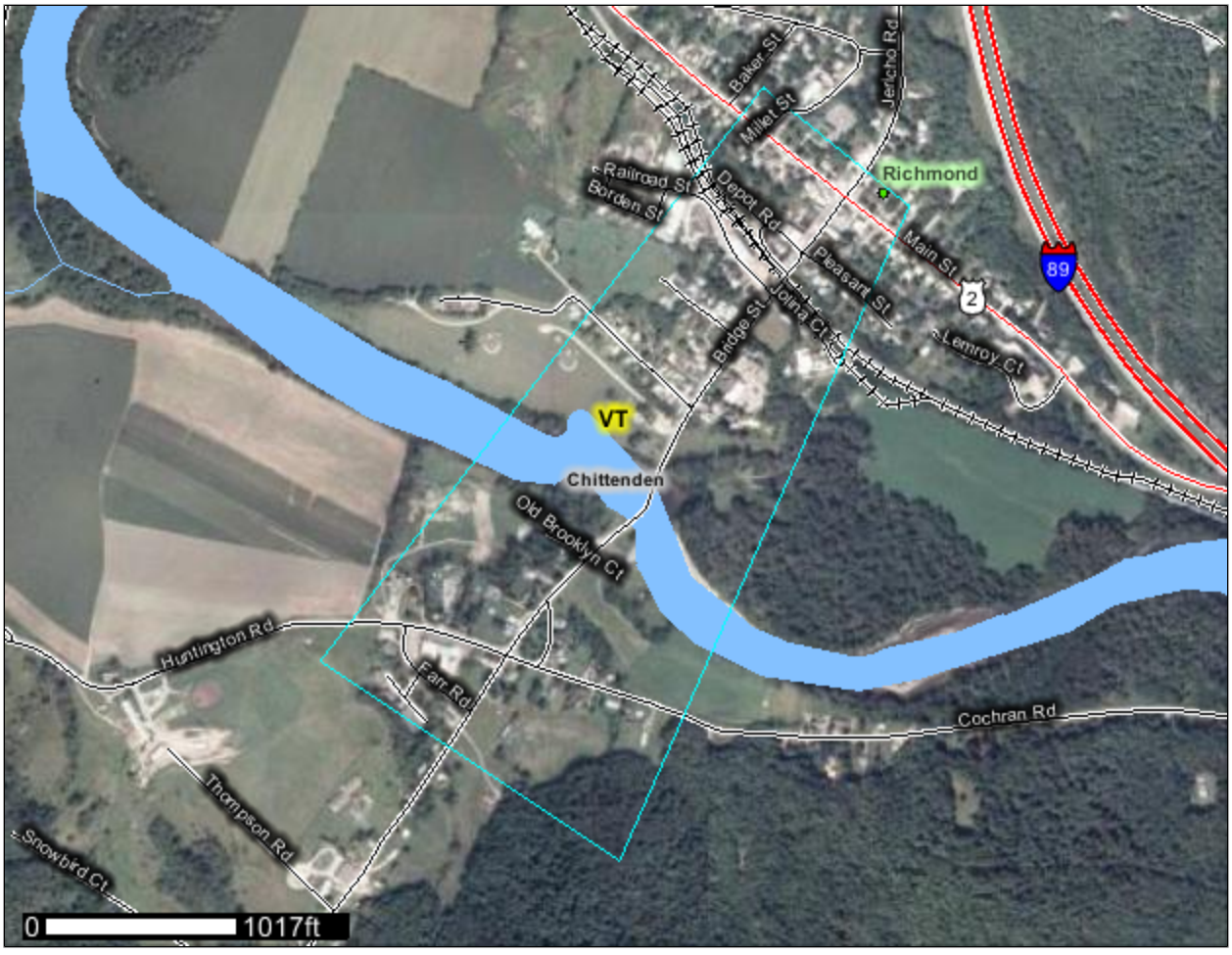
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Chittenden County, Vermont



October 29, 2009

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://soils.usda.gov/sqi/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://soils.usda.gov/contact/state_offices/).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Soil Data Mart Web site or the NRCS Web Soil Survey. The Soil Data Mart is the data storage site for the official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means

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Contents

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map (Bridge Street Richmond, VT)

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features
- Gully
- Short Steep Slope
- Other

Political Features
- Cities

Water Features
- Oceans
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:7,600 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:15,840.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 18N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Chittenden County, Vermont
Survey Area Data: Version 14, Jun 10, 2009

Date(s) aerial images were photographed: 8/20/2003

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend (Bridge Street Richmond, VT)

Chittenden County, Vermont (VT007)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
AgA	Agawam fine sandy loam, 0 to 5 percent slopes	25.6	20.8%
AgD	Agawam fine sandy loam, 12 to 30 percent slopes	0.4	0.3%
AgE	Agawam fine sandy loam, 30 to 60 percent slopes	5.7	4.6%
DdA	Duane and Deerfield soils, 0 to 5 percent slopes	6.8	5.5%
DdB	Duane and Deerfield soils, 5 to 12 percent slopes	18.8	15.3%
Hf	Hadley very fine sandy loam	21.5	17.5%
Hh	Hadley very fine sandy loam, frequently flooded	18.5	15.0%
HnE	Hinesburg fine sandy loam, 25 to 60 percent slopes	2.5	2.0%
MyC	Munson and Raynham silt loams, 6 to 12 percent slopes	1.2	1.0%
W	Water	8.3	6.7%
Wo	Winooski very fine sandy loam	13.8	11.2%
Totals for Area of Interest		**123.2**	**100.0%**

Map Unit Descriptions (Bridge Street Richmond, VT)

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a

particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Chittenden County, Vermont

AgA—Agawam fine sandy loam, 0 to 5 percent slopes

Map Unit Setting

Elevation: 90 to 1,200 feet
Mean annual precipitation: 30 to 50 inches
Mean annual air temperature: 37 to 52 degrees F
Frost-free period: 90 to 180 days

Map Unit Composition

Agawam and similar soils: 85 percent
Minor components: 15 percent

Description of Agawam

Setting

Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Parent material: Coarse-loamy glaciofluvial deposits over sandy and gravelly glaciofluvial deposits

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 5.4 inches)

Interpretive groups

Land capability (nonirrigated): 1

Typical profile

0 to 9 inches: Fine sandy loam
9 to 18 inches: Fine sandy loam
18 to 32 inches: Loamy sand
32 to 65 inches: Gravelly loamy fine sand

Minor Components

Adams

Percent of map unit: 3 percent
Landform: Terraces

Deerfield

Percent of map unit: 3 percent
Landform: Deltas, terraces

Hartland

Percent of map unit: 3 percent

Ninigret
Percent of map unit: 3 percent

Windsor
Percent of map unit: 3 percent
Landform: Terraces

AgD—Agawam fine sandy loam, 12 to 30 percent slopes

Map Unit Setting
Elevation: 90 to 1,200 feet
Mean annual precipitation: 30 to 50 inches
Mean annual air temperature: 37 to 52 degrees F
Frost-free period: 90 to 180 days

Map Unit Composition
Agawam and similar soils: 85 percent
Minor components: 15 percent

Description of Agawam

Setting
Landform: Terraces
Landform position (three-dimensional): Riser
Down-slope shape: Concave, convex
Across-slope shape: Concave, convex
Parent material: Coarse-loamy glaciofluvial deposits over sandy and gravelly glaciofluvial deposits

Properties and qualities
Slope: 12 to 30 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 5.4 inches)

Interpretive groups
Land capability (nonirrigated): 4e

Typical profile
0 to 9 inches: Fine sandy loam
9 to 18 inches: Fine sandy loam
18 to 32 inches: Loamy sand
32 to 65 inches: Gravelly loamy fine sand

Minor Components

Adams
Percent of map unit: 5 percent
Landform: Terraces

Hartland
Percent of map unit: 5 percent

Windsor
Percent of map unit: 5 percent
Landform: Terraces

AgE—Agawam fine sandy loam, 30 to 60 percent slopes

Map Unit Setting
Elevation: 90 to 1,200 feet
Mean annual precipitation: 30 to 50 inches
Mean annual air temperature: 37 to 52 degrees F
Frost-free period: 90 to 180 days

Map Unit Composition
Agawam and similar soils: 85 percent
Minor components: 15 percent

Description of Agawam

Setting
Landform: Terraces
Landform position (three-dimensional): Riser
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Coarse-loamy glaciofluvial deposits over sandy and gravelly glaciofluvial deposits

Properties and qualities
Slope: 30 to 60 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 5.4 inches)

Interpretive groups
Land capability (nonirrigated): 7e

Typical profile
0 to 9 inches: Fine sandy loam
9 to 18 inches: Fine sandy loam

18 to 32 inches: Loamy sand
32 to 65 inches: Gravelly loamy fine sand

Minor Components

Adams
Percent of map unit: 3 percent
Landform: Terraces

Munson
Percent of map unit: 3 percent

Raynham
Percent of map unit: 3 percent
Landform: Drainageways

Scantic
Percent of map unit: 3 percent
Landform: Drainageways

Windsor
Percent of map unit: 3 percent
Landform: Terraces

DdA—Duane and Deerfield soils, 0 to 5 percent slopes

Map Unit Setting
Elevation: 90 to 1,200 feet
Mean annual precipitation: 30 to 50 inches
Mean annual air temperature: 37 to 52 degrees F
Frost-free period: 90 to 180 days

Map Unit Composition
Deerfield and similar soils: 45 percent
Duane and similar soils: 45 percent
Minor components: 10 percent

Description of Duane

Setting
Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy and gravelly glaciofluvial deposits

Properties and qualities
Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: About 18 to 24 inches

Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 1.5 inches)

Interpretive groups
Land capability (nonirrigated): 3w

Typical profile
0 to 4 inches: Fine sandy loam
4 to 11 inches: Gravelly loamy fine sand
11 to 15 inches: Gravelly loamy fine sand
15 to 52 inches: Very gravelly sand

Description of Deerfield

Setting
Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy glaciofluvial deposits

Properties and qualities
Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)
Depth to water table: About 18 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 3.6 inches)

Interpretive groups
Land capability (nonirrigated): 3w

Typical profile
0 to 6 inches: Fine sandy loam
6 to 22 inches: Loamy sand
22 to 65 inches: Sand

Minor Components

Au gres
Percent of map unit: 10 percent

DdB—Duane and Deerfield soils, 5 to 12 percent slopes

Map Unit Setting
Elevation: 90 to 1,200 feet
Mean annual precipitation: 30 to 50 inches

Mean annual air temperature: 37 to 52 degrees F
Frost-free period: 90 to 180 days

Map Unit Composition
Deerfield and similar soils: 42 percent
Duane and similar soils: 42 percent
Minor components: 16 percent

Description of Duane

Setting
Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Sandy and gravelly glaciofluvial deposits

Properties and qualities
Slope: 5 to 12 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: About 18 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 1.5 inches)

Interpretive groups
Land capability (nonirrigated): 3w

Typical profile
0 to 4 inches: Fine sandy loam
4 to 11 inches: Gravelly loamy fine sand
11 to 15 inches: Gravelly loamy fine sand
15 to 52 inches: Very gravelly sand

Description of Deerfield

Setting
Landform: Terraces
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Sandy glaciofluvial deposits

Properties and qualities
Slope: 5 to 12 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)
Depth to water table: About 18 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 3.6 inches)

Interpretive groups
Land capability (nonirrigated): 3e

Typical profile

0 to 6 inches: Fine sandy loam
6 to 22 inches: Loamy sand
22 to 65 inches: Sand

Minor Components

Adams

Percent of map unit: 3 percent
Landform: Terraces

Colton

Percent of map unit: 3 percent
Landform: Terraces

Stetson

Percent of map unit: 3 percent

Windsor

Percent of map unit: 3 percent
Landform: Terraces

Agawam

Percent of map unit: 2 percent

Au gres

Percent of map unit: 2 percent

Hf—Hadley very fine sandy loam

Map Unit Setting

Elevation: 90 to 1,000 feet
Mean annual precipitation: 30 to 50 inches
Mean annual air temperature: 45 to 52 degrees F
Frost-free period: 120 to 180 days

Map Unit Composition

Hadley and similar soils: 85 percent
Minor components: 15 percent

Description of Hadley

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Coarse-silty alluvium

Properties and qualities

Slope: 0 to 3 percent

Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 48 to 72 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water capacity: High (about 10.5 inches)

Interpretive groups
Land capability (nonirrigated): 1

Typical profile
0 to 11 inches: Very fine sandy loam
11 to 68 inches: Very fine sandy loam
68 to 72 inches: Silt loam

Minor Components

Agawam
Percent of map unit: 5 percent

Occum
Percent of map unit: 5 percent
Landform: Flood plains

Winooski
Percent of map unit: 5 percent
Landform: Flood plains

Hh—Hadley very fine sandy loam, frequently flooded

Map Unit Setting
Elevation: 90 to 1,000 feet
Mean annual precipitation: 30 to 50 inches
Mean annual air temperature: 45 to 52 degrees F
Frost-free period: 120 to 180 days

Map Unit Composition
Hadley and similar soils: 85 percent
Minor components: 15 percent

Description of Hadley

Setting
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Coarse-silty alluvium

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 48 to 72 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Available water capacity: High (about 10.5 inches)

Interpretive groups

Land capability (nonirrigated): 1

Typical profile

0 to 11 inches: Very fine sandy loam
11 to 68 inches: Very fine sandy loam
68 to 72 inches: Silt loam

Minor Components

Limerick

Percent of map unit: 5 percent
Landform: Depressions on flood plains

Occum

Percent of map unit: 5 percent
Landform: Flood plains

Winooski

Percent of map unit: 5 percent
Landform: Flood plains

HnE—Hinesburg fine sandy loam, 25 to 60 percent slopes

Map Unit Setting

Elevation: 90 to 1,200 feet
Mean annual precipitation: 30 to 50 inches
Mean annual air temperature: 37 to 52 degrees F
Frost-free period: 90 to 180 days

Map Unit Composition

Hinesburg and similar soils: 85 percent
Minor components: 15 percent

Description of Hinesburg

Setting

Landform: Terraces
Landform position (three-dimensional): Riser
Down-slope shape: Concave

Across-slope shape: Concave
Parent material: Sandy glaciofluvial deposits over loamy glaciolacustrine deposits

Properties and qualities

Slope: 25 to 60 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: About 24 to 48 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 8.8 inches)

Interpretive groups

Land capability (nonirrigated): 7e

Typical profile

0 to 8 inches: Fine sandy loam
8 to 28 inches: Loamy fine sand
28 to 65 inches: Very fine sandy loam

Minor Components

Adams

Percent of map unit: 8 percent
Landform: Terraces

Windsor

Percent of map unit: 7 percent
Landform: Terraces

MyC—Munson and Raynham silt loams, 6 to 12 percent slopes

Map Unit Setting

Elevation: 90 to 1,000 feet
Mean annual precipitation: 30 to 50 inches
Mean annual air temperature: 45 to 52 degrees F
Frost-free period: 120 to 180 days

Map Unit Composition

Raynham and similar soils: 45 percent
Munson and similar soils: 45 percent
Minor components: 10 percent

Description of Munson

Setting

Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave

Parent material: Coarse-silty glaciolacustrine deposits over clayey glaciolacustrine deposits

Properties and qualities

Slope: 6 to 12 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: About 6 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: High (about 10.6 inches)

Interpretive groups

Land capability (nonirrigated): 3e

Typical profile

0 to 8 inches: Silt loam
8 to 15 inches: Silt loam
15 to 65 inches: Silty clay

Description of Raynham

Setting

Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Coarse-silty glaciolacustrine deposits

Properties and qualities

Slope: 6 to 12 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 0 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Available water capacity: High (about 11.6 inches)

Interpretive groups

Land capability (nonirrigated): 3w

Typical profile

0 to 6 inches: Silt loam
6 to 22 inches: Silt loam
22 to 65 inches: Silt loam

Minor Components

Belgrade

Percent of map unit: 5 percent

Hartland

Percent of map unit: 5 percent

W—Water

Map Unit Composition
Water: 100 percent

Wo—Winooski very fine sandy loam

Map Unit Setting
Elevation: 90 to 1,000 feet
Mean annual precipitation: 30 to 50 inches
Mean annual air temperature: 45 to 52 degrees F
Frost-free period: 120 to 180 days

Map Unit Composition
Winooski and similar soils: 85 percent
Minor components: 15 percent

Description of Winooski

Setting
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Coarse-silty alluvium

Properties and qualities
Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: About 18 to 36 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water capacity: High (about 10.4 inches)

Interpretive groups
Land capability (nonirrigated): 2w

Typical profile
0 to 10 inches: Very fine sandy loam
10 to 60 inches: Very fine sandy loam

Minor Components

Hadley
Percent of map unit: 5 percent

Landform: Flood plains

Limerick

Percent of map unit: 5 percent
Landform: Depressions on flood plains

Pootatuck

Percent of map unit: 5 percent
Landform: Flood plains

Soil Information for All Uses

Suitabilities and Limitations for Use

The Suitabilities and Limitations for Use section includes various soil interpretations displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each interpretation.

Building Site Development

Building site development interpretations are designed to be used as tools for evaluating soil suitability and identifying soil limitations for various construction purposes. As part of the interpretation process, the rating applies to each soil in its described condition and does not consider present land use. Example interpretations can include corrosion of concrete and steel, shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping.

Local Roads and Streets ( )

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or soil material stabilized by lime or cement; and a surface of flexible material (asphalt), rigid material (concrete), or gravel with a binder. The ratings are based on the soil properties that affect the ease of excavation and grading and the traffic-supporting capacity. The properties that affect the ease of excavation and grading are depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, depth to a water table, ponding, flooding, the amount of large stones, and slope. The properties that affect the traffic-supporting capacity are soil strength (as inferred from the AASHTO group index number), subsidence, linear extensibility (shrink-swell potential), the potential for frost action, depth to a water table, and ponding.

The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect the specified use. "Not limited" indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. "Somewhat limited" indicates that the soil has features that are moderately favorable for the

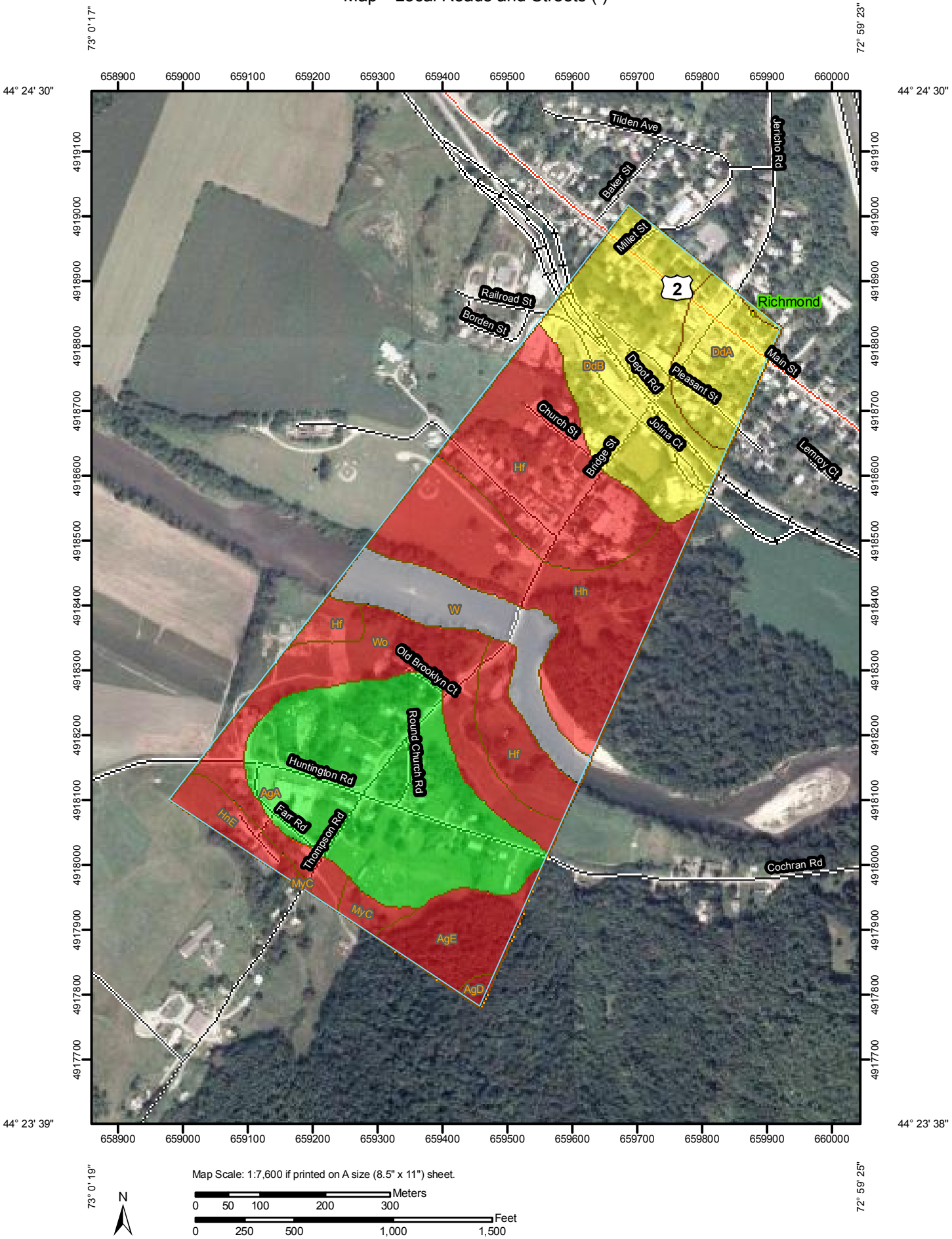
specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. "Very limited" indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

The map unit components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as listed for the map unit. The percent composition of each component in a particular map unit is presented to help the user better understand the percentage of each map unit that has the rating presented.

Other components with different ratings may be present in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.

Custom Soil Resource Report
Map—Local Roads and Streets ( )



MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Units

Soil Ratings

- Very limited
- Somewhat limited
- Not limited
- Not rated or not available

Political Features

- Cities

Water Features

- Oceans
- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:7,600 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:15,840.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 18N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Chittenden County, Vermont
Survey Area Data: Version 14, Jun 10, 2009

Date(s) aerial images were photographed: 8/20/2003

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Tables—Local Roads and Streets ( )

Local Roads and Streets— Summary by Map Unit — Chittenden County, Vermont						
Map unit symbol	**Map unit name**	**Rating**	**Component name (percent)**	**Rating reasons (numeric values)**	**Acres in AOI**	**Percent of AOI**
AgA	Agawam fine sandy loam, 0 to 5 percent slopes	Not limited	Agawam (85%)		25.6	20.8%
			Adams (3%)			
			Windsor (3%)			
AgD	Agawam fine sandy loam, 12 to 30 percent slopes	Very limited	Agawam (85%)	Too steep (1.00)	0.4	0.3%
			Adams (5%)	Too steep (1.00)		
			Hartland (5%)	Frost action (1.00)		
				Too steep (1.00)		
			Windsor (5%)	Too steep (1.00)		
AgE	Agawam fine sandy loam, 30 to 60 percent slopes	Very limited	Agawam (85%)	Too steep (1.00)	5.7	4.6%
			Adams (3%)	Too steep (1.00)		
			Munson (3%)	Depth to saturated zone (1.00)		
				Frost action (1.00)		
				Low strength (1.00)		
				Too steep (1.00)		
				Shrink-swell (0.50)		
			Raynham (3%)	Depth to saturated zone (1.00)		
				Frost action (1.00)		
				Slope (0.04)		
			Scantic (3%)	Depth to saturated zone (1.00)		
				Frost action (1.00)		
				Low strength (1.00)		
				Shrink-swell (0.50)		
			Windsor (3%)	Too steep (1.00)		
DdA	Duane and Deerfield soils, 0 to 5 percent slopes	Somewhat limited	Duane (45%)	Depth to saturated zone (0.43)	6.8	5.5%
			Deerfield (45%)	Frost action (0.50)		
				Depth to saturated zone (0.03)		

Local Roads and Streets— Summary by Map Unit — Chittenden County, Vermont						
Map unit symbol	**Map unit name**	**Rating**	**Component name (percent)**	**Rating reasons (numeric values)**	**Acres in AOI**	**Percent of AOI**
DdB	Duane and Deerfield soils, 5 to 12 percent slopes	Somewhat limited	Duane (42%)	Depth to saturated zone (0.43)	18.8	15.3%
				Slope (0.04)		
			Deerfield (42%)	Frost action (0.50)		
				Slope (0.04)		
				Depth to saturated zone (0.03)		
			Adams (3%)	Slope (0.04)		
			Colton (3%)	Slope (0.04)		
			Stetson (3%)	Slope (0.04)		
			Windsor (3%)	Slope (0.04)		
			Agawam (2%)	Slope (0.04)		
Hf	Hadley very fine sandy loam	Very limited	Hadley (85%)	Frost action (1.00)	21.5	17.5%
				Flooding (1.00)		
			Occum (5%)	Flooding (1.00)		
				Frost action (0.50)		
			Winooski (5%)	Frost action (1.00)		
				Flooding (1.00)		
				Depth to saturated zone (0.03)		
Hh	Hadley very fine sandy loam, frequently flooded	Very limited	Hadley (85%)	Frost action (1.00)	18.5	15.0%
				Flooding (1.00)		
			Limerick (5%)	Depth to saturated zone (1.00)		
				Frost action (1.00)		
				Flooding (1.00)		
			Occum (5%)	Flooding (1.00)		
				Frost action (0.50)		
			Winooski (5%)	Frost action (1.00)		
				Flooding (1.00)		
				Depth to saturated zone (0.03)		
HnE	Hinesburg fine sandy loam, 25 to 60 percent slopes	Very limited	Hinesburg (85%)	Too steep (1.00)	2.5	2.0%
				Frost action (0.50)		
			Adams (8%)	Too steep (1.00)		
			Windsor (7%)	Too steep (1.00)		

Local Roads and Streets— Summary by Map Unit — Chittenden County, Vermont						
Map unit symbol	**Map unit name**	**Rating**	**Component name (percent)**	**Rating reasons (numeric values)**	**Acres in AOI**	**Percent of AOI**
MyC	Munson and Raynham silt loams, 6 to 12 percent slopes	Very limited	Munson (45%)	Depth to saturated zone (1.00)	1.2	1.0%
				Frost action (1.00)		
				Low strength (1.00)		
				Shrink-swell (0.50)		
				Slope (0.04)		
			Raynham (45%)	Depth to saturated zone (1.00)		
				Frost action (1.00)		
				Slope (0.04)		
			Belgrade (5%)	Frost action (1.00)		
				Depth to saturated zone (0.35)		
				Slope (0.04)		
			Hartland (5%)	Frost action (1.00)		
				Slope (0.04)		
W	Water	Not rated	Water (100%)		8.3	6.7%
Wo	Winooski very fine sandy loam	Very limited	Winooski (85%)	Frost action (1.00)	13.8	11.2%
				Flooding (1.00)		
				Depth to saturated zone (0.03)		
			Hadley (5%)	Frost action (1.00)		
				Flooding (1.00)		
			Limerick (5%)	Depth to saturated zone (1.00)		
				Frost action (1.00)		
				Flooding (1.00)		
			Pootatuck (5%)	Flooding (1.00)		
				Frost action (0.50)		
				Depth to saturated zone (0.19)		
Totals for Area of Interest					**123.2**	**100.0%**

Local Roads and Streets— Summary by Rating Value		
Rating	**Acres in AOI**	**Percent of AOI**
Very limited	63.6	51.7%
Somewhat limited	25.7	20.8%
Not limited	25.6	20.8%
Null or Not Rated	8.3	6.7%
Totals for Area of Interest	**123.2**	**100.0%**

Rating Options—Local Roads and Streets ( )

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Shallow Excavations ( )

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for graves, utility lines, open ditches, or other purposes. The ratings are based on the soil properties that influence the ease of digging and the resistance to sloughing. Depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, the amount of large stones, and dense layers influence the ease of digging, filling, and compacting. Depth to the seasonal high water table, flooding, and ponding may restrict the period when excavations can be made. Slope influences the ease of using machinery. Soil texture, depth to the water table, and linear extensibility (shrink-swell potential) influence the resistance to sloughing.

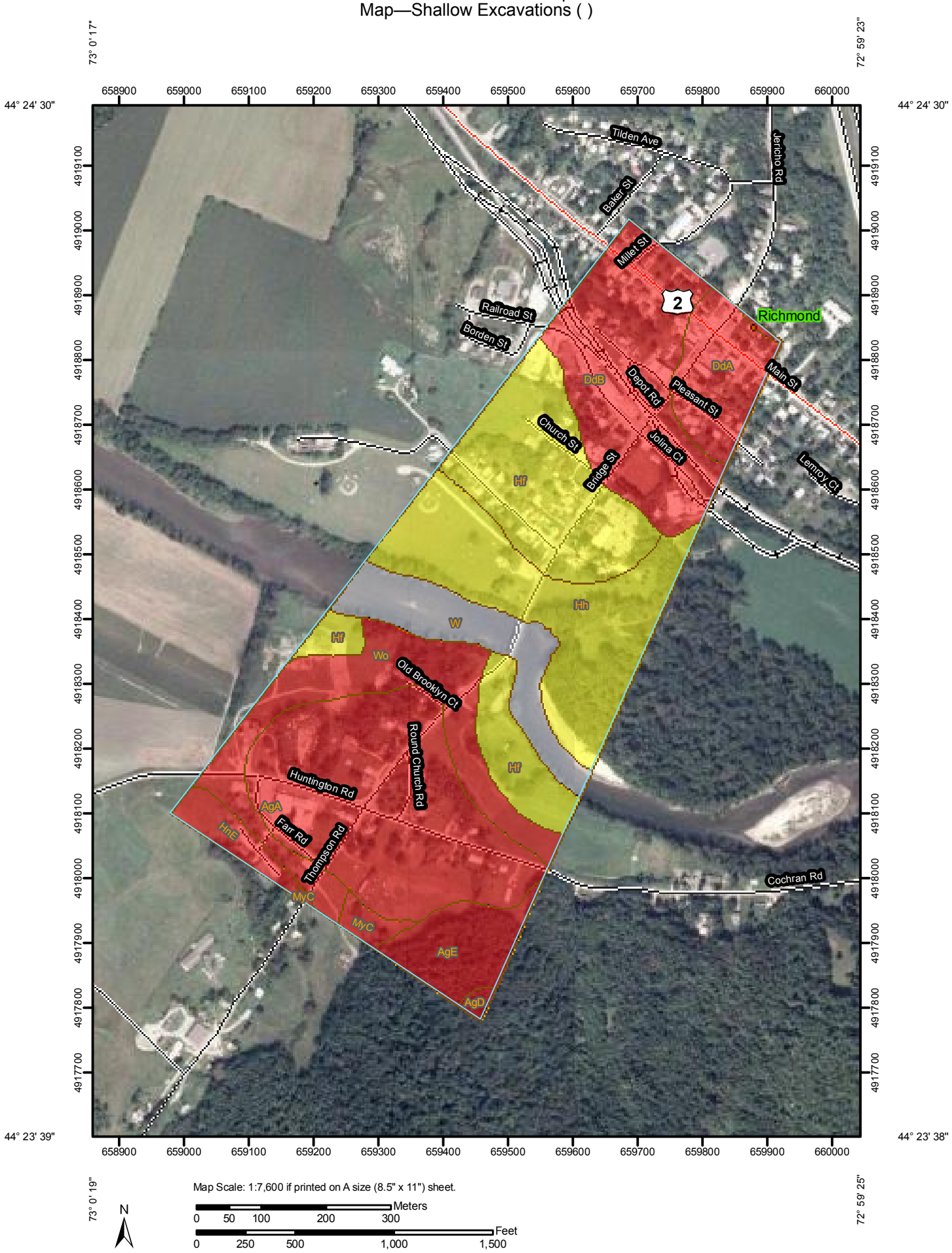
The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect the specified use. "Not limited" indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. "Somewhat limited" indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. "Very limited" indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

The map unit components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as listed for the map unit. The percent composition of each component in a particular map unit is presented to help the user better understand the percentage of each map unit that has the rating presented.

Other components with different ratings may be present in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.

Custom Soil Resource Report
Map—Shallow Excavations ( )



MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Units

Soil Ratings

- Very limited
- Somewhat limited
- Not limited
- Not rated or not available

Political Features

- Cities

Water Features

- Oceans
- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:7,600 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:15,840.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 18N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Chittenden County, Vermont
Survey Area Data: Version 14, Jun 10, 2009

Date(s) aerial images were photographed: 8/20/2003

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Tables—Shallow Excavations ( )

Shallow Excavations— Summary by Map Unit — Chittenden County, Vermont						
Map unit symbol	**Map unit name**	**Rating**	**Component name (percent)**	**Rating reasons (numeric values)**	**Acres in AOI**	**Percent of AOI**
AgA	Agawam fine sandy loam, 0 to 5 percent slopes	Very limited	Agawam (85%)	Cutbanks cave (1.00)	25.6	20.8%
			Adams (3%)	Cutbanks cave (1.00)		
			Deerfield (3%)	Depth to saturated zone (1.00)		
				Cutbanks cave (1.00)		
			Ninigret (3%)	Depth to saturated zone (1.00)		
				Cutbanks cave (1.00)		
			Windsor (3%)	Cutbanks cave (1.00)		
AgD	Agawam fine sandy loam, 12 to 30 percent slopes	Very limited	Agawam (85%)	Cutbanks cave (1.00)	0.4	0.3%
				Too steep (1.00)		
			Adams (5%)	Cutbanks cave (1.00)		
				Too steep (1.00)		
			Hartland (5%)	Too steep (1.00)		
				Cutbanks cave (0.10)		
			Windsor (5%)	Cutbanks cave (1.00)		
				Too steep (1.00)		
AgE	Agawam fine sandy loam, 30 to 60 percent slopes	Very limited	Agawam (85%)	Too steep (1.00)	5.7	4.6%
				Cutbanks cave (1.00)		
			Adams (3%)	Too steep (1.00)		
				Cutbanks cave (1.00)		
			Munson (3%)	Depth to saturated zone (1.00)		
				Too steep (1.00)		
				Too clayey (0.28)		
				Cutbanks cave (0.10)		
			Raynham (3%)	Depth to saturated zone (1.00)		
				Cutbanks cave (0.10)		
				Slope (0.04)		
			Scantic (3%)	Depth to saturated zone (1.00)		
				Too clayey (0.13)		
				Cutbanks cave (0.10)		
			Windsor (3%)	Too steep (1.00)		
				Cutbanks cave (1.00)		

Shallow Excavations— Summary by Map Unit — Chittenden County, Vermont						
Map unit symbol	**Map unit name**	**Rating**	**Component name (percent)**	**Rating reasons (numeric values)**	**Acres in AOI**	**Percent of AOI**
DdA	Duane and Deerfield soils, 0 to 5 percent slopes	Very limited	Duane (45%)	Depth to saturated zone (1.00)	6.8	5.5%
				Cutbanks cave (1.00)		
			Deerfield (45%)	Depth to saturated zone (1.00)		
				Cutbanks cave (1.00)		
			Au Gres (10%)	Depth to saturated zone (1.00)		
				Cutbanks cave (1.00)		
DdB	Duane and Deerfield soils, 5 to 12 percent slopes	Very limited	Duane (42%)	Depth to saturated zone (1.00)	18.8	15.3%
				Cutbanks cave (1.00)		
				Slope (0.04)		
			Deerfield (42%)	Depth to saturated zone (1.00)		
				Cutbanks cave (1.00)		
				Slope (0.04)		
			Adams (3%)	Cutbanks cave (1.00)		
				Slope (0.04)		
			Colton (3%)	Cutbanks cave (1.00)		
				Slope (0.04)		
			Stetson (3%)	Cutbanks cave (1.00)		
				Slope (0.04)		
			Windsor (3%)	Cutbanks cave (1.00)		
				Slope (0.04)		
			Agawam (2%)	Cutbanks cave (1.00)		
				Slope (0.04)		
			Au Gres (2%)	Depth to saturated zone (1.00)		
				Cutbanks cave (1.00)		
Hf	Hadley very fine sandy loam	Somewhat limited	Hadley (85%)	Flooding (0.60)	21.5	17.5%
				Depth to saturated zone (0.15)		
				Cutbanks cave (0.10)		
Hh	Hadley very fine sandy loam, frequently flooded	Somewhat limited	Hadley (85%)	Flooding (0.80)	18.5	15.0%
				Depth to saturated zone (0.15)		
				Cutbanks cave (0.10)		

Shallow Excavations— Summary by Map Unit — Chittenden County, Vermont						
Map unit symbol	**Map unit name**	**Rating**	**Component name (percent)**	**Rating reasons (numeric values)**	**Acres in AOI**	**Percent of AOI**
HnE	Hinesburg fine sandy loam, 25 to 60 percent slopes	Very limited	Hinesburg (85%)	Too steep (1.00)	2.5	2.0%
				Cutbanks cave (1.00)		
				Depth to saturated zone (0.95)		
			Adams (8%)	Too steep (1.00)		
				Cutbanks cave (1.00)		
			Windsor (7%)	Too steep (1.00)		
				Cutbanks cave (1.00)		
MyC	Munson and Raynham silt loams, 6 to 12 percent slopes	Very limited	Munson (45%)	Depth to saturated zone (1.00)	1.2	1.0%
				Too clayey (0.28)		
				Cutbanks cave (0.10)		
				Slope (0.04)		
			Raynham (45%)	Depth to saturated zone (1.00)		
				Cutbanks cave (0.10)		
				Slope (0.04)		
			Belgrade (5%)	Depth to saturated zone (1.00)		
				Cutbanks cave (0.10)		
				Slope (0.04)		
W	Water	Not rated	Water (100%)		8.3	6.7%
Wo	Winooski very fine sandy loam	Very limited	Winooski (85%)	Depth to saturated zone (1.00)	13.8	11.2%
				Flooding (0.60)		
				Cutbanks cave (0.10)		
			Limerick (5%)	Depth to saturated zone (1.00)		
				Flooding (0.80)		
				Cutbanks cave (0.10)		
			Pootatuck (5%)	Depth to saturated zone (1.00)		
				Cutbanks cave (1.00)		
				Flooding (0.80)		
Totals for Area of Interest					**123.2**	**100.0%**

Shallow Excavations— Summary by Rating Value		
Rating	**Acres in AOI**	**Percent of AOI**
Very limited	74.9	60.8%
Somewhat limited	40.0	32.5%
Null or Not Rated	8.3	6.7%
Totals for Area of Interest	**123.2**	**100.0%**

Rating Options—Shallow Excavations ( )

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Land Management

Land management interpretations are tools designed to guide the user in evaluating existing conditions in planning and predicting the soil response to various land management practices, for a variety of land uses, including cropland, forestland, hayland, pastureland, horticulture, and rangeland. Example interpretations include suitability for a variety of irrigation practices, log landings, haul roads and major skid trails, equipment operability, site preparation, suitability for hand and mechanical planting, potential erosion hazard associated with various practices, and ratings for fencing and waterline installation.

Erosion Hazard (Off-Road, Off-Trail) ( )

The ratings in this interpretation indicate the hazard of soil loss from off-road and off-trail areas after disturbance activities that expose the soil surface. The ratings are based on slope and soil erosion factor K. The soil loss is caused by sheet or rill erosion in off-road or off-trail areas where 50 to 75 percent of the surface has been exposed by logging, grazing, mining, or other kinds of disturbance.

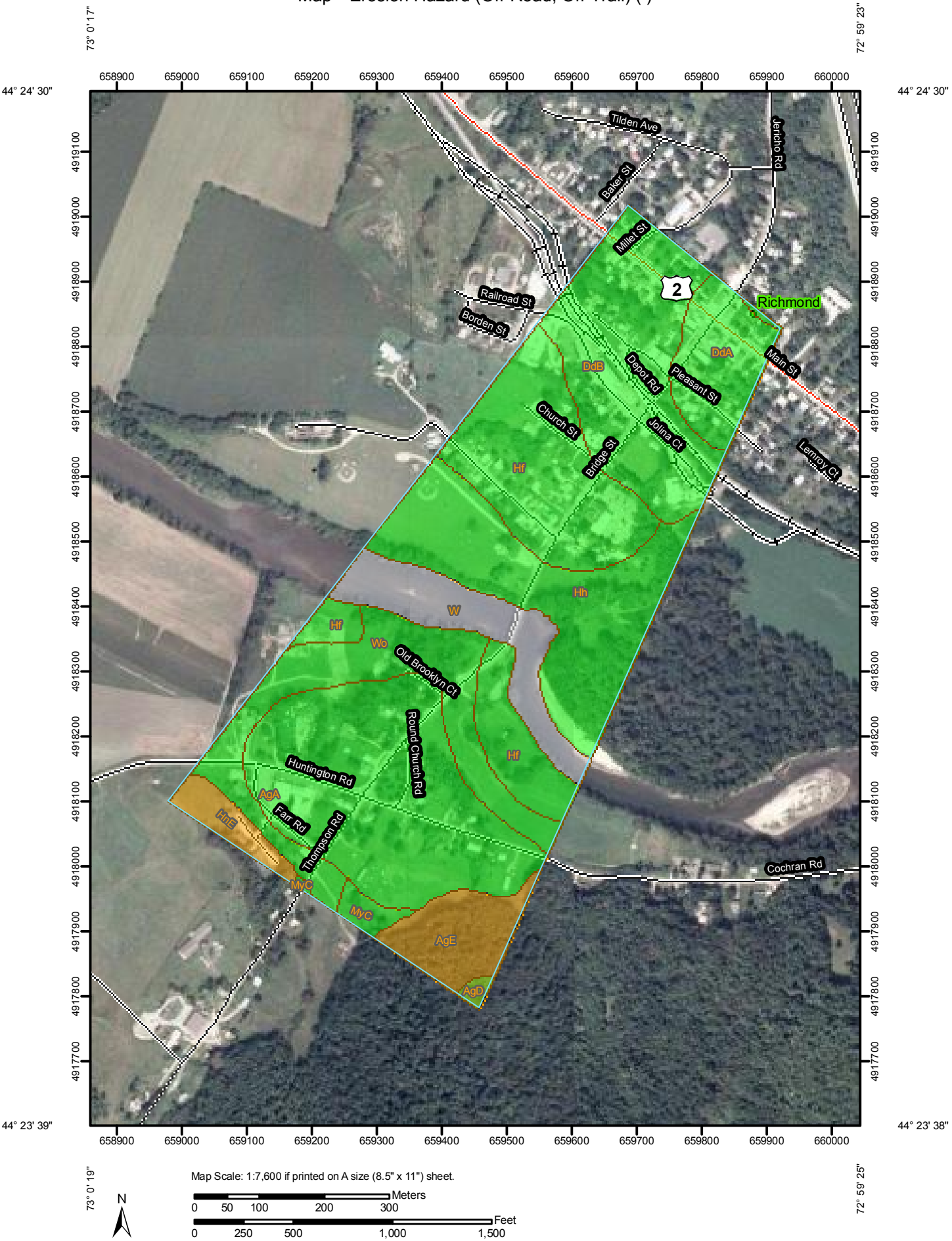
The ratings are both verbal and numerical. The hazard is described as "slight," "moderate," "severe," or "very severe." A rating of "slight" indicates that erosion is unlikely under ordinary climatic conditions; "moderate" indicates that some erosion is likely and that erosion-control measures may be needed; "severe" indicates that erosion is very likely and that erosion-control measures, including revegetation of bare areas, are advised; and "very severe" indicates that significant erosion is expected, loss of soil productivity and off-site damage are likely, and erosion-control measures are costly and generally impractical.

Numerical ratings indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the specified aspect of forestland management (1.00) and the point at which the soil feature is not a limitation (0.00).

The map unit components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as listed for the map unit. The percent composition of each component in a particular map unit is presented to help the user better understand the percentage of each map unit that has the rating presented.

Other components with different ratings may be present in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.

Custom Soil Resource Report
Map—Erosion Hazard (Off-Road, Off-Trail) ( )



MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Units

Soil Ratings

- Very severe
- Severe
- Moderate
- Slight
- Not rated or not available

Political Features

- Cities

Water Features

- Oceans
- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:7,600 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:15,840.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 18N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Chittenden County, Vermont
Survey Area Data: Version 14, Jun 10, 2009

Date(s) aerial images were photographed: 8/20/2003

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Tables—Erosion Hazard (Off-Road, Off-Trail) ( )

Erosion Hazard (Off-Road, Off-Trail)— Summary by Map Unit — Chittenden County, Vermont						
Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
AgA	Agawam fine sandy loam, 0 to 5 percent slopes	Slight	Agawam (85%)		25.6	20.8%
			Adams (3%)			
			Deerfield (3%)			
			Hartland (3%)			
			Ninigret (3%)			
			Windsor (3%)			
AgD	Agawam fine sandy loam, 12 to 30 percent slopes	Moderate	Agawam (85%)	Slope/erodibility (0.50)	0.4	0.3%
			Adams (5%)	Slope/erodibility (0.50)		
			Hartland (5%)	Slope/erodibility (0.50)		
			Windsor (5%)	Slope/erodibility (0.50)		
AgE	Agawam fine sandy loam, 30 to 60 percent slopes	Severe	Agawam (85%)	Slope/erodibility (0.75)	5.7	4.6%
			Adams (3%)	Slope/erodibility (0.75)		
			Windsor (3%)	Slope/erodibility (0.75)		
DdA	Duane and Deerfield soils, 0 to 5 percent slopes	Slight	Duane (45%)		6.8	5.5%
			Deerfield (45%)			
			Au Gres (10%)			
DdB	Duane and Deerfield soils, 5 to 12 percent slopes	Slight	Duane (42%)		18.8	15.3%
			Deerfield (42%)			
			Adams (3%)			
			Colton (3%)			
			Stetson (3%)			
			Windsor (3%)			
			Agawam (2%)			
			Au Gres (2%)			
Hf	Hadley very fine sandy loam	Slight	Hadley (85%)		21.5	17.5%
			Agawam (5%)			
			Occum (5%)			
			Winooski (5%)			
Hh	Hadley very fine sandy loam, frequently flooded	Slight	Hadley (85%)		18.5	15.0%
			Limerick (5%)			
			Occum (5%)			
			Winooski (5%)			
HnE	Hinesburg fine sandy loam, 25 to 60 percent slopes	Severe	Hinesburg (85%)	Slope/erodibility (0.75)	2.5	2.0%
			Adams (8%)	Slope/erodibility (0.75)		
			Windsor (7%)	Slope/erodibility (0.75)		

Erosion Hazard (Off-Road, Off-Trail)— Summary by Map Unit — Chittenden County, Vermont						
Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
MyC	Munson and Raynham silt loams, 6 to 12 percent slopes	Slight	Munson (45%)		1.2	1.0%
			Raynham (45%)			
			Belgrade (5%)			
			Hartland (5%)			
W	Water	Not rated	Water (100%)		8.3	6.7%
Wo	Winooski very fine sandy loam	Slight	Winooski (85%)		13.8	11.2%
			Hadley (5%)			
			Limerick (5%)			
			Pootatuck (5%)			
Totals for Area of Interest					**123.2**	**100.0%**

Erosion Hazard (Off-Road, Off-Trail)— Summary by Rating Value		
Rating	Acres in AOI	Percent of AOI
Slight	106.4	86.4%
Severe	8.1	6.6%
Moderate	0.4	0.3%
Null or Not Rated	8.3	6.7%
Totals for Area of Interest	**123.2**	**100.0%**

Rating Options—Erosion Hazard (Off-Road, Off-Trail) ( )

Aggregation Method: Dominant Condition

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The aggregation method "Dominant Condition" first groups like attribute values for the components in a map unit. For each group, percent composition is set to the sum of the percent composition of all components participating in that group. These groups now represent "conditions" rather than components. The attribute value associated

with the group with the highest cumulative percent composition is returned. If more than one group shares the highest cumulative percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher group value should be returned in the case of a percent composition tie.

The result returned by this aggregation method represents the dominant condition throughout the map unit only when no tie has occurred.

Component Percent Cutoff: None Specified

Components whose percent composition is below the cutoff value will not be considered. If no cutoff value is specified, all components in the database will be considered. The data for some contrasting soils of minor extent may not be in the database, and therefore are not considered.

Tie-break Rule: Higher

The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

Recreational Development

Recreational Development interpretations are tools designed to guide the user in identifying and evaluating the suitability of the soil for specific recreational uses. Example interpretations include camp areas, picnic areas, playgrounds, paths and trails, and off-road motorcycle trails.

Paths and Trails ( )

Paths and trails for hiking and horseback riding should require little or no slope modification through cutting and filling.

The ratings are based on the soil properties that affect trafficability and erodibility. These properties are stoniness, depth to a water table, ponding, flooding, slope, and texture of the surface layer.

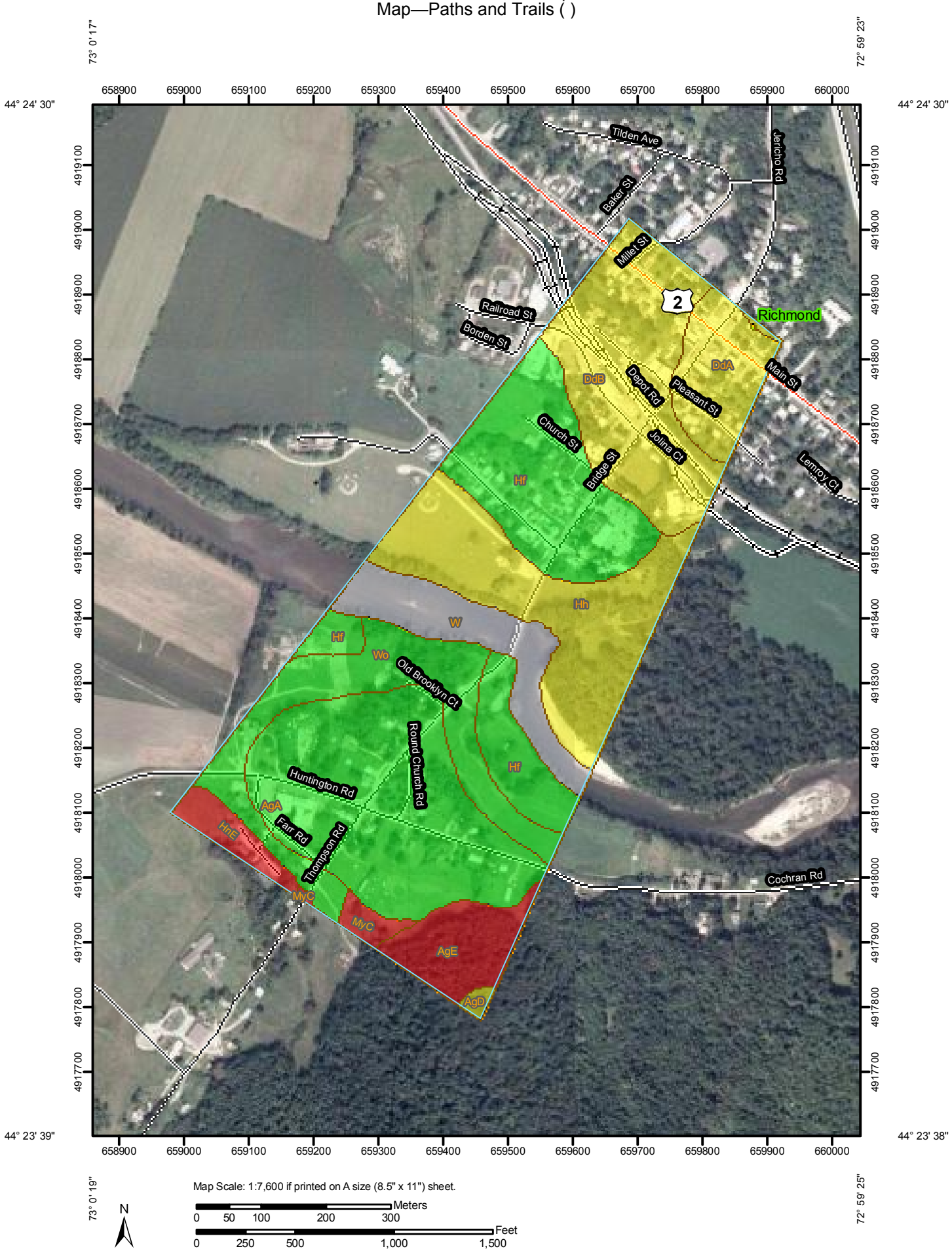
The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect the specified use. "Not limited" indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. "Somewhat limited" indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. "Very limited" indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

The map unit components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as listed for the map unit. The percent composition of each component in a particular map unit is presented to help the user better understand the percentage of each map unit that has the rating presented.

Other components with different ratings may be present in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.

Custom Soil Resource Report
Map—Paths and Trails ( )



MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Units

Soil Ratings

- Very limited
- Somewhat limited
- Not limited
- Not rated or not available

Political Features

- Cities

Water Features

- Oceans
- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:7,600 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:15,840.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 18N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Chittenden County, Vermont
Survey Area Data: Version 14, Jun 10, 2009

Date(s) aerial images were photographed: 8/20/2003

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Tables—Paths and Trails ( )

Paths and Trails— Summary by Map Unit — Chittenden County, Vermont						
Map unit symbol	**Map unit name**	**Rating**	**Component name (percent)**	**Rating reasons (numeric values)**	**Acres in AOI**	**Percent of AOI**
AgA	Agawam fine sandy loam, 0 to 5 percent slopes	Not limited	Agawam (85%)		25.6	20.8%
			Deerfield (3%)			
			Hartland (3%)			
			Ninigret (3%)			
AgD	Agawam fine sandy loam, 12 to 30 percent slopes	Somewhat limited	Agawam (85%)	Slope (0.68)	0.4	0.3%
			Adams (5%)	Slope (0.68)		
				Too sandy (0.55)		
			Windsor (5%)	Slope (0.68)		
				Too sandy (0.59)		
AgE	Agawam fine sandy loam, 30 to 60 percent slopes	Very limited	Agawam (85%)	Slope (1.00)	5.7	4.6%
			Adams (3%)	Slope (1.00)		
				Too sandy (0.55)		
			Munson (3%)	Depth to saturated zone (1.00)		
				Water erosion (1.00)		
				Slope (0.18)		
			Raynham (3%)	Depth to saturated zone (1.00)		
				Water erosion (1.00)		
			Scantic (3%)	Depth to saturated zone (1.00)		
			Windsor (3%)	Slope (1.00)		
				Too sandy (0.59)		
DdA	Duane and Deerfield soils, 0 to 5 percent slopes	Somewhat limited	Duane (45%)	Depth to saturated zone (0.08)	6.8	5.5%
DdB	Duane and Deerfield soils, 5 to 12 percent slopes	Somewhat limited	Duane (42%)	Depth to saturated zone (0.08)	18.8	15.3%
			Adams (3%)	Too sandy (0.55)		
			Colton (3%)	Too sandy (0.52)		
			Windsor (3%)	Too sandy (0.59)		
Hf	Hadley very fine sandy loam	Not limited	Hadley (85%)		21.5	17.5%
			Agawam (5%)			
			Winooski (5%)			
Hh	Hadley very fine sandy loam, frequently flooded	Somewhat limited	Hadley (85%)	Flooding (0.40)	18.5	15.0%
			Occum (5%)	Flooding (0.40)		

Paths and Trails— Summary by Map Unit — Chittenden County, Vermont						
Map unit symbol	**Map unit name**	**Rating**	**Component name (percent)**	**Rating reasons (numeric values)**	**Acres in AOI**	**Percent of AOI**
HnE	Hinesburg fine sandy loam, 25 to 60 percent slopes	Very limited	Hinesburg (85%)	Slope (1.00)	2.5	2.0%
			Adams (8%)	Slope (1.00)		
				Too sandy (0.55)		
			Windsor (7%)	Slope (1.00)		
				Too sandy (0.59)		
MyC	Munson and Raynham silt loams, 6 to 12 percent slopes	Very limited	Munson (45%)	Depth to saturated zone (1.00)	1.2	1.0%
				Water erosion (1.00)		
			Raynham (45%)	Depth to saturated zone (1.00)		
				Water erosion (1.00)		
			Belgrade (5%)	Water erosion (1.00)		
				Depth to saturated zone (0.04)		
			Hartland (5%)	Water erosion (1.00)		
W	Water	Not rated	Water (100%)		8.3	6.7%
Wo	Winooski very fine sandy loam	Not limited	Winooski (85%)		13.8	11.2%
			Hadley (5%)			
Totals for Area of Interest					**123.2**	**100.0%**

Paths and Trails— Summary by Rating Value		
Rating	**Acres in AOI**	**Percent of AOI**
Not limited	60.9	49.5%
Somewhat limited	44.6	36.2%
Very limited	9.4	7.6%
Null or Not Rated	8.3	6.7%
Totals for Area of Interest	**123.2**	**100.0%**

Rating Options—Paths and Trails ( )

Aggregation Method: Dominant Condition

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The aggregation method "Dominant Condition" first groups like attribute values for the components in a map unit. For each group, percent composition is set to the sum of the percent composition of all components participating in that group. These groups now represent "conditions" rather than components. The attribute value associated with the group with the highest cumulative percent composition is returned. If more than one group shares the highest cumulative percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher group value should be returned in the case of a percent composition tie.

The result returned by this aggregation method represents the dominant condition throughout the map unit only when no tie has occurred.

Component Percent Cutoff: None Specified

Components whose percent composition is below the cutoff value will not be considered. If no cutoff value is specified, all components in the database will be considered. The data for some contrasting soils of minor extent may not be in the database, and therefore are not considered.

Tie-break Rule: Higher

The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

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ATTACHMENT B
Historic Resource Assessment

Heritage Landscapes LLC
Broadreach Planning & Design
Bridge Street Bicycle & Pedestrian Feasibility Study, Richmond, VT
Historic Resources Assessment
10 November 2009

Heritage Landscapes conducted a field inspection of the project area on November 5, 2009 to assess potential historic resources in the project area. The focus of this review was the immediate areas along Bridge Street, including features in the right-of-way and the adjacent portions of abutting properties. Should the breadth of proposed improvements be broader than assumed for this review, the impacts to adjacent structures and other elements should be re-reviewed.

The goal of this review was to identify additional existing historic resources along the Bridge Street corridor that could potentially be affected by bicycle and pedestrian improvements. The Bridge Street Bridge and Round Church are both listed on the National Register of Historic Places, and additional structures are listed on the State Register of Historic Places. During field review, several additional historic resources were identified in the project area. Specific historic resources identified during field review are addressed in the following paragraphs. While the additional historic resources discussed in this review may have historic value, they are not necessarily eligible for official listing as historic resources at the local, state, or federal level.

Cemetery

The Cemetery, located on the east side of Bridge Street, represents an intact historic resource. The Cemetery has retained its current size and location at least since 1869, when it appeared on the Beers Atlas for Richmond, and its historic integrity remains high. At the periphery, the Cemetery is visually contained by tree plantings; the trees along Bridge Street provide separation between the busy street and the historic cemetery landscape.

Too great an encroachment on the Cemetery would diminish the visual separation between the street and the cemetery, and undermine the Cemetery's character as an intact, contained, historic resource. Additionally, encroachment could endanger the integrity of several burial markers positioned on the slope adjacent to the road, roughly in line with the existing trees.

R-RBP_20091105_092.jpg

Town Green

South of the Winooski River, the Round Church Green is an important historic resource, though the integrity of the Green has diminished slightly over time due to the loss of a portion of the landscape. The Round Church was built in 1812-1814 as a meetinghouse and place of worship, and the adjacent Green historically served as an important public landscape at the core of the community. The original western section, across Bridge Street from the Green core, is no longer legible as part of the common, though it is still town-owned. Considerable building setbacks and the position of residential walks terminating well before the street suggest the historic placement of the original Green.

Today, the Round Church Green is characterized by open lawn and trees both lining the street and scattered throughout the landscape. The Green serves as the hub around which activity takes place in this southern portion of the project area, and it is important to the legibility of the historic landscape. Therefore, impacts to the core Green should be avoided. If necessary, encroachments to the western parcel of the historic, original Green are preferable than to the existing, intact eastern parcel.

R-RBP_20091105_025.jpg


R-RBP_20091105_050.jpg

Bridge Street Bridge

The Bridge Street Bridge over the Winooski River, a National Register-listed resource, is an important resource in the project area. Any proposed project should not adversely impact this historic structure.

R-RBP_20091105_007.jpg

Retaining Walls

Retaining walls are positioned in several locations in the project area. South of the bridge, two retaining walls are found of the west side of the street. The more northerly wall, seen in the foreground in the following image, may have been historic. It has now been removed and is being replaced with a larger stone retaining wall. The second retaining wall, seen in the background of the image, does not appear to be historic.

R-RBP_20091105_016.jpg

Additional Small-Scale Historic Resources

A dressed piece of marble is located at the southeast corner of Bridge Street and Huntington Road is a potentially historic feature. The stone may be a portion of historic curbing or a dismount used to assist riders when descending from their horses.

R-RBP_20091105_044.jpg

ATTACHMENT C
Archeological Resources Analysis

Archaeological Resources Assessment for the Proposed Town of Richmond Bridge Street Bicycle and Pedestrian Feasibility Study, Richmond, Chittenden County, Vermont

Submitted to:

Jim Donovan, FASLA
Broadreach Planning & Design
PO Box 321
Charlotte, Vermont 05445

Submitted by:

Charles Knight, Ph.D.

University of Vermont
Consulting Archaeology Program
111 Delehanty Hall
180 Colchester Ave.
Burlington, VT 05405

Report No. 564

October 13, 2009

Archaeological Resources Assessment for the Proposed Town of Richmond Bridge Street Bicycle and Pedestrian Feasibility Study, Richmond, Chittenden County, Vermont

Project Description

The Town of Richmond will work with the landscape architectural firm of Broadreach Planning & Design to undertake a feasibility study for the proposed Richmond Bridge Street Bicycle and Pedestrian Feasibility Study, Richmond, Chittenden County, Vermont (Figure 1). The proposed project will see the construction of a multipurpose path in Richmond, Vermont, between Depot Street and Huntington Road. The proposed project area will include the Winooski River floodplain and adjacent terraces within the Town of Richmond.

The University of Vermont Consulting Archaeology Program (UVM CAP) conducted an Archaeological Resources Assessment (ARA) of the proposed project as part of the Section 106 permitting process and identified several landforms as sensitive for precontact Native American archaeological sites.

Study Goal

The goal of an ARA (or "review") is to identify portions of a specific project's Area of Potential Effects (APE) that have the potential for containing precontact and/or historic sites. An ARA is to be accomplished through a "background search" and a "field inspection" of the project area. For this study, reference materials were reviewed following established guidelines. Resources examined included the National Register of Historic Places (NRHP) files; the Historic Sites and Structures Survey; and the USGS master archaeological maps that accompany the Vermont Archaeological Inventory (VAI). Relevant town histories and nineteenth-century maps also were consulted. Based on the background research, general contexts were derived for precontact and historic resources in the study area.

Precontact Native American Site Potential

Several archaeological studies have been carried out in the general project area in the recent past, as part of unrelated development projects in the area, such as the replacement of the Bridge No. 31, the Bridge Street Bridge (Hartgen Archaeological Associates, Inc 2007; Kenny and Crock 2008), and work at the former Creamery Complex (Kenny and Crock 2009). Much of the discussion on archaeological site potential in the proposed project area stems from these studies.

The proposed project area covers an area that, in general, is recognized as archaeologically sensitive, since it borders the Winooski River, including the active floodplain and adjacent terraces. The Vermont Division for Historic Preservation's "Environmental Predictive Model for Locating Archaeological Sites" identifies major alluvial floodplains, such as that of the Winooski River, as automatically reaching the sensitivity threshold requiring a site inspection. One reason for this is that major rivers in Vermont were major thoroughfares for

transportation between the Champlain Lowlands to the Connecticut River Drainage in the precontact era. High concentrations of precontact Native American sites have been identified along the banks of the Winooski River just downriver from the Town of Richmond. As a result, the probability for ancient Native American settlements located on these floodplains is high.

Although there are no known archaeological sites within the limits of the proposed project area, a search of the Vermont Archaeological Inventory (VAI) indicates that there are four reported archaeological sites within approximately 3.2 km (2 mi) of the current project area (Figure 2). A description of these four sites is presented in Table 1. Sites VT-CH-639 and VT-CH-864 both have precontact Native American components. One of these sites, VT-CH-864, is also located near the boundary between the level floodplain of the Winooski River and the beginning of the valley's higher, geologically older terraces; similar topographic features are found within the proposed project's Area of Potential Effects (APE). The VDHP Archaeological Information System Model indicates that the current project area is considered potentially sensitive for precontact Native American material. Several factors, principally the project area's topography as well as its proximity to water and wetland resources, contribute to this assessment.

Table 1. Description of known archaeological sites (taken from Kenny & Crock 2009).

Site#	Type	Sub-Type	Time Period	Description
VT-CH-299	Historic	Ruin	Unknown	
VT-CH-639	Precontact	Unknown	Unknown	Lithic Debitage; Two Features
VT-CH-689	Historic	Cellar	Unknown	
VT-CH-864	Precontact Historic	Unknown Standing Structure	Unknown 19th Century	Lithic Debitage Monitor Barn

Historic Period Site Potential

Several structures within the proposed project's Area of Potential Effects, as diagrammed, are listed on the State Register of Historic Places. South of the Winooski River, structures located along Cochrane Road, and on the southeast corner junction of Bridge Street, Thompson Street, Huntington and Cochrane roads. North of the Winooski River, listed structures are located on Esplanade Street and off Bridge Street behind the Cemetery. This last structure is the old Farmer's Co-op building. Finally, the steel truss, Bridge Street Bridge is listed on the State Register. The Bridge Street Bridge also was listed on the National Register for Historic Places in 1990. The other structure within the project APE is the Round Church located back on Bridge Street, one block south of the Winooski River, which is listed on both the State and National Registers.

Structures depicted on the historic 1857 Walling' Map (Figure 3) and the historic 1869 Beers Atlas (Figure 4) do not include any structures that are no longer standing within the

proposed project area. The principal exception to this is the Steam Mill located on the south side of the Winooski River to the immediate southwest of the Bridge Street Bridge as depicted on the Walling's map (see Figure 3). By 1869 and the Beers Atlas, this structure is no longer depicted (see Figure 4). The most serious disturbance to historic properties within the proposed project area was the flood of the Winooski River in 1927. An aerial photograph of the Bridge Street Bridge crossing in Richmond shortly after the flood illustrates the degree of the damage caused by the flood (Figure 5). Both the north side of the river and especially the south side were heavily impacted by the flood, with isolated pockets of scouring throughout. One historic period building that may have been damaged by the flood was an apartment building located to the immediate southwest of the Bridge Street Bridge (see Figure 5). This apartment building was abandoned after the 1927 flood and finally razed in the 1940s. Whether this building was built upon the foundations of the "Steam Mill" depicted in the 1857 Walling's map is not known. Today, a small concrete foundation is located on the spot of the historic period Steam Mill and apartment building complex (Figure 6). At the time of the field inspection, a large trench was being excavated between the existing concrete foundation and Bridge Street for the placement of PVC piping.

Field Inspection

A field inspection of the proposed project's APE was undertaken on October 9, 2009 by Dr. Charles Knight, Assistant Director of the UVM CAP. The entire project area was walked and all archaeologically sensitive landforms were noted. Several large landforms were identified as archaeologically sensitive, due to their proximity to the Winooski River (Figure 7). Since the proposed project crosses active and ancient floodplains and terraces of the Winooski River, all areas of potentially intact soils within this area are archaeologically sensitive for precontact Native American sites. At the same time, the areas adjacent to the on and off ramps of the Bridge Street Bridge along Bridge Street are not archaeologically sensitive, due to extensive disturbances associated with the recent 2009 bridge replacement project and the 1927 flood that scoured this portion of the Winooski River floodplain. Scouring also occurred north of the Winooski River, such as along Esplanade Street where "the roadbed...was washed out to a depth of several feet" (Riggs 2007:381). Nonetheless, portions of the active floodplain not scoured by known flooding, and intact portions of the adjacent terraces, including residential yards, landscaped medians, and road right-of-ways, were identified as archaeologically sensitive (Figures 8-11).

Conclusions

The Town of Richmond will work with the landscape architectural firm of Broadreach Planning & Design to undertake a feasibility study for the proposed Richmond Bridge Street Bicycle and Pedestrian Feasibility Study, Richmond, Chittenden County, Vermont. The proposed project will see the construction of a multipurpose path in Richmond, Vermont, between Depot Street and Huntington Road. The proposed project area will include the Winooski River floodplain and adjacent terraces within the Town of Richmond. As part of the Section 106 permit review, the UVMCAP conducted a filed inspection along the proposed

project alignment and several areas of archaeological sensitivity were identified. Due to the large size of the proposed project limits, only major landforms within the project limits were identified as archaeologically sensitive. It must be noted that intact portions of residential yards along Bridge Street, especially south of the Winooski River on a high terrace also are archaeologically sensitive. As a result, a narrow, linear pedestrian path, even if it is kept within the existing right-of-way of Bridge Street may impact intact landforms and thus have the potential for disturbing intact archaeological sites. As a result, a Phase I site identification survey is recommended for those portions of the proposed project that fall within archaeologically sensitive areas.

Charles Knight, Ph.D.
Assistant Director

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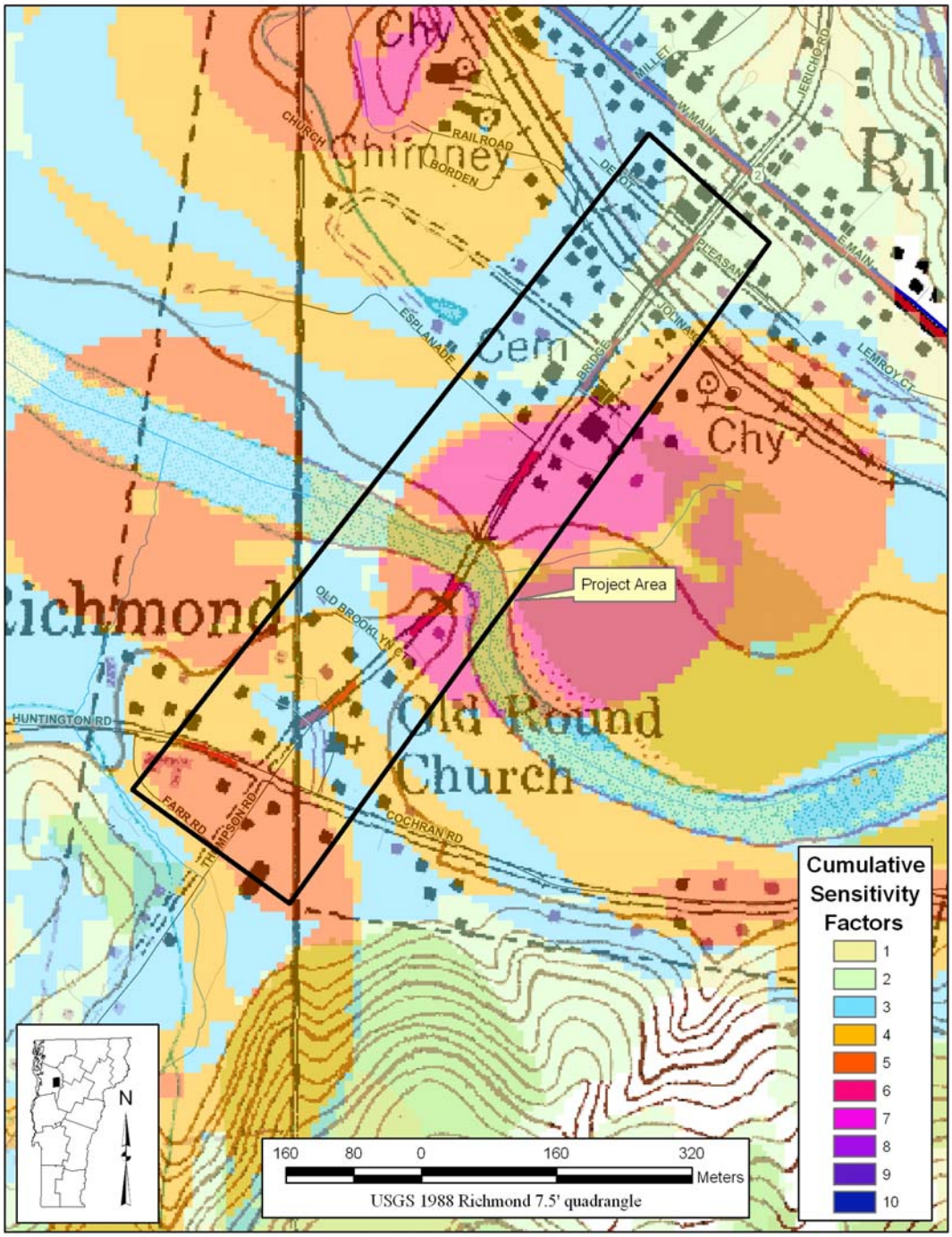


Figure 1. Map showing the location of the proposed Town of Richmond Bridge Street Bicycle and Pedestrian Feasibility Study in realtion to archaeological sensitivity factors, Richmond, Chittenden County, Vermont.

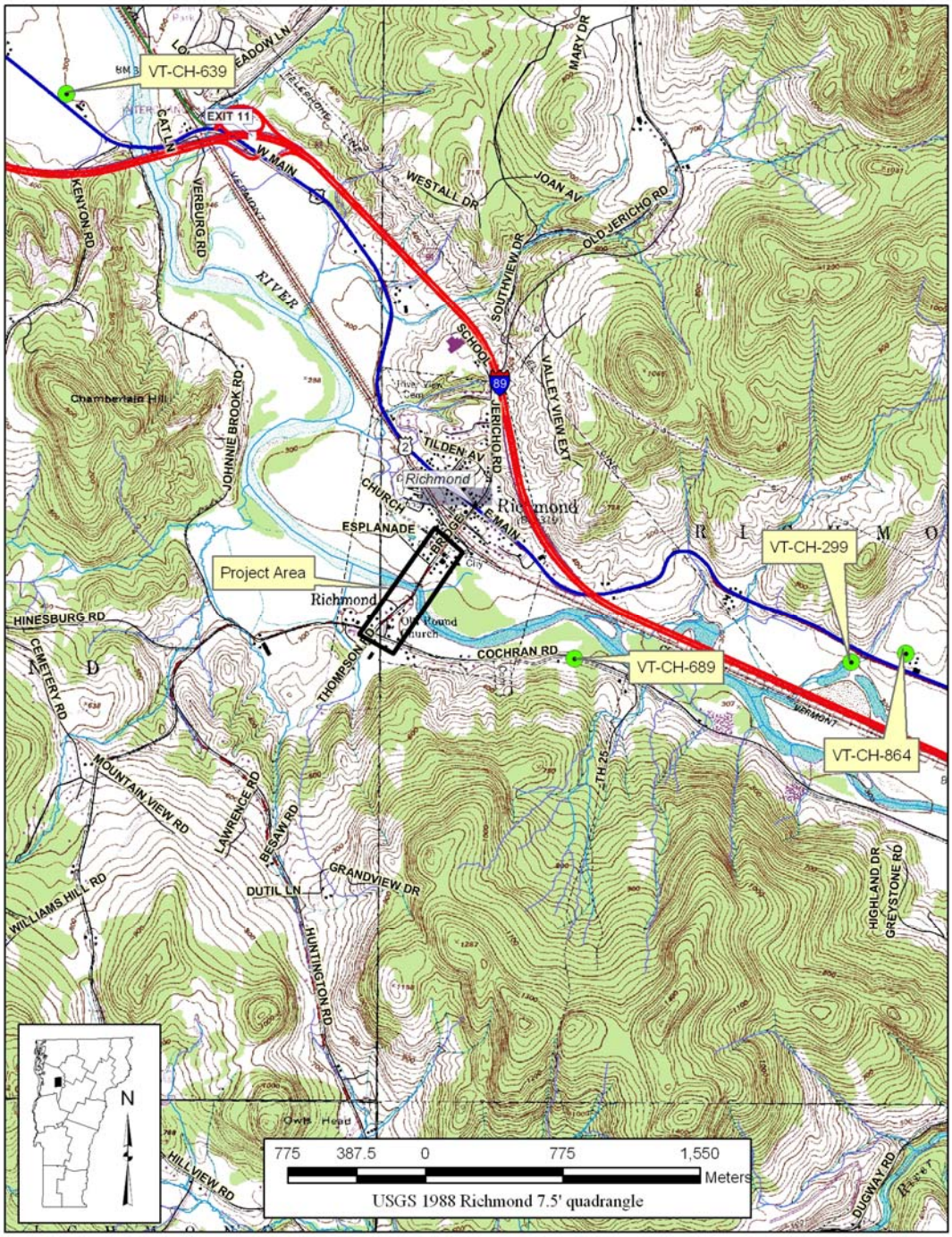


Figure 2. Map showing the location of the proposed Town of Richmond Bridge Street Bicycle and Pedestrian Feasibility Study area and nearby archaeological sites, Richmond, Chittenden County, Vermont.

Figure 3. Historic 1857 Walling's map showing the project area of the proposed Bridge Street Bicycle and Pedestrian Feasibility Study Area, Richmond, Chittenden County, Vermont.

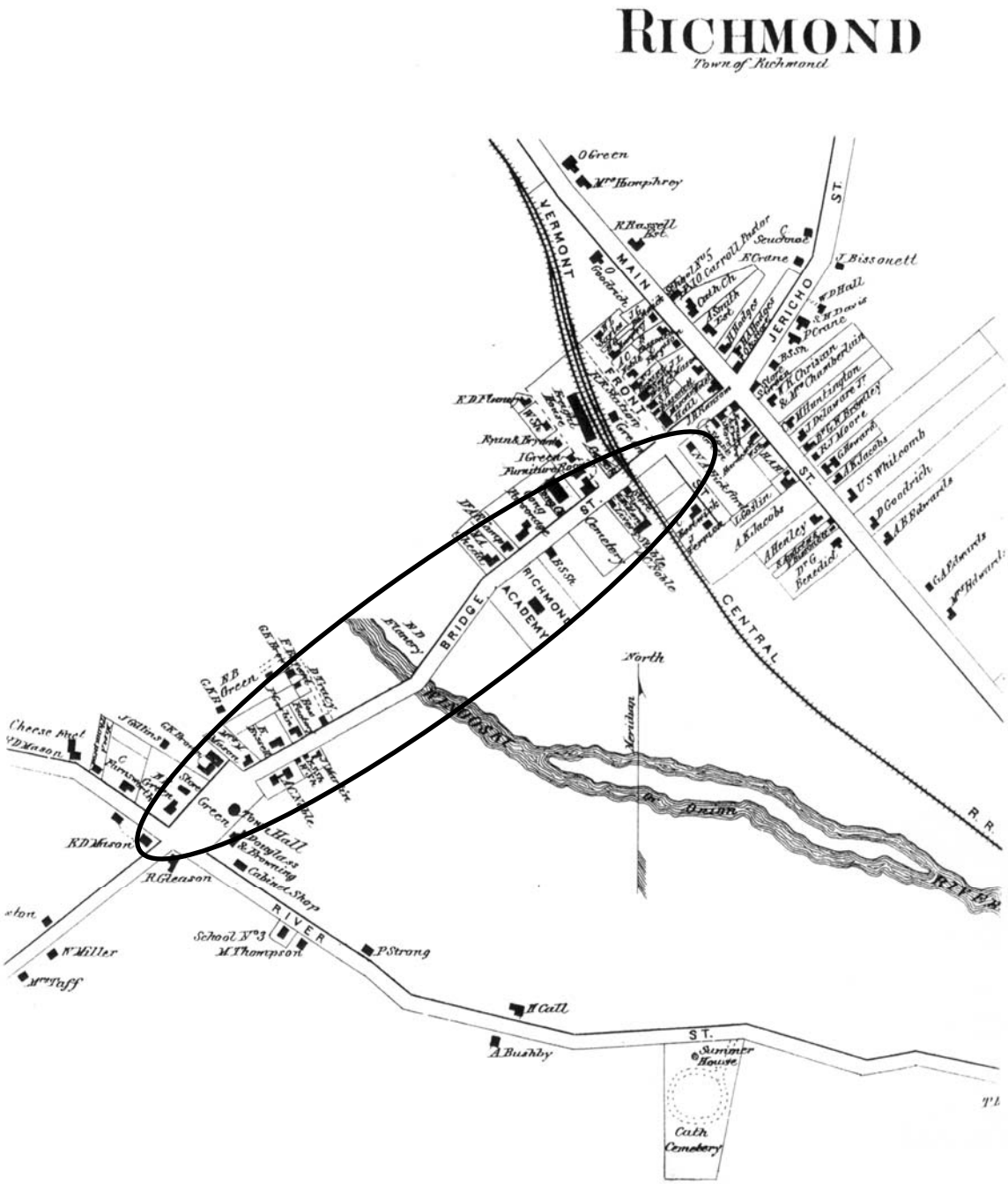


Figure 4. Historic 1869 Beers Atlas showing the project area of the proposed Bridge Street Bicycle and Pedestrian Feasibility Study Area, Richmond, Chittenden County, Vermont.

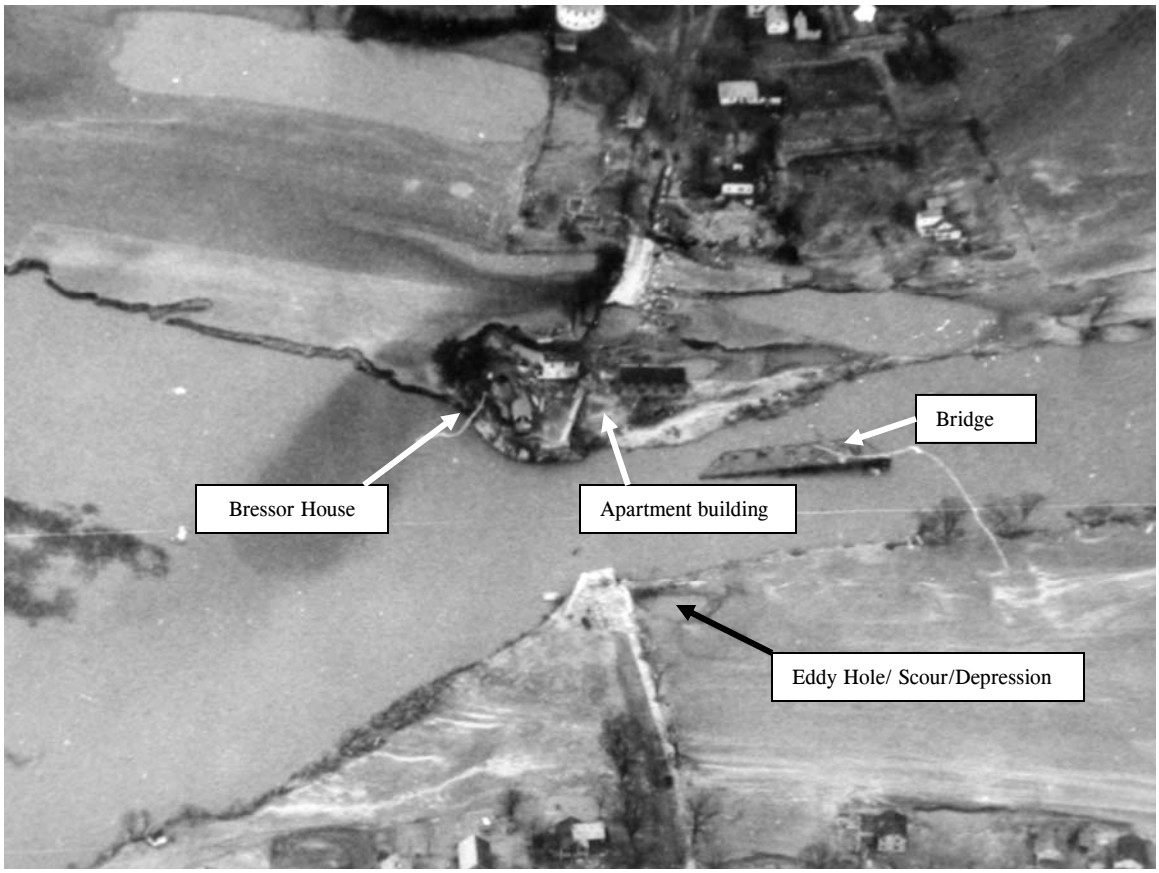


Figure 5. Aerial photograph of Richmond, Vermont, immediately after the flood of 1927 (taken from Kenny and Crock 2008).

Figure 6. Modern structure/foundation in the southwestern quadrant of the project area. This feature is located near the site of the late 19th to early 20th century apartment building (taken from Kenny and Crock 2008).

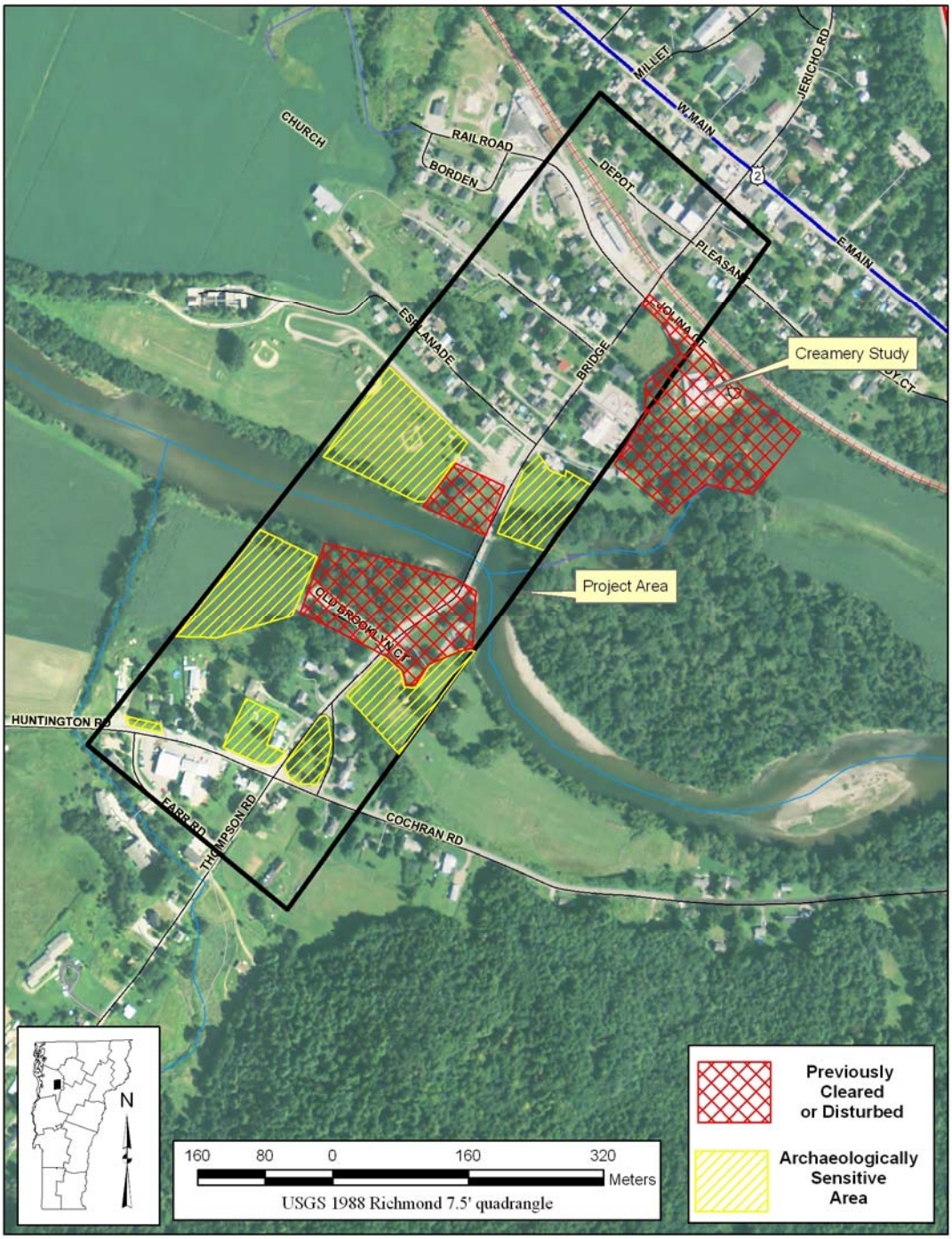


Figure 7. Map showing the archaeologically sensitive portions of the proposed Town of Richmond Bridge Street Bicycle and Pedestrian Feasibility Study, Richmond, Chittenden County, Vermont.

Figure 8. Aerial photograph of the general project area in 1937 (taken from Kenny and Crock 2008). North is at the top of the image.

Figure 9. Aerial photograph of the general project area in 1962 (taken from Kenny and Crock 2008). North is at the top of the image.

Figure 10. Aerial photograph of the general project area in 1974 (taken from Kenny and Crock 2008). North is at the top of the image.

Figure 11. Aerial photograph of the general project area in 1988 (taken from Kenny and Crock 2008). North is at the top of the image.

Appendix B
Preliminary Alternatives
(A description of all the alternatives initially considered as part of the review process**)**

Town of Richmond, Vermont

Bridge Street Bicycle & Pedestrian Feasibility Study

Appendix B: Alternatives

Submitted by:

Broadreach Planning & Design

In conjunction with

Lamoureux & Dickinson Consulting Engineers, Inc

Heritage Landscapes LLC.

University of Vermont Consulting Archeological Program

February 26, 2010

INTRODUCTION

This memo describes potential alternatives for improving bicycle and pedestrian circulation along Bridge Street in Richmond Village. The information in this memo served as the basis for the public work session on January 19, 2010. It outlined a wide variety of options to be considered by the public. The project consultant expected that the public would condense, combine, or eliminate some of the alternatives so that a more concise set of recommendations could be developed for Bridge Street and the Study Area.

The alternatives are based on the following: Project Steering Committee meetings; Public stakeholders' session (11/5/09); meetings with individual business and property owners; Meeting with Richmond Area Business Association (RABA) Main Street Committee (10/21/09); planning *charrette* with project team (11/12/09). A much larger group of initial ideas discussed by the Project Steering Committee (PSC) provided the basis for the alternatives described in this memo; Attachment A, an earlier version of this document developed for the discussions with the PSC, includes a list of these initial alternative ideas.

Each of the alternatives, except for those presented in the last category, Other Alternatives, were meant to be single options that would not be combined with the other options in the category. Those items in the Other Alternatives category could be developed in conjunction with other alternatives within that category or the other categories.

In addition, there are some improvements that were presented as options for implementation, irrespective of whatever other alternatives are selected.

There are numerous assumptions which guide the consideration of roadway or other alternatives. These include:

- New crosswalks should be added on all side streets;
- A new sidewalk on the north side of Railroad Street should be installed as part of the new market development;
- No new on-street parallel parking along Bridge Street south of the railroad;
- Adequate pedestrian access and other improvements to the new Town parking lot close to Depot Street, north of the railroad;
- The current location of the roadway allows for some alternatives involving new sidewalks and widened roadway without the need to acquire right-of-way from individual property owners; and
- New crosswalks on Bridge Street, Railroad Street, and Jolina Court, when and if the two side streets are improved.

The idea of burying utilities along Bridge Street was brought up in several forums, including PSC meetings, conversations with property and business owners, and the public stakeholders meeting. That idea has merit, especially in the section of Bridge Street where utility poles are actually in the roadway (between Church Street and Esplanade).

The following figures and table are presented as part of this memo:

- **Figures 1** to **11** are each depicted in "Proposed Possible Cross Sections along Bridge Street & Huntington Road";
- **Figure 12a** depicts the mapped alternatives for the north end of Bridge Street;
- **Figure 12b** depicts the mapped alternatives for the south end of Bridge Street; and
- **Table 4-1** provides a comparison of the different alternatives.

ROADWAY RIGHT-OF-WAY ALTERNATIVES

BRIDGE STREET (NORTH OF THE BRIDGE FROM THE NORTH END OF DEPOT STREET)

Alternative #1 – Restripe the existing 24-foot roadway surface to create two ten-foot travel lanes and, at a minimum, a two-foot wide paved shoulder on each side. Reclaim the green space between the sidewalk and the roadway for the section of road between Church Street and Esplanade. Repave the existing west side sidewalk with asphalt. Add additional street trees as appropriate. **Figure 1** shows the cross section for this Alternative.

Alternative #2 – Add up to two feet of additional pavement to the east side of the road to create a 26-foot wide roadway and repave/reclaim the roadway and/or restripe the road to create to ten-foot-travel lanes with a three-foot paved shoulder on each side of the pavement. Reclaim the green space between the sidewalk and the roadway for the section of road between Church Street and Esplanade. Reconstruct the existing sidewalk with concrete. Add additional street trees as appropriate. **Figure 2** shows the cross section for this Alternative.

Alternative #3 – Add two feet of additional pavement to the east side of the road and repave/reclaim the roadway and/or restripe the road to create two ten-foot-travel lanes with a three-foot paved shoulder on each side of the pavement. Reclaim the green space between the sidewalk and the roadway for the section of road between Church Street and Esplanade. Add a sidewalk along the east side of the road adjacent to the curb between Pleasant Street and the Railroad Street intersection, using a retaining wall up to about five feet high between Pleasant Street and the Railroad as needed. Place the curb at grade in front of Sonoma Station to maintain the off street parking. Reconstruct the existing sidewalk on the west side of the street with concrete. Add additional street trees as appropriate. **Figure 3/4** shows the cross section for this Alternative.

Alternative #4 – Add two feet of additional pavement to the east side of the road and repave/reclaim the roadway and/or restripe the road to create two ten-foot-travel lanes with a three-foot paved shoulder on each side of the pavement. Reclaim the green space between the sidewalk and the roadway for the section of road between Church Street and Esplanade. Add a sidewalk along the east side of the road between Pleasant Street and the Town

Offices, with the sidewalk adjacent to the curb north of the railroad and with a two-foot green strip between the curb and the sidewalk south of Railroad Street. Place the sidewalk behind a curb in front of Sonoma Station and remove direct access from Bridge Street to the off street parking. Use two retaining walls, one between Pleasant Street and the Railroad as needed up to approximately five feet high and a smaller, dry laid stone retaining wall approximately one foot high along the edge of the cemetery. Reconstruct the existing sidewalk with concrete. Add additional street trees as appropriate. **Figure 3/4** shows the cross section for this Alternative.

Alternative #4a – The same as Alternative 4 except that the new sidewalk extends on the east side of Bridge Street to Esplanade, with a new crosswalk at the end of the sidewalk.

BRIDGE STREET (SOUTH OF THE BRIDGE)

Alternative #5 – Create a new curb four feet to the east of the existing west side curb to create a four-foot green space between the existing sidewalk and new curb. Add four feet of pavement on the east side of the roadway and restripe the road to create two ten-foot travel lanes and two four-foot paved shoulders. If needed, reclaim the road to shift the center crown as needed to coincide with the new center line of the roadway. Relocate the two utility poles on the east side of the road to the west side in the newly created green space. Add new street trees as possible. **Figure 5** shows the cross section for this Alternative.

Alternative #5a – This is the same as Alternative 5 except that instead of four feet added to Bridge Street, it adds two feet of pavement on the east side of the roadway and restripes the road to create two ten-foot travel lanes and two three-foot paved shoulders. **Figure 5a** shows the cross section for this Alternative.

Alternative #6 – Create a new curb two feet to the east of the existing west side curb to create a two-foot green space between the existing sidewalk and new curb. Add two feet of pavement on the east side of the roadway and restripe the road to create two ten-foot travel lanes and two four-foot paved shoulders. Add new street trees as possible. **Figure 6** shows the cross section for this Alternative.

(Alternative #6a) – This is the same as Alternative 6 except that Bridge Street is not widened and the existing pavement is restriped to create two ten-foot travel lanes and two three-foot paved shoulders. **Figure 6a** shows the cross section for this Alternative.

Alternative #7 – Restripe the existing 28-foot side roadway to create two ten-foot lanes with a four-foot shoulder on each side. Add new street trees as possible. **Figure 7** shows the cross section for this Alternative.

HUNTINGTON ROAD

Alternative #8 – Restripe the roadway to create two ten-foot lanes with a two-foot wide paved shoulder on either side. Extend the existing sidewalk on the north side of the street approximately 50 feet to the existing postboxes, which will need to be relocated further west. Add a crosswalk on Huntington Road at the end of the sidewalk, cutting through the existing curbed parking island. Close the center access point with a new curbing, leaving the eastern and western access points open. Add street trees as possible. **Figure 8** shows the cross section for this Alternative.

Alternative #9 –Restripe the road to create two ten-foot travel lanes with a two-foot wide paved shoulder on each side. Add a five-foot sidewalk on the south side of the road with a two-foot green strip between the sidewalk and the curb. Add street trees as possible. **Figure 9** shows the cross section for this Alternative.

Alternative # 10 – Add two feet of pavement to the south side of the roadway and restripe to create two ten-foot travel lanes with a three-foot wide paved shoulder on each side. Add street trees as possible. **Figure 10** shows the cross section for this Alternative.

Alternative #11 – Add two feet of pavement to the south side of the roadway and restripe to create two ten-foot travel lanes with a three-foot wide paved shoulder on each side. Add a curb on the south side of the road with an adjacent, five-foot sidewalk. Extend the sidewalk west to the edge of the existing commercial parking area. Continue the pedestrian way via striping through the parking area west to Farr Road. Add street trees as possible. **Figure 11** shows the cross section for this Alternative.

BRIDGE STREET: RAILROAD STREET TO RAILROAD

NOTE: These alternatives for that section between the railroad and Railroad Street on the west side of the road build on the choice of which width is most appropriate for the rest of Bridge Street.

Bridge Street Railroad Alternative #1 – Add a curb at the appropriate location. Add a five-foot wide, concrete sidewalk two feet behind the curb with a 2-foot wide grass strip between the walk and the curb. **Figure 12** shows the cross section for this alternative.

Bridge Street Railroad Alternative #2 – Add a curb at the appropriate location and back with a seven-foot concrete sidewalk. **Figure 13** shows the cross section for this alternative.

In order to create an overall friendlier environment for pedestrians and bicyclists on Bridge Street, it may be appropriate to consider the addition of small, pedestrian scale resting points. One alternative is suggested at this time to address this potential.

Mini Park Alternative #1 – Develop a small pedestrian seating area south of the railroad tracks on the west side of Bridge Street in front of the new market to take advantage of the views east towards Camels Hump.

BRIDGE STREET BY VOLUNTEERS GREEN

Bridge Street Volunteers Green Alternative #1 – Link the existing sidewalks on either side of the parking lot entrance via a painted crosswalk. Regrade the parking area to create a small rise to keep gravel and debris from flooding into the roadway during rainstorms. Add a new storm drain in the parking area to eliminate potential ponding that the regrading could cause.

Bridge Street Volunteers Green Alternative #2 – Link the existing sidewalks on either side of the parking lot entrance with a new concrete sidewalk placed at grade through the asphalt. Regrade the parking area to create a small rise to keep gravel and debris from flooding into the roadway during rainstorms. Add a new storm drain in the parking area to eliminate potential ponding that the regrading could cause.

Bridge Street Volunteers Green Alternative # 3 – Link the existing sidewalks on either side of the parking lot entrance with a new raised concrete sidewalk. Regrade the parking let entrance to gradually rise and fall to meet the grade of the new sidewalk. Add a new storm drain in the parking area.

BRIDGE STREET/HUNTINGTON ROAD INTERSECTION IMPROVEMENTS

Intersection Improvement Alternative #1 – Add street trees along the northwest corner of the intersection to begin to close in the intersection.

Intersection Improvement Alternative #2 – Reduce the turning radius of the turn from Cochran Road to Bridge Street at the southwest corner of the Round Church Green. This will reduce the overall amount of pavement in the intersection which leads to slower vehicular traffic and allows drivers more time to notice and react to pedestrians in and around the intersection.

Intersection Improvement Alternative #3 – Reduce the turning radius of the turn from Bridge Street to Huntington Road on the northwest corner of the intersection. This could bring the edge of the roadway back into the existing right-of-way and make it more difficult to make the turn at speed higher than the posted speed limit of 25 mph.

LIGHTING ALTERNATIVES FOR THE ENTIRE STUDY AREA

Lighting #1 – Maintain the existing cobra head light fixtures but add additional fixtures to create a more even lighting levels along the length of Bridge Street.

Lighting #2 – Replace the existing cobra head light fixtures with a more pedestrian scale light fixture to match as much as possible the light fixtures used on Church Street, mounted on the existing utility poles to create a more even yet lower height light level along the length of Bridge Street.
Lighting #3 – Replace the existing cobra head light fixtures with a more pedestrian scale light fixture that matches those already used on Church Street, mounted on new poles, to create a more even yet lower height light level along the length of Bridge Street.

OTHER ALTERNATIVES

The following four alternatives are meant to improve the overall condition of walking and bicycling on Esplanade. They are meant to address the anticipated increase in truck traffic going to and from the sewage treatment plant, to minimize the number of vehicles bringing park users that park on Esplanade, both of which create difficult walking and bicycling conditions on the street.

Esplanade Alternative #1 – Extend the existing concrete sidewalk on the south side of the east end of the street approximately 20 further west to the bakery access drive/entrance walk. Add a crosswalk diagonally across the street to the north side. Reconstruct the existing concrete sidewalk with a five-foot wide sidewalk to the west end of the street.

Esplanade Alternative #2 – Repave and widen Esplanade to a consistent minimum width of 20 feet to accommodate bicycle travel.

Volunteers Green Access Road Alternative #1 – Add head-in parking facing south along the side of the road, after confirming the acceptability of this addition with the adjacent land owners to the north. Add a crushed gravel path along the south side of the parking linking the west side of the park with the east side parking lot near Bridge Street.

Volunteers Green Access Road Alternative #2 – Upgrade the park road to 20 feet wide and provide a link to the sewer treatment plant. Add a crushed gravel pedestrian path along the south side of the road linking the west side of the park with the east side parking lot. Remove the link between Esplanade and the sewer treatment plant.

RIVER CROSSING

The current Bridge Street bridge across the Winooski River is approximately 18 feet wide, with nine-foot wide travel lanes in each direction. A five-foot wide sidewalk is cantilevered from the west side of the bridge. Bicycle access is poor across the bridge. For those comfortable doing it, one of the best ways to cross the road on a bicycle is to move to the center of the lane you are in and ride across the bridge - "taking the lane" and preventing motor vehicles to pass the bicycle on the bridge. The other way is to dismount move to the

sidewalk and walk the bicycle across the bridge. The most common way of crossing the bridge on bicycle appears to be riding on the sidewalk.

Few alternatives for crossing the river appear to be viable. To date, the following alternatives have been initially offered:

- Widening the sidewalk to six or eight feet wide;
- Constructing a new prefabricated, single span bicycle/pedestrian bridge to the west of the existing bridge; and
- Instigating a permanent pedestrian/bicycle ferry.

Each of these options appears to have at least one insurmountable obstacle that would keep it from being a feasible solution. However, there could be some unrealized potential in any of them, so they should be at least considered and discussed before being eliminated.

One last option, which is possible, is to provide "share the road" signs on the approaches to the bridge and/or other notices to bicyclists to dismount and use the sidewalk.

Table 4-1: Comparison of Alternatives

Alternative	Positive Aspects	Negative Aspects	Relative Costs
Bridge Street North			
#1 - 10' travel lane & 2' paved shoulder	Minimal Construction; no cemetery impact	Minimal improvements for less experienced bicyclists; requires additional bicylce facility improvements	$
#2 - 10' travel lane & 3' paved shoulder	Minimal cemetery impact; minimal construction; links two sides of the railroad	Requires pavement overlay	$$
#3 - 10' travel lane and 3' paved shoulder, new east side sidewalk to Railroad St.	Better pedestrian access south of railroad; links two sides of railroad; new stone wall sets off cemetery	Requires pavement overlay; impacts to edge of cemetery	$$$
#4 - 10' travel lane and 3' paved shoulder, new east side sidewalk to Town Offices.	Better pedestrian access south of railroad with full link to Town offices; links two sides of railroad; new stone wall sets off cemetery	Requires pavement overlay; impacts to edge of cemetery	$$$
Bridge Street South			
#5 - New 4' green space & 10' travel lane and 4' paved shoulders	Separates sidewalk from roadway; improves bicycle conditions; enhances views of Round Church	Extends roadway 4 feet to the east; requires pavement overlay; potential impacts to Round Church Green and archeological resources	$$$
#6 - New 2' green space & 10' travel lane and 4' paved shoulders	Separates sidewalk from roadway; improves bicycle conditions;	Extends roadway 2 feet to the east; requires pavement overlay; potential impacts to Round Church Green and archeological resources	$$
#7 - 10' travel lane and 4' paved shoulders	Improves conditions for bicyclists; minimal costs		$

Huntington Road			
#8 - 10' travel lanes and 2' paved shoulders	Minimal costs; Maintains existing road cross section	Minimal improvements for less experienced bicyclists; slight improvements for pedestrians.	$
#9 - 10' travel lanes and 3' paved shoulders	Improves conditions for bicyclists; minimal improvements for pedestrians	Takes 2 feet of grass; requires pavement overlay	$$
#10 - 10' travel lanes and 3' paved shoulders & add curb and 5' sidewalk	Improves conditions for bicyclists; Improves conditions for pedestrians	Takes 7 feet of grass; requires pavement overlay	$$$$
#11 - 10' travel lanes and 3' paved shoulders & add 5' sidewalk with a two foot green space	Improves conditions for bicyclists; Improves conditions for pedestrians	Takes 9 feet of grass; requires pavement overlay	$$$
Bridge Street Railroad			
#14 - curb & 5' sidewalk with green strip	Improves pedestrian circulation; creates separation between vehicles and pedestrians; defines corner and truck turning radius for Railroad Street	Ties block more to residential southern portion of Bridge Street rather than commercial northern portion	$$
#15 - curb & 7' sidewalk	Improves pedestrian circulation; creates a wider space for pedestrians adjcent to the road; defines corner and truck turning radius for Railroad Street; links two sides of the railroad		$$
Lighting Alternatives			
#1 - additional cobras	Creates consistent light levels	Does not enhance Village character or pedestrian circulation	$
#2 - new fixtures on existing poles	Creates pedestrian scale lighting; adds to village character		$$
#3 - new fixtures on new poles	Creates consistent light levels; enhances pedestrian focus of roadway; enhances Village character	requires locating new posts and underground wiring in existing or newly created green strips	$$$$
Intersection Alternatives			
#1 Street Trees	Will eventually slow traffic		$
#2 Reduce Radius	Assists pedestrian crossings: may slow traffic; provides easier turning for bicyclists	Could slow traffic and create slight vehicular back ups	$

Other Alternatives			
Esplanade #1	Improves pedestrian circulation	Potentially changes character of street; uses lawn space for sidewalks; Potential floodplain permit issues	
Esplanade #2	Improves bicycle circulation	Potentially changes character of street; uses lawn space for sidewalks	
Park Access Road #1	Adds parking to park and removes parking pressure on Esplanade; creates defined pedestrian access through the park	Violates earlier agreement with Esplanade landowners; requires further discussion with land owners; uses more park land for parking; potential impacts to archeological resources; Floodplain permit requirements	
Park Access Road #2	Removes trucks sewage treatment trucks from Esplande	Puts trucks in park; potential impacts to archeological resources; Floodplain permit requirements	
Mini Park #1	Creates pedestrian destination on south side of railroad tracks; allows enjoyment of eastern views down railroad corridor to Camels Hump	Requires use of private land; view from available location partially blocked by railroad signals	

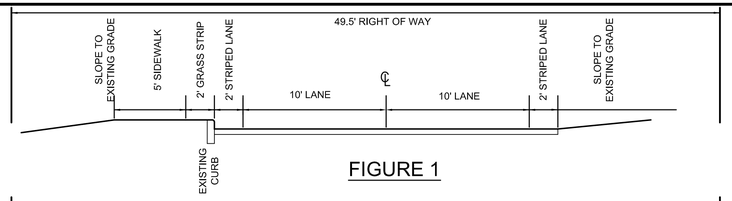


FIGURE 1

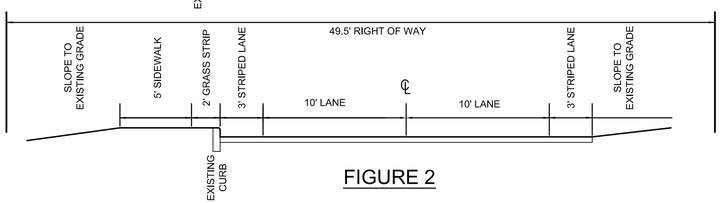


FIGURE 2

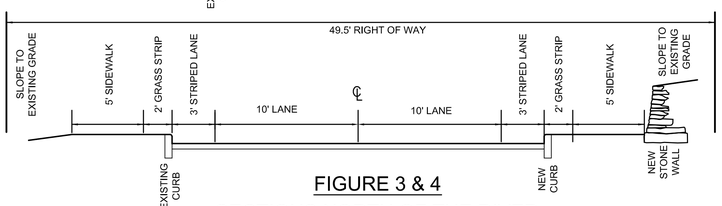


FIGURE 3 & 4

SECTIONS NORTH OF THE RIVER

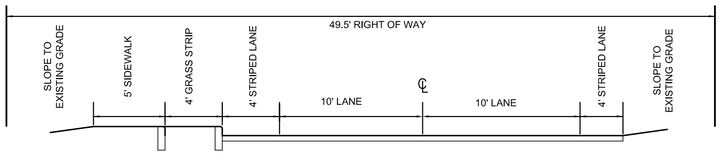


FIGURE 5

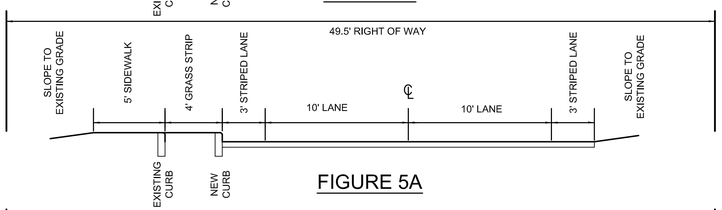


FIGURE 5A

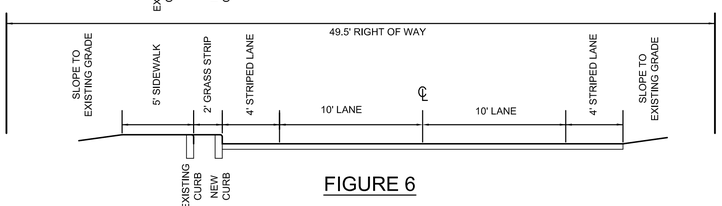


FIGURE 6

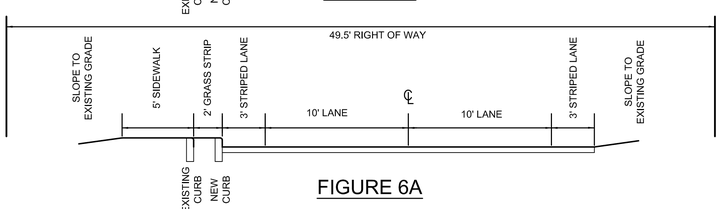


FIGURE 6A

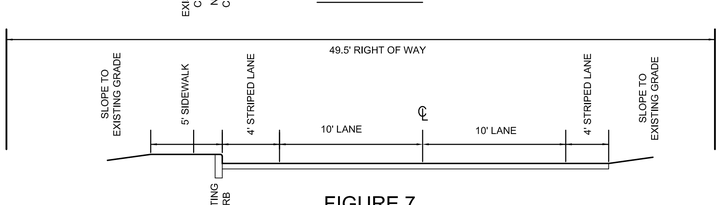


FIGURE 7

SECTIONS SOUTH OF THE RIVER

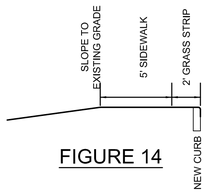


FIGURE 14

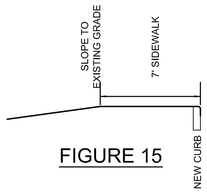


FIGURE 15

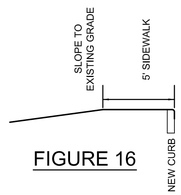


FIGURE 16

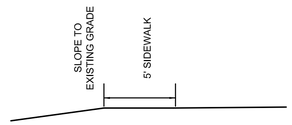


FIGURE 17

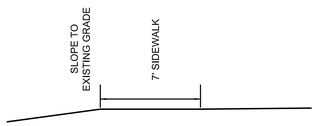


FIGURE 18

SECTIONS BETWEEN RAILROAD STREET AND DEPOT STREET

GRAPHIC SCALE

5 0 2.5 5 10 20

(IN FEET)

1 inch = 5 ft.

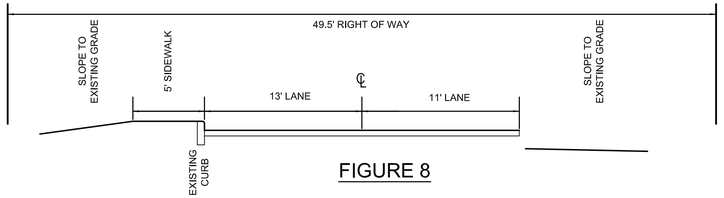


FIGURE 8

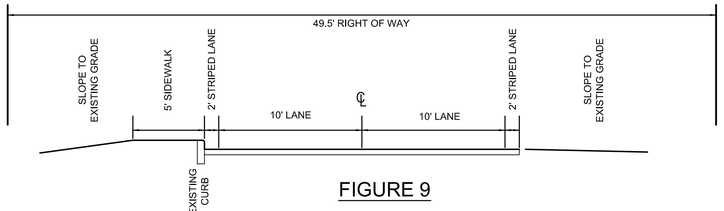


FIGURE 9

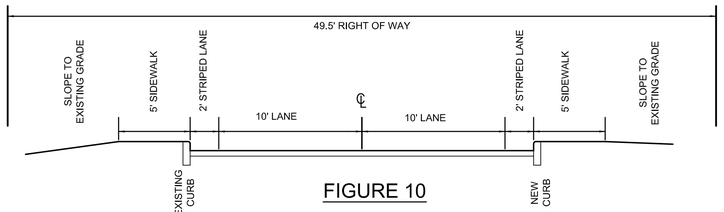


FIGURE 10

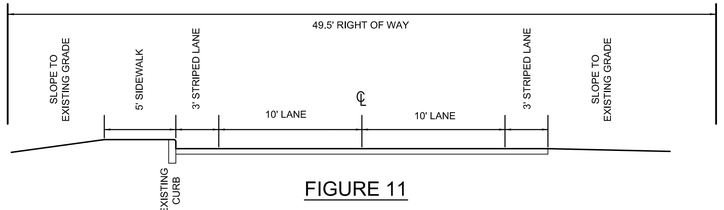


FIGURE 11

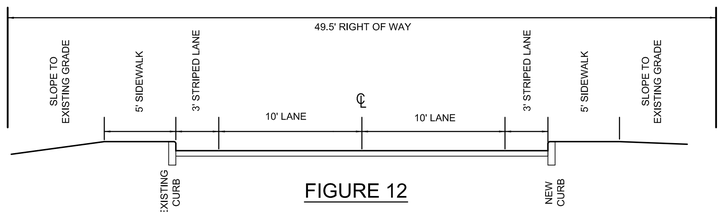


FIGURE 12

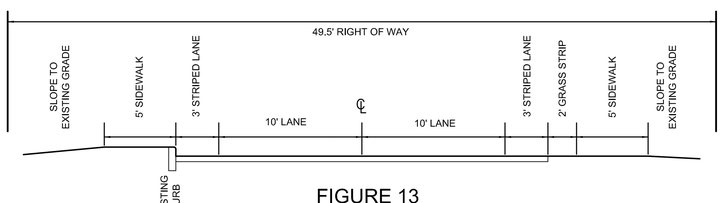


FIGURE 13

SECTIONS ALONG HUNTINGTON ROAD

BROADREACH Planning & Design

DATE	REVISIONS	BY

THESE PLANS WITH LATEST REVISIONS SHOULD ONLY BE USED FOR THE PURPOSE SHOWN BELOW:

- ■ SKETCH/CONCEPT
- ☐ PRELIMINARY
- ☐ FINAL
- ☐ CONTRACT

BICYCLE & PEDESTRIAN FEASIBILITY STUDY

BRIDGE STREET RICHMOND, VERMONT

PROPOSED POSSIBLE CROSS SECTIONS ALONG BRIDGE STREET & HUNTINGTON ROAD

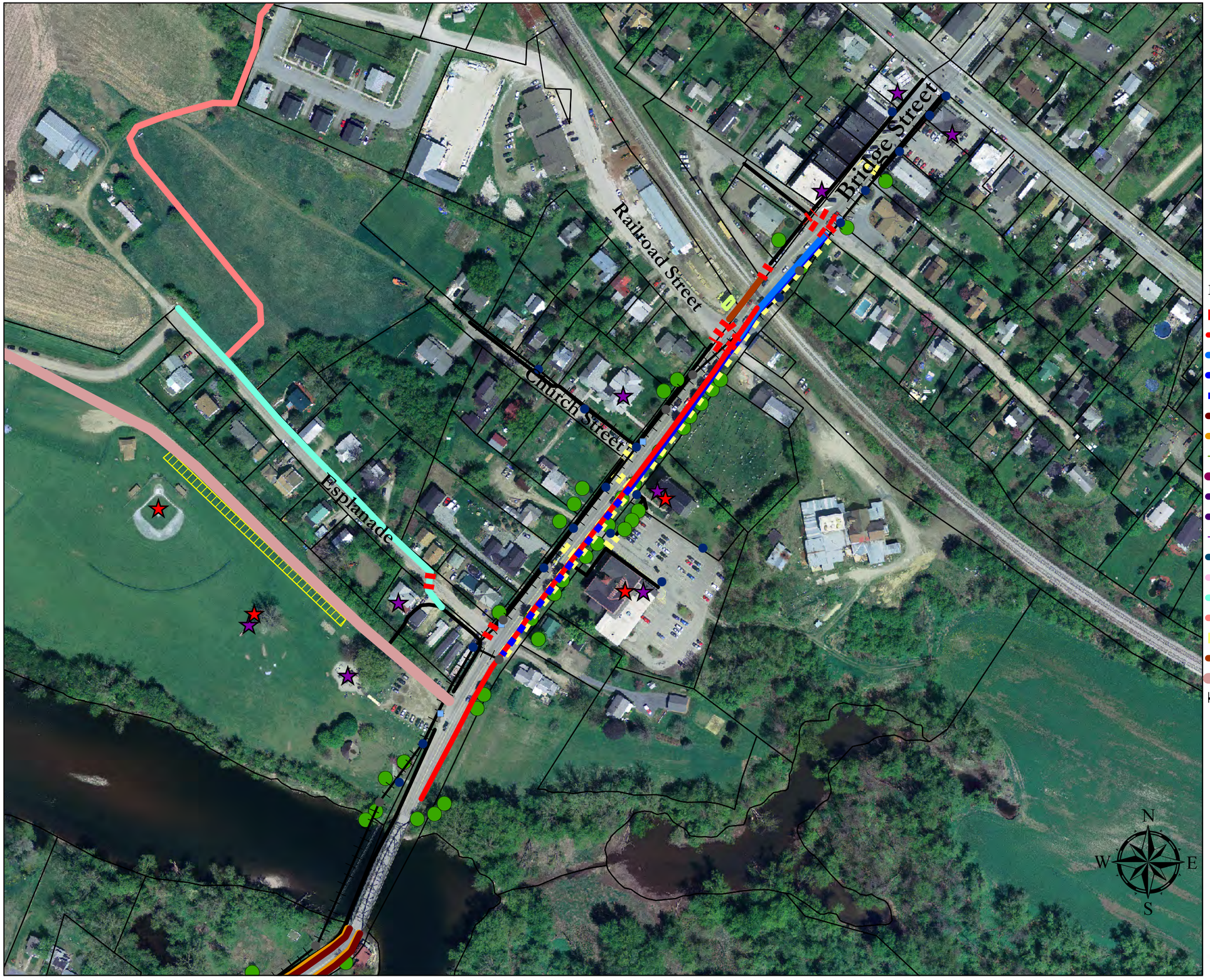
LAMOUREUX & DICKINSON
Consulting Engineers, Inc.
14 Morse Drive
Essex Junction, VT 05452
Tel: 802-878-4450

# OF SHEETS	
Proj. no.	09094
Survey	ADP
Design	—
Drawn	DLH
Checked	DLH / DJG
Date	11-3-09
Scale	AS NOTED
Sht. no.	3 OF 3

Bridge Street Bicycle & Pedestrian Feasibility Study

Richmond, Vermont

Alternatives North



Legend

- New Crosswalks
- Alt 2
- Alt 3
- Alt 4
- Alt 4a
- Alt 5
- Alt 6
- Alt 7
- Alt 8
- Alt 9
- Alt 10
- Alt 11
- Alt 12
- Aalt 13
- Esplanade 1
- Bike 1
- Bike 2
- Bridge Railroad
- Park Road 2
- Overhead Utility Line
- Crosswalks
- Street Trees
- Sidewalks
- MiniPark 1
- Park road 1
- Property Lines
- Bicycle Activity Center
- Pedestrian Activity Center
- Utility Pole
- Light Fixtures
- Storm Drain Inlet

C112210.sid

RGB

- Red: Band_1
- Green: Band_2
- Blue: Band_3

N W E S

BROADREACH
Planning & Design
PO Box 321
Charlotte, Vermont 05445
802-425-5061

Figure 19a

Bridge Street Bicycle & Pedestrian Feasibility Study

Richmond, Vermont

Alternatives South

Legend

- New Crosswalks
- Alt 2
- Alt 3
- Alt 4
- Alt 4a
- Alt 5
- Alt 6
- Alt 7
- Alt 8
- Alt 9
- Alt 10
- Alt 11
- Alt 12
- Aalt 13
- Esplanade 1
- Bike 1
- Bike 2
- Bridge Railroad
- Park Road 2
- Overhead Utility Line
- Crosswalks
- Street Trees
- Sidewalks
- MiniPark 1
- Park road 1
- Property Lines
- Bicycle Activity Center
- Pedestrian Activity Center
- Utility Pole
- Light Fixtures
- Storm Drain Inlet

C112210.sid

RGB

- Red: Band_1
- Green: Band_2
- Blue: Band_3

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802-425-5061

Figure 19b

ATTACHMENT A
Initial Alternative Ideas

Town of Richmond, Vermont

Bridge Street Bicycle & Pedestrian Feasibility Study

Task 4 Memo: Alternatives

Submitted by:

Broadreach Planning & Design

In conjunction with

Lamoureux & Dickinson Consulting Engineers, Inc

Heritage Landscapes LLC.

University of Vermont Consulting Archeological Program

December 9, 2009

INTRODUCTION

This memo describes potential alternatives for improving bicycle and pedestrian circulation along Bridge Street in Richmond Village. The information in this memo serves as the basis for the upcoming discussions of the Project Steering Committee (PSC) on December 17, 2009. It outlines a wide variety of options to be considered by the PSC, representing a larger number than will actually be presented at the next public work session on January 19, 2010. The project consultant expects that the PSC will condense, combine, or eliminate some of the alternatives so that a more reasonable set of options can be presented next month.

The alternatives are based on the following: Project Steering Committee meetings; Public stakeholders' session (11/5/09); meetings with individual business and property owners; Meeting with Richmond Area Business Association (RABA) Main Street Committee (10/21/09); planning charrette with project team (11/12/09).

Each of the alternatives, except for those presented in the last category, Other Alternatives, is meant to be a single option that is not combined with the other options in the category. Those items in the Other Alternatives category could be developed in conjunction with other alternatives within that category or the other categories.

In addition, there are some improvements that are presented as options for implementation, irrespective of whatever other alternatives are selected.

There are numerous assumptions which guide the consideration of roadway or other alternatives. These include:

- New crosswalks should be added on all side streets;
- A new sidewalk on the north side of Railroad Street should be installed as part of the new market development;
- No new on-street parallel parking along Bridge Street south of the railroad;
- Adequate pedestrian access and other improvements to the new Town parking lot close to Depot Street, north of the railroad;
- The current location of the roadway allows for some alternatives involving new sidewalks and widened roadway without the need to acquire right-of-way from individual property owners; and
- New crosswalks on Bridge Street, Railroad Street, and Jolina Court, when and if the two side streets are improved.

The idea of burying utilities along Bridge Street was brought up in several forums, including PSC meetings, conversations with property and business owners, and the public stakeholders meeting. That idea has merit, especially in the section of Bridge Street where utility poles are actually in the roadway (between Church Street and Esplanade).

The following figures and table are presented as part of this memo:

- **Figures 1** to **18** are each depicted in "Task 4 Memo Figures 1-18"
- **Figure 19a** depicts the mapped alternatives for the north end of Bridge Street
- **Figure 19b** depicts the mapped alternatives for the south end of Bridge Street
- **Table 4-1** provides a comparison of the different alternatives.

ROADWAY RIGHT-OF-WAY ALTERNATIVES

BRIDGE STREET (NORTH OF THE BRIDGE FROM THE NORTH END OF DEPOT STREET)

Alternative #1 – Restripe the existing 24-foot roadway surface to create two ten-foot travel lanes and, at a minimum, a two-foot wide paved shoulder on each side. Reclaim the green space between the sidewalk and the roadway for the section of road between Church Street and Esplanade. Repave the existing west side sidewalk with asphalt. Add additional street trees as appropriate. **Figure 1** shows the cross section for this Alternative.

Alternative #2 – Add up to two feet of additional pavement to the east side of the road to create a 26-foot wide roadway and restripe the road to create to ten-foot-travel lanes with a three-foot paved shoulder on each side of the pavement. Reclaim the green space between the sidewalk and the roadway for the section of road between Church Street and Esplanade. Reconstruct the existing sidewalk with concrete. Add additional street trees as appropriate. **Figure 2** shows the cross section for this Alternative.

Alternative #3 – Add two feet of additional pavement to the east side of the road and restripe the road to create to ten-foot-travel lanes with a three-foot paved shoulder on each side of the pavement. Reclaim the green space between the sidewalk and the roadway for the section of road between Church Street and Esplanade. Add a sidewalk along the east side of the road adjacent to the curb between Pleasant Street and the Railroad Street intersection, using a retaining wall between Pleasant Street and the Railroad as needed. Place the curb at grade in front of the Sonoma Station to maintain the off street parking. Reconstruct the existing sidewalk with concrete. Add additional street trees as appropriate. **Figure 3** shows the cross section for this Alternative.

Alternative #4 – Add two feet of additional pavement to the east side of the road and restripe the road to create to ten-foot-travel lanes with a three-foot paved shoulder on each side of the pavement. Reclaim the green space between the sidewalk and the roadway for the section of road between Church Street and Esplanade. Add a sidewalk along the east side of the road between Pleasant Street and the Town Offices, with the sidewalk adjacent to the curb north of the railroad and with a two-foot green strip between the curb and the sidewalk south of the railroad. Place the sidewalk behind a curb in front of the Sonoma Station and remove direct access from Bridge Street to the off street parking. Use two retaining walls, one between Pleasant Street and the Railroad as needed and a smaller, dry laid stone retaining wall along the edge of the cemetery. Reconstruct the existing

sidewalk with concrete. Add additional street trees as appropriate. **Figure 4** shows the cross section for this Alternative.

Alternative #4a – The same as Alternative 4 except that the new sidewalk extends on the east side of Bridge Street to Esplanade, with a new crosswalk at the end of the sidewalk.

BRIDGE STREET (SOUTH OF THE BRIDGE)

Alternative #5 – Create a new curb four feet to the east of the existing west side curb to create a four-foot green space between the existing sidewalk and new curb. Add two feet of pavement on the east side of the roadway and restripe the road to create two ten-foot travel lanes and two three-foot paved shoulders. Relocate the two utility poles on the east side of the road to the west side in the newly created green space. Add new street trees as possible. **Figure 5** shows the cross section for this Alternative.

Alternative #6 – Create a new curb two feet to the east of the existing west side curb to create a two-foot green space between the existing sidewalk and new curb. Add two feet of pavement on the east side of the roadway and restripe the road to create two ten-foot travel lanes and two four-foot paved shoulders. Add new street trees as possible. **Figure 6** shows the cross section for this Alternative.

Alternative #7 – Restripe the existing 28-foot side roadway to create two ten-foot lanes with a four-foot shoulder on each side. Add new street trees as possible. **Figure 7** shows the cross section for this Alternative.

HUNTINGTON ROAD

Alternative #8 – Maintain the roadway as it is, with two 12-foot lanes. Add a new sidewalk on the south side of the road, separated by a green space at least three feet wide. Extend the existing sidewalk on the north side of the road an additional 50 feet to approximately the existing postboxes, which will need to be relocated further west. Add a crosswalk on Huntington Road at the end of the sidewalk, cutting through the existing curbed parking island. Close the center access point with new curbing, leaving the eastern and western access points open. Add street trees as possible. **Figure 8** shows the cross section for this Alternative.

Alternative #9 – Restripe the roadway to create two ten-foot lanes with a two-foot wide paved shoulder on either side. Add street trees as possible. **Figure 9** shows the cross section for this Alternative.

Alternative # 10 – Restripe the roadway to create two ten-foot lanes with a two-foot wide paved shoulder on either side. Add a curb on the south side of the road with a five-foot wide sidewalk adjacent to it. Close the center access point with new curbing, leaving the eastern and western access points open and extend the sidewalk west through the parking islands to Farr Road. Add street trees as possible. **Figure 10** shows the cross section for this Alternative.

Alternative #11 – Add two feet of pavement to the south side of the roadway and restripe to create two ten-foot travel lanes with a three-foot wide paved shoulder on each side. Add street trees as possible. **Figure 11** shows the cross section for this Alternative.

Alternative #12 – Add two feet of pavement to the south side of the roadway and restripe to create two ten-foot travel lanes with a three-foot wide paved shoulder on each side. Add a curb on the south side of the road with an adjacent, five-foot sidewalk. Extend the sidewalk west to the edge of the existing commercial parking area. Continue the pedestrian way via striping through the parking area west to Farr Road. Add street trees as possible. **Figure 12** shows the cross section for this Alternative.

Alternative #13 – Add two feet of pavement to the south side of the roadway and restripe to create two ten-foot travel lanes with a three-foot wide paved shoulder on each side. Add a curb and a five-foot sidewalk on the south side of the road with a two-foot green strip between the sidewalk and the curb. Add street trees as possible. **Figure 13** shows the cross section for this Alternative.

BRIDGE STREET: RAILROAD STREET TO RAILROAD

NOTE: These alternatives for that section between the railroad and Railroad Street on the west side of the road build on the choice of which width is most appropriate for the rest of Bridge Street.

Bridge Street Railroad Alternative #1 – Add a curb at the appropriate location. Add a five-foot wide, concrete sidewalk two feet behind the curb with a 2-foot wide grass strip between the walk and the curb. **Figure 14** shows the cross section for this alternative.

Bridge Street Railroad Alternative #2 – Add a curb at the appropriate location and back with a seven-foot concrete sidewalk. **Figure 15** shows the cross section for this alternative.

Bridge Street Railroad Alternative #3 – Add a curb at the appropriate location and back with a five-foot concrete sidewalk with no separation between the sidewalk and the curb. **Figure 16** shows the cross section for this alternative.

Bridge Street Railroad Alternative #4 – Add a five-foot concrete sidewalk at the same elevation as the roadway, with no curb separating the road pavement and the sidewalk. **Figure 17** shows the cross section for this alternative.

Bridge Street Railroad Alternative #5 – Add a seven-foot concrete sidewalk at the same elevation as the roadway, with no curb separating the road pavement and the sidewalk. **Figure 18** shows the cross section for this alternative.

BRIDGE STREET BY VOLUNTEER PARK

Bridge Street Volunteer Park Alternative #1 – Link the existing sidewalks on either side of the parking lot entrance via a painted crosswalk. Regrade the parking area to create a small rise to keep

gravel and debris from flooding into the roadway during rainstorm. Add a new storm drain in the parking area to eliminate potential ponding that the regarding could cause.

Bridge Street Volunteer Park Alternative #2 – Link the existing sidewalks on either side of the parking lot entrance with a new concrete sidewalk placed at grade through the asphalt. Regrade the parking area to create a small rise to keep gravel and debris from flooding into the roadway during rainstorm. Add a new storm drain in the parking area to eliminate potential ponding that the regarding could cause.

Bridge Street Volunteer Park Alternative # 3 – Link the existing sidewalks on either side of the parking lot entrance with a new raised concrete sidewalk. Regrade the parking let entrance to gradually rise and fall to meet the grade of the new sidewalk. Add a new storm drain in the parking area.

LIGHTING ALTERNATIVES FOR THE ENTIRE STUDY AREA

Lighting #1 – Maintain the existing cobra head light fixtures but add additional fixture to create a more even lighting levels along the length of Bridge Street.

Lighting #2 – Maintain the existing cobra head light fixtures but add additional smaller, more pedestrian scale light fixtures to the existing utility poles to create a more even yet lower light level along the length of Bridge Street.

Lighting #3 – Replace the existing cobra head light fixtures with a more pedestrian scale light fixture to match as much as possible the light fixtures used on Church Street, mounted on the existing utility poles to create a more even yet lower height light level along the length of Bridge Street.

Lighting #4 – Replace the existing cobra head light fixtures with a more pedestrian scale light fixture that matches those already used on Church Street, mounted on new poles, to create a more even yet lower height light level along the length of Bridge Street.

BRIDGE STREET/HUNTINGTON ROAD INTERSECTION IMPROVEMENTS

Intersection Improvement Alternative #1 – Add a center median to provide a pedestrian refuge between travel lanes and to slow vehicular traffic on the curve.

Intersection Improvement Alternative #2 – Reduce the curve radius to bring at least the curb and edge of the pavement back within the existing right of way, creating a tighter turn for vehicles which could slow travel speed on the curve.

Intersection Improvement Alternative #3 – Construct a roundabout at the intersection, which would slow the traffic around the curve, provide a gateway into the Village area, and create a safer situation for bicyclists and pedestrians.

OTHER ALTERNATIVES

Bicycle Alternative #1 – Improve and extend the existing bike path linking Volunteers Park, Esplanade, and Church Street to link with Railroad Street via the field to the northwest of the existing housing units on Borden Lane (at end of Railroad Street) and the end of Church Street. Explore options for routing the path along Railroad Street to Bridge Street or finding an existing agricultural crossing of the railroad west of Bridge Street that could be used to bring the path to the north side of the railroad tracks.

Bicycle Alternative #2 – Add a shared use path along the east side of Bridge Street between Esplanade and Pleasant Street. Use two retaining walls, one between Pleasant Street and the Railroad as needed and a dry laid stone retaining wall along the edge of the cemetery. Add additional street trees as appropriate.

Esplanade Alternative #1 – Extend the existing concrete sidewalk on the south side of the east end of the street approximately 20 further west to the bakery access drive/entrance walk. Add a crosswalk diagonally across the street to the north side. Reconstruct the existing concrete sidewalk with a five-foot wide sidewalk to the west end of the street.

Esplanade Alternative #2 – Repave and widen Esplanade to a consistent 20 feet wide to accommodate bicycle travel.

Park Access Road Alternative #1 – Add head-in parking facing south along the side of the road, after confirming the acceptability of this addition with the adjacent land owners to the north. Add a crushed gravel path along the south side of the parking linking the west side of the park with the east side parking lot near Bridge Street.

Park Access Road Alternative #2 – Upgrade the park road to 20 feet wide and provide a link to the sewer treatment plant. Add a crushed gravel pedestrian path along the south side of the road linking the west side of the park with the east side parking lot. Remove the link between Esplanade and the sewer treatment plant.

Mini-Park Alternative #1 – Develop a small pedestrian seating area south of the railroad tracks on the west side of Bridge Street in front of the new market to take advantage of the views east towards Camels Hump.

RIVER CROSSING

The current Bridge Street bridge across the Winooski River is approximately 20 feet wide, with ten-foot wide travel lanes in each direction. A five-foot wide sidewalk is cantilevered from the west side of the bridge. Bicycle access is poor across the bridge. For those comfortable doing it, one of the best way to cross the road on a bicycle is to move to the center of the lane you are in and ride across the bridge - "taking the lane" and preventing motor vehicles to pass the bicycle on the bridge. The

other way is to dismount move to the sidewalk and walk the bicycle across the bridge. The most common way of crossing the bridge on bicycle appears to be riding on the sidewalk.

Few alternatives for crossing the river appear to be viable. To date, the following alternatives have been initially offered:

- Widening the sidewalk to six or eight feet wide;
- Constructing a new prefabricated, single span bicycle/pedestrian bridge to the west of the existing bridge; and
- Instigating a permanent pedestrian/bicycle ferry.

Each of these options appears to have at least one insurmountable obstacle that would keep it from being a feasible solution. However, there could be some unrealized potential in any of them, so they should be at least considered and discussed before being eliminated.

One last option, which is possible, is to provide "share the road" signs on the approaches to the bridge and/or other notices to bicyclists to dismount and use the sidewalk.

Appendix C
Initial Estimate of Probable Construction Costs

Recommendation #1: Restriping and Asphalt Sidewalk

Item	Quantity	Units	Unit Cost	Total
New 5-foot Wide Sidewalk with Granite Curb		LF	$90	$0
New 7-foot Wide Sidewalk		LF	$125	$0
New Granite Curb	390	LF	$30	$11,700
Pavement Excavation	15	CY	$25	$375
Common Excavation	45	CY	$12	$540
Topsoil	60	CY	$32	$1,920
Basecourse		CY	$30	$0
Bituminous Asphalt	345	SY	$60	$20,700
Restriping	1370	LF	$0.40	$548
Crosswalk		LF	$20	$0
Cold Planing		SY	$2	$0
Concrete Retaining Wall		CF	$20	$0
Stone Retaining Wall		SF	$35	$0
Street Tree	15	Each	$250	$3,750
Sub Total				**$39,533**
Engineering				$5,930
Municipal Project Manager				$1,977
Contingency				$5,930
Total (in 2010 Dollars)				**$53,370**

Recommendation #2: New Sidewalk on the East Side

Item	Quantity	Units	Unit Cost	Total
New 5-foot Wide Sidewalk	600	LF	$90	$54,000
New 7-foot Wide Sidewalk		LF	$125	$0
New Granite Curb	560	LF	$30	$16,800
Pavement Excavation		CY	$25	$0
Common Excavation	350	CY	$12	$4,200
Topsoil		CY	$32	$0
Basecourse	306	CY	$30	$9,180
Bituminous Asphalt	525	SY	$60	$31,500
Restriping	1370	LF	$0.40	$548
Crosswalk		LF	$20	$0
Cold Planing		SY	$2	$0
Concrete Retaining Wall	450	CF	$20	$9,000
Stone Retaining Wall	200	SF	$35	$7,000
Street Tree	4	Each	$250	$1,000
Sub Total				**$133,228**
Engineering 15%				$19,984
Municipal Project Manager 5%				$6,661
Contingency 15%				$19,984
Total (in 2010 Dollars)				**$179,858**

Recommendation #3: Railroad to Railroad Street

Item	Quantity	Units	Unit Cost	Total
New 5-foot Wide Sidewalk with Granite Curb		LF	$90	$0
New 7-foot Wide Sidewalk	95	LF	$125	$11,875
New Granite Curb	95	LF	$30	$2,850
Pavement Excavation		CY	$25	$0
Common Excavation		CY	$12	$0
Topsoil		CY	$32	$0
Basecourse		CY	$30	$0
Bituminous Asphalt		SY	$60	$0
Restriping		LF	$0.40	$0
Crosswalk		LF	$20	$0
Cold Planing		SY	$2	$0
Concrete Retaining Wall		CF	$20	$0
Stone Retaining Wall		SF	$35	$0
Street Tree		Each	$250	$0
Sub Total				**$14,725**
Engineering				$2,209
Municipal Project Manager				$736
Contingency				$2,209
Total (in 2010 Dollars)				**$19,879**

Recommendation #5: Esplanade Street Sidewalk

Item	Quantity	Units	Unit Cost	Total
New 5-foot Wide Sidewalk	730	LF	$90	$65,700
New 7-foot Wide Sidewalk		LF	$125	$0
New Granite Curb		LF	$30	$0
Pavement Excavation		CY	$25	$0
Common Excavation		CY	$12	$0
Topsoil		CY	$32	$0
Basecourse		CY	$30	$0
Bituminous Asphalt		SY	$60	$0
Restriping		LF	$0.40	$0
Crosswalk	26	LF	$20	$520
Cold Planing		SY	$2	$0
Concrete Retaining Wall		CF	$20	$0
Stone Retaining Wall		SF	$35	$0
Street Tree		Each	$250	$0
Sub Total				**$66,220**
Engineering				$9,933
Municipal Project Manager				$3,311
Contingency				$9,933
Total (in 2010 Dollars)				**$89,397**

Recommendation #6: Rasied Sidewalk at Volunteers Green

Item	Quantity	Units	Unit Cost	Total
New 5-foot Wide Sidewalk	40	LF	$180	$7,200
New 7-foot Wide Sidewalk		LF	$125	$0
New Granite Curb		LF	$30	$0
Pavement Excavation		CY	$25	$0
Common Excavation		CY	$12	$0
Topsoil		CY	$32	$0
Basecourse		CY	$30	$0
Bituminous Asphalt		SY	$60	$0
Restriping		LF	$0.40	$0
Crosswalk		LF	$20	$0
Cold Planing		SY	$2	$0
Concrete Retaining Wall		CF	$20	$0
Stone Retaining Wall		SF	$35	$0
Street Tree		Each	$250	$0
Sub Total				**$7,200**
Engineering				$1,080
Municipal Project Manager				$360
Contingency				$1,080
Total (in 2010 Dollars)				**$9,720**

Recommendation #7: South Bridge Street Restriping

Item	Quantity	Units	Unit Cost	Total
New 5-foot Wide Sidewalk		LF	$90	$0
New 7-foot Wide Sidewalk		LF	$125	$0
New Granite Curb		LF	$30	$0
Pavement Excavation		CY	$25	$0
Common Excavation		CY	$12	$0
Topsoil		CY	$32	$0
Basecourse		CY	$30	$0
Bituminous Asphalt		SY	$60	$0
Restriping	4000	LF	$0.40	$1,600
Crosswalk		LF	$20	$0
Cold Planing		SY	$2	$0
Concrete Retaining Wall		CF	$20	$0
Stone Retaining Wall		SF	$35	$0
Street Tree		Each	$250	$0
Sub Total				**$1,600**
Engineering				$0
Municipal Project Manager				$0
Contingency				$0
Total (in 2010 Dollars)				**$1,600**

Recommendations #8 & 9: Widening
South Bridge Street

Item	Quantity	Units	Unit Cost	Total
New 5-foot Wide Sidewalk		LF	$90	$0
New 7-foot Wide Sidewalk		LF	$125	$0
New Granite Curb	1010	LF	$30	$30,300
Pavement Excavation	45	CY	$25	$1,125
Common Excavation	325	CY	$12	$3,900
Topsoil	220	CY	$32	$7,040
Basecourse	120	CY	$30	$3,600
Bituminous Asphalt	315	SY	$60	$18,900
Restriping	4000	LF	$0.40	$1,600
Crosswalk	60	LF	$20	$1,200
Cold Planing	3275	SY	$2	$6,550
Concrete Retaining Wall		CF	$20	$0
Stone Retaining Wall		SF	$25	$0
Street Tree		Each	$250	$0
Sub Total				**$74,215**
Engineering 15%				$11,132
Municipal Project Manager 5%				$3,711
Contingency 15%				$11,132
Total (in 2010 Dollars)				**$100,190**

New storm inlet and connection to existing storm drains not included.

Recommendations #10, 11, & 12: Reducing Intersection Speeds

Item	Quantity	Units	Unit Cost	Total
New 5-foot Wide Sidewalk		LF	$90	$0
New 7-foot Wide Sidewalk		LF	$125	$0
New Granite Curb	92	LF	$30	$2,760
Pavement Excavation	13	CY	$25	$325
Common Excavation	70	CY	$12	$840
Topsoil	100	CY	$32	$3,200
Basecourse		CY	$30	$0
Bituminous Asphalt		SY	$60	$0
Restriping		LF	$0.40	$0
Crosswalk		LF	$20	$0
Cold Planing		SY	$2	$0
Concrete Retaining Wall		CF	$20	$0
Stone Retaining Wall		SF	$35	$0
Street Tree	12	Each	$250	$3,000
Sub Total				**$10,125**
Engineering 15%				$1,519
Municipal Project Manager 5%				$506
Contingency 15%				$1,519
Total (in 2010 Dollars)				**$13,669**

Recommendations#13: Huntington Restriping and North Sidewalk

Item	Quantity	Units	Unit Cost	Total
New 5-foot Wide Sidewalk	70	LF	$90	$6,300
New 7-foot Wide Sidewalk		LF	$125	$0
New Granite Curb	145	LF	$30	$4,350
Pavement Excavation	5	CY	$25	$125
Common Excavation		CY	$12	$0
Topsoil	15	CY	$32	$480
Basecourse		CY	$30	$0
Bituminous Asphalt		SY	$60	$0
Restriping	1600	LF	$0.40	$640
Crosswalk		LF	$20	$0
Cold Planing		SY	$2	$0
Concrete Retaining Wall		CF	$20	$0
Stone Retaining Wall		SF	$35	$0
Street Tree		Each	$250	$0
Sub Total				**$11,895**
Engineering 15%				$1,784
Municipal Project Manager 5%				$595
Contingency 15%				$1,784
Total (in 2010 Dollars)				**$16,058**

Recommendations#14: Huntington Road Widening and South Sidewalk

Item	Quantity	Units	Unit Cost	Total
New 5-foot Wide Sidewalk	165	LF	$90	$14,850
New 7-foot Wide Sidewalk		LF	$125	$0
New Granite Curb	165	LF	$30	$4,950
Pavement Excavation	12	CY	$25	$300
Common Excavation	70	CY	$12	$840
Topsoil		CY	$32	$0
Basecourse	80	CY	$30	$2,400
Bituminous Asphalt	118	SY	$60	$7,080
Restriping	1590	LF	$0.40	$636
Crosswalk		LF	$20	$0
Cold Planing	1470	SY	$2	$2,940
Concrete Retaining Wall		CF	$20	$0
Stone Retaining Wall		SF	$25	$0
Street Tree		Each	$250	$0
Sub Total				**$33,996**
Engineering 15%				$5,099
Municipal Project Manager 5%				$1,700
Contingency 15%				$5,099
Total (in 2010 Dollars)				**$45,895**

TOWN OF RICHMOND
VERMONT

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