Walk Bike planBTV

Main Street Bikeway

Project Scoping Report

Prepared for:

City of Burlington, Vermont Public Works Department

Prepared by:

DuBois & King, Inc. GPI STREETPLANS Miami San Francisco New York

July 2017

This report was developed with the collaboration and assistance of many people. The following individuals provided valuable guidance:

- Nicole Losch, Senior Transportation Planner, Burlington Public Works
- Nicholas Meltzer, Assistance Bicycle and Pedestrian Coordinator, VTrans
- Peter Keating, Senior Transportation Planner, CCRPC
- Kelly Stoddard-Poor, AARP- Vermont
- Jim Barr, Transportation and Parking Services, UVM

Project Consultant Team

- Lucy Gibson, DuBois & King
- Carolyn Radsich, GPI

Main Street Bikeway

Project Scoping Report

Table of Contents

OVERVIEW OF PLANBTV WALK BIKE 1

Public involvement process 3

planBTV Goals and Priorities 3

Purpose and Need Statement 6

EXISTING CONDITIONS 7

Context 7

Roadway 7

Right of way 7

Street Cross Section 7

Functional Classification and Jurisdiction 7

Traffic 8

Topography 9

Safety 10

Natural Resources 13

Cultural Resources 13

Utilities 13

ALTERNATIVES 14

Bikeway Options 14

Conventional or Buffered Bike Lanes 14

Shared Use Path 14

Protected Bike Lanes 15

Intersection Treatment Alternatives 17

Raised Intersections 17

Recessed Crossing 17

Roundabouts 19
Preferred Concept 21
Corridor Overview 21
South Union to South Willard 23
South Willard to Summit Street 23
Summit Street to UVM 27
PROJECT IMPLEMENTATION, FUNDING AND MAINTENANCE 34
Cost Estimates 34
Implementation Plan 34
Construction phasing and traffic control concepts 34
Short term phasing 35
Permit Requirements 35
Cultural Resources 35
City of Burlington Review 36
Stormwater 36
Section 106 and 4(f) 36
Act 250 36
Maintenance Requirements 37
Project Viability 37
ATTACHMENTS 37

1) Public Meeting Notes and Comments
2) Historic/Cultural Report
3) Utilities Maps
4) Existing/Proposed Cross Sections for corridor
5) Plan for entire corridor
6) Plan between Union and UVM
7) Cost Estimates

Main Street Bikeway

PROJECT SCOPING REPORT

With the completion of planBTV Walk Bike, Burlington's first comprehensive plan for pedestrian and bicycle infrastructure, a future bikeway network is mapped out that will enable the City to meet its goals for the share of trips made by biking. The planBTV Walk Bike process is intended to be action and implementation focused, and broadens implementation strategies to include rapid implementation and Quick Build approaches to installing bicycle infrastructure, in addition to longer term capital projects. planBTV Walk Bike included the development of this project scoping report for Main Street. For decades City plans have noted the lack of a continuous east-west route for people bicycling. The Main Street corridor was identified as a high-priority east-west route during the development of planBTV Walk Bike, when Local Motion surveyed over 330 people during a protected bike lane demonstration on North Winooski Avenue. Of those people surveyed, Main Street was identified as their top priority for protected bike lanes. At the same time, the City's Great Streets Initiative is developing options for the redesign and reconstruction of Main Street through downtown, making this an opportune time to develop a corridor-wide design concept. The intent of this report is to explore the feasibility of design concept alternatives for the entire Main Street corridor between the Campus District and the waterfront, and develop a project scoping report for the corridor between the Campus District and South Union Street.

Overview of planBTV Walk Bike

The City of Burlington Public Works Department initiated the development of a master plan for bicycle and pedestrian infrastructure in the summer of 2015. The planning process included an analysis of current walking and biking infrastructure, patterns and safety; public outreach including demonstration projects that prototyped new street types, workshops to assess needs and priorities, and meetings to present the plan and recommendations. The plan sets out goals for the mode shares of walking and biking in Burlington, and maps out a network of bikeways that will provide "low stress" bicycling throughout the city that will be needed to achieve these goals.

Figure 1: Existing / Future Bikeway Network

Legend

- Shared Use Path
- Protected Bike Lane
- Neighborhood Greenway
- Buffered/Conventional Bicycle Lane
- Advisory Bicycle Lane
- Shared Use Lane Markings

Existing Bikeway Network

Five Year Planned Bikeway Network

Future Bikeway Network

Source: planBTV Walk Bike

The concept of bicycle level of stress is useful for planning a bikeway network that will appeal to a broader range of the potential bicycle riding population. Stress arises from exposure to high traffic volumes and/or high traffic speeds, and exposed crossings. On more heavily traveled routes, more protection between the bikeway and vehicle traffic is needed to achieve a low level of stress, and thereby attract a greater range of riders.

There is a significant lack of east west bicycle routes in Burlington. With the typical 66 foot right-of-way of most City streets, providing a low stress route would involve elimination of on-street parking or the tree lawn. Main Street has a right-of-way of 99 feet, so there is room for a low stress bikeway to share the public realm with other uses.

A bikeway on Main Street emerged as a priority component of the future bikeway network, and shows up on the 5 year bikeway network map.

Public involvement process

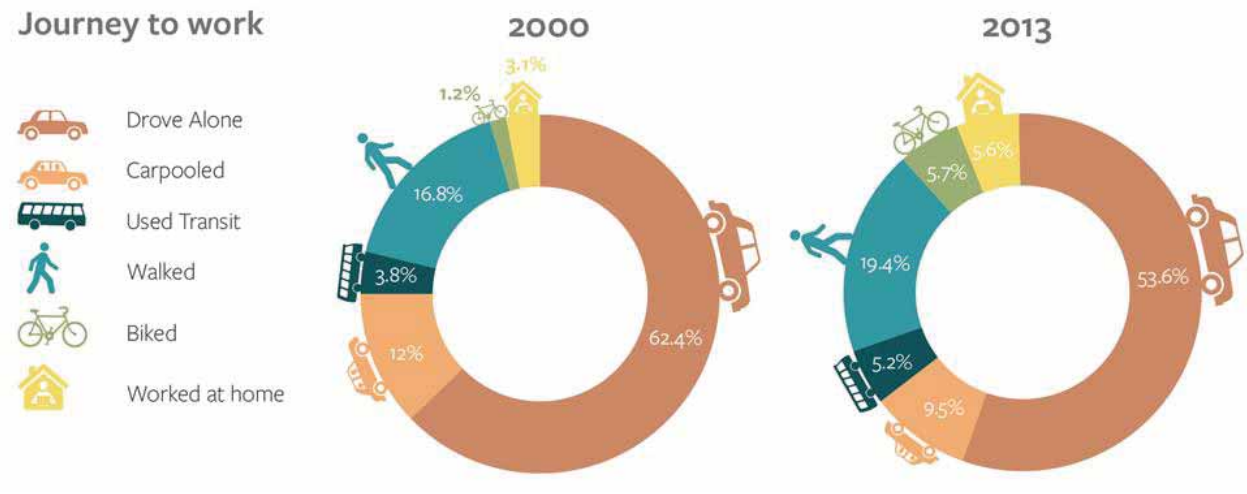
PlanBTV Walk Bike included a robust public involvement process with three major engagement events:

- an initial public kick-off meeting with tours in July 2015;
- a weekend of pilot demonstrations, street prototyping and public workshops in September 2015; and
- a final plan presentation in January 2016.

As project scoping began, an alternatives presentation for the Main Street scoping study was held on February 28, 2016 at Burlington City Hall, and a final project presentation on May 28, 2016 at the Burlington Farmers Market. The presentations and comments received from the public are attached to this report.

planBTV Goals and Priorities

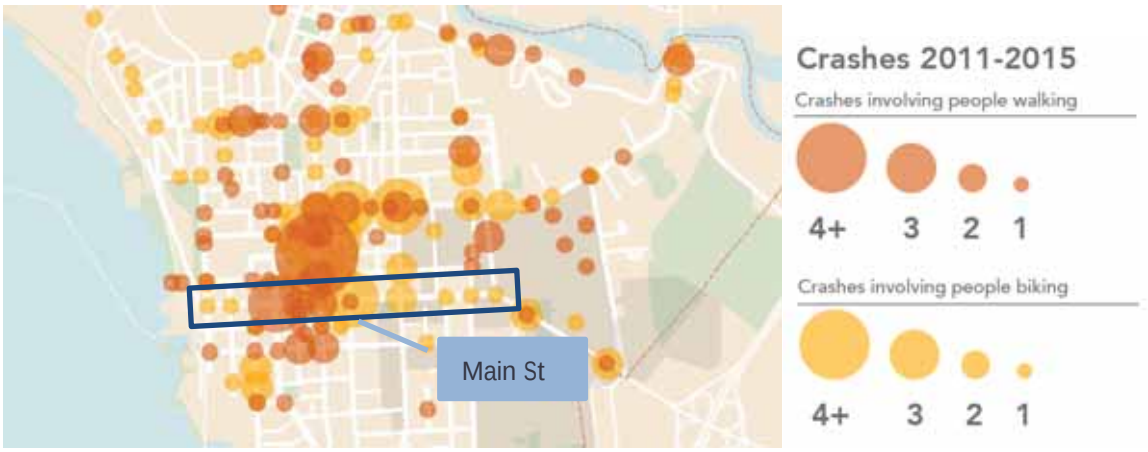
Burlington has seen substantial growth of the bicycle commuting share from 1.2% in 2000 to 5.7% in 2013. This percentage of commuters puts Burlington in the top tier of bicycle mode share in cities across the US[1]. This growth occurred without significant expansion of bicycle infrastructure.



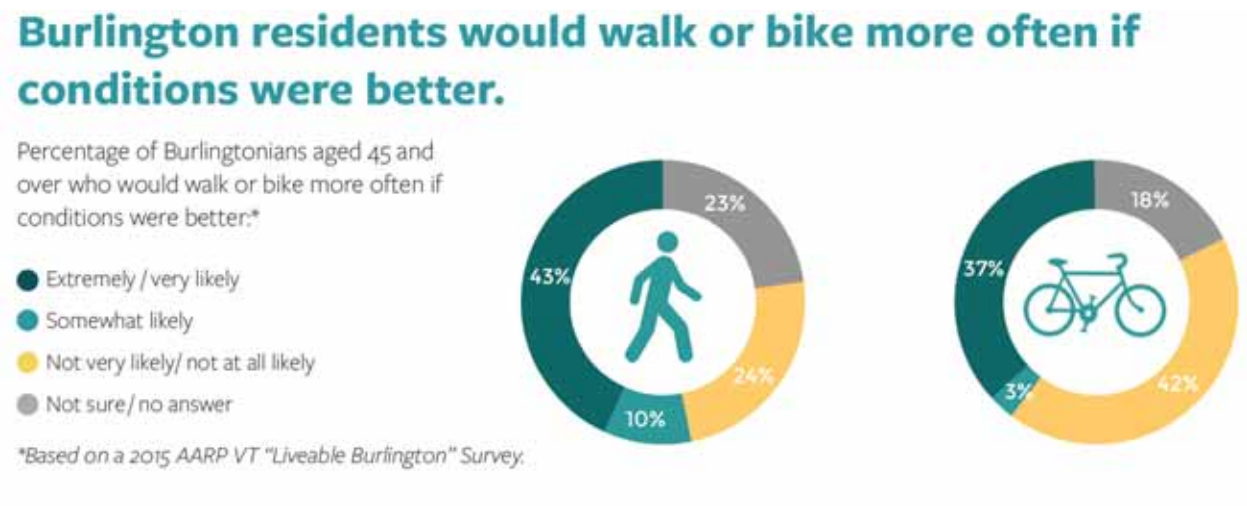
The result has been increased crashes and conflicts on Burlington's streets, putting all users at risk. There is a need for the infrastructure to "catch up" to the current levels of bicycling. The crash statistics are illustrated on the following page, showing that people bicycling suffer a disproportionate number of crash injuries. The locations of crashes involving people walking or biking in the central part of Burlington is shown in Figure 2.

[1] Modes Less Traveled-—Bicycling and Walking to Work in the United States: 2008–2012, US Census Bureau, May 2014.

Figure 2: Walk and Bike Crashes in Burlington



A survey was conducted as part of AARP's Livable Burlington initiative asked respondents about the likelihood of walking or biking more if conditions were improved. The results are shown below, and indicate a lot of potential for more walking and biking over time as the infrastructure is adapted for these modes.



planBTV Walk Bike also conducted a survey of people that live or travel through Burlington to help gauge priorities for improvements to bicycle infrastructure. The following shows the top priority corridors, which include Main Street.

In addition, planBTV Walk Bike sets goals for further increasing the bicycle mode share to 12% of commute trips by 2026. A survey conducted as part of planBTV Walk Bike indicated that 40% of respondents were likely or highly likely to bike more often if conditions were improved.

Purpose and Need Statement

Based on the findings in planBTV Walk Bike, which mapped out the City's future bike network based on data and public input, the following paragraph summarizes the purpose and need of the Main Street bikeway:

> The **purpose** of this project is to identify the impacts and understand the feasibility of developing a low stress bikeway between the Campus District and the Burlington waterfront and bike path that will serve both existing riders and foster the planned growth in bicycle transportation mode share. The **need** exists due to the lack of east-west connectivity for people bicycling to and through the downtown.

EXISTING CONDITIONS

Context

Main Street traverses two distinct zones between the Waterfront and UVM: (1) the Downtown and (2) the Hill. The Downtown/Waterfront area, encompassing roughly seven blocks between the waterfront and South Union Street, includes the core of Burlington's Central Business District including a mixture of offices, higher-density residential, hotels, and traditional street-oriented retail shops. Within this area Main Street is intersected by streets generally every 400 feet. Church Street, which intersects Main Street on a plateau overlooking Lake Champlain, is Burlington's main shopping street, and a significant destination within the City. East of South Union Street, the area transitions to Burlington's 'Hill' neighborhood of predominantly residential uses situated on the west-facing slope overlooking the lake. In addition to residential uses there are several significant institutional uses along Main Street including Edmunds elementary and middle schools, Champlain College and the Campus District.

Roadway

Right of way

The public right-of-way (ROW) along Main Street is 99 feet (6 rods) throughout the project area. This generous width should allow the accommodation of bicycle facilities to be constructed within the ROW, and it is not expected that any additional ROW acquisition will be required. As alternatives for addressing the project need are developed, among the goals will be to avoid the need to acquire ROW, given the constrained setting.

Street Cross Section

The composition of the street section varies, but through the Hill neighborhood typically includes five-six foot sidewalks on both sides of the street, generous tree lawns ranging from 13 feet to 20 feet in width with mature trees, on-street parallel parking, one through travel lane in each direction and exclusive left-turn lanes at some of intersections. The curb-to-curb dimensions range from 36 feet at the top of the hill between Summit and South Willard Street, to 50 feet west of South Willard Street. Through the Downtown area, the cross section varies block by block, including some diagonal on-street parking and wider sidewalks.

Functional Classification and Jurisdiction

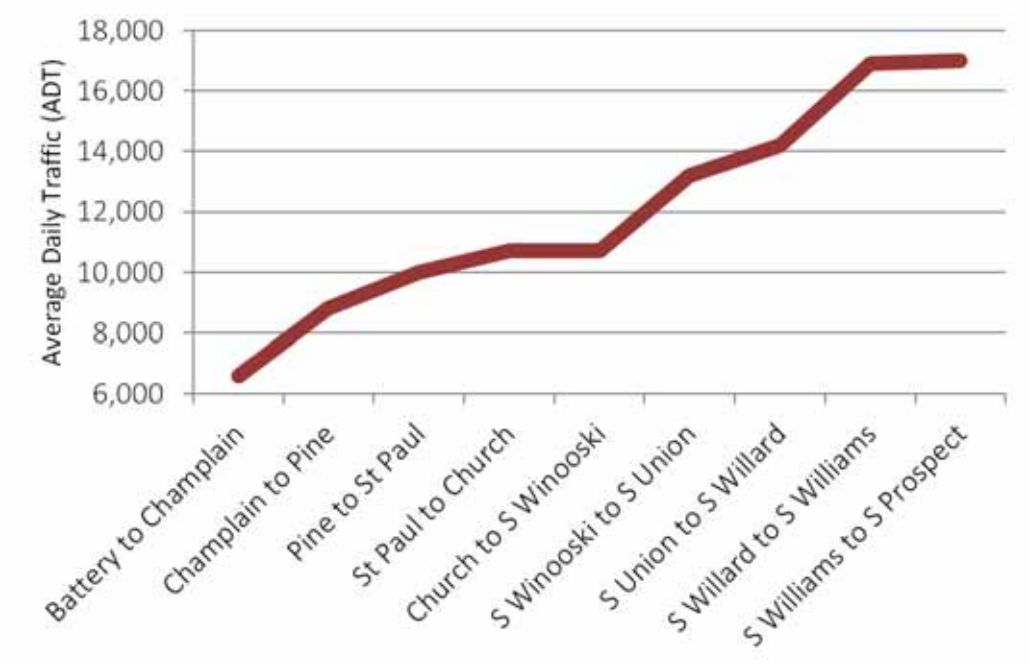
Main Street is an urban arterial route and that is a Class 1 Town Highway, designated as US Route 2, between the intersection of South Willard Street and the Burlington/South Burlington border. In this section, the City owns and maintains the corridor, and Vermont Agency of Transportation (VTrans) shares some responsibility and jurisdiction. For example, major resurfacing projects are funded primarily by the VTrans with a local match from the City of Burlington. Main Street is also considered a primary

truck route between the South Burlington boundary and South Willard Street. The City of Burlington does not designate city streets as truck routes other than those on the State system.

Traffic

Main Street is a major transportation gateway into downtown Burlington, with an average annual daily traffic volume (AADT) of 17,000 vehicles per day (vpd) at South Prospect Street. However, going west from the Campus District to the waterfront, the traffic volumes drop substantially. The AADT on Main Street as it approaches Battery Street is just over 6,000 vpd. The chart below shows available traffic counts from VTrans.

Figure 3: Average Daily Traffic Volumes on Main Street



Truck traffic volumes on Main Street were recently counted by VTrans in August, 2016 on the segment between South Union Street and South Willard Street. The results are summarized in the table below, with the daily average volume of heavy trucks of 142 per day along the corridor (total volume including both directions).

Table 1: Vehicle Classification on Main Street

Vehicle Classification	Description	Percent	Average Daily Count
Light Duty Vehicles	Passenger cars and light duty trucks	93.1%	11,603 vpd
Medium trucks	single unit delivery trucks	5.8%	717 vpd
Heavy trucks	Tractor trailers	1.1%	142 vpd

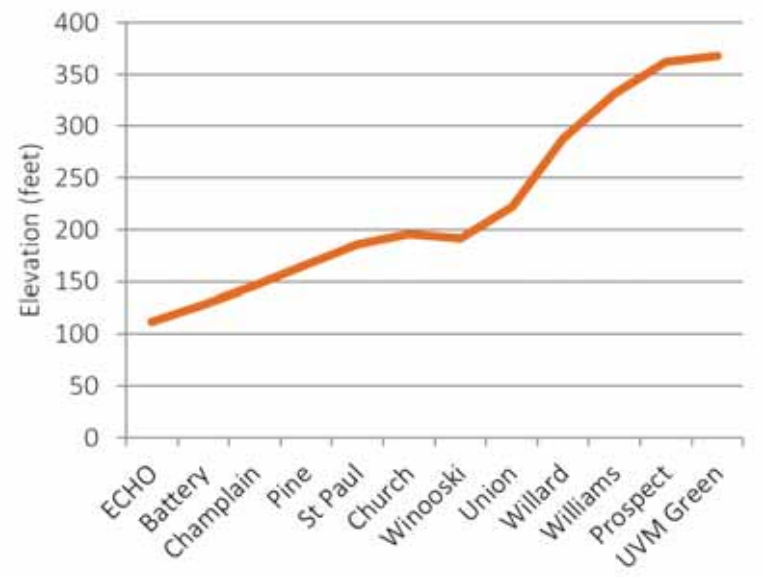
Topography

Main Street drops in elevation about 240 feet between the UVM green and Battery Street. The table to the right shows the average grade in percent on each block of Main Street between Battery and the Campus District. Bikeways typically require additional width on steeper sections, particularly on the uphill. Grades steeper than 3% can be a barrier to riding for less experienced and fit riders; and slopes exceeding 5% may require additional width to accommodate passing and potential of higher downhill speeds. Burlington's topography does not provide many options to travel between the Campus District and the waterfront on significantly less steep slopes. It is possible that some riders will choose to walk their bicycles on the steepest blocks, and the growth of electric assist bicycles may address bicycle use on steeper grades. Measures to encourage lower speeds of downhill cyclists through signage and textures should be incorporated into the design.

Table 2: Average grades on Main St

Segment	Ave Grade
Battery to S Champlain	4.67%
S Champlain to Pine	4.30%
Pine to St Paul	5.46%
St Paul to Church	2.79%
Church to S Winooski	1.53%
S Winooski to S Union	5.65%
S Union to S Willard	**7.40%**
S Willard to S Williams	**6.99%**
S Williams to S Prospect	4.59%
S Prospect to the UVM	2.40%

Figure 4: Profile of Main Street



The segment between South Union and South Williams Streets has the steepest grades, and careful design will be important to address potential downhill speeds, and provide passing opportunities for uphill riders.

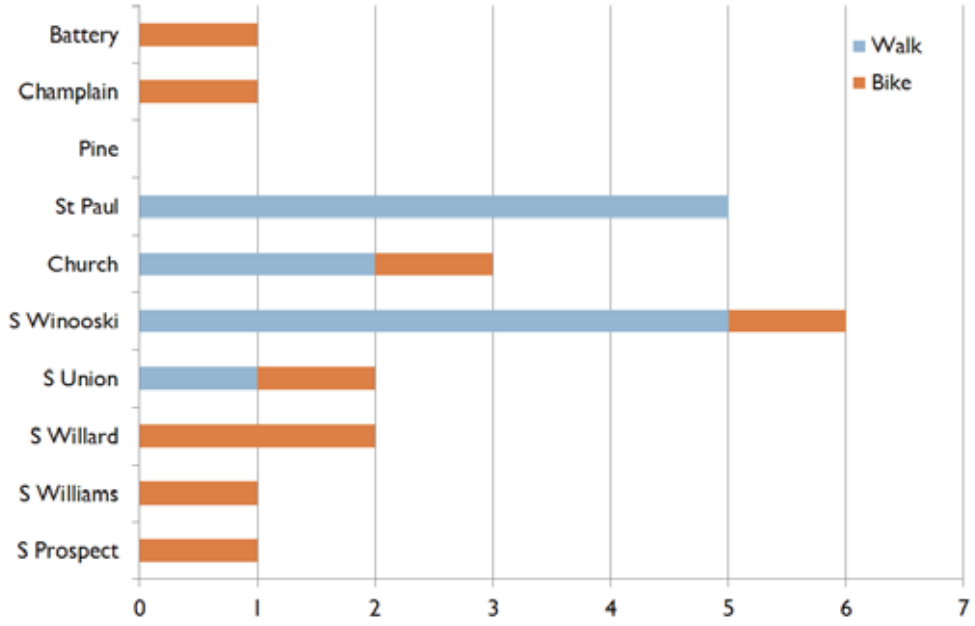
Safety

Main Street is a corridor with a documented history of high crash rates, with five high crash intersections within the study area, as shown below. The great majority of crashes are "property damage only", with one fatality and 59 injuries during the most recent five year reporting period.

Map of High Crash Locations in Study area (2010-2014, VTrans)

A detailed review of crashes that involved pedestrians and bicycles was conducted, and indicated that all crashes occurred at intersections rather than mid-block locations. The chart below shows the number of bike and walk related crashes at each intersection on Main Street through the corridor. Bicycle crashes were distributed throughout the corridor, and pedestrian crashes were more prevalent in the center of downtown.

Figure 5: Walk and Bike Crashes on Main Street, 2011 through 2015



Public Transit Service

There is frequent transit service on Main Street from several Green Mountain Transit routes. The following routes use part of all of Main Street within this study area:

- 1-Williston and 1V-Williston Village (15 minute headways): these routes connect downtown transit center with destinations in Williston, with some routes continuing to the historic village center. These routes use Main Street to Battery Street to access the Downtown Transit Center on St Paul Street.
- 5-Pine Street (30 minute headways): This route only uses Main Street between Pine and Battery, and stops at the Downtown Transit Center.
- 6-Shelburne Road (30 minute headways): This route uses Main Street for the westbound direction between St Paul and Battery Street as the buses access the Downtown Transit Center.
- 12-U Mall/Airport (60 minute headways on Main St): This route uses Main St to access downtown.
- 76-Middlebury LINK (peak hour only): This service uses Main Street between South Willard and South Prospect only in the eastbound direction, eventually serving the UVM Medical Center and other destinations in Burlington.

Most of the stops lack amenities other than a sign; the Great Streets initiative envisions creating more defined and convenient bus stop areas that will provide bus bulbs for efficient boarding, shelters, route and schedule information, lighting, and streetscape enhancements.

Natural Resources

Main Street traverses a highly urbanized environment, and there are no features present such as wetlands, sensitive wildlife habitats, or natural waterways. However, the stormwater from the corridor enters Burlington's combined wastewater/stormwater sewer, and during heavy rainfall events, overflows of the system can send polluted water into Lake Champlain. Therefore, it is a priority for the City to reduce the quantity of stormwater entering the system by incorporating any of a variety of measures to capture and retain stormwater and reduce the flow into the sewer system.

Cultural Resources

An assessment of cultural (historic and archaeological) resources will be attached to this report pending completion. The following cultural resource considerations apply to this project:

- High level of disturbance from street and utility projects indicates the areas along street that would be excavated for this project is not archaeologically sensitive.
- Historic buildings line the corridor, so the project design needs to respond appropriately to the historic context.

Utilities

There are a number of utilities in the Main Street corridor:

- Burlington Electric distribution– primarily underground
- City of Burlington Water
- City of Burlington Wastewater/Stormwater (combined system)
- Telecommunications (Fairpoint and Burlington Telecom)
- Vermont Gas

The project design should be cognizant of utility locations and avoid conflicts with these where possible. It is expected that many of the underground utilities will be below the depth where impacts might occur. The stormwater collection system is most likely to be affected by the project. Maps of the utilities in the corridor are included in the appendix, and potential conflicts with utilities are identified in the alternatives section.

ALTERNATIVES

The following section reviews design concept alternatives; analyzes these options in terms of safety, impacts and bicycle level of stress; and recommends a preferred design concept.

Bikeway Options

There are several options for implementing low stress infrastructure for bicycling along Main Street, as described below:

Conventional or Buffered Bike Lanes

Bike lanes consist of a portion of the roadway set aside for the exclusive use of bicycles. Bike lanes are designated by pavement markings (i.e. striping, bike icons, arrows and sometimes green paint) and signage. Bike lanes typically are located on the right side of a travel lane and may be along the curb or to the left of parked cars, and flow in the same direction as traffic - unless a contra-flow lane is used on a one-way street (as on South Winooski Avenue). Bike lanes are widely used and are well recognized by bicyclists and drivers.

A buffered bike lane includes additional space designated by striping that 'buffers' the bike lane from adjoining traffic or parked cars.

Bike lanes have many benefits and are relatively easy to implement if there is space. They designate space for bicycles and automobiles, and visually remind motorists that bicycles are present and have a right to the street. However, as there is not a physical separation between bicyclists and cars, bike lanes will provide a low stress bicycle route only on streets with lower volume and speeds. On streets with parallel parking, a buffer area alongside the parked cars is required to prevent crashes with opening car doors.

Buffered bike lanes provide additional separation between cars and bicyclists and lowers stress somewhat for bicyclists on busy roadways, and thus appeals to a somewhat wider range of bicyclists.

Bike lanes would not provide a low stress bike route on Main Street due to the combination of high traffic volume and on-street parking.

Shared Use Path

A shared use path is a two-way path which is separated from motor vehicle travel and used by both bicyclists and pedestrians. Due to separation from motor vehicles, a shared use path lowers bicycle stress, and attracts a wider range of bicyclists, including children. At a width of 10 to 12 feet, a shared use path provides an attractive, low stress facility for bikes.

Figure 6: Urban Shared Use Path Examples

Indianapolis Cultural Trail, IN. Credit: Citylab

Boulder, CO. Credit: Carolyn Radisch

In areas where the volume of pedestrian and bicycle traffic, is high, however, there is greater potential for conflicts between users. Paths with steep grades are a particular concern as the speed differential between bicycles and pedestrians is potentially hazardous. In addition, more experienced and confident bicyclists do not want to ride with pedestrians. Shared use paths also create safety concerns at driveway crossings where motorists do not expect bicyclists coming from the opposite direction of the traffic flow or traveling faster than pedestrians on the sidewalk.

A shared use path, which may be accommodated by widening a sidewalk on one side of the street, would not be suitable for much of Main Street due to high pedestrian volumes (downtown), steep topography, and numerous driveway crossings. A shared use path could be a viable option for Main Street between Summit Street and the UVM Green, which is level and has few curb cuts.

Protected Bike Lanes

Protected bike lanes (PBLs) provide a physical separation between motor vehicles, pedestrians and bicyclists. PBLs may be one- way on each side of the street, or two-way facilities on one side of the street. They may be at street level or sidewalk level, or in-between, but in all cases bicycle traffic is separated from motor vehicles and sidewalks, providing a low stress and efficient facility.

A one-way PBL may be separated by plastic bollards, planters, a raised median, or parked cars. If the PBL is adjacent to parked cars, a three-foot buffer is required to allow for door opening and passenger loading. Raised PBLs provide many of the benefits of street level lanes, and an extra measure of protection from encroachment by motor vehicles, particularly at driveways. They can visually reduce the width of the street, which provides a traffic calming benefit, and may be easier for snow removal, depending on the design of the facility and the maintenance equipment of the municipality.

Figure 7: One-Way Protected Bike Lane examples

Cambridge, MA. Credit: Carolyn Radisch

Seattle, WA. Credit: Mike Lydon

A two-way PBL in some cases requires less right-of-way than one-way facilities, as only one buffer zone is needed. However, like shared use paths, there are safety concerns at driveways and side street crossings where motorists are not expecting bikes to be riding against the flow of traffic. With the steep topography on Main Street, there could also be conflicts between fast downhill riders and slower uphill climbers. Two-way PBLs are best suited to streets that are less steep, more 'one-sided;' with few driveways and street crossings on one-side of the street, as accessing destinations across the street from the PBL can be difficult.

Figure 8: Two-Way Protected Bike Lane examples

San Francisco, CA. Credit: NACTO

Montreal, QC. Credit: Greg DeFrancis

One-way protected bike lanes can provide a safe, low stress option for Main Street. The numerous intersections with driveways, side streets, destinations on both sides of the street and steep topography make Main Street not well suited for two-way protected bike lanes.

Intersection Treatment Alternatives

Most bicycle crashes occur at intersections. The overall approach to increase safety at intersections is to reduce speeds of vehicular traffic, increase the visibility of bicyclists and other competing modes of transportation, provide adequate sight distance, and communicate a priority for the right of way. This can be achieved through pavement markings, carefully placed medians, and signage. An overview of appropriate intersection treatments follows.

Intersection Crossing Markings

Bicycle crossing markings indicate the path for bicyclists to follow, and signal to motorists that a bicyclist may be present and yielding may be required. Where PBLs are present, it is desirable to distinguish bicycle crossings from pedestrian crossings by using green paint, which will also increase the visibility of the crossing.

Figure 9: Bike Crossing Example

Raised Intersections

Raising the crossing is another strategy to help slow traffic and encourage both motorists and people riding bicycles to slow down and cross with care. A raised crossing signals to both people riding bicycles and driving vehicles that they are entering a crossing zone and are useful for driveways and intersections.

Recessed Crossing

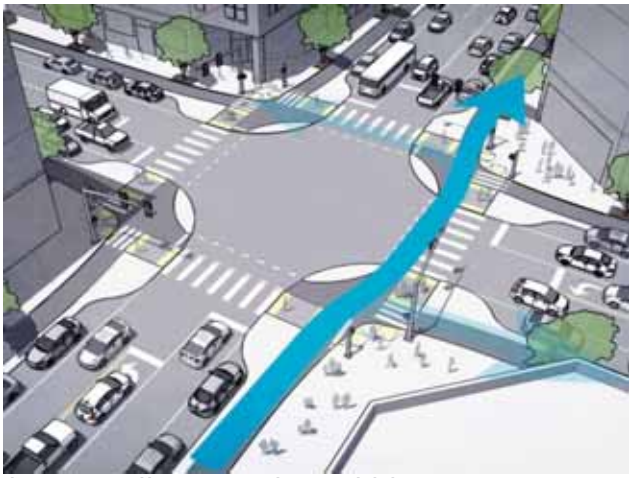
A recessed crossing aligns the crossing further back from the corner of the intersection in order to provide space for a motorist to yield to a crossing bicyclist at the edge of the road and out of the center of the intersection. In this manner, the motorist has a direct line of sight to the crossing bicyclist and can yield without blocking either the intersection or the crossing. This treatment requires more room, but with the 99 foot wide right-of-way, this treatment can be provided in selected locations without requiring additional property.

Figure 10: Recessed Bicycle Crossing (FHWA Separated Bike Lane Planning and Design Guide)

Protected Intersections

Protected intersections provide refuge islands for bicyclists (and pedestrians) that serve as a buffer from motor vehicles, increase visibility of the bicyclist and improve eye contact with drivers. The buffers allow crossing bicycles and walkers to get a head start across the intersection and reduce the crossing distance. They provide much more clarity for all users of the intersection on crossing zones and priority. This treatment also requires more room, but Main Street's wide right-of-way could allow this option without requiring additional property.

Figure 11: Protected Intersection Concept



(NACTO Bikeway Design Guide)

Roundabouts

Roundabouts have been proven to reduce crashes and the severity of crashes at intersections. Traffic moves slowly and steadily through an intersection, yielding to vehicles, bikes or pedestrians, providing a safer crossing and often higher capacity. Due to the slow speed of traffic at single lane roundabouts, bicyclists can merge and ride with traffic. If protected bike lanes are present, ideally a separate protected bike lane can be provided parallel to the sidewalk, with separate, designated bicycle crossings. The primary constraint to roundabouts is available right of way, and steep topography is also somewhat more challenging for roundabouts.

Figure 12: Roundabout Bike Crossing

Source: MassDOT Separated Bicycle Lane Guide

The following figures show concepts for incorporating roundabouts into protected bike lanes on Main Street.

Figure 13: Mini-Roundabout + Protected Bike Lane Concept for Main & South Union Intersection

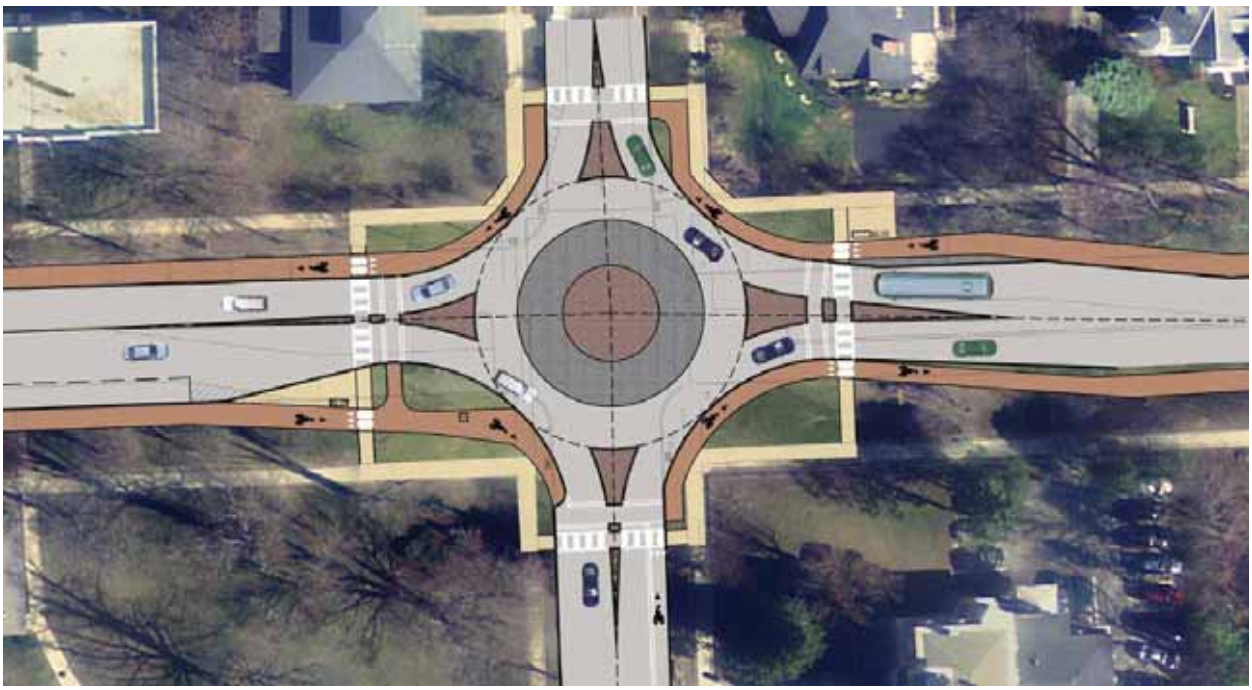


Figure 14: Roundabout + Protected Bike Lane Concept for Main & South Winooski Intersection

Preferred Concept

Corridor Overview

After a review of the bikeway and intersection options described previously, the preferred concept for Main Street is to provide one-way protected bike lanes (PBLs) along the length of Main Street, from Battery Street to Summit Street, near the the Campus District. At Summit Street, the facilities would transition to a shared use path to the UVM green and connect to the existing shared use path network on campus. An illustrative concept for the entire corridor is shown on the following page. The PBLs are recommended to be raised facilities, which provide a greater separation from motor vehicle traffic and an extra measure of safety at driveway crossings. The width of the PBL is proposed to be six and a half feet, to provide a safer facility for higher speeds on the downhill sections and room for passing on the uphill sections. This width will also make maintenance much easier, allowing access for snow removal equipment. The PBLs can be separated from sidewalks by landscaped tree lawns, street trees, and possibly a different surface to separate bicycle and pedestrian traffic. A three-foot buffer is provided adjacent to on-street parking to allow for safe door opening and passenger loading and unloading. In addition a buffer between the PBL and the curb is recommended to allow the PBL to remain raised above street level at driveway crossings, increasing the safety and visibility of bicyclists.

There are several bus stops along Main Street, shown in the plan on the next page. A 'floating' bus stop configuration is proposed, which places the PBL behind the bus waiting area is recommended to reduce conflicts between bicyclists and transit passengers. Pavement markings, including yield lines and painted pedestrian crosswalks, should be incorporated into the PBL to direct pedestrian activity and warn bicyclists of pedestrian activity around bus stops. The concept is illustrated below.

Figure 15: Floating Bus Stop with Protected Bike Lanes (NACTO Transit Design Guide)

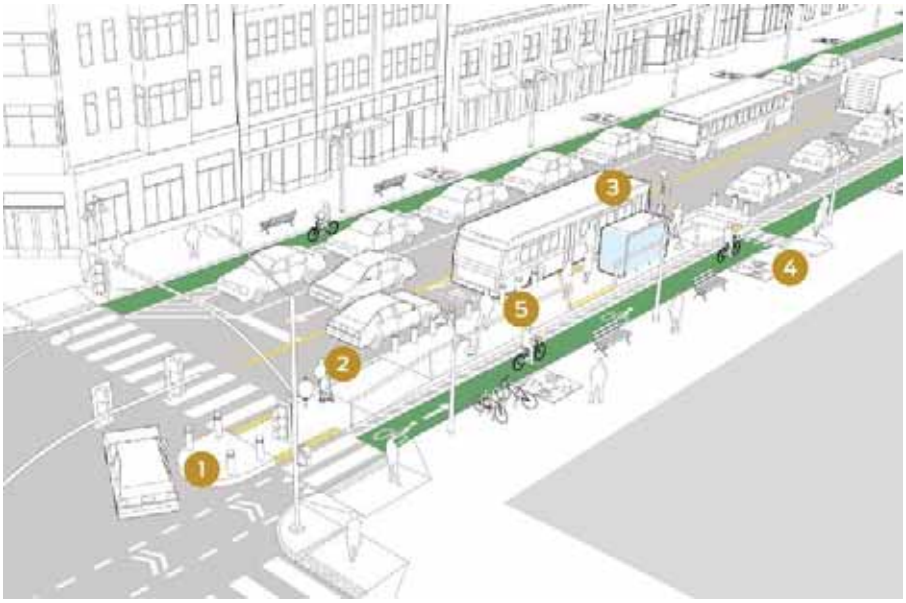
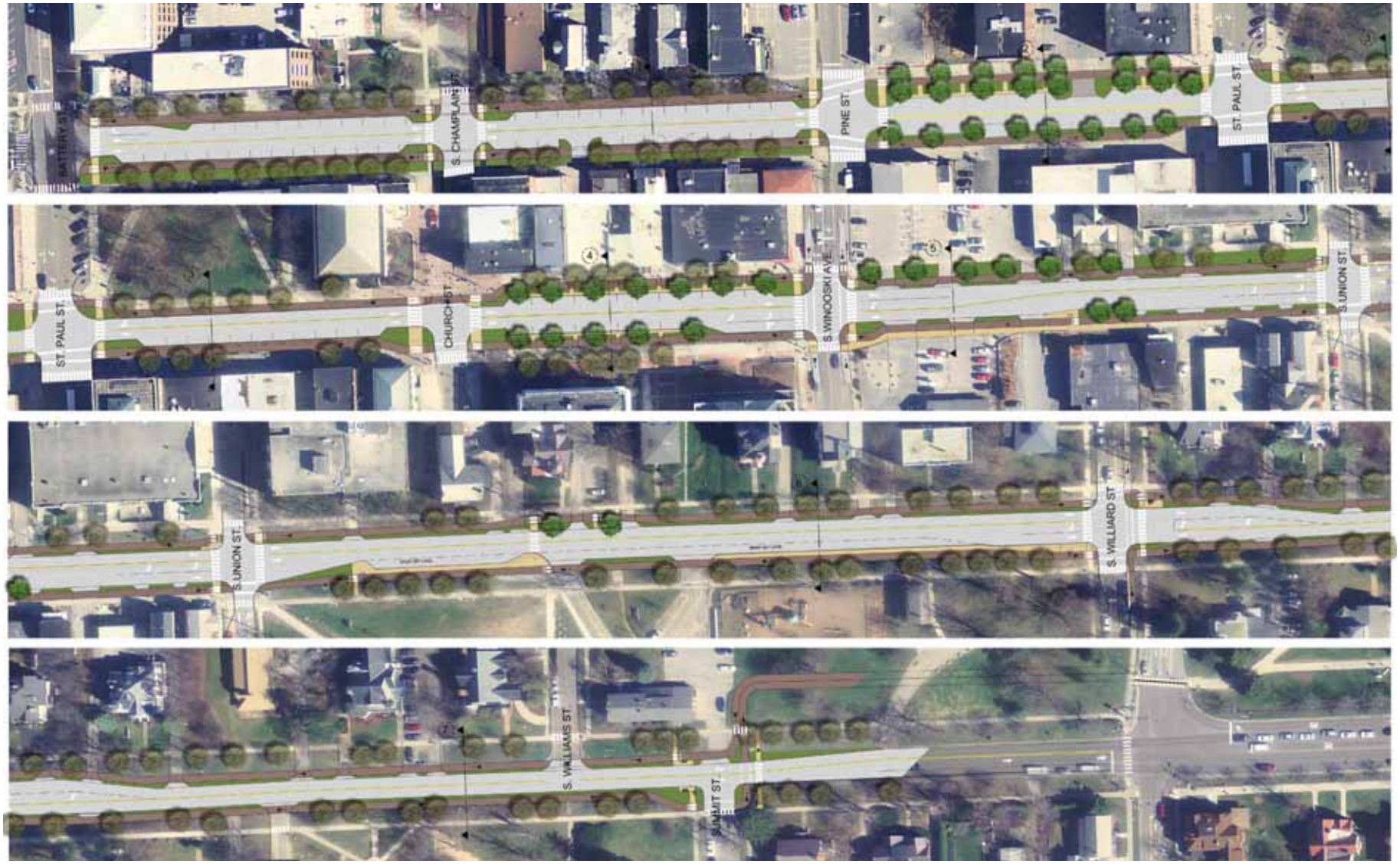


Figure 16: Illustrative Concept of the Main Street Corridor



The following sections describe the refined plan, which is shown on page 19 and attached to this report.

South Union to South Willard

The graphics on the following page show the proposed plan for this section, along with existing and proposed cross sections. The protected bike lanes are provided by removing the 36 on-street parking spaces on the north side of Main Street to be protected bike lanes. Field observations conducted for this study on numerous occasions indicated that the parking spaces in this location are often lightly utilized, as most of the properties that line the north side of Main Street have off street parking.

The Edmunds School drop-off area is maintained. A curbside loading and unloading area of five-feet is recommended adjacent to the curb at the Edmunds school drop-off zone to accommodate the drop-off activity here. During drop-off periods, this area will be a mixing zone of pedestrian and bike activity with slow bike traffic and heavy pedestrian volumes.

There is limited widening of the existing pavement of 7 feet for the south side of Main Street which will reduce the existing generous 22 foot tree lawn in front of the Edmunds School to be 15 feet wide. With appropriate care taken during construction, and the possibility of using structural soils under the bike lanes, it is expected that there would be no loss or degradation of the street trees.

Utility impacts are not expected due to underground power, gas and telecommunications well below the area of disturbance for construction. Stormwater infrastructure may need to be adjusted with new curb lines, and has been included in the cost estimate.

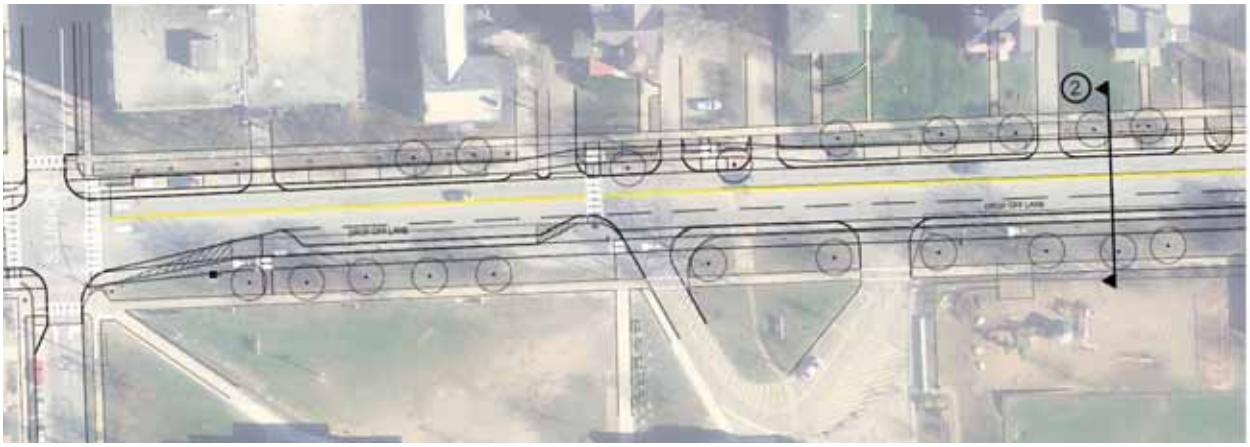
South Willard to Summit Street

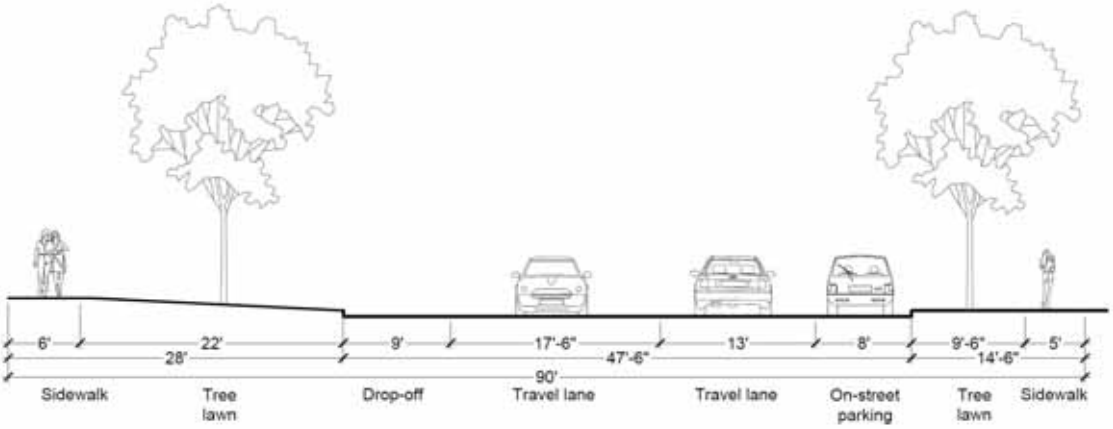
This block has unmetered, unmarked parking on the north side of the street and generous twenty-foot tree belts on both sides of the street. The land uses along Main Street at this location include on site parking lots on each parcel, and use of the on-street parking appears to be primarily unpermitted campus overflow parking. The concept for this block is to reallocate the on-street parking, serving approximately 18 vehicles at maximum use, and use a portion of the tree lawn to accommodate protected bike lanes on both sides of the street. The tree lawn on the north side of Main Street would be narrowed from about 21 feet to 14 feet, still allowing ample room for healthy tree growth. It is not expected that street trees would be impacted from the bike lane construction if appropriate care is taken during construction. Additional mitigation could include using structural soils under the bike lanes, or narrowing the buffer strip.

Utility impacts are not expected due to underground power, gas and telecommunications well below the area of disturbance for construction. Stormwater infrastructure may need to be adjusted with new curbing, and has been included in the cost estimate.

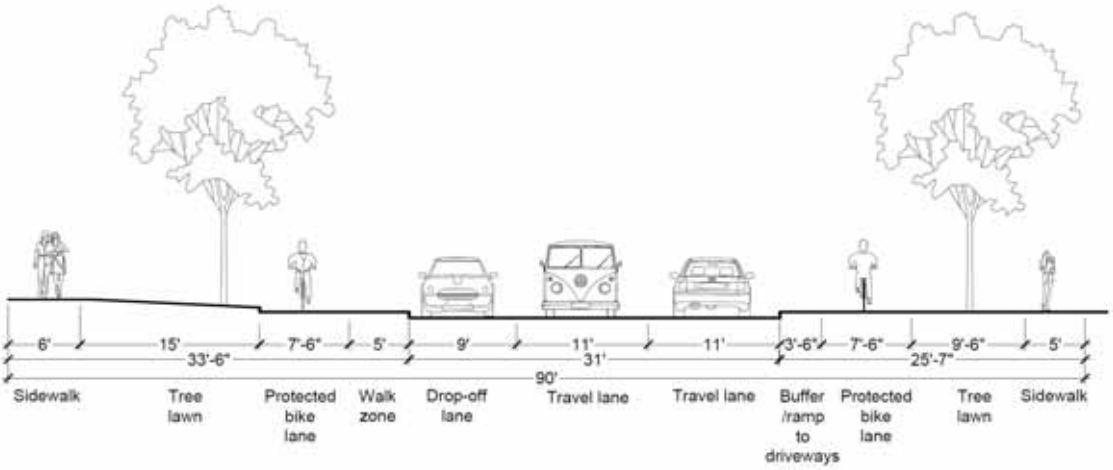
Figure 17: Preferred Concept for Main Street Protected Bike Lanes: South Union to the Campus District

Figure 18: Plan View and Cross Sections of Main Street, South Union to South Willard



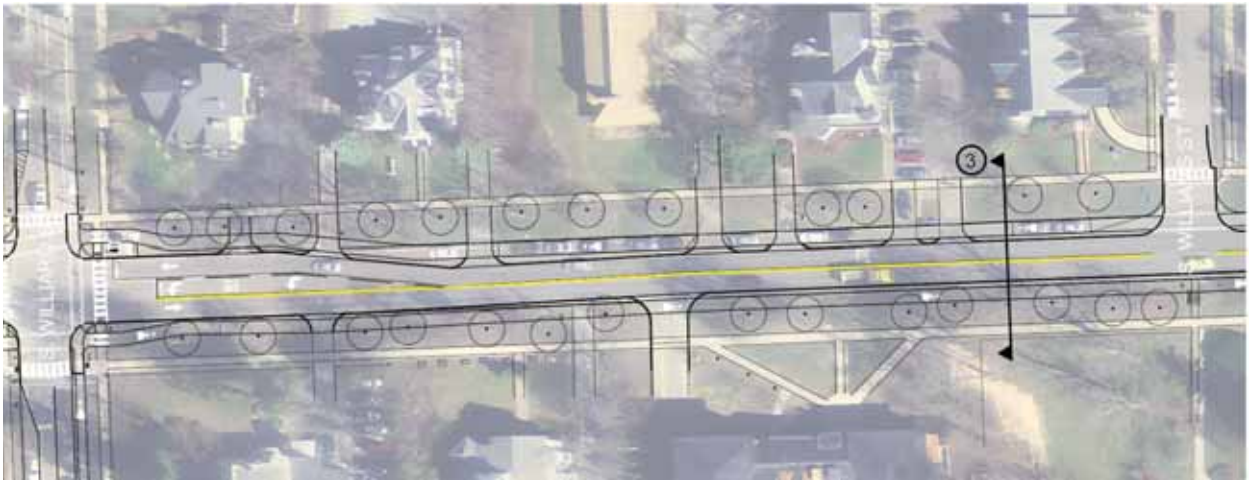


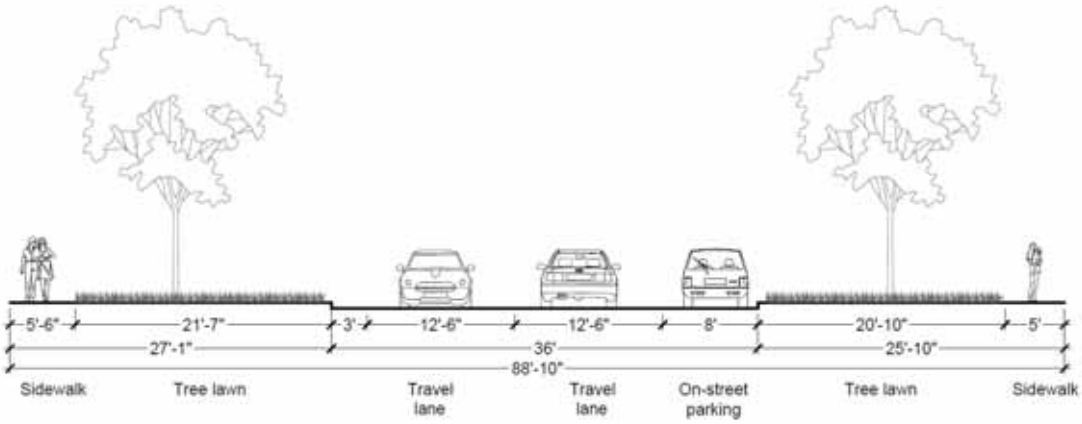
EXISTING CONDITIONS



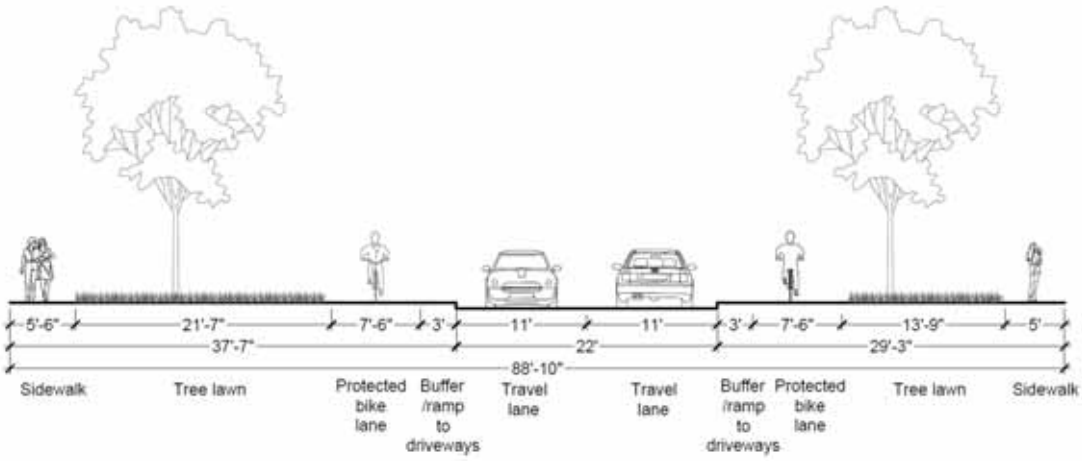
PROPOSED SECTION

Figure 19: Plan View and Cross Sections of Main Street, South Willard to South Williams





EXISTING CONDITIONS



PROPOSED SECTION

Summit Street to the Campus District

The eastbound protected bike lanes would cross Main Street adjacent to the existing pedestrian crosswalk, as shown below. This crossing has good sight distance, but due to the high traffic volumes, enhancements such as a Rectangular Rapidly Flashing Beacon (RRFB) may be warranted. As the bikeway continues east, it will transition to a two-way shared use path through UVM's property. This portion of the bikeway has been reviewed by UVM officials, and incorporated into UVM Moves, the campus active transportation plan, currently released in draft form.

Utility impacts are not expected due to underground power, gas and telecommunications well below the area of disturbance for construction.

Figure 20: Plan Views of Main Street Crossing and UVM Campus Section

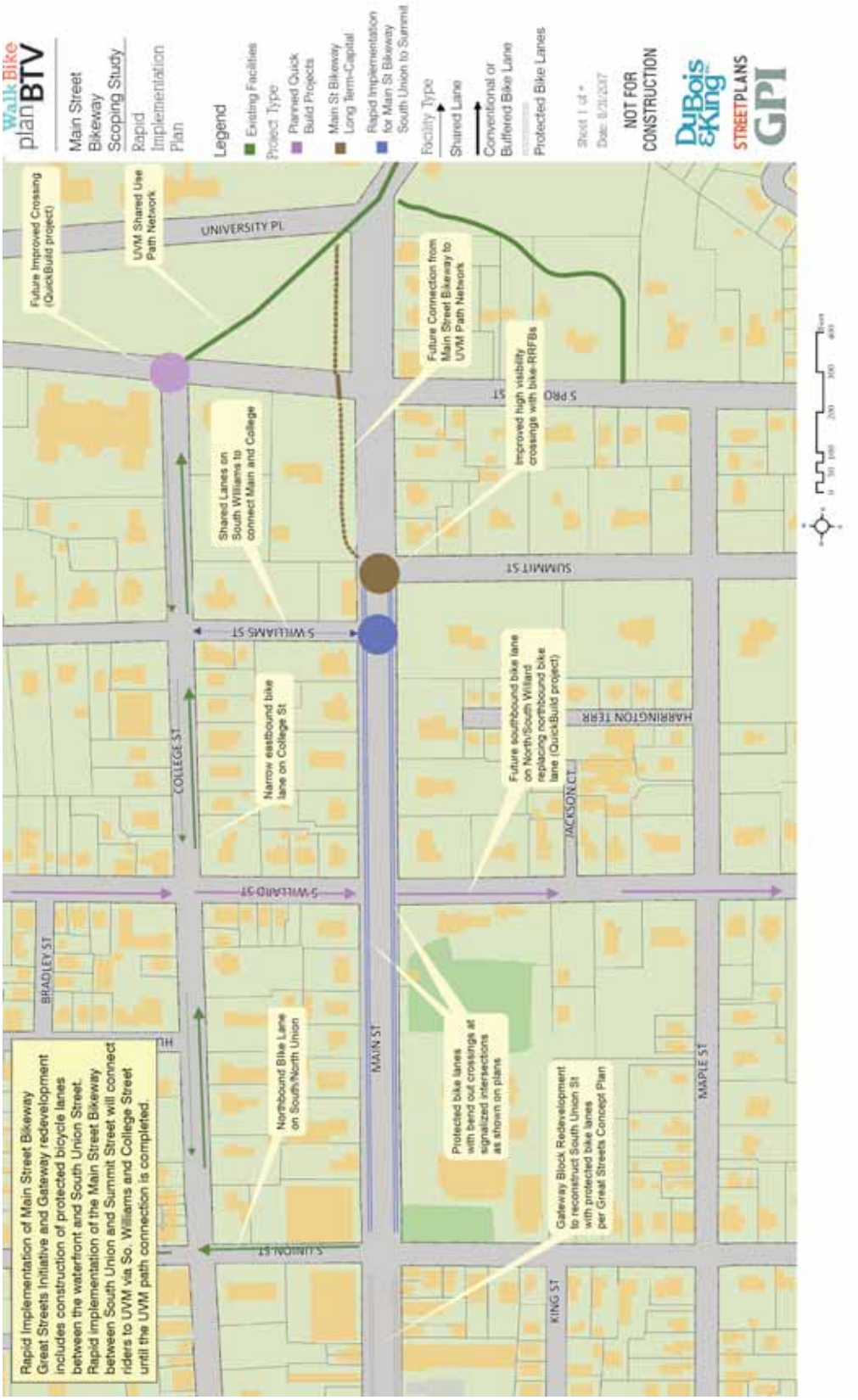
Rapid Implementation

With the bicycle network envisioned in planBTV Walk Bike, there is a need to shift implementation strategies to include a broader range of options besides major capital projects. The following diagram summarizes a spectrum of implementation options.

From *Quick Build for Better Streets: A New Project Delivery Model for U.S. Cities*, by People for Bikes, 2016

The Quick Build approaches of installing a pilot project, iterating and refining based on observations and experience, and then a longer term interim design installation will allow the City to achieve goals for bicycle and pedestrian transportation mode share in a cost effective way. For the Main Street corridor, it is expected that the six blocks of Main Street through downtown will be reconstructed through Great Streets Initiative projects, some of which may be funded through Tax Increment Financing or with developer participation. An Interim Design approach could be used for Main Street between South Union and South Prospect Street if funds for permanent capital construction are not available. The figure on the following page shows how the rapid implementation on Main Street between Union and South Prospect can link to existing and planned bicycle infrastructure, providing an important connection between the Campus District and Downtown Burlington.

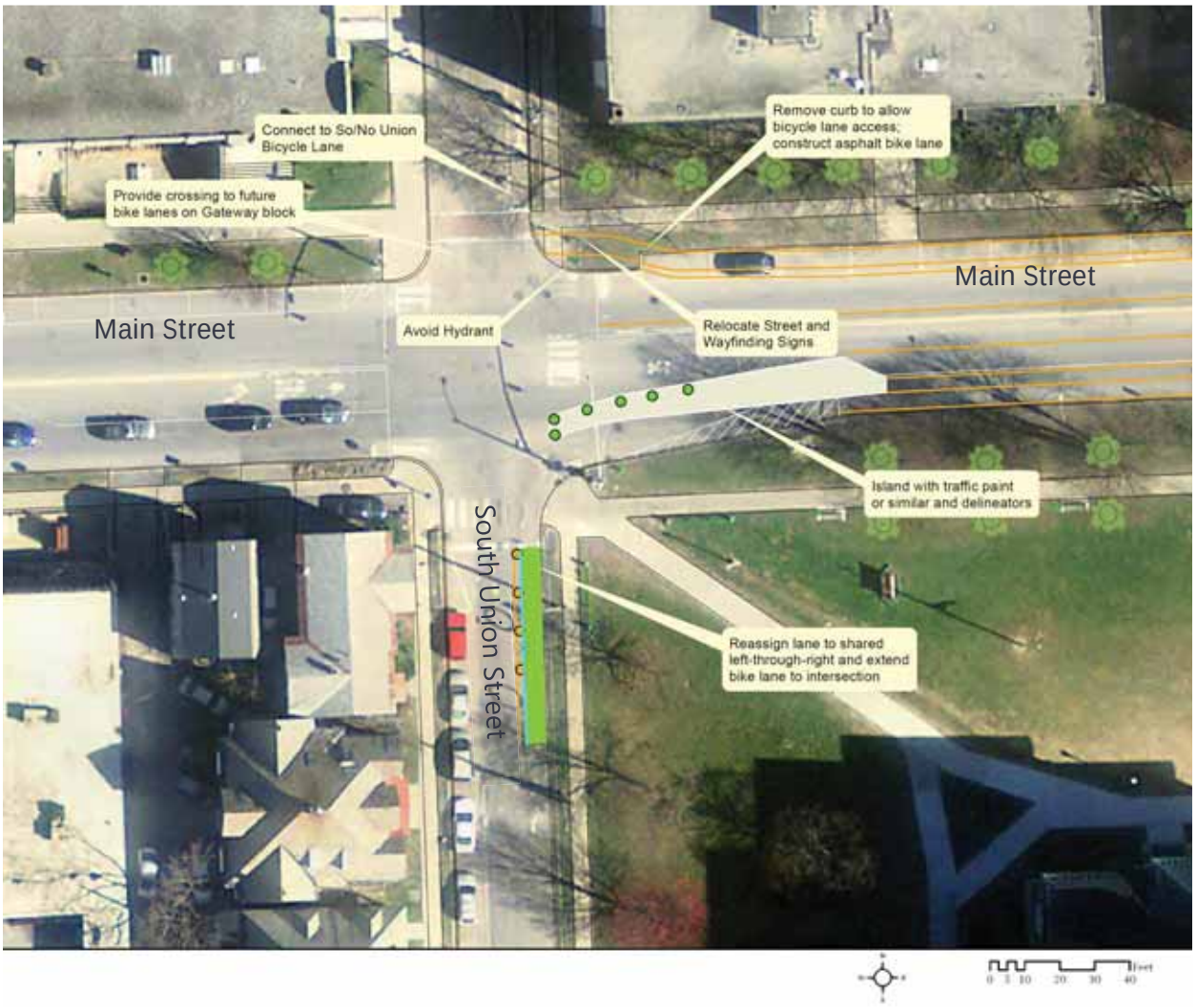
Figure 21: Quick Build on Main Street Map



A potential rapid implementation option for this portion of the Main Street bikeway includes the following changes.

Main/South Union Street. The intersection can be reconfigured using Quick Build materials to define an eastbound protected bicycle lane. To bring the westbound bicycle lane to the intersection, a small amount of new paving would be required.

Figure 22: Main/South Union Intersection Interim Design Concept

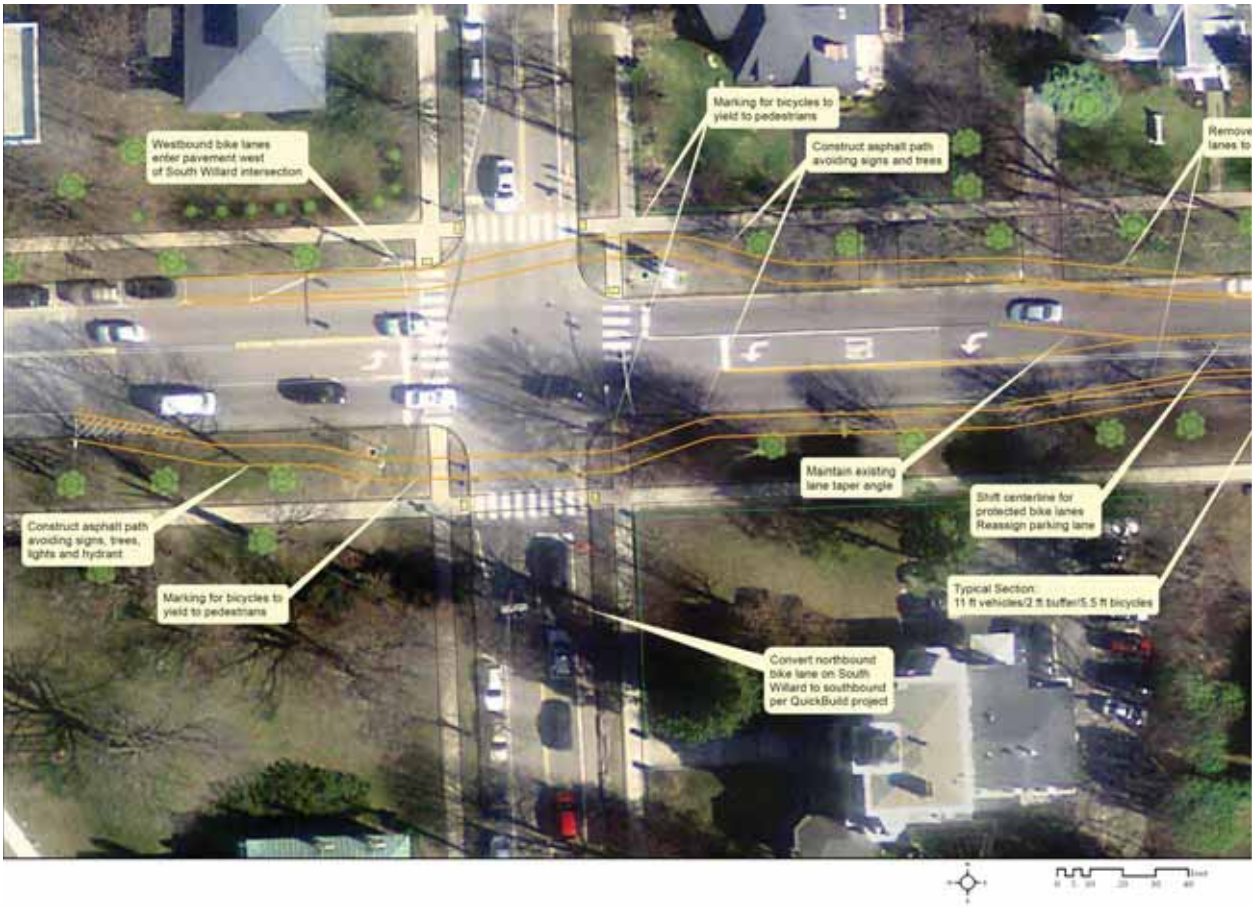


South Union to South Willard. The existing 47.5 feet paved area can be reassigned to provide protected bike lanes and an 8 ft wide parking area for school drop-offs. This would require some changes to the curb extensions, as shown below.

Figure 23: South Union to South Willard Interim Design Concept

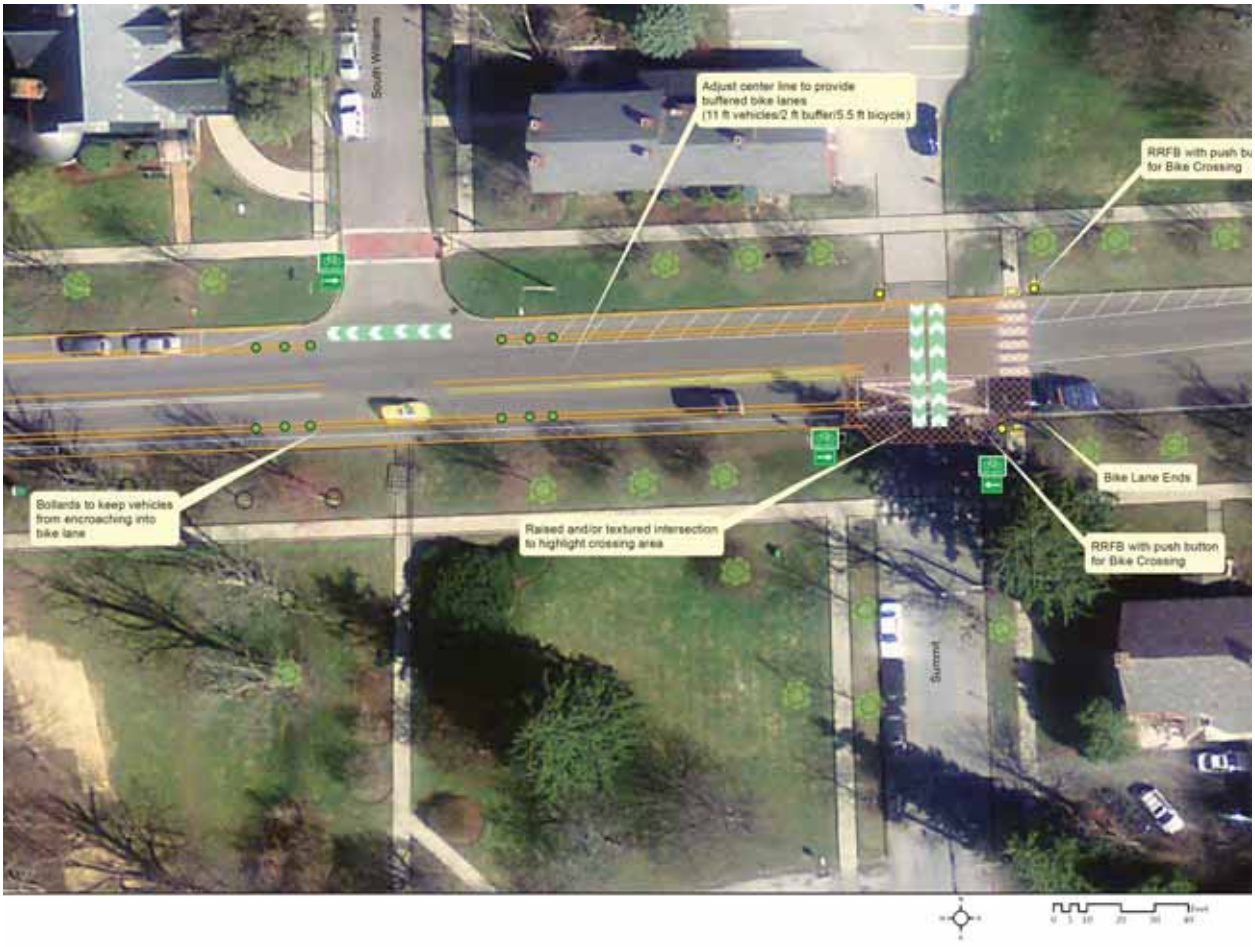
Main/South Willard Street. This intersection marks a transition for Main Street with a wider paved surface to the west (40 feet +/-) and a narrower paved surface to the east (35 feet +/-). In order to provide the desired safety and comfort for people riding through this intersection on Main Street, construction of paved directional bicycle lanes outside of the existing curbs is required for the southwest, southeast, and northeast corners, as shown below. East of the end of the westbound left turn lane, the bike lanes can taper back to the existing paved surface. The typical cross section east of the intersection can have 11 foot travel lanes, 2 foot buffers, and 5.5 foot bicycle lanes, which can be accommodated on the 35 foot paved width. They can be just painted or protected with plastic delineator bollards.

Figure 24: South Union to South Willard Interim Design Concept



Main/South Williams/Summit Street Intersection. The typical cross section through this section will continue from the previous segment: 11 foot travel lanes, 2 foot buffers, and 5.5 foot bicycle lanes. The bicycle lanes will terminate at the intersection of Summit Street, where people may turn north on South Williams to access the College Street bikeway, or turn south on Summit Street, where they can use Maple Street to South Prospect Street to access the existing shared use path from South Prospect to Main Street, as shown in Figure 21. The crossing at Summit Street will need to be highlighted with options such as a painted or textured surface, and an RRFB to alert motorists when people are crossing on foot or on a bike. Bollards can be placed in the buffer zones near the intersections to keep vehicles out of the bicycle lanes.

Figure 25: South Union to South Willard Interim Design Concept



PROJECT IMPLEMENTATION, FUNDING AND MAINTENANCE

Cost Estimates

The table below summarizes the project cost estimate, and details are attached to this report. The following considerations were incorporated into this cost opinion:

- Estimated fees for design and construction engineering through a consultant are included.
- Estimates assume that a federally funded program is used to fund the project. These require more extensive design and review processes, which increases the engineering fees beyond what would be needed if non-federal funds were utilized.
- The estimated construction costs were developed using VTrans recent bid history, and include a 20% contingency, which is appropriate for the conceptual nature of the project.

Table 3: Estimated Construction and Total Project Costs

Section	Feet	Estimated Construction Cost	Cost/ft	Total Project Cost
Union to Willard	870	$ 346,899	$ 399	$ 485,658
Willard to Summit	810	$ 344,898	$ 426	$ 482,857
Summit to UVM Green	752	$ 165,744	$ 220	$ 232,042
	2,432	$ 857,541	$ 353	$ 1,200,557

Implementation Plan

This City of Burlington is considering advancing the downtown portion of the protected bike lane network as part of the Great Streets initiative. A concept plan for Main Street has been developed, and funding is being sought for implementation. For the section outside of downtown, South Union to the Campus District, potential funding includes the Vermont Bicycle and Pedestrian Program. This federally funded program provides 80% of funds for project development and construction, and has a competitive application process.

Construction phasing and traffic control concepts

Traffic control during construction should be considered early in the project development process. With the high traffic volumes on Main Street, maintaining 2-way traffic throughout construction, with only short duration stops permitted, is appropriate. Construction phasing will need to be carefully planned. One possible approach is to undertake construction on one side at a time, and removing the on-street parking at the start of construction. With parking removed, it is expected that construction could occur on one side of the street, then switch to the other side. A temporary asphalt curb may allow for the use of the new bike lane by vehicles, and would require greater depth of pavement.

Short term phasing

With the potential for a very high construction cost, the City of Burlington may seek to implement the project in a phased manner. A potential short term, phased implementation strategy is as follows:

- Mark a shared lane in the downhill direction, and provide a conventional bike lane in the uphill direction. Alternatively, remove on-street parking on the north side of Main Street as a conventional or buffered bicycle lane.
- Based on the crash history, improvements at the most dangerous locations could be implemented using City force accounts to construct protected bike lanes and crossings through the signalized intersections at South Willard and South Union Street.
- Mark a shared lane route at South Williams Street going north to join the College Street Bikeway for riders to access the UVM green.
- Mark a shared lane route on Summit Street south to Maple Street, where riders can connect to South Prospect, and the shared use path around the UVM Admissions Office.
- Mark the crossing at South Williams Street to include a bicycle crossing.

Permit Requirements

The project will have very few environmental impacts, so it is not anticipated that permits will be needed. The following areas will need further exploration in the project design and permitting phases, depending on the funding source.

Cultural Resources

Hartgen Archeological Associates conducted a review of the historic and archeologic resources, and assessed potential impacts. Their report is attached to this document, and has special emphasis on assessing the archeological sensitivity of the areas where subsurface impacts are proposed. This includes the two blocks between Battery and Pine Streets, and the area in front of the Edmunds Middle School where road widening is proposed, as well as the two parcels of UVM land on either side of South Prospect Street where project plans include widening of an existing pathway and creation of a shared use path.

Main Street, between Battery and Pine Streets, is bordered by grass medians, which are considered to have been previously disturbed by road and curb construction and utility installation. There were several manholes noted in the grass median on the south side of the street, as well as fire hydrants on the north side. There are metal boxes present, suggesting the presence of buried electric or telephone lines. These are located closer to the sidewalk than the roadway, indicating disturbance even further from the road. Other features present which indicate disturbance to the area include parking meters, walkways, signs, a bike rack and a mailbox on a cement pad. Exposed soils in places appeared to be loose sand fill. No further archeological study is recommended for the Battery Street to Pine Street project alignment based on the appearance of previous ground disturbance.

A similar assessment was made for the proposed road widening in front of the Edmunds Middle School. Several intrusive features were noted along this median, including manholes, street lights, walkways and street signs, as well as exposed soil fill. No further archeological study is recommended for the Edmunds Middle School alignment based on the appearance of previous ground disturbance.

The two areas on UVM property located on the UVM Green, and on the city block located to the west, west of South Prospect Street, where bike path construction and sidewalk widening are proposed, are considered to have archeological sensitivity for both historic and precontact resources. It is recommended that further archeological Phase IB assessment be conducted for these two portions of the project area.

If federal funds are used, because the project traverses an area rich in historic resources, the project design must be shown to respect historic character, particularly along the UVM campus where a newly constructed or widened path is proposed.

City of Burlington Review

It is also recommended that, if the project advances to design, the plans should be submitted to the City of Burlington and/or the VDHP for review and concurrence.

Stormwater

The design as proposed in this report would have an increase in impervious surfaces of about 18,000 square feet, which is less than a half-acre. If green permeable buffers are incorporated into the design, the impact will be even less. This is not large enough to require a stormwater permit; however, the City of Burlington seeks opportunities to integrate green stormwater infrastructure into public rights-of-way where feasible. Opportunities for green infrastructure include creating permeable buffers, and using permeable asphalt or concrete for the bike lanes. While these could increase the project costs, there are offsetting benefits to both water quality and reduced demand on the city's storm sewer.

Section 106 and 4(f)

The portion of the shared use path that crosses the UVM Green may require additional review under these guidelines. As the intent of the project is to allow greater enjoyment of and access to the historic green, and the project footprint is only a small expansion of an existing sidewalk, gaining approval is not expected to be difficult.

Act 250

An Act 250 permit is not anticipated, due to the area being less than 10 acres and no properties affected that are governed by Act 250 permits.

Maintenance Requirements

For the bicycle lanes on Main Street, it is anticipated that this will be conducted by the City of Burlington. The design of raised bicycle lanes was selected in part for relatively easy snow removal. PlanBTV Walk Bike contains a policy on winter bicycle maintenance. It is recommended that Main Street receive high priority winter maintenance, due to it being a major connecting corridor. It is anticipated that UVM will maintain the shared use path between Summit Street and the UVM Green, where it connects with existing pathways currently maintained by the University.

Project Viability

This project has enjoyed enthusiastic support throughout the planBTV Walk Bike process, and is an excellent joint project of the City of Burlington with UVM for both organizations to achieve their goals of increasing active modes of travel. It also has received support from CCRPC, addressing a key regional link in the active transportation network. The project will have few impacts other than a reduction in on-street parking, and great benefits for the City, UVM and the regional transportation network.

ATTACHMENTS

1) Public Meeting Notes
2) Historic/Cultural Report
3) Utilities Maps (Stormwater, power poles)
4) Existing/Proposed Cross Sections for corridor
5) Plan for entire corridor
6) Plan between Union and the Campus District
7) Cost Estimates

ATTACHMENT 1

Public Meeting Documentation

- Alternatives Presentation (February 27, 2016)
- Final Presentation (Burlington Farmers Market, May 5, 2016)
    - Project Plans as displayed
    - Photos
    - Comments received

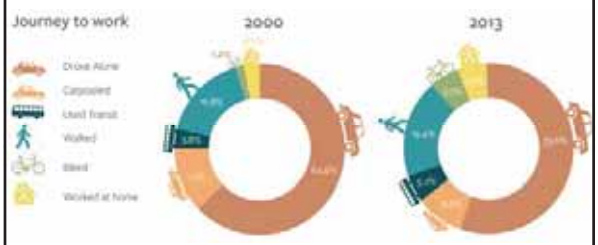
Main St Bikeway

Alternatives Presentation
February 28, 2016

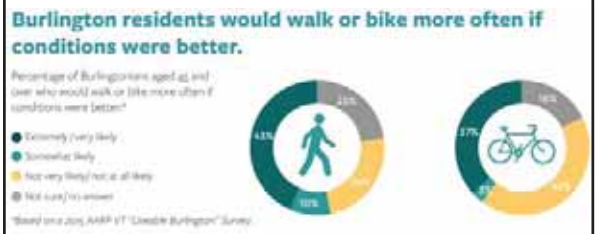
Tonight

- Highlights from planBTV Walk Bike draft
  - to be released soon!
- Phase 2 - Scoping Studies
  - Loomis-Grant-Peru Greenway and Main St
  - Completed by end of June 2015
  - Will provide conceptual design, costs, impacts, issues
- About Main St
- About protected bike lanes
- Your input – what might work here?

Even without infrastructure, people are biking more



Great potential to increase bike transportation



Bike crashes over-represented

Priority corridors

Status

- North Avenue
  - Pilot planned summer 2016
- Main
- Battery
- Winooski/Union
  - Corridor study planned 2016
- Shelburne
  - Corridor study planned for post-Champlain Pkwy
- Pine
  - Champlain Pkwy side path

Why a bikeway on Main St?

- It has the **widest right-of-way** of any east-west street
- **Land uses** in the eastern portion (above Union) **are less reliant on on-street parking** than other corridors (i.e. Maple, College, Pearl)
- **Connects to existing Main St bikeway** along UVM campus to the east towards South Burlington
- **Connects campus**, points east **and downtown**
- CCRPC Active Transportation Plan to **address bicycle connection** across **I-89 Exit 14** interchange

Protected bike lanes

- Most likely to encourage the less confident potential cyclists
- Different arrangements possible
  - 2-way on one side of street
  - Directional at street level with different types of separation
  - Raised possibly with different surface
- Snow removal will be a consideration

Basic bicycle lanes

- Not appealing to 8-80 potential riders
- Large buffer needed between bike lane and parked cars

2-way protected bike lanes

- Appropriate on streets with few driveways

- Montreal, above
- San Francisco, left

1-way, directional protected bike lanes

- Better option for streets with driveway crossings
- Many possibilities for separation

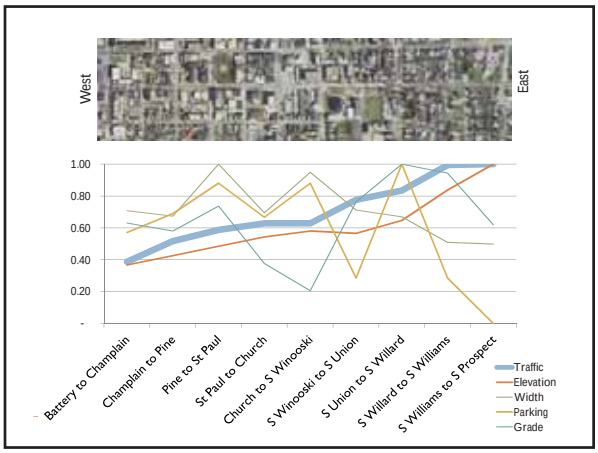
Raised Bike Lanes

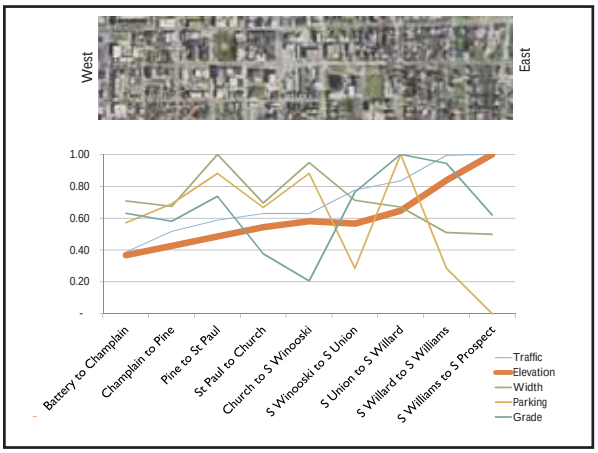
- Easier to maintain in winter
- Easier for bicycle overtaking
- Mountable by vehicles (may get blocked by deliveries)
- An option when space is not available for a more substantial barrier

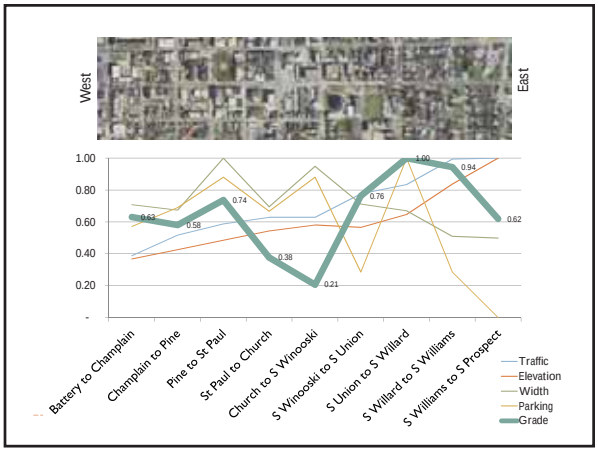
Protected intersections

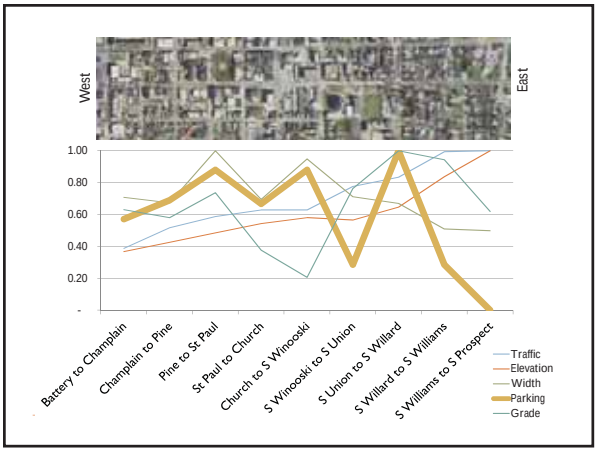
Every block is different

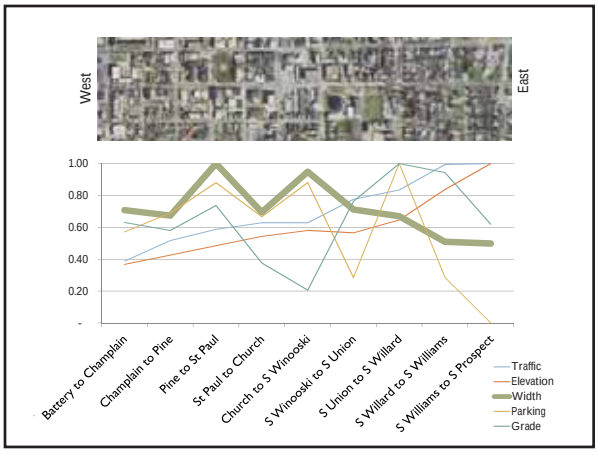
- Traffic
- Grade
- Parking
- Width

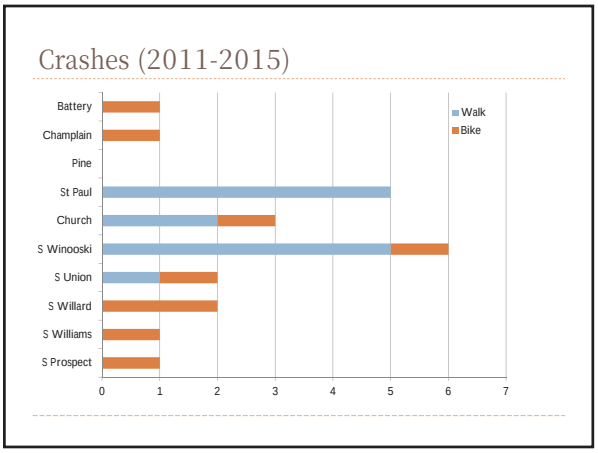

West
East
1.00
0.80
0.60
0.40
0.20
-
Battery to Champlain
Champlain to Pine
Pine to St Paul
St Paul to Church
Church to S Winooski
S Winooski to S Union
S Union to S Willard
S Willard to S Williams
S Williams to S Prospect
Traffic
Elevation
Width
Parking
Grade


West
East
1.00
0.80
0.60
0.40
0.20
-
Battery to Champlain
Champlain to Pine
Pine to St Paul
St Paul to Church
Church to S Winooski
S Winooski to S Union
S Union to S Willard
S Willard to S Williams
S Williams to S Prospect
Traffic
Elevation
Width
Parking
Grade


West
East
1.00
0.80
0.60
0.40
0.20
-
0.63
0.58
0.74
0.38
0.21
0.76
1.00
0.94
0.62
Battery to Champlain
Champlain to Pine
Pine to St Paul
St Paul to Church
Church to S Winooski
S Winooski to S Union
S Union to S Willard
S Willard to S Williams
S Williams to S Prospect
Traffic
Elevation
Width
Parking
Grade


West
East
1.00
0.80
0.60
0.40
0.20
-
Battery to Champlain
Champlain to Pine
Pine to St Paul
St Paul to Church
Church to S Winooski
S Winooski to S Union
S Union to S Willard
S Willard to S Williams
S Williams to S Prospect
Traffic
Elevation
Width
Parking
Grade

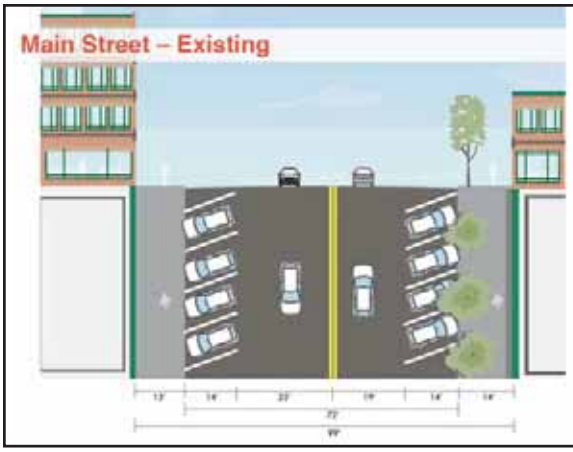

West
East
1.00
0.80
0.60
0.40
0.20
-
Battery to Champlain
Champlain to Pine
Pine to St Paul
St Paul to Church
Church to S Winooski
S Winooski to S Union
S Union to S Willard
S Willard to S Williams
S Williams to S Prospect
Traffic
Elevation
Width
Parking
Grade


Crashes (2011-2015)
Battery
Champlain
Pine
St Paul
Church
S Winooski
S Union
S Willard
S Williams
S Prospect
0
1
2
3
4
5
6
7
Walk
Bike

Visions for Main St

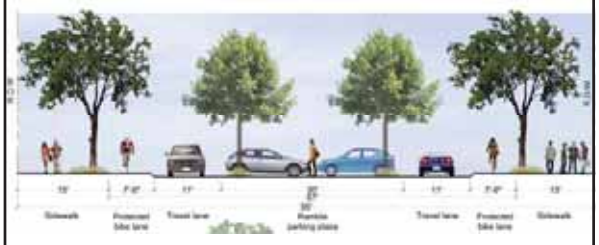
planBTV Downtown

Main at Winooski
Gateway Redevelopment



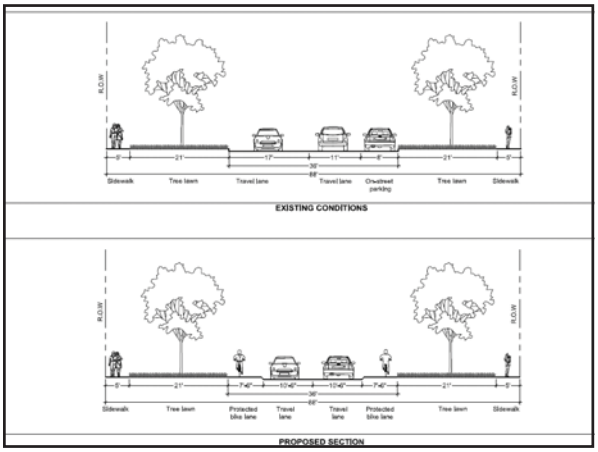
Main: Church to Winooski

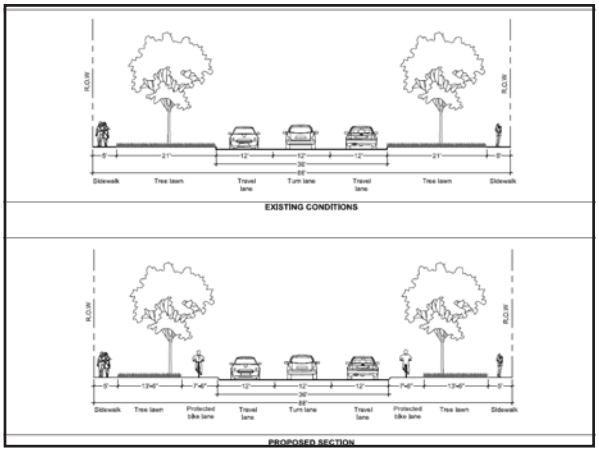
Lancaster, CA



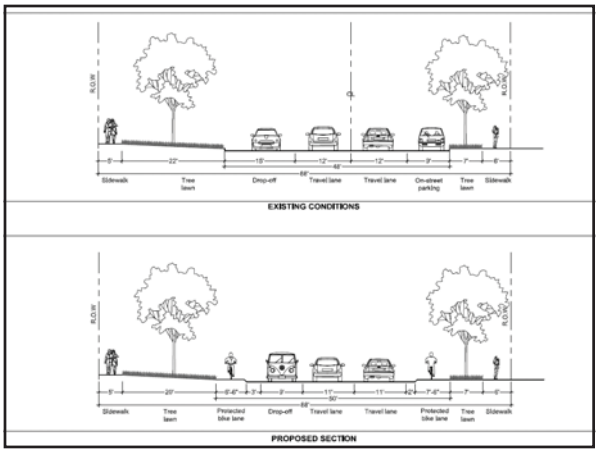
Main Street: University Place to Summit

Main St: Summit to Willard

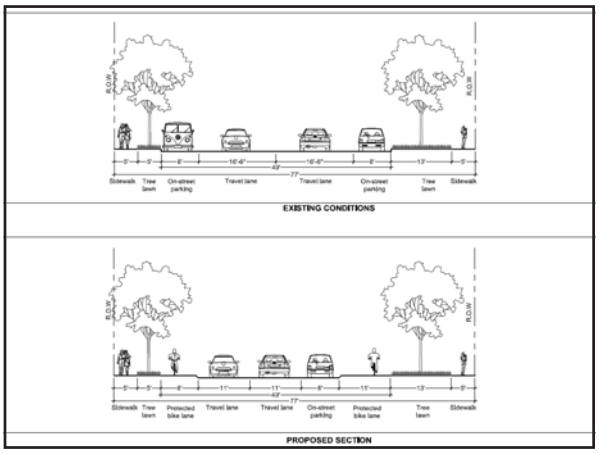




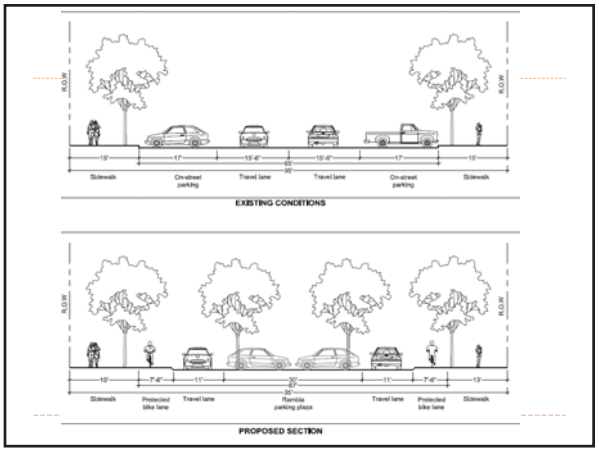
Main St: Willard to Union



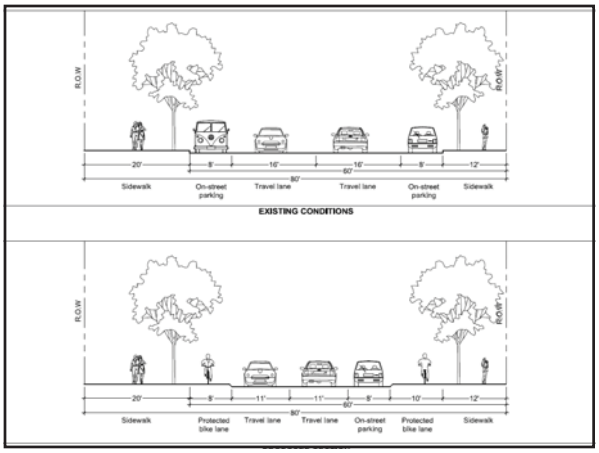
Main St: Union to Winooski



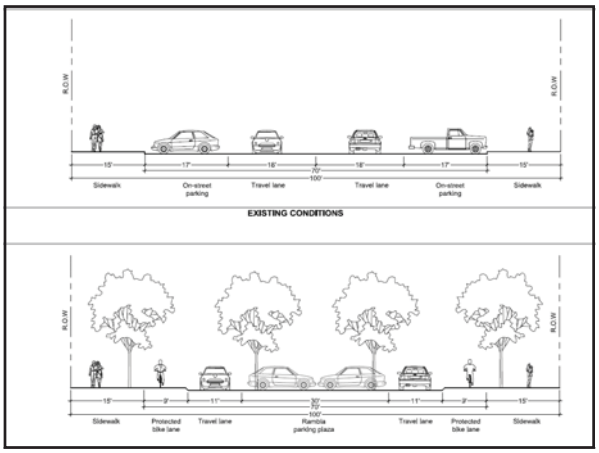
Main St: Winooski to Church



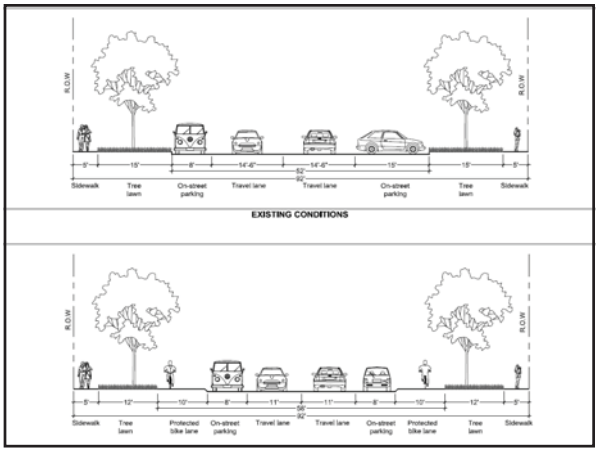
Main St: Church to St Paul



Main St: St Paul to Pine



Main St: Pine to Champlain



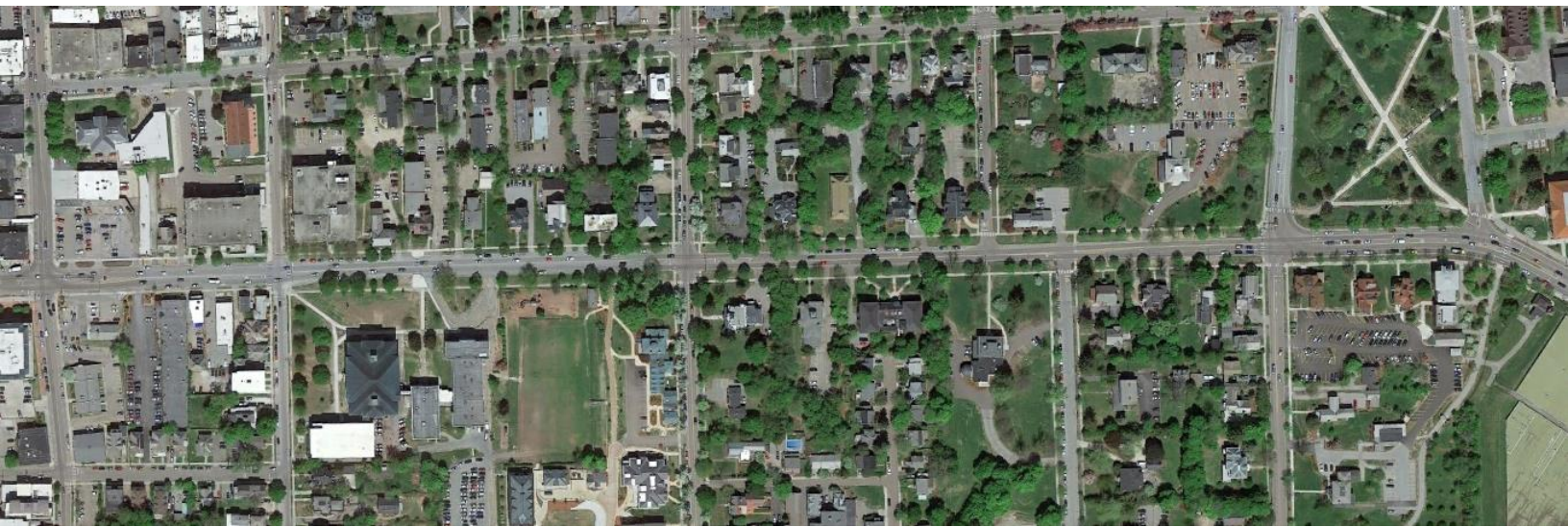
Main St: Champlain to Battery

What do you think?

The Main Street Bikeway
Review of Project Alternatives
Burlington Farmers Market
May 28, 2016 9:30a.m. to 1:00 p.m.

Walk Bike planBTV

About planBTV Walk Bike	Burlington is currently preparing its first city-wide master plan for walking and bicycling infrastructure: planBTV Walk Bike. This plan will soon be released for public review. As part of this process, several projects are getting a more detailed look with a project scoping study. The Main Street corridor is one of these projects, and draft concepts are ready for comment and discussion.
About this project	One of the overall goals in planBTV Walk Bike is to establish a low stress bikeway along Main Street from Battery to UVM's campus, connecting with existing paths. The scoping study is looking at the whole corridor with particular focus on the section between Winooski and UVM. It will dovetail with the City's *Great Streets* project, which will focus on a more refined design for Main Street through downtown, and begin construction on Main Street between Pine and Church Streets.
Why Main Street?	East-west bikeways through the City are lacking, and Main Street has the most generous right-of-way of any of east-west street. While it is steeper than other routes, it is a key link connecting UVM and points east to downtown. Having attractive bike facilities on Burlington's major gateway will also send a strong message about the City's goals and priorities.
What about other corridors?	planBTV Walk Bike found that there are 5 major corridors in the city where better bicycle infrastructure is urgently needed. Many of these corridors are already the focus of planning or design for walk-bike safety projects through other programs, such as North Avenue (pilot bike lanes this summer) and Pine Street (the Champlain Parkway will provide bicycle infrastructure). Main Street has not changed in many, many years, and is ripe for a fresh look.
When?	The scoping study will be finished in early July, and then the City will look at options for funding. These may include the Vermont Bicycle Pedestrian Program, which takes applications for projects later this summer.



Inspiration

Walk Bike planBTV

Photo by Julie Campoli

EXISTING CONDITIONS

PROPOSED SECTION

GPI Greenman-Pedersen, Inc.

DuBois & King Inc.

MAIN STREET- WINOOSKI TO S.UNION ST
Burlington Bike-Ped
Burlington, VT

EXISTING CONDITIONS

PROPOSED SECTION

GPI
Greenman-Pedersen, Inc.
Design, Planning, Engineering and Construction Services

DuBois & King Inc.

MAIN STREET- S. UNION TO S. WILLARD ST
Burlington Bike-Ped
Burlington, VT

EXISTING CONDITIONS

PROPOSED SECTION

GPI
Greenman-Pedersen, Inc.
Design, Planning, Engineering and Construction Services

DuBois & King Inc.

MAIN STREET- S. WILLARD ST to S. WILLIAMS
Burlington Bike-Ped
Burlington, VT

Walk Bike plan BTV

Name: (optional): Mira Atherton

Email (optional): ather22m@mtholyoke.edu

My thoughts about the Main Street Bikeway:

Very good idea - like the raised divider between car traffic and bikes. Also really happy to see trees included in plan → shade trees are necessary for any Complete Street!

Walk Bike plan BTV

Name: (optional): _____

Email (optional): _____

My thoughts about the Main Street Bikeway:

Yes, please!

Walk Bike planBTV

Name: (optional): Ben Kaufman

Email (optional): BLKAUFMA@UVM.edu

My thoughts about the Main Street Bikeway:

Will there be a speed mitigation plan for Main Street → downtown?

Walk Bike planBTV

Name: (optional): Vinson Pierce

Email (optional):

My thoughts about the Main Street Bikeway:

Burlington has a great bike culture, but safe bike lanes are noticeably missing from the cycling infrastructure. Putting separate bike lanes down Main St makes sense & would take Burlington to the next level in promoting healthy, sustainable transportation.

Walk Bike planBTV

Name: (optional): TYLER GOESCHEL

Email (optional): TRGOESCHEL@YAHOO.COM

My thoughts about the Main Street Bikeway:

IT LOOKS BEAUTIFUL! IT MAKES SENSE TO REDUCE THE WIDTH OF THE GRASS AREAS ON THE SIDE OF THE STREETS TO IMPROVE BIKE SAFETY. AN ENVIRONMENTAL IMPACT ASSESSMENT SHOULD BE PERFORMED IN ORDER TO MITIGATE POTENTIAL RUN-OFF ISSUES WITH ADDED CONCRETE/PAVED AREAS. IF IT CAN BE DONE RESPONSIBLY, THEN IT'S A GREAT VISION & SHOULD BE CARRIED OUT!

Walk Bike planBTV

Name: (optional): Philip Wagner

Email (optional): blueridersg@verizon.net

My thoughts about the Main Street Bikeway:

Incorporate streetcar/transit into design

Walk Bike plan BTV

Name: (optional): D. DAVIS

Email (optional): bluebirdandme2@yahoo.com

My thoughts about the Main Street Bikeway:

Always a great idea to minimize traffic + parking concerns. Safety first.

Walk Bike plan BTV

Name: (optional): _____

Email (optional): _____

My thoughts about the Main Street Bikeway:

Good concepts - great for children + environment

Add children to the graphics for politicians!

Walk Bike planBTV

Name: (optional): Aimee Wilson

Email (optional): aimee.wilson@uvmhealth.org

My thoughts about the Main Street Bikeway:

From Main St. bikeway - commute to work part time by bike - would appreciate off road path up hill to UVM.

Walk Bike planBTV

Name: (optional): Emily Nosse-Leirer

Email (optional):

My thoughts about the Main Street Bikeway:

Love it! The city desperately needs N-S bike connections!

Walk Bike plan BTV

Name: (optional): Mike Reilly

Email (optional): mpr33vt@gmail.com

My thoughts about the Main Street Bikeway:

love the project. We need it. I'd bike here with this!

Walk Bike plan BTV

Name: (optional): Spencer Blackmon

Email (optional): SPB1974FLA@gmail.com

My thoughts about the Main Street Bikeway:

This will make these streets safer for everyone who wants to bike. Please approve this.

Walk Bike planBTV

Name: (optional): Kiersten Hallquist

Email (optional): kiersten.hallquist@gmail.com

My thoughts about the Main Street Bikeway:

I ride King to UVM almost everyday ~~(for work)~~ - work commute. I used to take College b/c of the "bike lane", but it's just soooo narrow and the pavement is often in tough shape + littered w/ glass. I mostly take main street now regardless of scary traffic b/c there's just more space, pavement is better, and less "time mines."

Thanks for exploring this option!

Walk Bike planBTV

Name: (optional): ☺

Email (optional): ☺

My thoughts about the Main Street Bikeway:

Awesome idea!

Keeps people safe, w/ happy bikers, walkers, + drivers!

Walk Bike planBTV

Name: (optional): _____

Email (optional): _____

My thoughts about the Main Street Bikeway:

- SIGN FOR BIKES ON SIDEWALK - 'BIKES KEEP LEFT'

- SEGWAYS SHOULD HAVE A HORN!

- I HAVE ALMOST BEEN HIT BY BIKES & SEGWAYS ON SIDEWALK ON COLLEGE ST. WHERE I LIVE

Walk Bike planBTV

Name: (optional): JACK DAGGETT

Email (optional): NONE

My thoughts about the Main Street Bikeway:

I support the proposed re-design of Main St. from S. Willard to S. Williams, Union to Willard, and Union to Winooski. In addition, I urge that all angle parking on Main Street be eliminated and replaced with bike lanes and parallel parking for cars. Parking should be developed and encouraged in satelite parking lots served by circulating shuttle buses. This has been done in Cooperstown NY and works very well.

Walk Bike planBTV

Name: (optional): ADAM WEHMANN

Email (optional): adamwehmann@gmail.com

My thoughts about the Main Street Bikeway:

LOOKS GREAT. BUT I WORRY ABOUT THE STEEPNESS OF THE HILL. MAYBE WE COULD ADD A BIKE LIFT OR CONVEYER BELT SYSTEM FOR THE UPHILL.

Walk Bike planBTV

Name: (optional): _____

Email (optional): _____

My thoughts about the Main Street Bikeway:

SUCH A GOOD IDEA AND SO NECESSARY!!! Yes please to protected bike lanes !!!!!

Walk Bike planBTV

Name: (optional): Whitney Feiringer

Email (optional): whitneyfeiringer@gmail.com

My thoughts about the Main Street Bikeway:

looks good! please build better bike lanes in burlington!

Walk Bike planBTV

Name: (optional): _____

Email (optional): _____

My thoughts about the Main Street Bikeway:

I love the design... I love biking with my young children, but I'm hesitant to get off the sidewalks and on to the road with them. But, the sidewalks aren't really for bikes either - the driveways are dangerous and we get in the way of people. This would provide a safe way to ride with my kids!

Can we please do this on Shelburne Rd too!

Walk Bike planBTV

Name: (optional): T. Gustafson

Email (optional): _____

My thoughts about the Main Street Bikeway:

I think it's a GREAT idea to have protective bike lanes on Main Street. I live in So. Burl now and wouldn't bike to Burlington. If I lived in Burl (maybe someday!), I definitely bike more if it was safer.

Walk Bike planBTV

Name: (optional): _____

Email (optional): _____

My thoughts about the Main Street Bikeway:

Keep colorized bike lane

Planters in road would be hard to maintain + people could fall in them

Main St. should have protected left turns

Please don't widen the street

Walk Bike planBTV

Name: (optional): Kathi Fischer

Email (optional): fischmg@comcast.net

My thoughts about the Main Street Bikeway:

Biker need unforced rules of equipment !!!

Love proposed bike Lanes

Walk Bike planBTV

Name: (optional): Owen Kunicel

Email (optional): kunicelo@gmail.com

My thoughts about the Main Street Bikeway:

It's a fantastic idea that would make it safer for us and our baby to safely get around town. We would be much more likely to bike around if we could do so safely

Walk Bike plan BTV

Name: (optional): Karen Talentino, Burlington

Email (optional): ktalentino@gmail.com

My thoughts about the Main Street Bikeway:

We need to have a much more bike-friendly downtown. Bigger bikepath & bike lanes throughout.

Portland Oregon is a great model.

Walk Bike plan BTV

Name: (optional): CHRIS O'ROURKE

Email (optional):

My thoughts about the Main Street Bikeway:

As someone who bikes in NYC I know that protected bike lanes are much better than shared bike lanes. + they encourage more riders.

I am here in Burlington for a visit

Walk Bike planBTV

Name: (optional): _____

Email (optional): _____

My thoughts about the Main Street Bikeway:

I would feel a lot safer biking (especially downhill) with the proposed plan. My concern - parking?

They're needed. That's the easiest way to get through Burlington from campus to downtown. I avoid biking on main street now bc of the traffic.

Burlington Farmers Market:
Final Presentation

Burlington Farmers Market:
Final Presentation

ATTACHMENT 2

Historic/Cultural Report by Hartgen Archaeological Associates

ARCHEOLOGICAL INVESTIGATION

Burlington Main Street Bike-Pedestrian Project

City of Burlington
Chittenden County, Vermont

HAA # 5116.11

Submitted to:
Lucy Gibson, P.E.
DuBois & King
28 North Main Street
Randolph, Vermont 05060
p 802.728.3376
p lgibson@dubois-king.com

Prepared by:
Hartgen Archeological Associates, Inc.
PO Box 81
Putney, Vermont 05346
p +1 802 387 6020
f +1 802 387 8524
e emanning@hartgen.com

www.hartgen.com

An ACRA Member Firm
www.acra-crm.org

March 2017

ARCHEOLOGICAL RESOURCE ASSESSMENT

INTRODUCTION

Hartgen Archeological Associates, Inc. conducted an Archeological Resource Assessment for the proposed Bike-Pedestrian Path improvement project located along Main Street in the City of Burlington, Chittenden County, Vermont (Map 1). The proposed project includes improvements along both sides of Main Street, extending from Battery Street to South Prospect Street (Map 2A & 2B). The project is being overseen by the City of Burlington. The project may include federal funding, and as such, the cultural resources investigation is required according to Section 106 of the National Historic Preservation Act (NHPA). The report will be reviewed by the City's historic resource commission and/or the Vermont Division for Historic Preservation.

The proposed project includes the following components:

- The proposed project alignment measures approximately 4,800 feet (712 m) in length, extending from Battery Street on the west, to the east side of the UVM Green (Map 2A & 2B).
- Widening on both sides of Main Street by approximately five feet (1.5 m), extending from Battery Street to Pine Street.
- Widening the street by approximately 5 feet, r in front of the Edmunds Middle School located on the southeast corner of Main and South Union Streets.
- Creation of a shared use path on UVM land at the northwest quadrant of the South Prospect and Main Street intersection.
- Widening (approximately 5 feet) of existing pathway on UVM land on the north side of Main Street, east of South Prospect.
- Project plans do not propose the removal of any trees along the Main Street alignment (Map 2B).

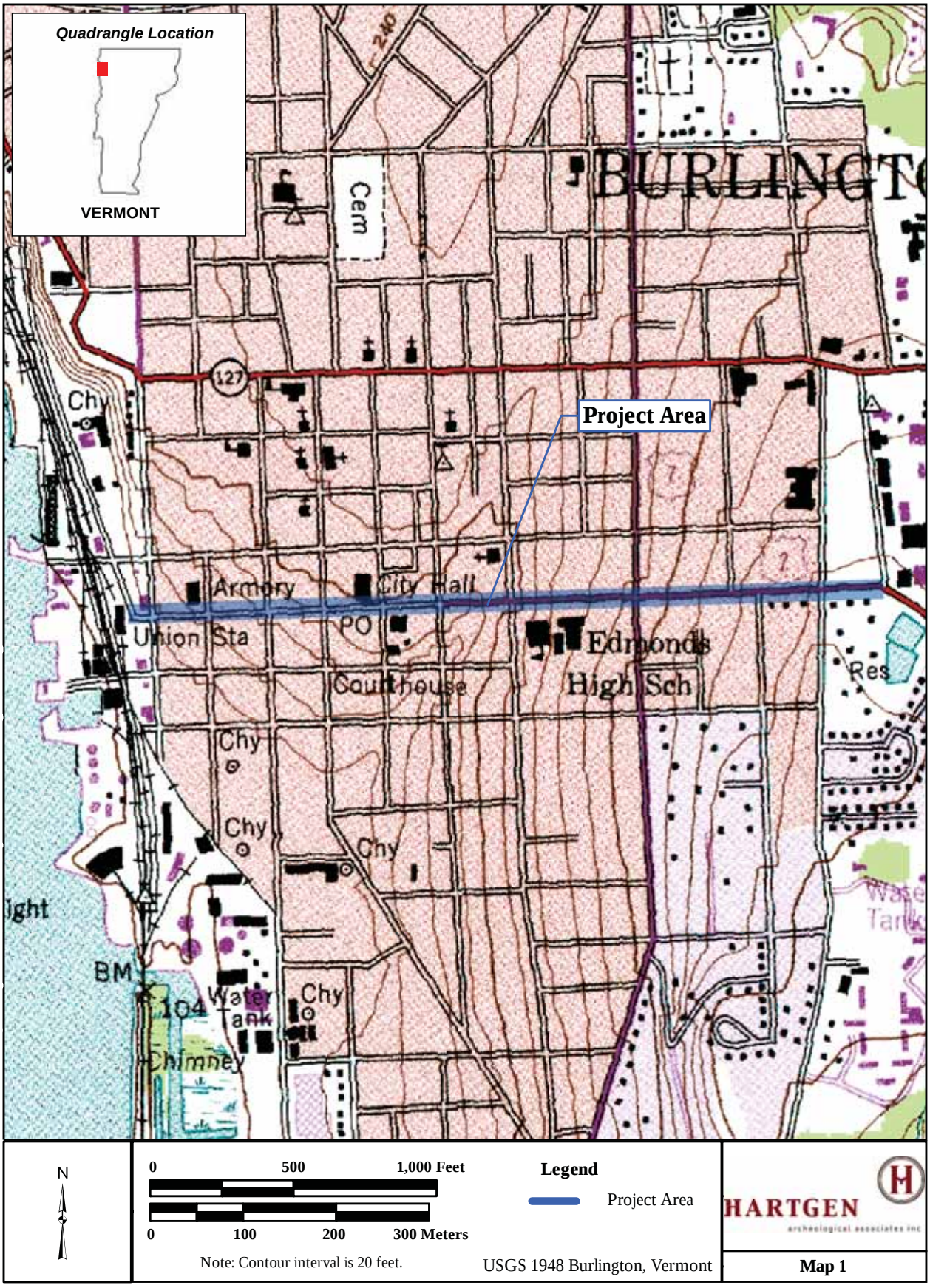
BACKGROUND RESEARCH

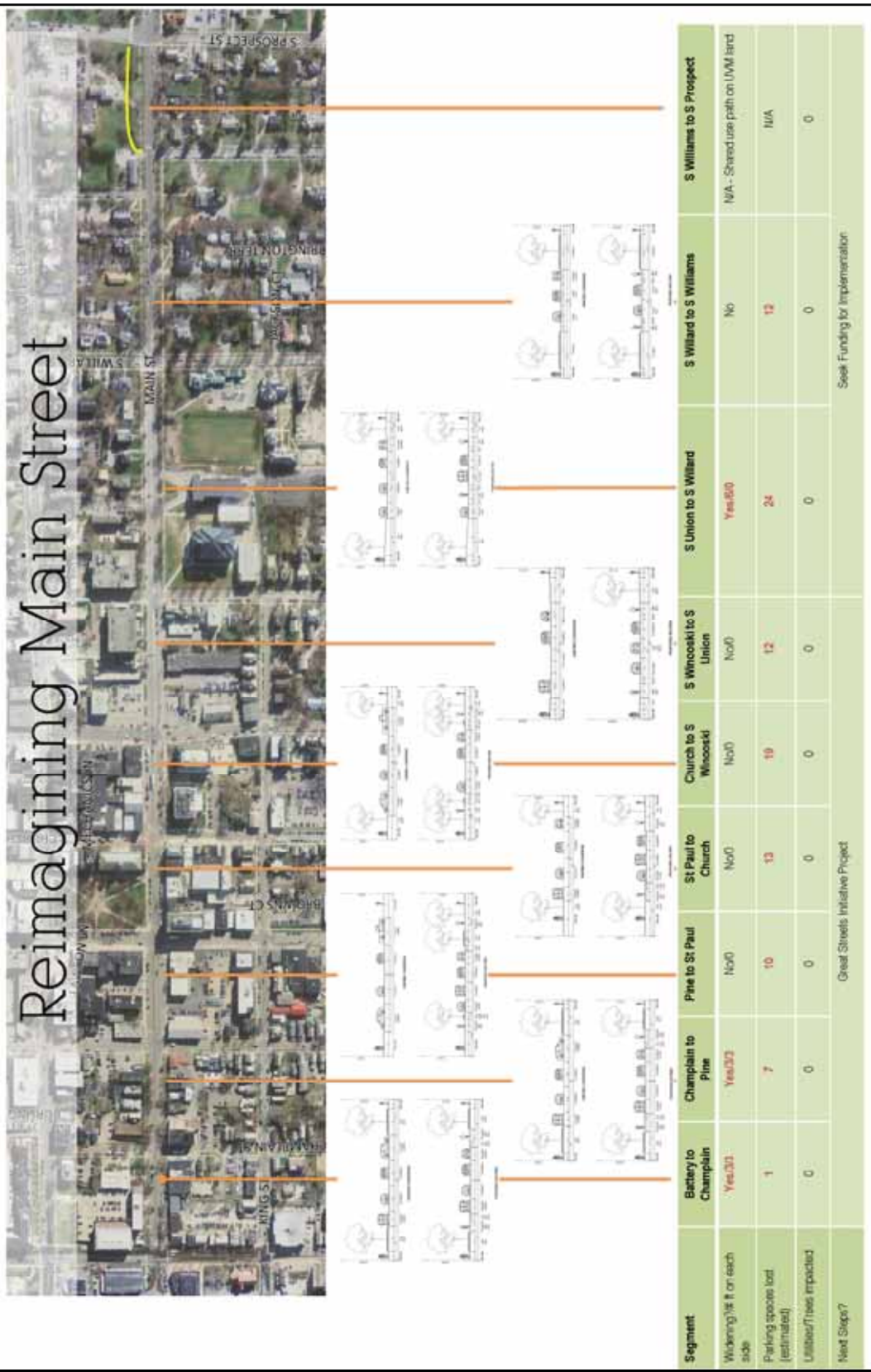
Precontact Site File Research and Archeological Sensitivity

Environmental characteristics of an area are significant for determining the sensitivity for archeological resources. Precontact and historic groups often favored level, well-drained locations near wetlands and waterways. Therefore, topography, proximity to wetlands, and soils are examined to determine if there are landforms in the project area that are more likely to contain archeological resources. In addition, bedrock formations or other lithic sources may contain resources that may have been quarried by precontact groups. Other locations can also be special purpose sacred and traditional use sites. Soil conditions can provide a clue to past climatic conditions, as well as changes in local hydrology.

The project area is located within the Champlain Lowlands, situated adjacent to Lake Champlain (Maps 2 and 3). The project alignment is located along both sides of Main Street, which is comprised of sections of moderate to gentle slope, as well as areas of level terrain. There is a gentle slope from Battery Street to Pine Street (Photo 1). Main Street is relatively level from Pine Street to South Winooski. East of South Winooski Street, the terrain begins a gentle slope upwards in front of the Edmunds Middle School (Photo 2). The upward slope increases to the east. At the eastern end of the project alignment, west of South Williams Street, the land levels out to a high raised terrace overlooking the Lake Champlain basin (Photo 3). The elevation of the project area begins at a height of 120 feet (37 m) above mean sea level (amsl) at Battery Street, and averages a 5% slope uphill to Prospect Street near the UVM Green, at an elevation of 360 feet (110 m) amsl (Photo 4).

The Winooski River is located approximately 4,600 feet (1.4 km) to the north. A quarry, which produces Monkton quartzite, is located approximately two miles (3.2 km) to the northwest. The soils along Battery Street consist of Adams and Windsor loamy sands, 0 to 5 percent slopes, which are typically encountered on relatively level terrace landforms, and are somewhat excessively drained (USDA 2017). West of Battery


Quadrangle Location
VERMONT
Project Area
BURLINGT
Cem
127
Armory
City Hall
PO
Union Sta
Courthouse
Edmonds
High Sch
Res
Chy
BM
104
Water Tank
Chimney
N
0 500 1,000 Feet
0 100 200 300 Meters
Note: Contour interval is 20 feet.
Legend
Project Area
USGS 1948 Burlington, Vermont
HARTGEN
archeological associates inc
Map 1
BBS March 20, 2017 C:\My Documents\HAA\CAD-GIS\ProjectFiles\5116.11-Main-St-Burlington\5116-11-Map1.mxd



Segment	Battery to Champlain	Champlain to Pine	Pine to St Paul	St Paul to Church	Church to S Winooski	S Winooski to S Union	S Union to S Willard	S Willard to S Williams	S Williams to S Prospect
Widening/st ft on each side	Yes/0/0	Yes/0/0	No/0	No/0	No/0	No/0	Yes/8/0	No	N/A - Shared use path on UVM land
Parking spaces lost (estimated)	1	7	10	13	19	12	24	12	N/A
Utilities/Trees impacted	0	0	0	0	0	0	0	0	0
Next Steps?	Great Streets Initiative Project							Seek Funding for Implementation	

BBS March 27, 2017 C:\My Documents\HAA\CAD-GIS\ProjectFiles\5116.11-Main-St-Burlington\5116-11-Map2A.mxd

N

0 1,000 2,000 Feet

0 200 400 600 Meters

Main Street Burrlington
Project Spread Map
(DuBois & King, Hartgen Assoc., 2017)

HARTGEN archeological associates inc

Map 2A

BBS March 27, 2017 C:\My Documents\HAA\CAD-GIS\ProjectFiles\5116.11-Main-St-Burlington\5116-11-Map2B.mxd

N

0 100 200 Feet
0 20 40 60 Meters

Main Street Burrlington
Project Map
(GPI, DuBois & King 2016, Hartgen Assoc., 2017)

HARTGEN archeological associates inc

Map 2B

Photo 1. Photo shows the median on the south side of Main Street, south of Pine Street. View is to the west.

Photo 2. Photo shows the median on the south side of Main Street in front of Edmunds Middle School. View is to the west.

Photo 3. Photo shows the median on the south side of Main Street in front of Edmunds Middle School. Note the manhole cover on the street side of the median. View is to the northwest.

Photo 4. Photo shows the south end of the UVM Green. View is to the east.

Street, the existing soils are comprised of fill. The online USDA soil survey indicates that the remainder of the project area, and most of the City of Burlington are designated as LSS – located outside of the Limit of Detailed Soil Survey (USDA 2017).

Examination of VDHP site files indicates that within several miles of the project area there are hundreds of sites, representing all precontact time periods, located on the shores of Lake Champlain, within the Winooski Intervale, and along the Winooski and Lamoille Rivers and their many tributaries. The precontact site in closest proximity to the project area is VT-CH-789, a small lithic scatter on raised delta deposits above the Winooski River, situated 3,400 feet (1,036 m) to the north.

The VDHP Environmental Predictive Model was completed for the project area which produced an overall rating of 80 (Appendix 1), with a rating of 32 or above indicating precontact sensitivity. The project area received points based on its location adjacent to Lake Champlain and the Champlain Sea/Glacial Lake Shore Line. The project area is located within a primary travel corridor, and, more importantly, within a general area of high recorded site density, a factor which would add an additional 32 points to its rating. However, the majority of precontact sites are located near the Winooski River or Lake Champlain, with the closest site situated two-thirds of a mile to the north. Thirty-two points were subtracted because of previous disturbance from road, sidewalk and utility construction directly adjacent to Main Street. Undisturbed areas of level terrain in the project vicinity would be considered to have archeological sensitivity.

Historic Site File Research and Archeological Sensitivity

National Register Sites and Cemeteries

The easaternmost end of the project area is located within the National Register (NR) listed University Green Historic District (UGHD). The Historic District is focused around the University Green, which was donated to the University in 1791 by Ira Allen. The NR Nomination form notes that the district is "significant as a resource to the University and to the City" and is a "visual testimony of the University's history" (NR Nomination Form 1973; Sect. 8, P.16). Structures within the project area on both sides of Main Street, extending from the UVM Green westward to west of the Summit Street and South Williams Street intersections, are located within the historic district.

A large number of the individual structures on Main Street are listed on the Vermont State Register in various historic districts. The original historic documentation of these structures are listed by street name and number, as well as the district to which they are affiliated. The historic districts which include structures located on Main Street include; University Green, Main Street-College Street, City Hall Park, Wells-Richardson Complex, and Battery Street.

The eastern end of the project area contains a number of well-kept historic domestic structures, some of which are located in the University Green Historic District, as noted above (Photo 5). The central and western sections of the project alignment primarily contain historic businesses, community structures and industrial buildings (Photo 6).

There are no cemeteries located within or adjacent to the project APE (Hyde and Hyde 1991).

Historic Research and Archeological Sites

An Archeological Resource Assessment (ARA) Letter of Addendum for the Prospect Street, Pearl Street and Colchester Avenue intersection study provided information which is instructive for the present archeological study (UVM 2012c). Specifically, there were a number of earlier (early 19th and possibly late 18th century) structures located at the south and north ends of the University Green. A number of these structures were eventually razed or torn down, many in the 1830s, and the foundations, cisterns and other outbuildings infilled. The following excerpt (UVM 2012c: p. 1-2) provides details about these structures, their demolition, and potential archeological sensitivity:

Photo 5. Photo shows a well maintained historic structure located on the south side of Main Street within the University Green Historic District at the eastern end of the project alignment. View is to the south.

Photo 6. Photo shows the central portion of the Main Street project alignment. View is to the west.

> The larger area around the head of Pearl Street and on "College Hill" in the City of Burlington was essentially a small hamlet, which was settled in the late 1780s and flourished into the 1830s, after which it developed as part of the University of Vermont. It was one of the four early centers of Burlington that would, in time, grow and fuse together into the city seen today. Specifically, the area which is now part of the northern end of University Green that is located south of Colchester Avenue and in between South Prospect Street and University Place, had at least three structures on it; one was a store located in the northeast corner built ca. 1814 and two structures (currently of unknown ownership/function), were built between 1816 and 1830 on the east side Prospect Street (Figures 1 and 2). Ownership history of these properties is extremely complicated but ended with a ca. 1830 court decision which declared that the entire area was part of the "College Common". As a result of this decision, all three buildings were very likely removed or razed by 1833.
>
> Soon after the structures were removed, an effort was made to improve the whole green. This effort included filling cellars holes at either end of the Green. Based on documentary evidence, it is believed that the filling of the cellar holes on the Green in the 1830s did not completely obliterate these historical features. As late as 1918, it was noted that on the south part of the Green a cellar and old well could be seen in outline, and that old cellar outlines were also visible at the extreme north end of the Green. This assumption of limited disturbance for the sites on the green appears to have held true at the partially excavated Hurlburt-Moore site (VT-CH- 676) located on the southeast part of the University Green in 1993. Although, this site was covered by post occupational fills, a house foundation and a stone-lined well were identified, and a significant number of early 19th-century artifacts were recovered (Baker, Hathaway, and Frink 2002 Vol. I: 40-41).

An examination of the VDHP archeological site files indicated that there are five historic archeological sites located near the southern end of the UVM Green, three of which are located directly adjacent to the project APE.

VT-CH-165 – Wheeler House Site – A site containing a cistern, the top refuse deposit of which dates to the 1880s. The historic features are located underneath the parking lot of the Wheeler House directly west of South Prospect Avenue (Photo 7).

VT-CH-676 – Hurlburt-Moore Site – A site containing two foundations dating to 1810-1830. This site is located at the southeast corner of the UVM Green.

VT-CH-677 – Shequin Site – A site containing a foundation that dates to 1912. This site is located on the south side of Main Street across from the UVM Green.

VT-CH-678 – Burbank Homestead - A house foundation and blacksmith shop that dates 1822-1891. This site is located on the south side of Main Street across from University Place at the eastern end of the UVM Green.

VT-CH-684 – Barnes-Buckham Site – A possible tavern site that dates from 1810-1890. This site was identified by archival research, and appears to have been located at the southern end of the UVM Green.

The Wheeler House Site, the Hurlburt-Moore Site and the Barnes-Buckham Site are located on UVM land directly adjacent to the eastern end of the project alignment. Therefore, these areas are considered to have a high sensitivity for the presence of historic archeological resources.

Photo 7. Photo shows the existing sidewalk in front of the Wheeler House. Site VT-CH-165 is located within the parking lot on this property. View is to the west.

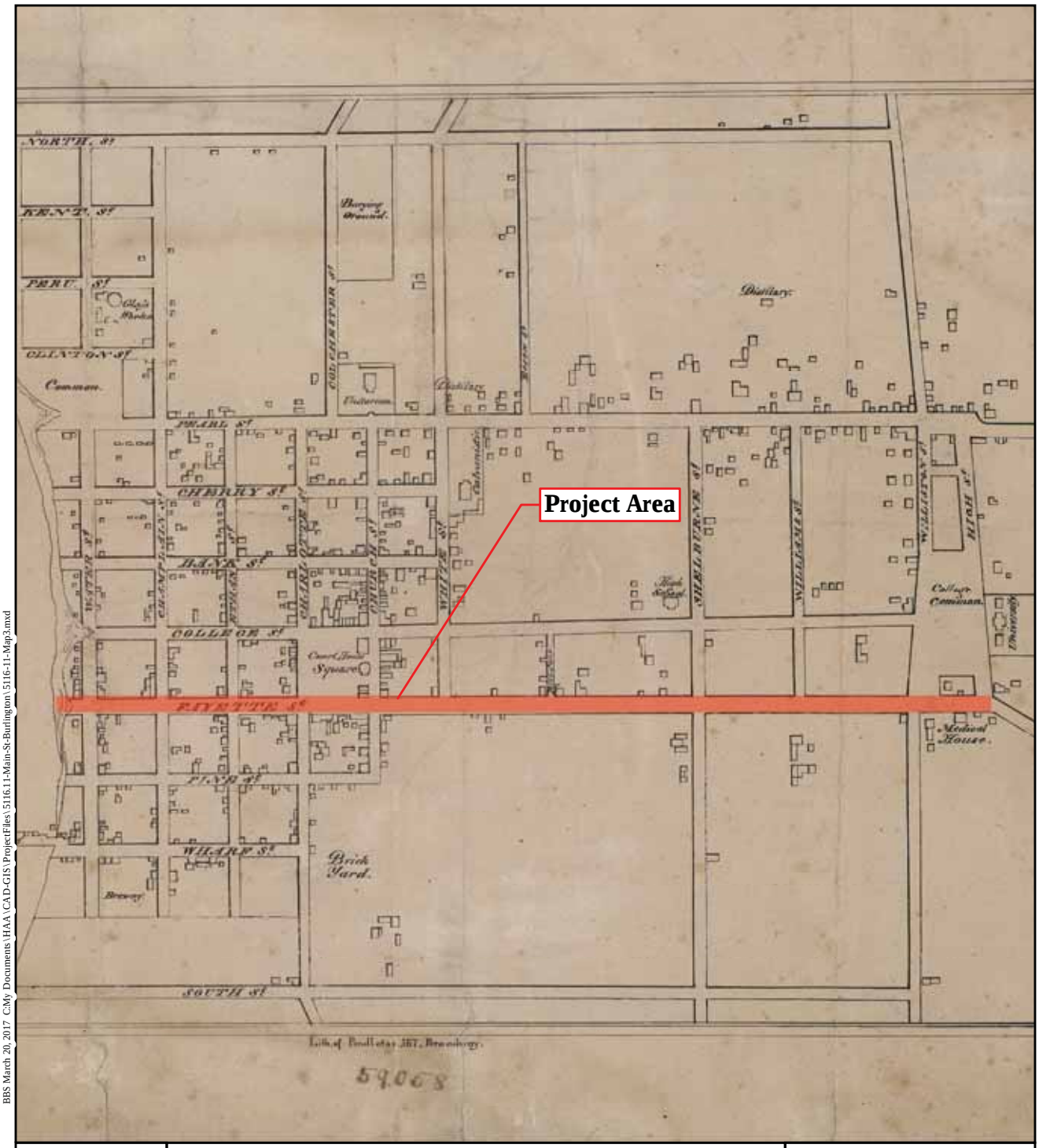
Historic Maps

A review of historic maps of the project area was conducted to attain an overview of the changing historical and environmental landscape within the project area. This review includes the study of historic structures that may or may no longer be extant, alterations to road and rail systems, and changes in stream and river courses.

The detail of Ammi B. Young's 1830 *Map of Burlington Village* shows Fayette Street (later to be Main Street), with numerous buildings located on its western end, including Court House Square. At this time, the western end of the street, extending to Church and White streets, was the most highly developed, with an established regular grid system (Map 3). The central and western portions of Main Street contained approximately a dozen structures, most likely domiciles or small farmsteads, including the Wheeler House, located west of South Prospect Street. Several small buildings are depicted in a square section on the southern end of the University Green.

The 1833 Johnson map depicts the newly renamed Main Street, and while this map does not depict specific structures, it does show the grid pattern for the Village of Burlington (Map 4). The smaller size of the lots located at the western end of the town adjacent to Lake Champlain, and the north section of town near the Battery were the most highly developed.

The 1862 Wainwright map of *The Village of Burlington, Vermont* provides the names of home and business owners, many of which strongly correlate to the location of houses and buildings as depicted on Young's 1830 map (Map 5). On this map, the UVM Green no longer is depicted as containing any structures, consistent with the historical accounts of their removal. The city block located west of the UVM green indicates two lots which were owned by Capt. Nib (?) on the western half, and J. Wheeler on the eastern half.



BBS March 20, 2017 C:\My Documents\HAA\CAD-GIS\ProjectFiles\5116.11-Main-St-Burlington\5116-11-Map3.mxd

N

0 1,000 2,000 Feet

0 200 400 600 Meters

Note: Graphic scale approximate.

Legend

Project Area

Young 1830

HARTGEN archeological associates inc

Map 3

BBS March 20, 2017 C:\My Documents\HAA\CAD-GIS\ProjectFiles\5116.11-Main-St-Burlington\5116.11-Map4.mxd

N

0 1,000 2,000 Feet

0 200 400 600 Meters

Note: Graphic scale approximate.

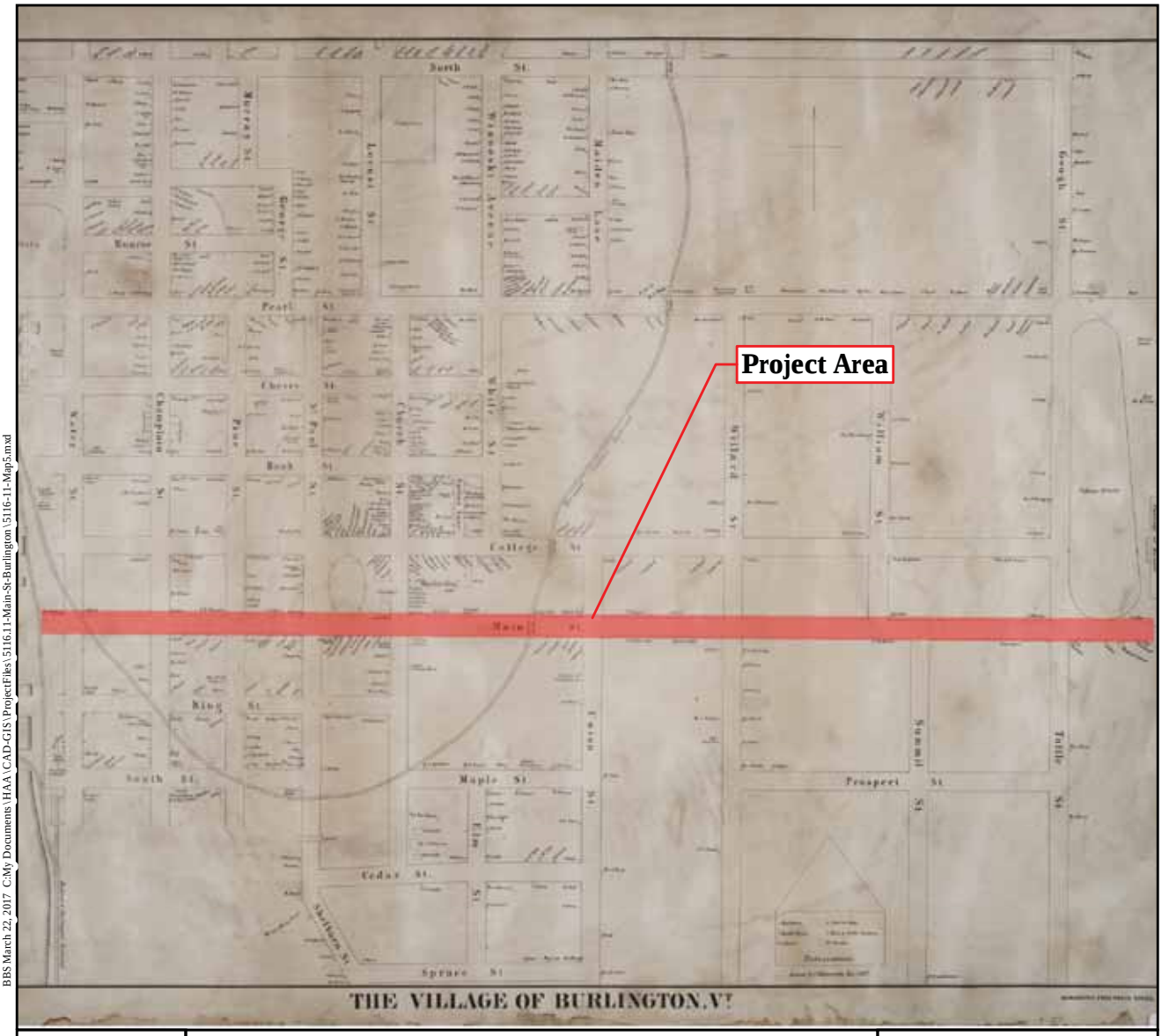
Legend

Project Area

Johnson 1833

HARTGEN archeological associates inc

Map 4



BBS March 22, 2017 C:\My Documents\HAA\CAD-GIS\ProjectFiles\5116.11-Main-St-Burlington\5116-11-Map5.mxd

This map also shows the location of the Rutland & Burlington Railroad, one line which runs north-south along the eastern side of Lake Champlain. Another line begins at a rail yard in the north section of Burlington, and then makes a semi-circular route to the southeast and then northeast, connecting brick and stone yards located at the southern end of town to other businesses and sections of Burlington.

Several other 19th-century maps were studied, including the 1853 Presdee and Edwards, the 1857 Walling map, 1869 Beers and the 1890 Hopkins maps (Maps 6-9). These maps illustrate the way in which Burlington grew and prospered during the last half of the century. These maps all show, in various levels of detail, the two residences located on the city block west of South Prospect Street and the UVM Green, including the Wheeler residence. No structures are depicted within the UVM Green on any of the 19th century maps studied after 1830, which correlates with historic documentation of the razing of the structures in this locale.

SITE RECONNAISSANCE AND RECOMMENDATIONS

A site visit was made to the Main Street project area on March 9th under very cold and windy conditions. The previous day, the temperatures were in the 60s, leaving only a thin layer of snow. The ground contours could clearly be discerned through this thin snow cover.

A walkover of the entire project area was made, with special emphasis on assessing the archeological sensitivity of the areas where subsurface impacts are proposed. This includes the two blocks between Battery and Pine Streets, and the area in front of the Edmunds Middle School where road widening is proposed, as well as the two parcels of UVM land on either side of South Prospect Street where project plans include widening of an existing pathway and creation of a shared use path.

Main Street, between Battery and Pine Streets, is bordered by grass medians, up to 15 feet (4.6 m) in width, in the center of which are a line of trees (Photo 6). Beyond, concrete sidewalks are constructed directly adjacent to buildings and storefronts (Photo 8). The grass medians located directly adjacent to Main Street are considered to have been previously disturbed by road and curb construction and utility installation (Photo 9). There were several manholes noted in the grass median on the south side of the street, as well as fire hydrants on the north side. There are metal boxes present, suggesting the presence of buried electric or telephone lines. These are located closer to the sidewalk than the roadway, indicating disturbance even further from the road. Other features present which indicate disturbance to the area include parking meters, walkways, signs, a bike rack and a mailbox on a cement pad. Exposed soils in places appeared to be loose sand fill.

No further archeological study is recommended for the Battery Street to Pine Street project alignment based on the appearance of previous ground disturbance.

A similar assessment was made for the proposed road widening in front of the Edmunds Middle School. Several intrusive features were noted along this median, including manholes, street lights, walkways and street signs, as well as exposed soil fill.

No further archeological study is recommended for the Edmunds Middle School alignment based on the appearance of previous ground disturbance.

The two areas on UVM property located on the UVM Green, and on the city block located to the west, west of South Prospect Street, where bike path construction and sidewalk widening are proposed, are considered to have archeological sensitivity for both historic and precontact resources. It is recommended that further archeological Phase IB assessment be conducted for these two portions of the project area.

These recommendations should be submitted to the City of Burlington and/or the VDHP for review and concurrence.

BBS March 20, 2017 C:\My Documents\HAA\CAD-GIS\ProjectFiles\5116.11-Main-St-Burlington\5116-11-MapGB.mxd

N

0 1,000 2,000 Feet

0 200 400 600 Meters

Note: Graphic scale approximate.

Legend

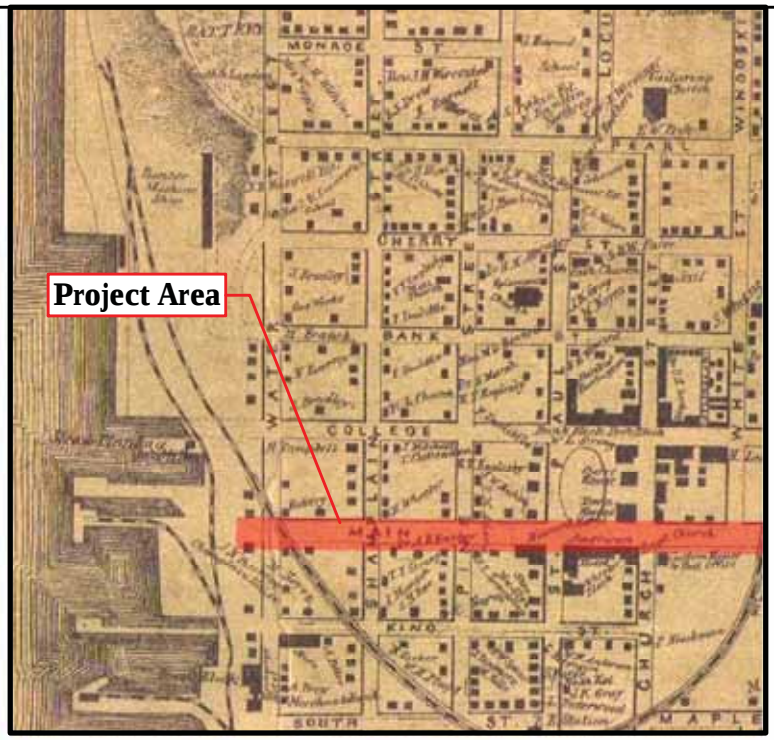
Project Area

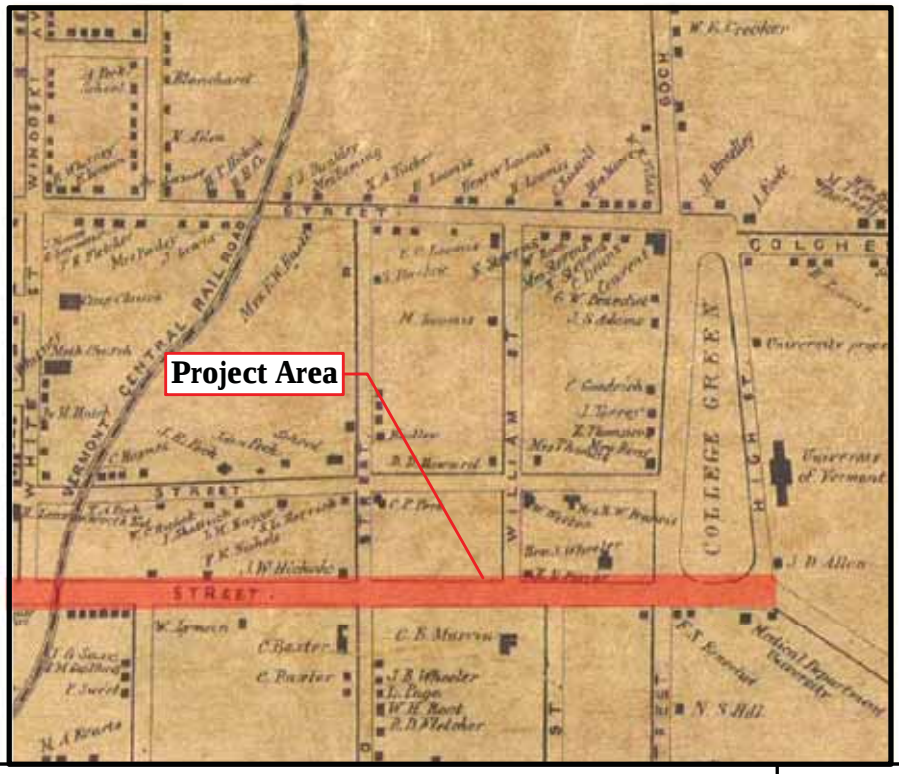
Presdee & Edwards 1853

HARTGEN archeological associates inc

Map 6

Lake Champlain West





University District East

BBS March 22, 2017 C:\My Documents\HAA\CAD-GIS\ProjectFiles\5116.11-Main-St-Burlington\5116.11-Map7B.mxd

N

0 1,000 2,000 Feet

0 200 400 600 Meters

Note: Graphic scale approximate.

Legend

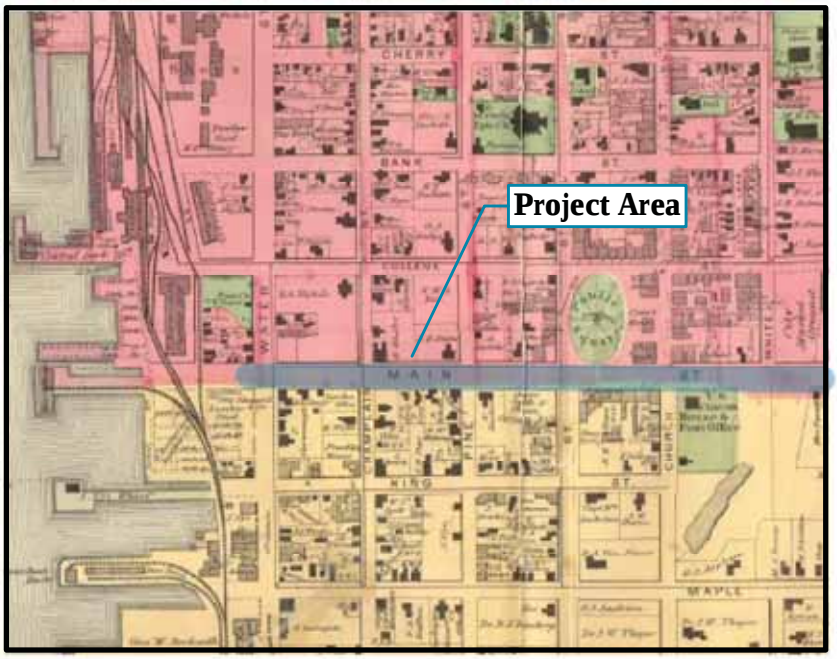
Project Area

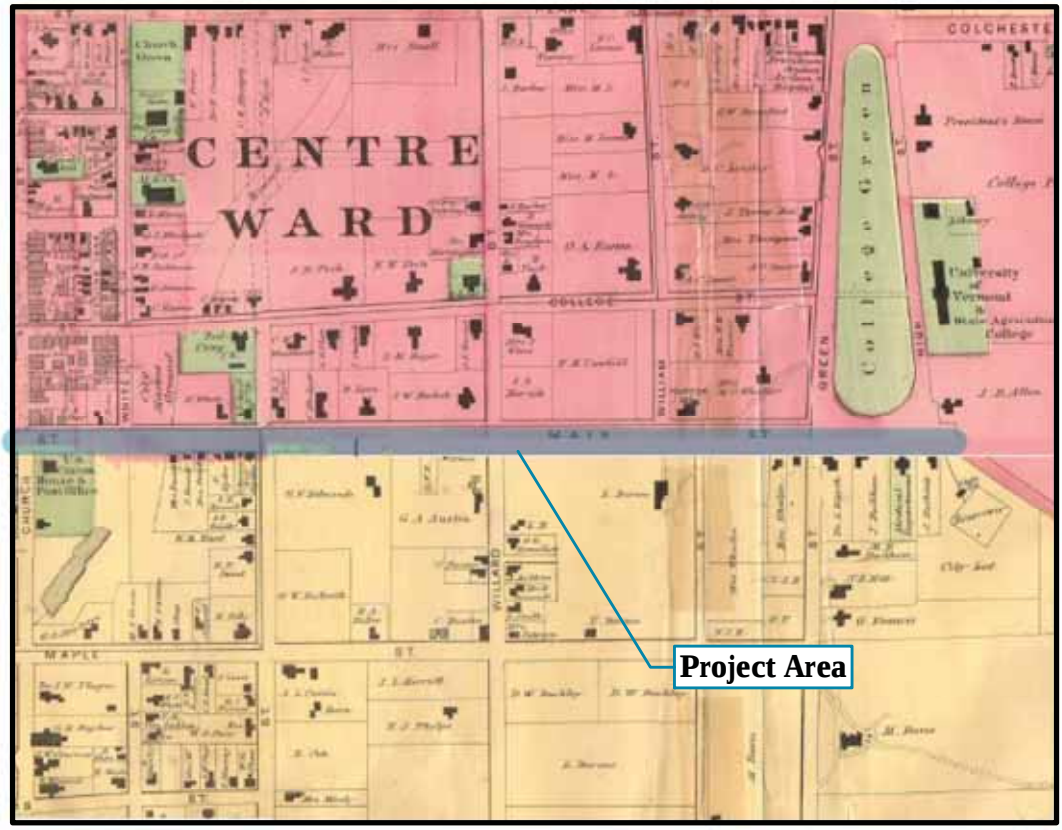
Walling 1857

HARTGEN archeological associates inc

Map 7

Lake Champlain West





University District East

BBS March 22, 2017 C:\My Documents\HAA\CAD-GIS\ProjectFiles\5116.11-Main-St-Burlington\5116-11-Map8.mxd

N

0 1,000 2,000 Feet

0 200 400 600 Meters

Note: Graphic scale approximate.

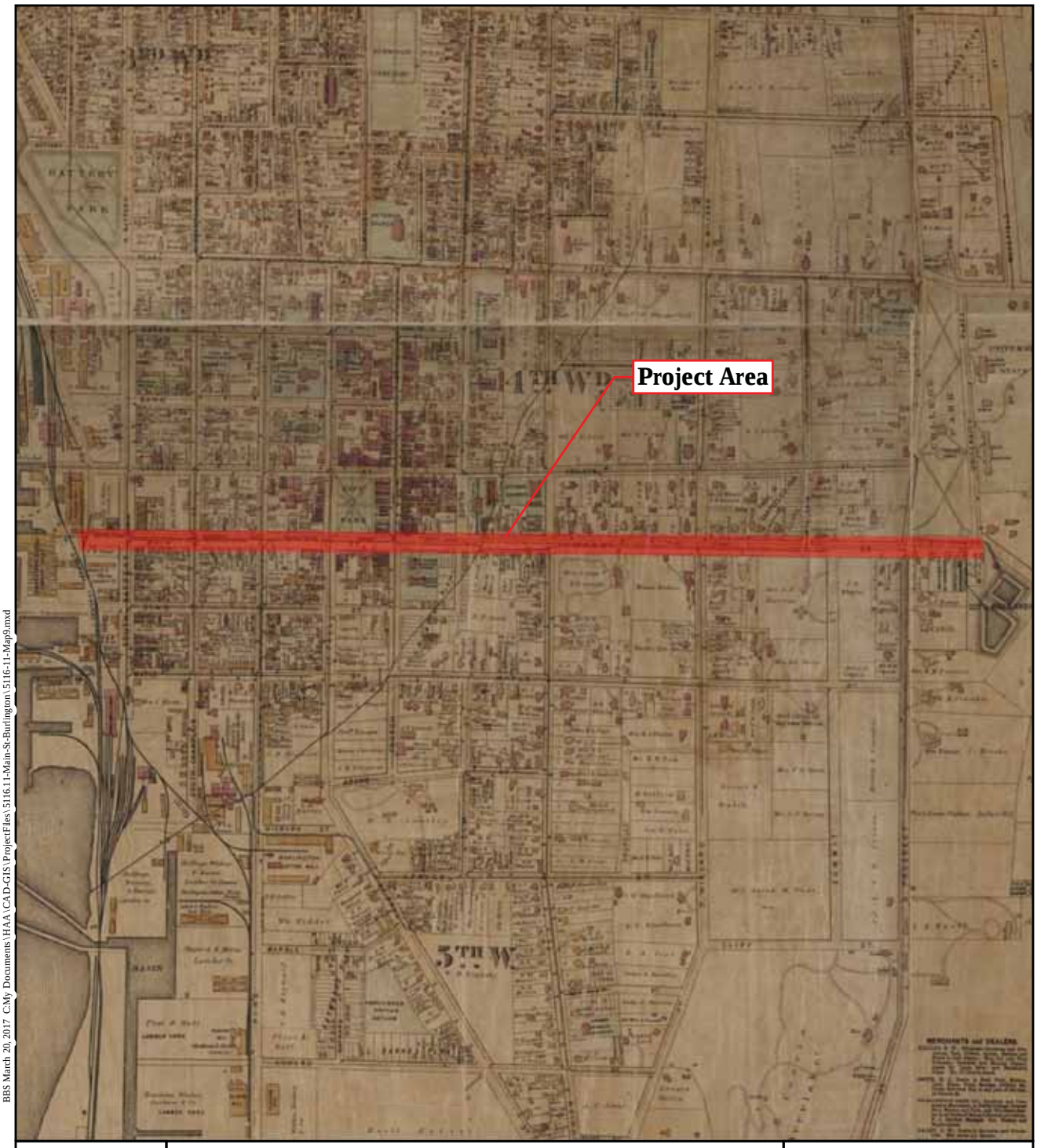
Legend

Project Area

Beers 1869

HARTGEN archeological associates inc

Map 8



BBS March 20, 2017 C:\My Documents\HAA\CAD-GIS\ProjectFiles\5116.11-Main-St-Burlington\5116-11-Map9.mxd

N

0 1,000 2,000 Feet

0 200 400 600 Meters

Note: Graphic scale approximate.

Legend

Project Area

Hopkins 1890

HARTGEN archeological associates inc

Map 9

Photo 8. Photo shows the median on the south side of Main Street, east of Battery Street. View is to the east.

Photo 9. Photo shows the median on the north side of Main Street, east of Battery Street. View is to the east.

BIBLIOGRAPHY

Beers, F.W.
1869 *Atlas of Chittenden County, Vermont*. By F.W. Beers & Co., New York. Reprinted in 1971 by Charles E. Tuttle Company, Rutland, Vermont.

Doll, Charles G., Wallace M. Cady, James B. Thompson, Jr. and Marland P. Billings
1961 *Centennial Geologic Map of Vermont.* State of Vermont Geological Survey, Waterbury, Vermont.

Hopkins, G.M
1890 *Map of the City of Burlington, Vermont from Official Records, Private Plans and Actual Surveys.* Philadelphia, PA. Accessed at www://cdi.uvm.edu/collections

Hyde, Arthur L. and Frances P. Hyde, editors
1991 *Burial Grounds of Vermont.* Published by The Vermont Old Cemetery Association, Bradford, VT.

Johnson, John
1833 *Village of Burlington, Vermont.* Lithograph of Endicott and Swett, NY. Accessed at www://cdi.uvm.edu/collections

McClellan, C.
1856 *McClellan's Map of Chittenden County, Vermont 1856*. Surveyed by J. Chace, Jr., Troy, New York. Published by C. McLellan & Co., Philadelphia, Pennsylvania.

Presdee and Edwards
1853 *Map of Burlington, Vermont.* Lithograph of Sarony and Major, NY. Accessed at www://cdi.uvm.edu/collections

Thomas, Peter A.
1983 *Burlington M5000(3)- Howe Farm Archaeological Report.* Department of Anthropology, University of Vermont. Report No. 45. On file at the VDHP, Montpelier, VT.

1989 *Vermont Gas System's Proposed Pipeline, Winooski Intervale, Preliminary Archaeological Review.* Report completed for the Vermont Gas Systems, Inc., Burlington, Vermont. On file at the VDHP in Montpelier.

Thomas, Peter A. and R. Scott Dillon
1988 *Archaeological Reconnaissance Survey, Pine Grove Terrace, Winooski, Vermont.* Department of Anthropology, University of Vermont. Report No. 90. One file at the VDHP in Montpelier.

United States Department of Agriculture (USDA)
2017 Web Soil Survey 2.0, National Cooperative Soil Survey at http://websoilsurvey.nrcs.usda.gov/app/United States Geological Survey (USGS).

University of Vermont Consulting Archaeology Program
2012a *Archaeological Resources Assessment for the Proposed Pearl Street/Prospect Street/Colchester Avenue Intersection Scoping Study, Burlington, Chittenden County, Vermont.* Submitted by Charles Knight, University of Vermont Consulting Archaeology Program, Burlington, VT. Report No. 703.

2012b *Historic Resources Review for the Pearl Street, Prospect Street and Colchester Avenue Intersection Scoping Study, Burlington, Chittenden County, Vermont.* Submitted by Catherine

A. Quinn and Kate Kenny, Consulting Archaeology Program, University of Vermont, Burlington, VT. Report No. 704.

2012c *Addendum to the Historic Resources Review for the Pearl Street, Prospect Street and Colchester Avenue Intersection Scoping Study, Burlington, Chittenden County, Vermont.* Submitted by Charles Knight, Consulting Archaeology Program, University of Vermont, Burlington, VT.

United States Geological Survey (USGS)

1948/84 *Burlington, Vermont 7.5' Topographic Quadrangle.* Surveyed 1954. U.S. Government Printing Office, Washington, D.C.

Vermont Division for Historic Preservation (VDHP)

2017 Guidelines for Conducting Archeology in Vermont. The Vermont State Historic Preservation Office, Montpelier, VT.

Wainwright, C.

1862 *The Village of Burlington, Vermont.* Drawn by C. Wainwright. Published by the Burlington Free Press. Accessed at www://cdi.uvm.edu/collections.

Walling, Henry Francis

1857 *Map of Chittenden County, Vermont from Actual Surveys.* Baker, Tilden & Co. Publishers, New York.

Young, A. B.

1830 *Plan of Burlington Village, Vermont.* Drawn by A. B. Wainwright. Lithography by Pendleton, 157 Broadway, NY. Accessed at www://cdi.uvm.edu/collections.

.

APPENDIX I: VDHP Predictive Model

VERMONT DIVISION FOR HISTORIC PRESERVATION

Environmental Predictive Model for Locating Pre-contact Archaeological Sites

Project Name Burlington Main St. Bike- Pe **County** Chittenden **Town** Burlington
DHP No. **Map No.** **Staff Init.** **Date** 3/2017

Additional Information

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

17) Marine/Lake Delta Complex**		12	
18) Champlain Sea or Glacial Lake Shore Line**		32	32
E. OTHER ENVIRONMENTAL FACTORS:			
19) Caves /Rockshelters		32	
20) ☑ Natural Travel Corridor ☐ Sole or important access to another drainage ☑ Drainage divide		12	24
21) Existing or Relict Spring	0 – 90 m 90 – 180 m	8 4	
22) Potential or Apparent Prehistoric Quarry for stone procurement	0 – 180 m	32	
23)) Special Environmental or Natural Area, such as Milton acquifer, mountain top, etc. (these may be historic or prehistoric sacred or traditional site locations and prehistoric site types as well)		32	
F. OTHER HIGH SENSITIVITY FACTORS:			
24) High Likelihood of Burials		32	
25) High Recorded Site Density		32	32
26) High likelihood of containing significant site based on recorded or archival data or oral tradition		32	
G. NEGATIVE FACTORS:			
27) Excessive Slope (>15%) or Steep Erosional Slope (>20)		- 32	
28) Previously disturbed land as evaluated by a qualified archeological professional or engineer based on coring, earlier as-built plans, or obvious surface evidence (such as a gravel pit)		- 32	-32
**** refer to 1970 Surficial Geological Map of Vermont**			
		Total Score:	80
Other Comments :			
0- 31 = Archeologically Non- Sensitive **32+ = Archeologically Sensitive**			

ATTACHMENT 3

Utilities Maps (Stormwater, power poles)

Walk Bike plan BTV

Main Street Bikeway

Project Scoping

Utilities

Legend

- wSystemValve
- ssCleanout
- ssInlet
- ssManhole
- wCurbStopValve
- wFittings
- wHydrant
- ssGravityMain
- wLateralLine
- wMains

NOT FOR CONSTRUCTION

DuBois & King

STREETPLANS

GPI

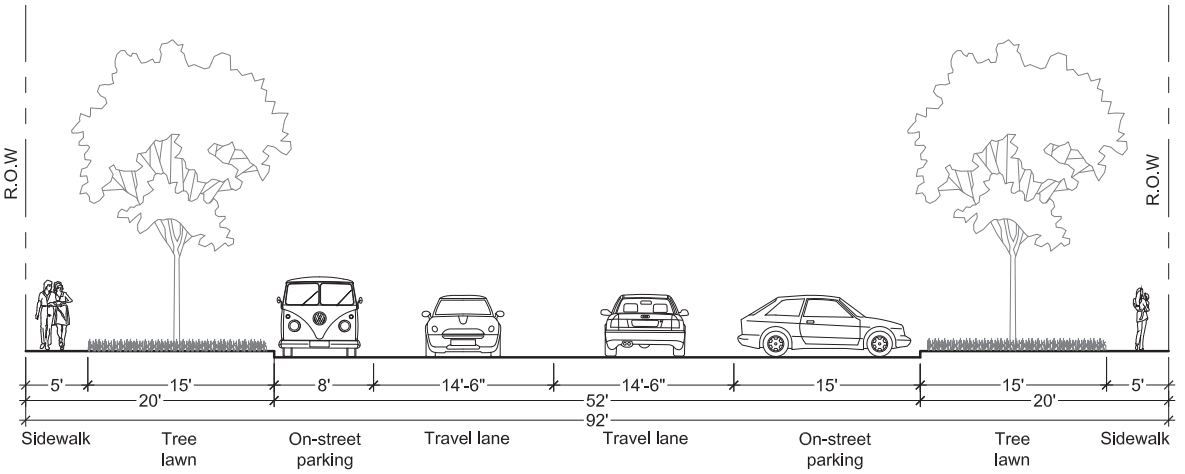
0 25 50 100 150 200 feet

ATTACHMENT 4

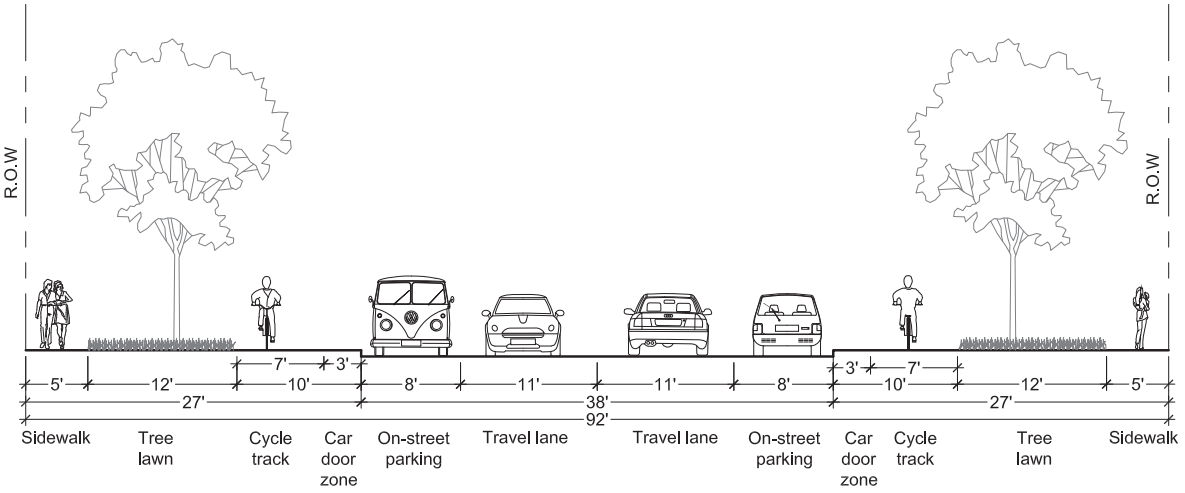
Existing/Proposed Cross Sections for corridor

1- Main Street from Battery St. to S. Champlain St. and Pine St.

NORTH



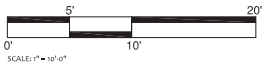
EXISTING CONDITIONS

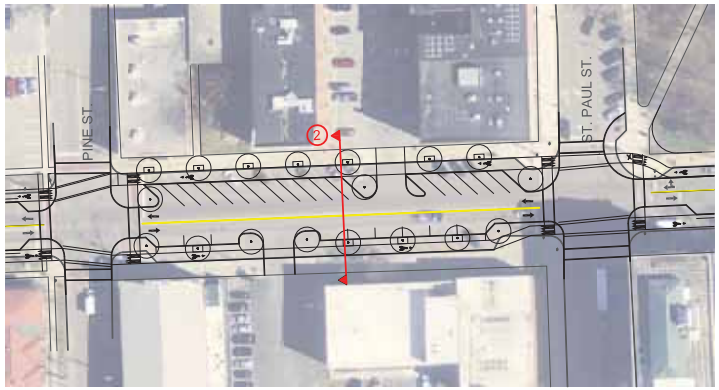


PROPOSED SECTION

GPI
Greenman-Pedersen, Inc.
DuBois & King INC.

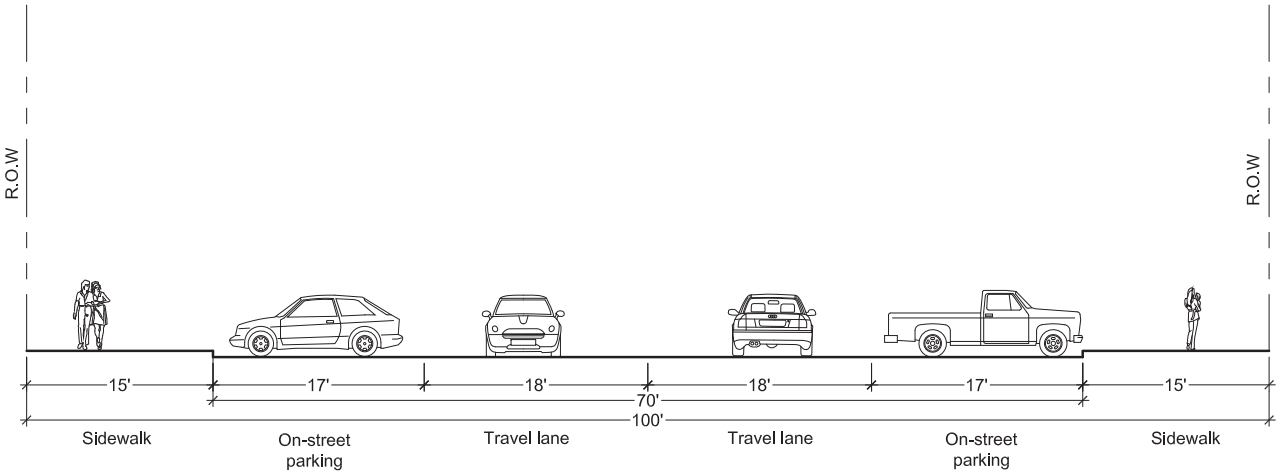
MAIN STREET SECTIONS
Burlington Bike-Ped
Burlington, VT



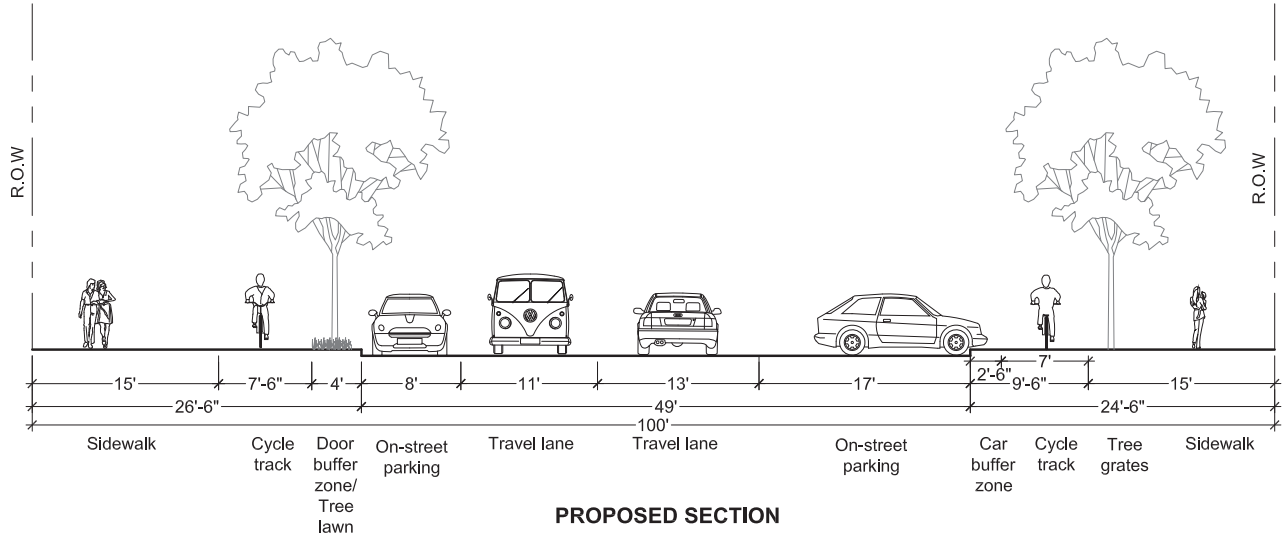


Main Street from Pine St. to St. Paul St.
OPTION 1

NORTH



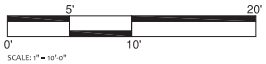
EXISTING CONDITIONS

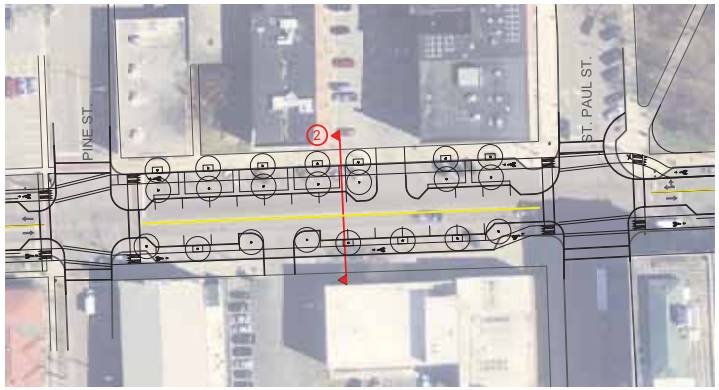


PROPOSED SECTION

GPI Greenman-Pedersen, Inc.
DuBois & King INC.

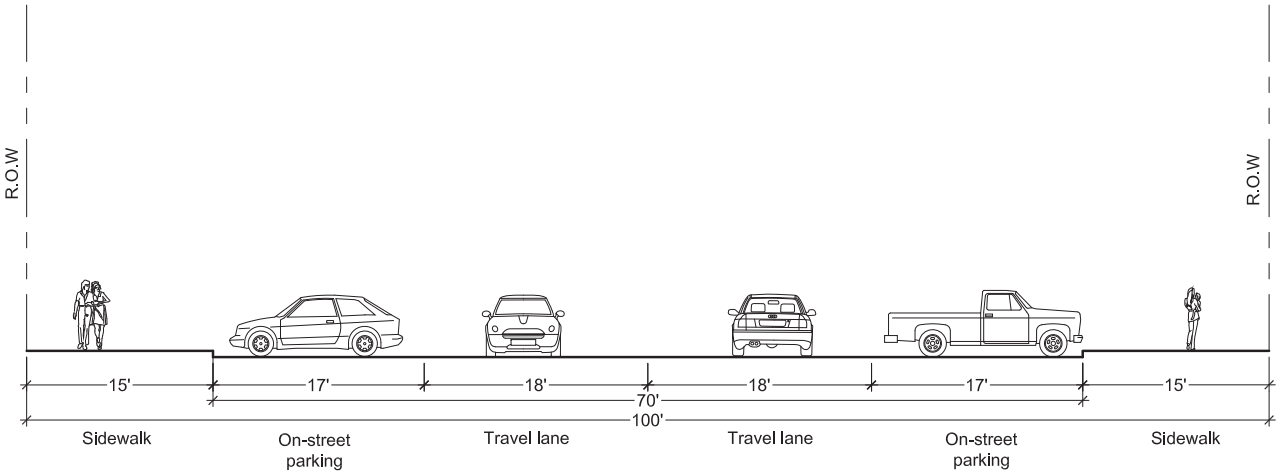
MAIN STREET SECTIONS
Burlington Bike-Ped
Burlington, VT



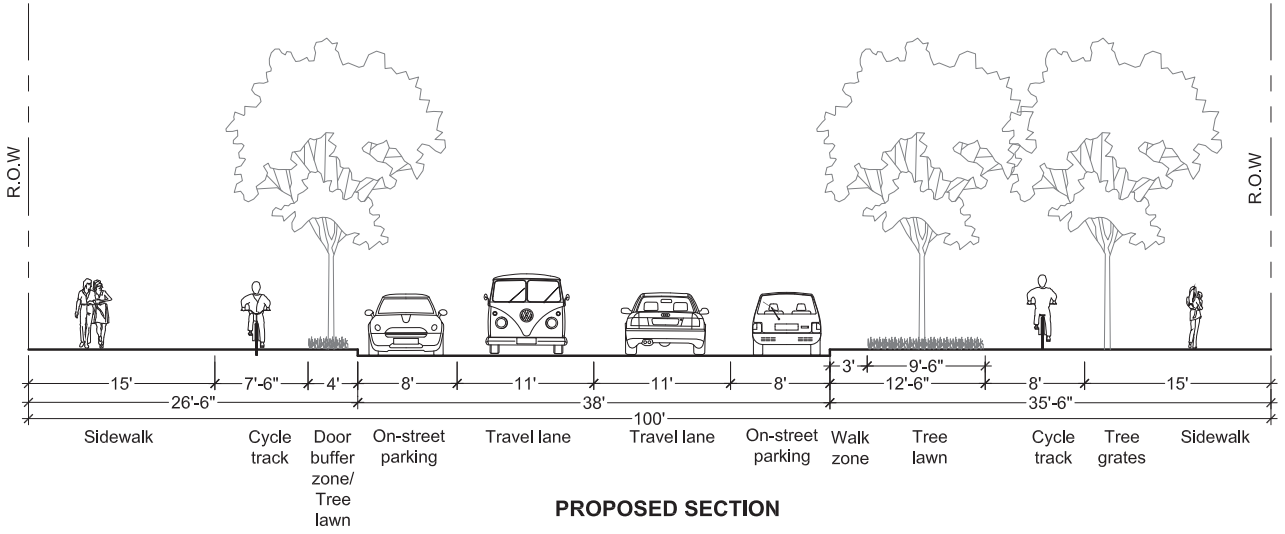


Main Street from Pine St. to St. Paul St.
OPTION 2

NORTH



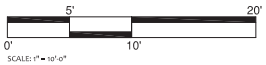
EXISTING CONDITIONS

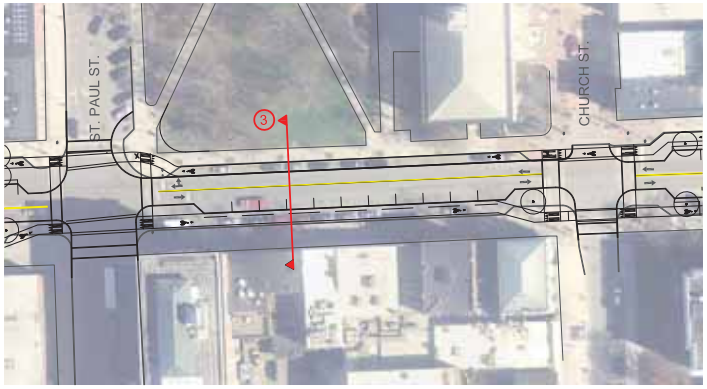


PROPOSED SECTION

GPI Greenman-Pedersen, Inc.
DuBois & King INC.

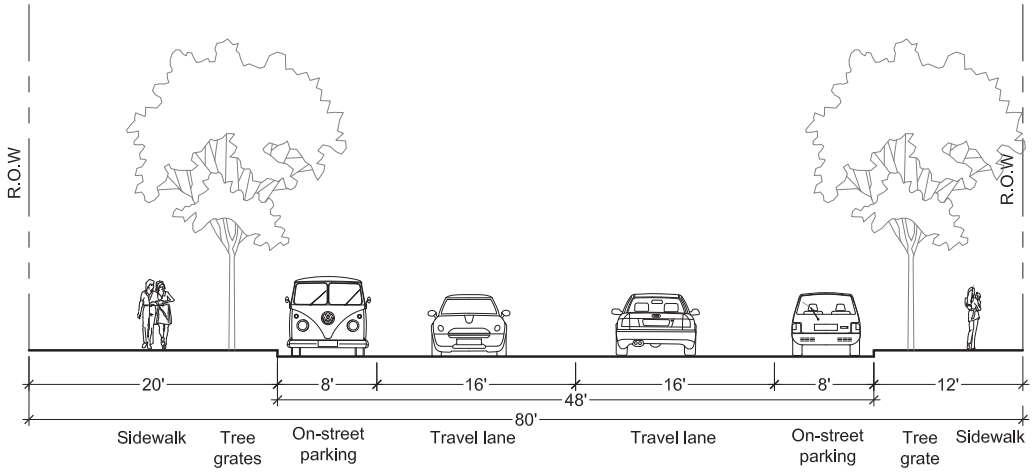
MAIN STREET SECTIONS
Burlington Bike-Ped
Burlington, VT



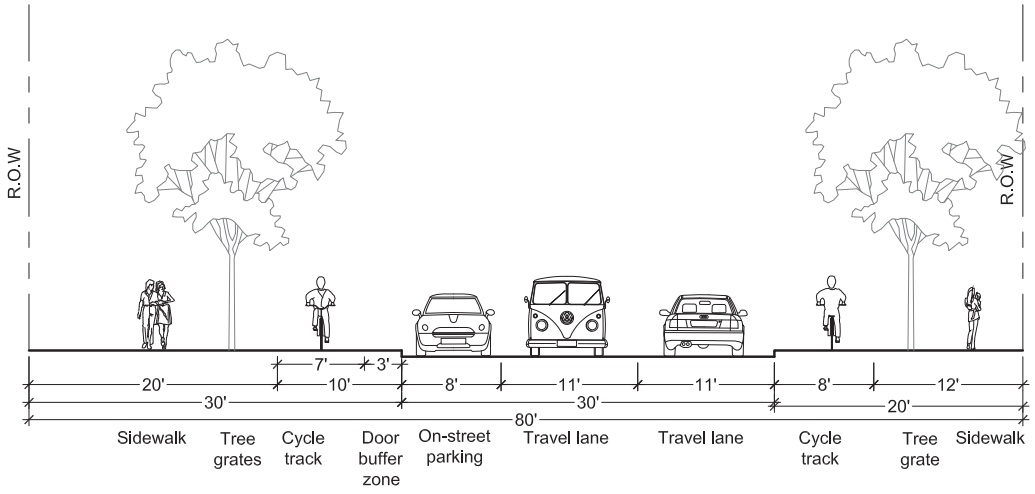


3 -Main Street from St. Paul St. to Church St.

NORTH



EXISTING CONDITIONS

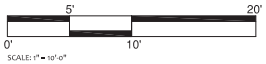


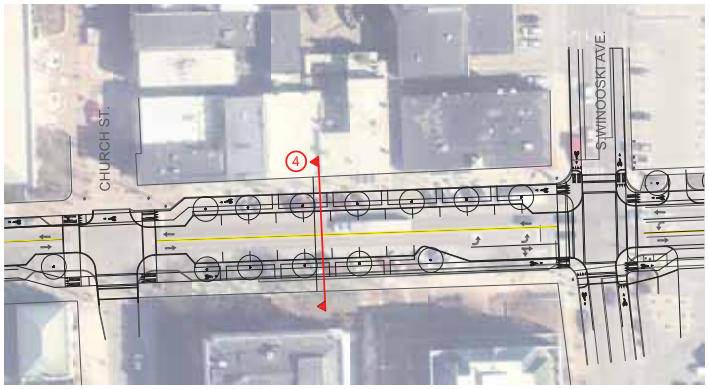
PROPOSED SECTION

GPI Greenman-Pedersen, Inc.

DuBois & King Inc.

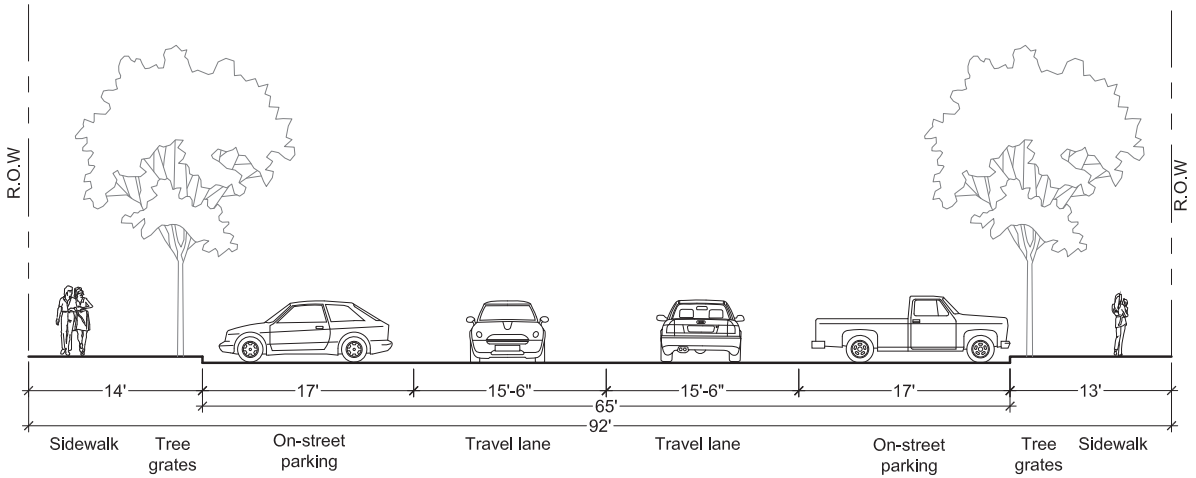
MAIN STREET SECTIONS
Burlington Bike-Ped
Burlington, VT



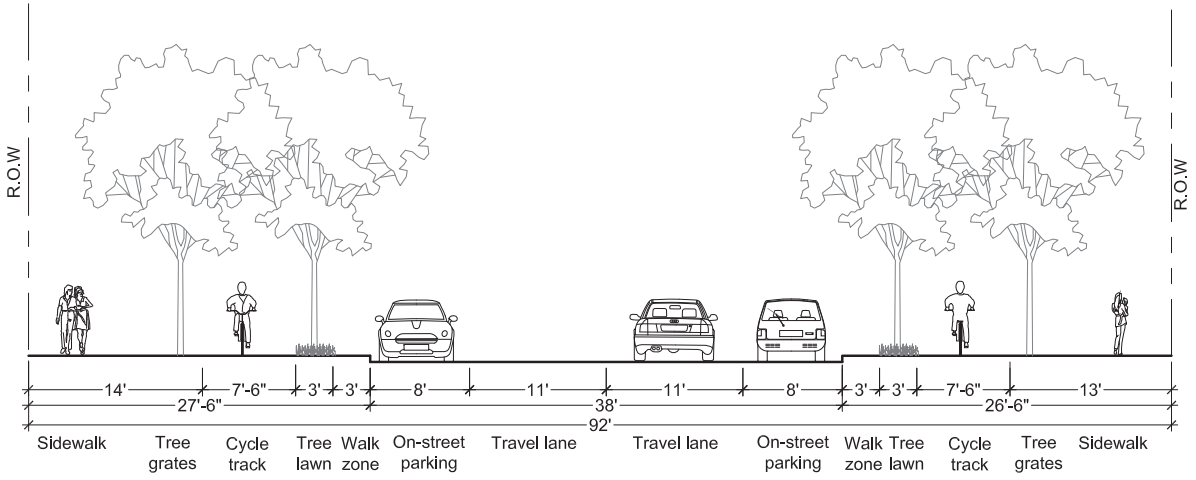


4 -Main Street from Church St. to Winooski Ave.

NORTH



EXISTING CONDITIONS

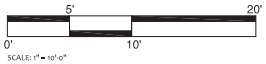


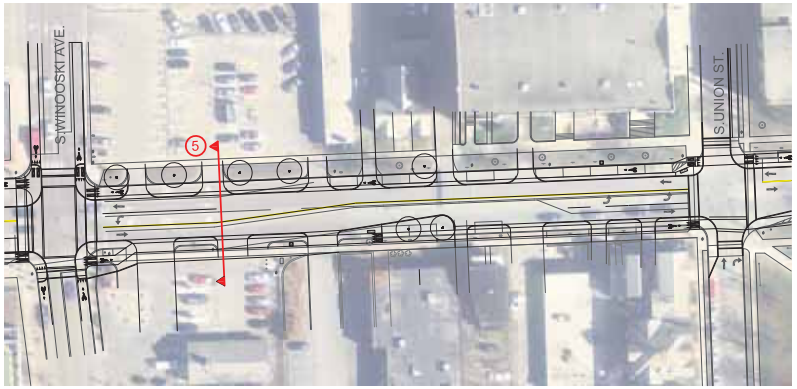
PROPOSED SECTION

GPI Greenman-Pedersen, Inc.

DuBois & King Inc.

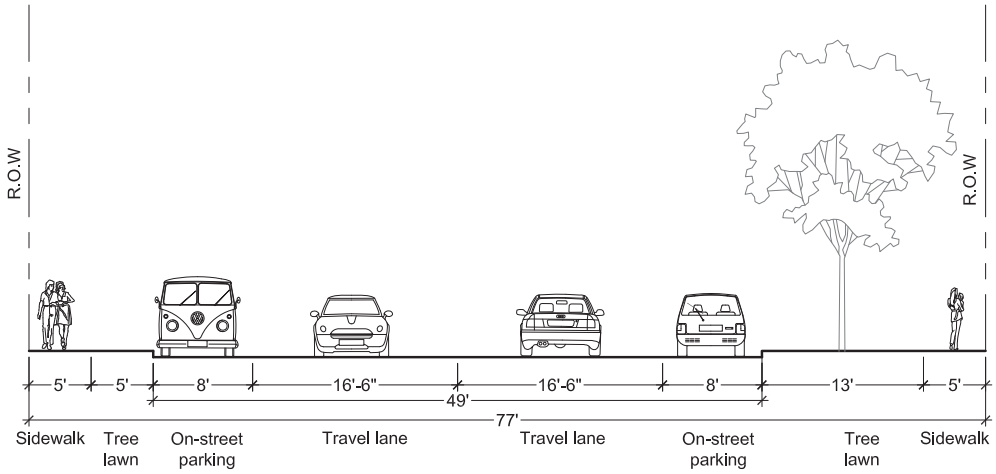
MAIN STREET SECTIONS
Burlington Bike-Ped
Burlington, VT



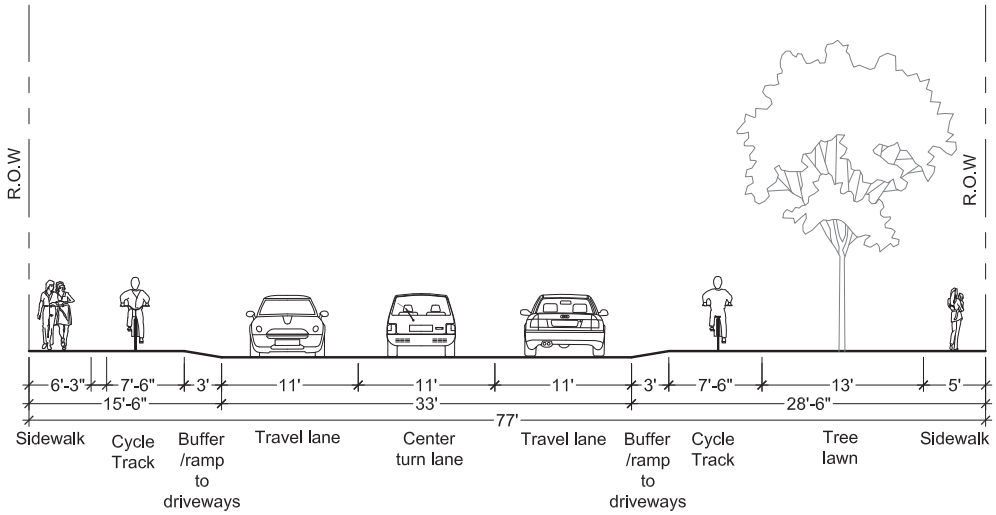


5 -Main Street from Winooski Ave. to S. Union

NORTH



EXISTING CONDITIONS

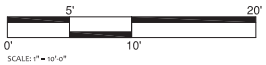


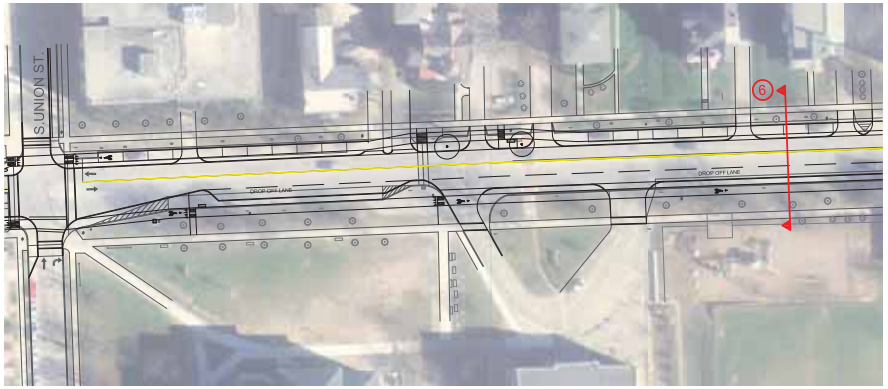
PROPOSED SECTION

GPI Greenman-Pedersen, Inc.

DuBois & King Inc.

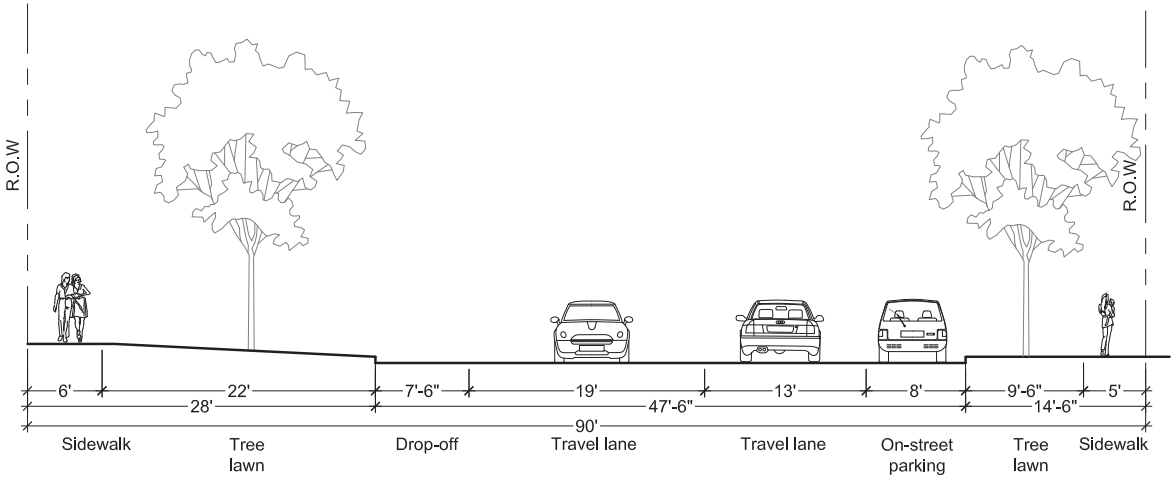
MAIN STREET SECTIONS
Burlington Bike-Ped
Burlington, VT



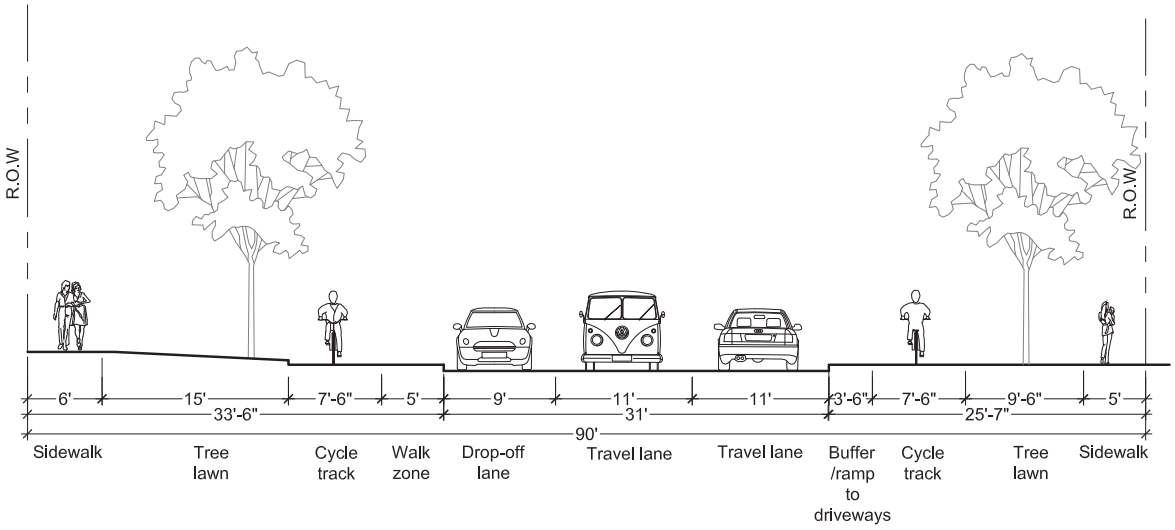


6 -Main Street from S. Union to St. Willard

NORTH



EXISTING CONDITIONS

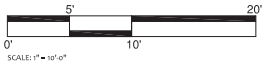


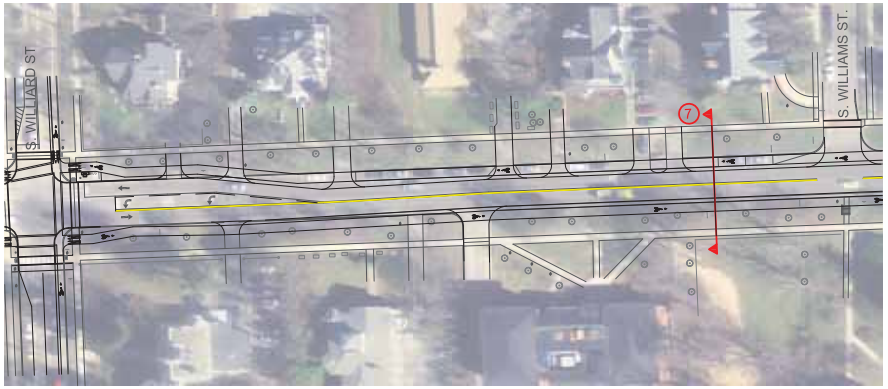
PROPOSED SECTION

GPI Greenman-Pedersen, Inc.

DuBois & King Inc.

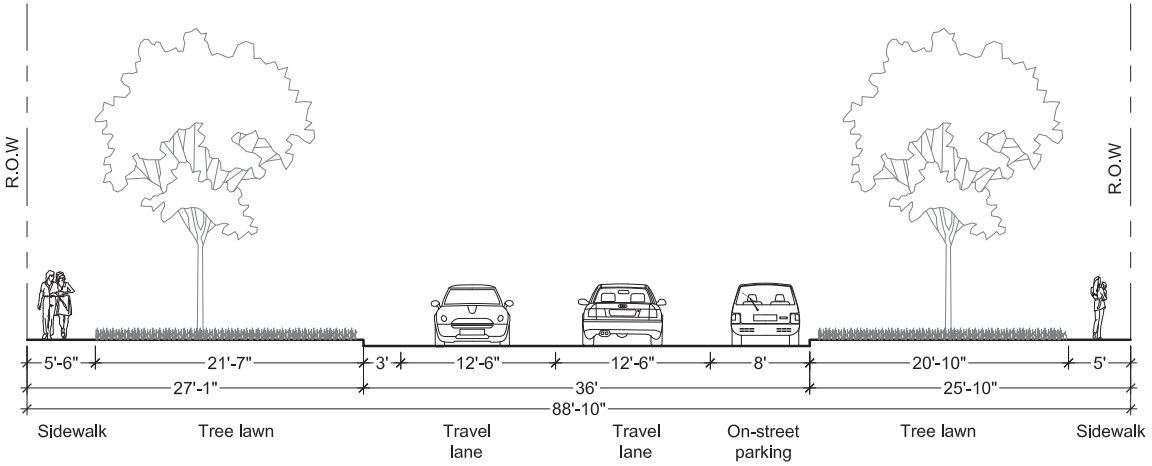
MAIN STREET SECTIONS
Burlington Bike-Ped
Burlington, VT



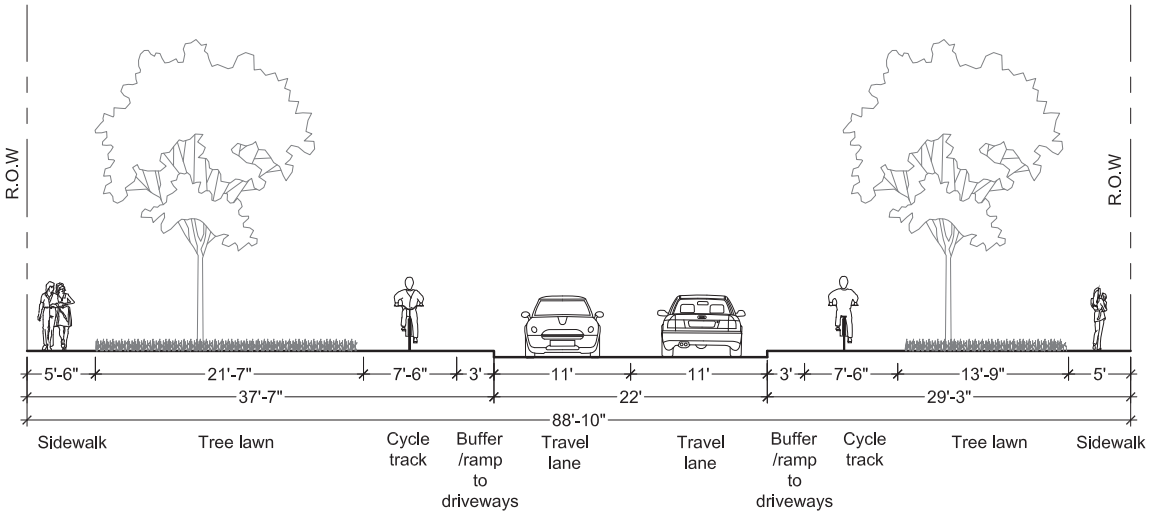


7-Main Street from S. Willard St. to Summit St.

NORTH



EXISTING CONDITIONS

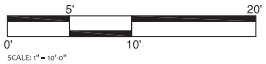


PROPOSED SECTION

GPI Greenman-Pedersen, Inc.

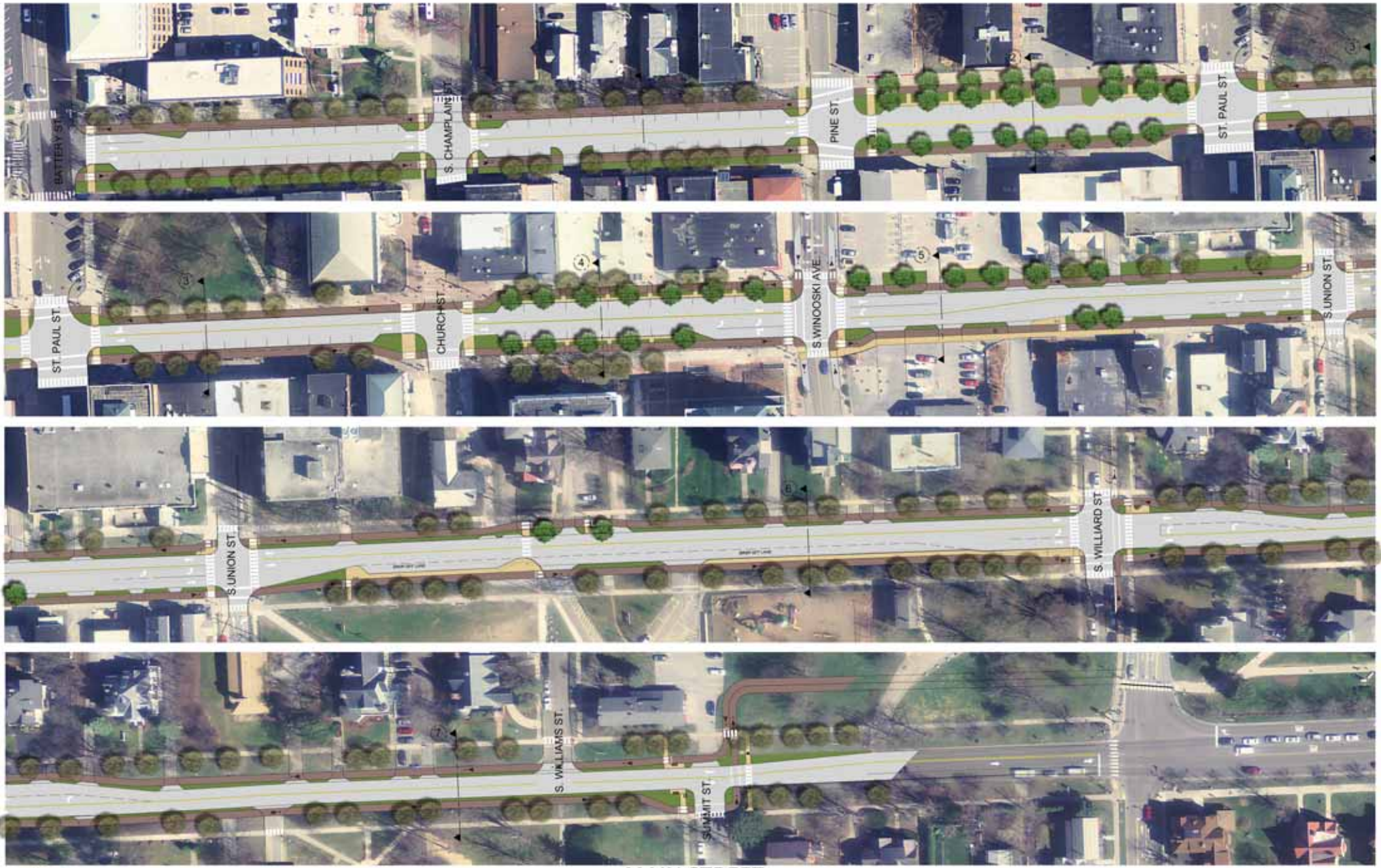
DuBois & King Inc.

MAIN STREET SECTIONS
Burlington Bike-Ped
Burlington, VT



ATTACHMENT 5

Plan for entire corridor



MAIN STREET

Burlington, Vermont

GPI DuBois & King

ATTACHMENT 6

Plan between Union and the Campus District

GPI DuBois & King

MAIN STREET
Burlington, VT

ATTACHMENT 7

Cost Estimates

Union to Willard						
	Tons per cu yd bituminous		2			
	Width of street pavement repair		2			
	Length of block face		870	ft		
	Widening		6	ft	one side	
	Depth of subbase		1	ft	9 inches	
	Width of path		6.5	ft		
	Depth of pavement on path		0.25	ft	3 inches	
	Depth of pavement on street		0.5	ft		
	Width of green buffer		2			
				Vtrans 2 yea	Adjusted	
Pay Item #	Items	Quantity	Units	Unit Cost		
	Remove pavement (path plus two feet)	129	cy	$ 26.68	$ 27.00	$ 3,480
	Remove curb	1,740	lf	$ 28.51	$ 29.00	$ 50,460
	Gravel subbase for path and buffer	548	cy	$ 35.00	$ 35.00	$ 19,172
	Concrete beveled curb (1 ft wide, flush at driveways)	1,740	lf	$ 50.00	$ 50.00	$ 87,000
	Buffer strip (permeable, planted/cobbles, 2 ft, absorbs runoff from path)	3,480	sf	n/a	$ 5.00	$ 17,400
	Asphalt bike path (6.5 feet, colored)	209	tons	$ 134.45	$ 150.00	$ 31,417
	Resurface street along curb (2 feet along new curb)	129	tons	$ 134.45	$ 135.00	$ 17,400
	Relocate drainage structures	4	ea	$ 2,800.00	$ 3,000.00	$ 12,000
	Allowance for bus stop and shelter	1	ea		$ 20,000.00	$ 20,000
	Allowance for Traffic Control	1	ea		$ 25,000.00	$ 25,000
	Allowance for mobilization	8%				$ 22,666
		Estimated Construction cost				$ 305,995
		Contingency (20%)				$ 61,199
		Total Construction Cost				$ 367,194
		Design Engineering				$ 91,799
		Construction Engineering				$ 55,079
		Grand Total Project Cost				$ 514,072

Willard to Summit			Tons per cu yd bituminous	2			
			Width of street pavement repair	2			
			Length of block face	810	ft		
			Widening	7	ft	one side	
			Depth of subbase	1	ft	9 inches	
			Width of path	6.5	ft		
			Depth of pavement on path	0.25	ft	3 inches	
			Depth of pavement on street	0.5	ft		
			Width of green buffer	2			
					Vtrans 2 yea	Adjusted	
Pay Item #	Items	Quantity	Units	Unit Cost			
	remove pavement (path plus two feet)	135	cubic yards	$ 26.68	$ 27.00	$ 3,645	
	Remove curb	1,620	lf	$ 28.51	$ 29.00	$ 46,980	
	Gravel subbase for path and buffer	510	cubic yards	$ 35.00	$ 35.00	$ 17,850	
	Concrete beveled curb (1 ft)	1,620	lf	$ 50.00	$ 50.00	$ 81,000	
	Buffer strip (permeable, planted/cobbles, 2 ft, absorbs runoff from path)	3,240	sf	n/a	$ 5.00	$ 16,200	
	Asphalt bike path (6.5 feet, colored)	195	tons	$ 134.45	$ 150.00	$ 29,250	
	Resurface street along curb (2 feet along new curb)	120	tons	$ 134.45	$ 135.00	$ 16,200	
	Relocate drainage structures	4	ea	$ 2,800.00	$ 3,000.00	$ 12,000	
	Allowance for crossing (RRFB)	1		15000	18000	$ 18,000	
	Allowance for Traffic Control	1	ea		$ 25,000	$ 25,000	
	Allowance for mobilization	8%				$ 21,290	
		Estimated Construction cost				$ 287,415	
		Contingency (20%)				$ 57,483	
		Total Construction Cost				$ 344,898	
		Design Engineering				$ 86,225	
		Construction Engineering				$ 51,735	
		Total Construction Cost				$ 482,857	

Summit to UVM Green

	Units		Vtrans unit	Item Cost
Length of new path	430	ft	$ 197.00	$ 84,710
Length of widened sidewalk	322	ft	$ 155.00	$ 49,910
Allowance for crosswalk				$ 3,500
Estimated Construction cost				$ 138,120
Contingency (20%)				$ 27,624
Total Construction Cost				$ 165,744
Design Engineering (25%)				$ 41,436
Construction Engineering (15%)				$ 24,862
Grand Total Project Cost				$ 232,042

Summary

Section	Feet	Estimated Con	Cost/ft	Total Project Cost
Union to Willard	870	$ 367,194	$ 422	$ 514,072
Willard to Summit	810	$ 344,898	$ 426	$ 482,857
Summit to UVM Green	752	$ 165,744	$ 220	$ 232,042
	2,432	$ 877,836	$ 361	$ 1,228,971