SHELBURNE ROAD CORRIDOR STUDY

December 2012

Prepared for:

Chittenden County RPC

southburlington VERMONT

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Chapter 1: Study Introduction and Overview

This report details the findings and recommendations of the Shelburne Road Corridor Study. The study assessed transportation conditions along a one mile segment of Shelburne Road (US Route 7) in South Burlington, extending from Holmes Road/IDX Drive in the south to the I-189 off-ramp at the border of South Burlington and Burlington in the north.

The study was funded and managed by the Chittenden County Regional Planning Commission (CCRPC) in association with the City of South Burlington. Other participating public agencies were the Vermont Agency of Transportation (VTrans) and Chittenden County Transit Authority (CCTA). Additionally, a project Steering Committee participated throughout the study, as described below. A consultant team led by Parsons Brinckerhoff, with support from Third Sector Associates and Cambridge Systematics, Inc., conducted the study for CCRPC.

Study Process

The study process involved four primary steps, in addition to project management and public outreach activities occurring throughout the study:

- Assess existing and future conditions
- Define the corridor vision, goals and candidate strategies
- Recommend, evaluate and prioritize strategies
- Draft study report and implementation plan

The final report is organized into two sections; Existing and Future Conditions, and Recommendations and Implementation Plan. Public involvement is summarized in this introductory section, as are the vision and goals that were established to guide development of corridor recommendations.

Public Involvement

The public involvement process is summarized here, with further details provided in Appendix A. A Public Involvement Plan for the Shelburne Road Corridor Study was designed in the spirit of the CCRPC's Public Participation Plan. The plan was predicated on an effective public involvement and public outreach campaign that involved transportation stakeholders and the broader public early in the process, checked in with them frequently, and then supported an outreach effort to present the final plan. The intent of the public involvement effort was to foster a spirit of inclusiveness and ownership of the Shelburne Road Corridor Study.

Public involvement was integrated into all aspects of the work plan. A Steering Committee consisting of nine members representing a broad range of community interests was convened to work with the study team. The group met six times between April 27, 2011 and July 2, 2012. Information management for the study included a website with background information, Steering Committee meeting notes, public meeting documents (agendas, meeting notes, web links to video), and interim project reports. The website was hosted on the CCRPC's website: http://www.ccrpcvt.org/

There were three public meetings held on November 17, 2011, March 15, 2012, and finally on July 11, 2012 (hosted by the South Burlington Planning Commission). All meetings were videotaped by Channel 17 and made available via television and on-demand online. The first meeting, held on November 17, 2011 featured vision, goals, objectives, and issues of the corridor. It was attended by twenty-three members of the public and eight members of the Steering Committee. Meeting outreach was most successful through emails, Front Porch Forum, and "The Other Paper" advertisements (and, when possible, these outreach methods were used for subsequent meetings).

The second public meeting was held on March 15, 2012 to define and evaluate corridor strategies. Twenty-five members of the public and six Steering Committee members attended the meeting. This meeting included a presentation of general options and a workshop where project team members and meeting attendees worked together to identify potential solutions.

The third and final meeting was held on July 11, 2012 and featured a summary of the final Draft Corridor Study. Ten members of the public attended the meeting along with seven Planning Commission members and six members of the Steering Committee.

Vision and Goals

The study team developed a vision statement and related goals to guide development of corridor recommendations. The vision statement is intended to reflect community values, needs, and perspectives, and was developed with participation of the project Steering Committee and public through the open house process.

Vision Statement

As South Burlington continues to transform in the coming decades, Shelburne Road will remain a key travel corridor for both the community and the region. Through a combination of actions, Shelburne Road will become safer, more attractive, and better integrated with the surrounding neighborhoods and community. The corridor will offer convenient travel choices, including transit, walking and bicycling opportunities. Corridor improvements will support economic development as envisioned in local plans, while enhancing the quality of life for area residents by improving accessibility, safety, and visual character.

Supporting Corridor Goals

Goals more specifically identify how progress toward the study's vision could be achieved. Also developed with participation of the Steering Committee and public, the study goals guided the development and ultimate selection of recommendations.

Goal 1: Create an efficient transportation system serving the corridor that balances regional and local transportation needs

1.1 Maintain the corridor's ability to accommodate regional travel.

1.2 Provide for safe and convenient access to local land uses.

1.3 Upgrade traffic control systems to more efficiently move people and goods in the corridor.

1.4 Improve local circulation within the study area to reduce demands on Shelburne Road.

1.5 Simplify and clarify traffic control, signage, and striping.

Goal 2: Improve safety for all users

2.1 Manage access to the corridor and reduce conflicting turning movements.

2.2 Provide safe and convenient crossing and travel opportunities for pedestrians and bicyclists.

2.3 Reduce and/or better manage recurrent congestion.

2.4 Design to moderate travel speeds.

2.5 Consider all potential users in the planning and design process.

Goal 3: Provide a range of convenient transportation options

3.1 Improve public transit service and make it a more competitive travel option in the corridor.

3.2 Improve access to and encourage the use of public transit services for walkers, bicyclists and autos (park and ride).

3.3 Provide safe and attractive pedestrian accommodations.

3.4 Establish bicycle facilities that provide an uninterrupted north-south route through the study area.

3.5 Improve conditions for bicyclists on Shelburne Road and local streets.

Goal 4: Enhance the quality of life along the corridor

4.1 Encourage and foster sustainable travel choices and development practices.

4.2 Encourage and support development consistent with local plans.

4.3 Improve the visual character of the corridor.

4.4 Reduce adverse effects on open spaces, neighborhoods and the environment.

Overview of Findings

Existing and anticipated future conditions in the study area are described in detail in the following section. Several key findings were fundamental in guiding the development of study recommendations, in particular:

- Congestion on the corridor today is primarily related to the interchange with I-189.
- Congestion is worse during the afternoon peak, especially in the northbound direction.
- Traffic conditions are expected to deteriorate over time due to continuing growth in the region. This is especially true if the proposed Champlain Parkway extension from I-189 is not built; in which case traffic destined to Burlington will increasingly use the I-189 interchange and especially the northbound off ramp.
- Shelburne Road is not a pedestrian-friendly corridor. In addition to being a busy vehicular corridor, sections of poorly designed or maintained sidewalk, buildings set back far from the street, and a lack of safe crossing opportunities are all issues today.
- Shelburne Road does not offer space for bicyclists, either in the form of bike lanes or shoulders. The lack of parallel roadways limits opportunities for bicyclists to use alternate routes.
- Nearly continuous two-way left turn lanes and frequent driveways result in a low degree of access management and a high number of potential conflicts between turning vehicles. VTrans has identified two high crash locations on the northern portion of the corridor.

To address these and other issues, a number of potential near- term improvements have been recommended. These are actions that could, if pursued, be implemented within five years at low to moderate cost. Over the longer-term, a full reconstruction of the corridor is recommended to incorporate bicycle lanes, a center raised median, and streetscape improvements. Corridor reconstruction south of Queen City Park could potentially be completed independent of decisions related to the Champlain Parkway, however, to the north the two projects' designs would need to be coordinated to determine how best to accommodate access in the I-189 interchange area.

Chapter 2: Existing and Future Corridor Conditions

Corridor Setting

The Shelburne Road corridor is located in the city of South Burlington, part of the greater Burlington metropolitan area in Chittenden County. The study area extends for approximately one mile along US Route 7 between GE Healthcare at the US Route 7/IDX Drive intersection and the Burlington City Line at the US Route 7/Interstate 189 interchange (Exhibit 2.1). US Route 7 functions as a north-south principal arterial and serves the commercial and residential developments that straddle the highway in the study area.

Chittenden County is Vermont's largest economic center and home to 25 percent of the state's population. Burlington is the principal city in Chittenden County, with 42,417 residents (Exhibit 2.2). Neighboring South Burlington is the second largest city in the county - and third statewide - with 17,904 residents. The region has grown relatively modestly since 1990, at an average of 0.9 percent annually. Growth in South Burlington has occurred at a higher average rate of about 1.6 percent annually over the same timeframe.

The City of South Burlington is divided into two distinct areas by I-89. Shelburne Road is the primary travel corridor for the areas southwest of I-89. The area surrounding Shelburne Road is both an employment center and a residential area. An analysis of work and home locations for those living in the vicinity of Shelburne Road indicates strong commuting patterns to the north and northeast toward Burlington (Exhibit 2.3). Very few residents who live near Shelburne Road commute to the south, though a more sizable minority of employees who work near the corridor do commute from communities to the south. The analysis also shows that for the area bordering the corridor, most residents commute to jobs elsewhere (90 percent), and most employees who work along Shelburne Road live elsewhere (95 percent).

Exhibit 2.1: Shelburne Road Corridor Study Location

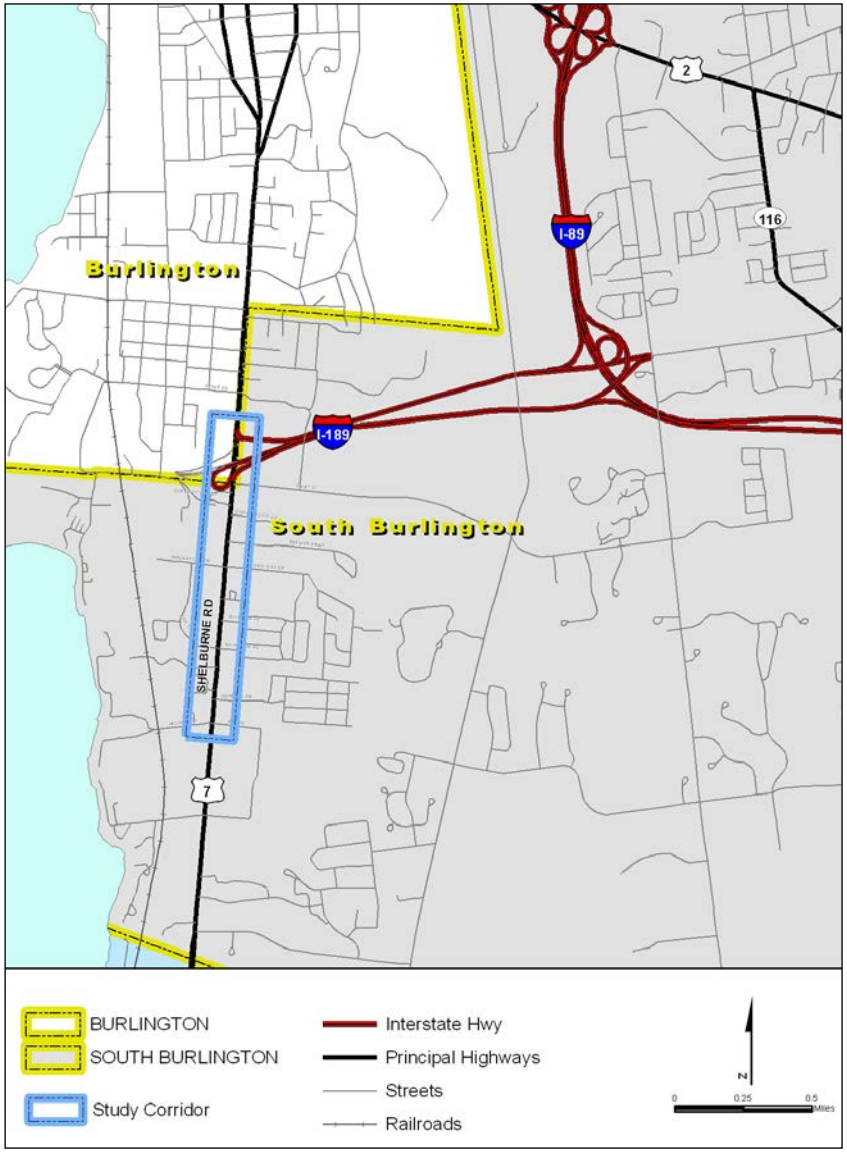
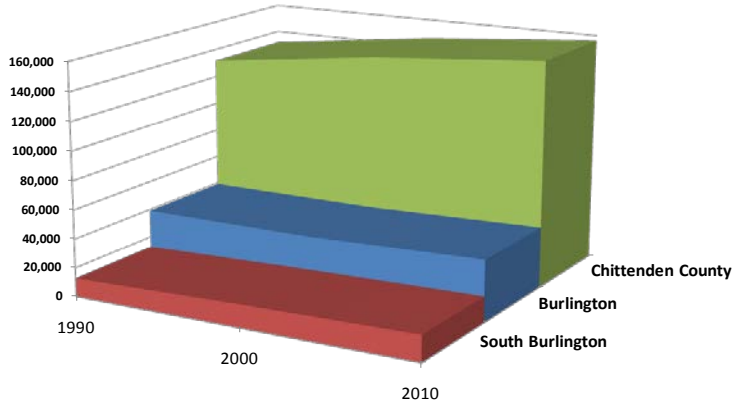


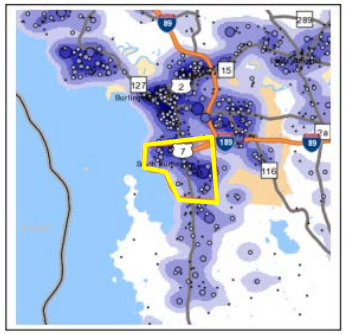
Exhibit 2.2: Local and Regional Population, 1990 - 2010



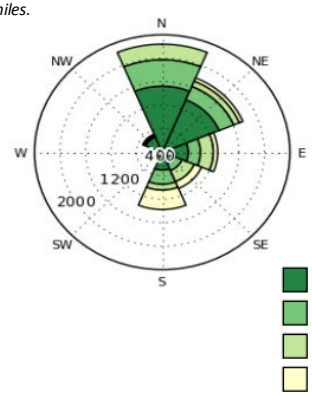
	1990	2000	2010
South Burlington	12,809	15,814	17,904
Burlington	39,127	38,889	42,417
Chittenden County	131,761	146,571	156,545

Exhibit 2.3: Commute Patterns for Shelburne Road Area Workers and Residents

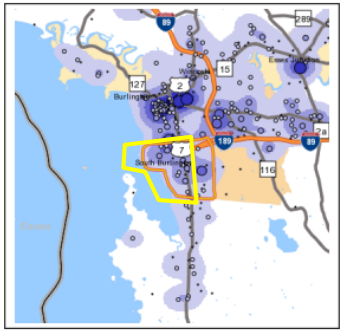
Location of residence (blue) for employees who work near the Shelburne Road Corridor (within the yellow area)



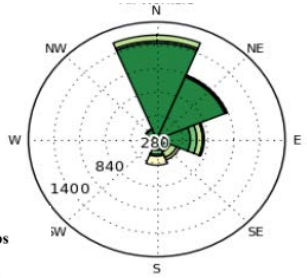
*Most **workers** commute from the north and east, though some do commute from the south as well. Many commuters from the south travel more than 50 miles.*

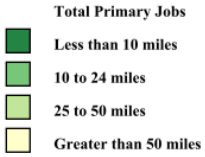


Location of work (blue) for residents who live near Shelburne Road Corridor (within the yellow area)



*Very few **residents** commute to jobs further south. Most have short commutes to the north and northeast.*





Source: US Census Bureau, OnTheMap website (2011): http://lehdmap.did.census.gov/

Land Uses

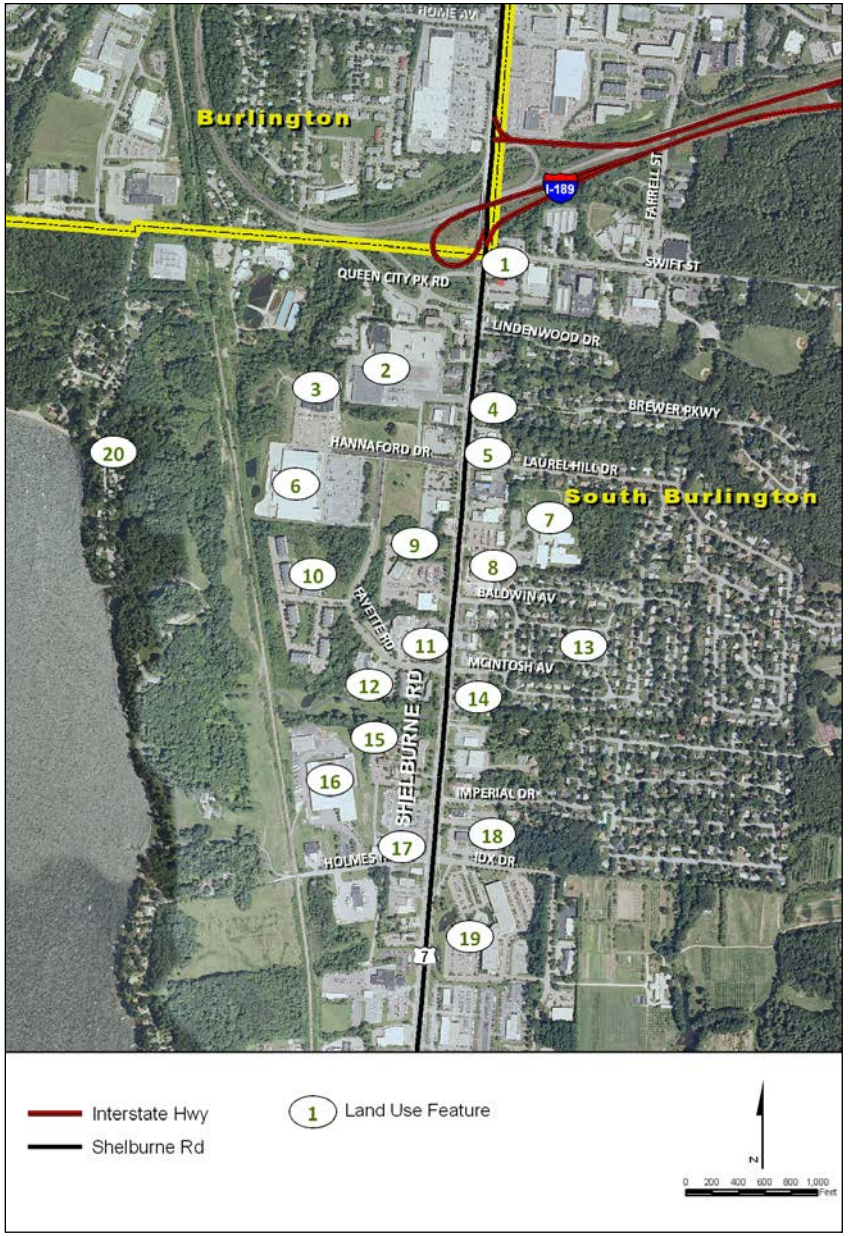
Land uses along US Route 7 are primarily commercial, and typically feature parking lots fronting the roadway with one- to two-story buildings set further back. There are a number of automotive related uses along US Route 7, including three auto dealerships, a rental car facility, and several gas stations and auto parts stores. Exceptionally large parcels include a large-lot Kmart store at the Brewer Parkway intersection, a Hannaford Supermarket and a Lowe's Home Improvement store accessed via Hannaford Drive, the Farrell Distributing Corporation facility on Holmes Road, and the GE Healthcare site on IDX Drive. Other commercial uses along US Route 7 include professional offices, retail shops, restaurants, banks, motels, and a movie theater (Exhibit 2.4).

Municipal uses along the Corridor include the South Burlington Fire Department station, located just off of US Route 7 on Holmes Road, and Orchard School, a public elementary school in the South Burlington School District located between Baldwin Avenue and Laurel Hill Drive. Adjacent to the school is a baseball field and running track. The Shelburne Road Cemetery is also located on the Baldwin Avenue to Laurel Hill Drive block of US Route 7.

Land Use Feature Key

1: Swift Street Mixed-use
2: Kmart
3: Hannaford Supermarket
4: Brewer Pkwy. Res.
5: Bakery & Café
6: Lowes
7: Orchard School
8: Auto Dealership
9: Shelburne Rd. Cemetery
10: Old Orchard Apartments
11: McDonalds
12: Palace Cinema
13: Residential Neighborhood
14: Ho Hum Motel
15: Offices at Comstock Ctr.
16: Farrell Distributing
17: Fire Dept. Station
18: Retail (Talbots)
19: GE Healthcare
20: Residential Neighborhood

Exhibit 2.4: Representative Land Uses



Aerial image source: Vermont Center for Geographical Information (VCGI)

To the east of US Route 7, land use consists of moderate density residential, characterized by the single-family homes of the well-established Orchard neighborhood. Farrell Park, a community park that provides ball-fields for public use, is located east of US Route 7 in the northern section of the study area. Immediately west of US Route 7 are the Old Orchard Park apartments, accessed off of Fayette Drive. Further west, there is open green space and low density residential use, characterized by waterfront single-family homes on Shelburne Bay (Lake Champlain).

Exhibit 2.5 illustrates the South Burlington zoning districts. A description of the zoning districts found within the Shelburne Road Corridor can be found in Exhibit 2.6. Along US Route 7, the corridor is zoned for commercial uses; these uses are primarily Commercial 1 (general retail and office) but also include Commercial 1-Automotive (allows automotive sales and service facilities) and Commercial 2 (allows certain industrial uses). Aside from the municipal zoning district at the site of Orchard School, the land east of US Route 7 in the Corridor is zoned Residential 4 (moderate density). The west portion of the Corridor is mainly zoned Residential 1 (low density). The Queen City Park zoning district is located in the northwest section of the Corridor, designed to protect the historic development patterns found in the neighborhood which are characterized by small lots and reduced setbacks. The Swift Street commercial district is located at the northeast section of the Corridor and permits mixed commercial and residential uses. A portion of the Corridor, in the southeast section of the study area, falls within the Stormwater Management Overlay District.

Planning Vision

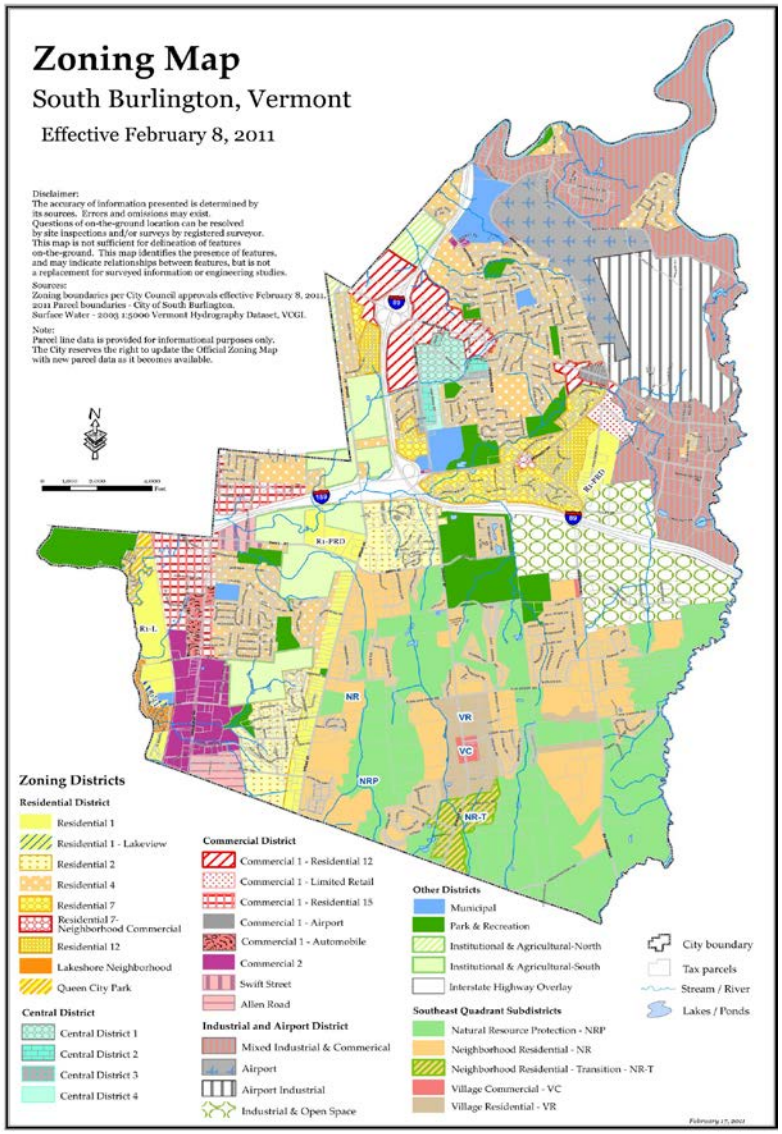
The City of South Burlington Comprehensive Plan provides a set of guidelines and recommended actions to aid the city in achieving its future community-wide goals for appropriate development. During the Shelburne Road Corridor study effort, a draft Comprehensive Plan was under development by the Planning Commission and, upon adoption by the City Council, will replace the re-adopted 2006 Plan (with minor amendments) that went into effect on March 9, 2011. The draft Plan encourages concentrated infill and conversion mixed-use development along the Shelburne Road Corridor – perhaps allowing higher density residential development in commercial areas than allowed today to encourage mixed use development – with appropriate transitions from the primarily commercial US Route 7 to adjacent residential neighborhoods. While some industrial uses are allowed in commercially zoned areas, the planning vision for the area emphasizes the development of mixed-use retail/office/residential along the corridor. The Plan notes that retail uses should meet the shopping and employment needs for both the local community as well as the region. The Plan recommends that future land uses east of US Route 7 remain primarily residential. Commercial and mixed-use development is anticipated to the west of Shelburne Road, with lower density residential and open space nearer Lake Champlain.

The City also maintains an Official Map (Exhibit 2.7), which depicts existing infrastructure and also designates future right-of-ways and infrastructure improvements. Three future improvements relevant to the Shelburne Road corridor are identified:

- An extension of IDX Drive from Shelburne Road to Spear Street, connecting at Deerfield Road.
- Development of an internal street network connecting Queen City Parkway with Fayette Drive.
- Intersection improvements at the Spear Street/Swift Street intersection, which could improve the viability of Spear Street as an alternate route to Shelburne Road.

These improvements would help to establish more redundancy in the street network, which currently has a largely linear orientation along Shelburne Road.

Exhibit 2.5: South Burlington Zoning



Source: City of South Burlington Planning Department. Retrieved from web August 30, 2011

Exhibit 2.6: City of South Burlington Zoning District Descriptions

The following zoning districts, as described in the City of South Burlington Land Development Regulations, are found along the Shelburne Road Corridor.

Residential 1

This district protects scenic views and cultural resources by limiting land uses to low density, single-family residential.

Residential 4

This district permits moderate density residential uses that are compatible with existing neighborhoods.

Queen City Park

This district is designed to protect the historic development patterns found in the Queen City Park neighborhood, characterized by small lots and reduced setbacks.

Commercial 1

This district allows general retail and office uses but prohibits large-lot retail, warehouses, and incompatible industrial uses.

Commercial 1 - Automobile

This district allows for automobile sales and service facilities which do not detract from a compact central business area.

Commercial 2

This district permits general commercial uses, including large-lot retail and certain industrial uses.

Swift Street

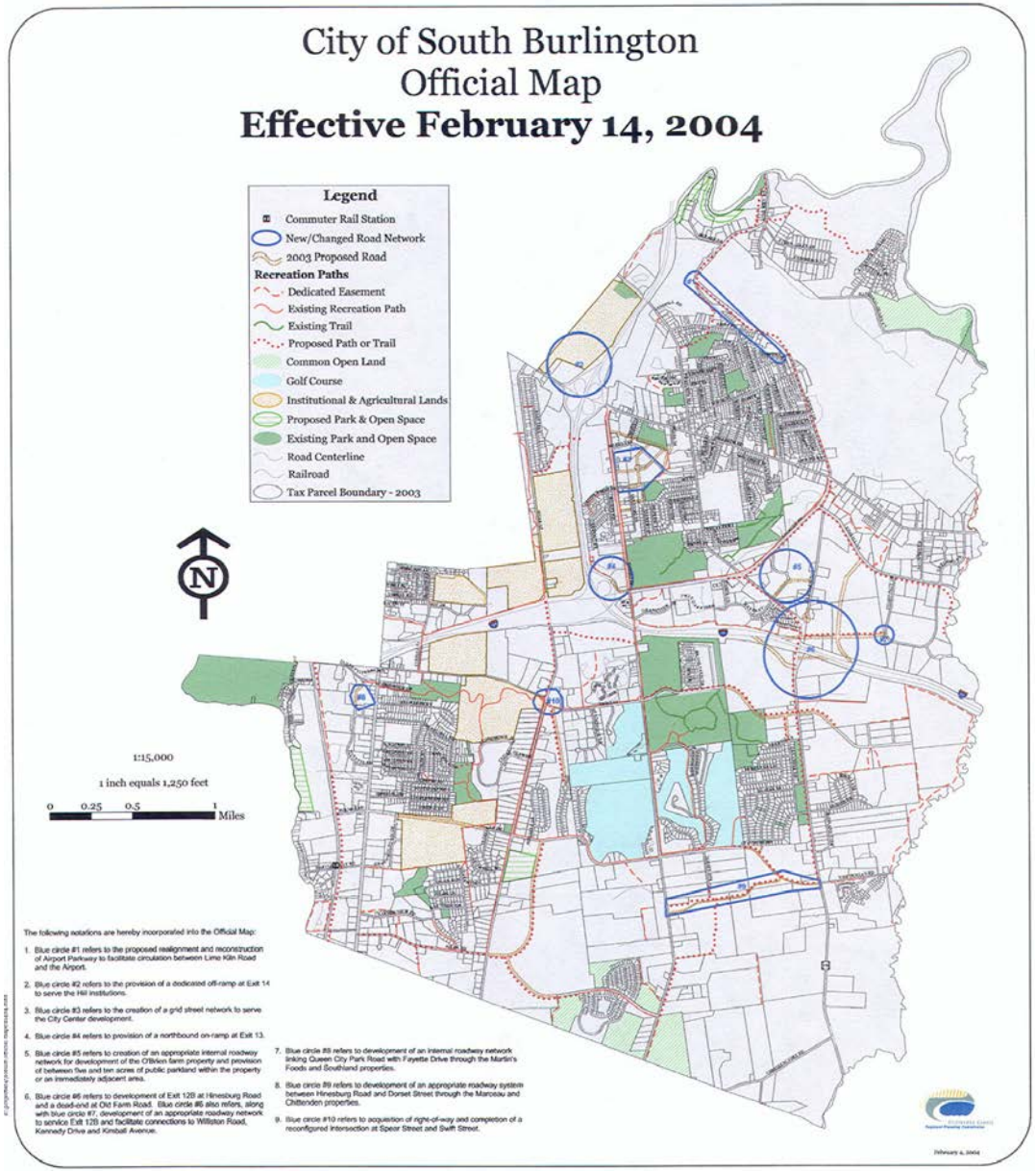
This district permits high density residential uses as well as offices and other commercial uses that are compatible with and serve the needs of the residential properties.

Municipal

This district provides for public schools and municipal services such as administration, police, fire, etc.

Source: City of South Burlington Land Development Regulations. Retrieved from web September 2, 2011

Exhibit 2.7: South Burlington Official Map



Source: City of South Burlington Planning Department. Retrieved from web August 30, 2011

Transportation Context

Shelburne Road (US 7) is both the primary commercial and commuter corridor in the area of South Burlington west of I-89, and additionally the main north-south regional travel corridor serving western Vermont. Parallel or alternative routes are limited; only Spear Street to the east fully traverses the city and connects to Burlington to the north. The street grid, with a system of connecting arterials and collector roads, is not well developed and is comprised primarily of local streets that connect to Shelburne Road. Shelburne Road therefore has to fulfill several different roles:

- Intercity travel between communities in western Vermont.
- Commute travel to/from/through South Burlington.
- Local circulation providing access to businesses and residents, including short trips between nearby locations.

In addition to serving as a key north-south travel corridor, Shelburne Road connects to I-189 at the north end of the study corridor at the Burlington city limits. I-189 presently terminates at Shelburne Road, and is a major access point between the corridor and region. As described later in this report, more traffic enters and exits Shelburne Road at the I-189 interchanges than continues on the corridor into Burlington.

Shelburne Road also has an important role in moving long haul freight and facilitating deliveries to local businesses, providing access and through routes for pedestrians and bicycles, and accommodating transit service to South Burlington and beyond.

Shelburne Road Characteristics

Shelburne Road is a multi-lane, major highway corridor. As South Burlington developed, not only have the demands on the corridor increased, but the roadway characteristics are increasingly at odds with the surrounding context. Originally designed to move large amounts of traffic quickly, the roadway now needs to morph into a more multi-functional corridor that reduces barriers to walking and biking, provides safe and convenient access to abutting uses, while accommodating heavy travel demands at speeds that are consistent with its urbanizing context.

The corridor lies within an approximate 99-foot right-of-way, suggesting an original designation as a "six-rod road." Available parcel data indicates that the road does not follow the centerline of the corridor, but is instead typically offset slightly to the west. Mapping also suggests that some developments near Swift Street and Queen City Parkway may infringe on the highway right-of-way, though this cannot be confirmed without field surveying.

Shelburne Road has a base five-lane cross section, with two travel lanes in each direction and a two-way center turn lane that transitions into a dedicated left-turn lane at intersections. Certain major intersections also have auxiliary right turn lanes on the approach to the intersection. Travel lanes, including the center turn lane, vary in width from 10.5 to 12 feet. While shoulders are not provided, lanes adjacent to the curb are wider, typically 12 to 14 feet. The resulting cross-section width (measure from the back side of sidewalk to the back side of the opposite sidewalk) is commonly 85 feet for five lane sections, and 95 feet or more for locations where an additional turn lane is provided.

Driveways and Access Management

Newer developments typically have well organized access that is consolidated to one driveway connecting to the corridor. However, older developments with multiple or poorly defined driveways, as well as small parcels, are also common. These tend to occur more frequently on the east side of the street and are particularly problematic near Swift Street and Queen City Parkway given traffic congestion and the configuration of connecting side streets in that area. In most locations, vehicles can enter commercial driveways

from either direction of travel, using a center turn lane when traveling on the opposite side of the roadway.

Traffic Control and Regulations

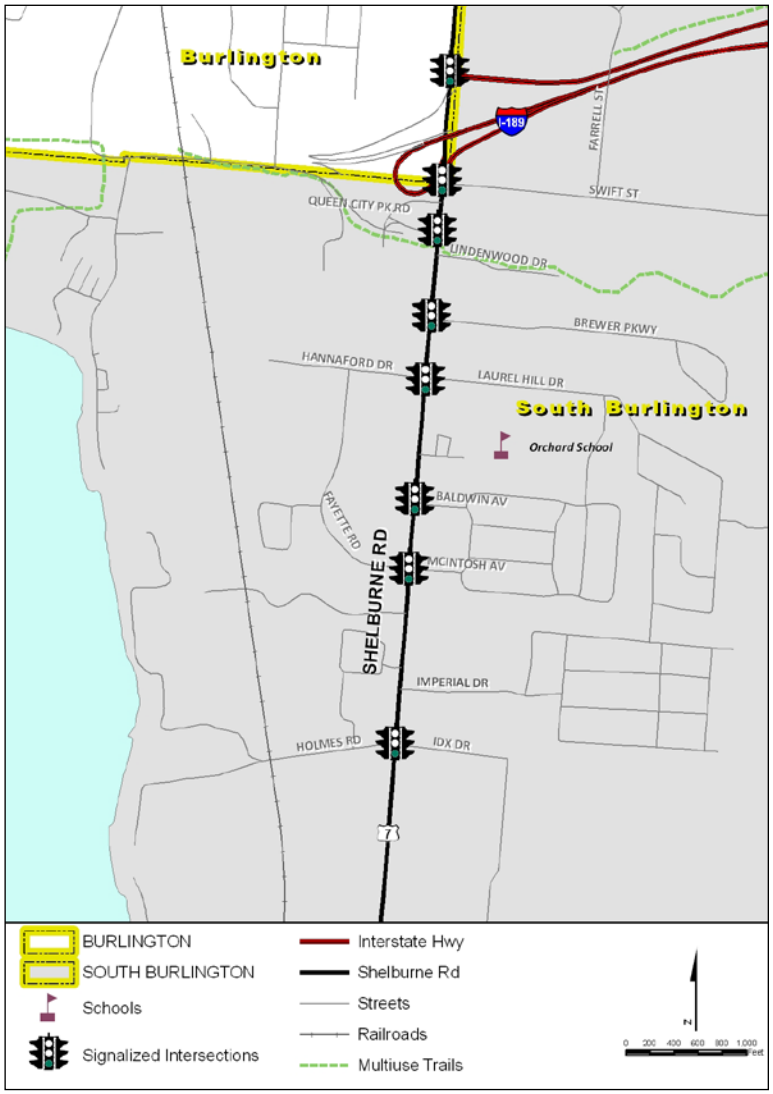
Traffic signals govern traffic movements at major intersections along Shelburne Road (Exhibit 2.8):

- I-189 westbound off-ramp
- Swift Street/I-189 eastbound on-ramp
- Queen City Parkway (eastbound)
- K-mart Plaza/Brewer Parkway
- Hannaford Plaza/Laurel Hill Dr
- Saturn Way/Baldwin Ave
- Fayette Drive/McIntosh Ave
- Holmes Road/IDX Drive

The intersection at Holmes Road/IDX was improved in 2007 as part of the Shelburne Road reconstruction project that extended from Imperial Road to the south. This work included installation of a new traffic signal with mast arms. The other intersections to the north on Shelburne Road have older, smaller signal heads that hang from an overhead wire that runs diagonally across the intersection. These signals cannot be aligned as precisely with travel lanes, are sometimes more difficult to see, and can be buffeted in windy conditions.

All traffic signals along the corridor are fully actuated (detect vehicles on each leg) and coordinated. The intersections between Swift Street and Fayette Drive/McIntosh Avenue operate in coordination using a 98 second cycle length during the morning (AM) commute, and 106 seconds during the afternoon (PM). The signal at the intersection with the I-189 offramp is coordinated with traffic signals to the north in Burlington and operated with a cycle length of 70 during the AM, and 80 seconds during the PM. Similarly, the Holmes Road/IDX Drive intersection operates in coordination with signals to the south, using 70 and 80 second cycles during the AM and PM peaks, respectively.

Exhibit 2.8: Location of Signalized Intersections



Signal phasing is heavily biased toward accommodating north/south flows on Shelburne Road, which typically receive 75 percent or more of the allocated green time.

Access to eastbound I-189 is provided by ramp connections from both directions of Shelburne Road. Other connections to the corridor include Lindenwood Street and Imperial Drive, as well as numerous driveways. These side streets are controlled by stop signs, while Shelburne Road operates without encumbrance.

A posted 35-mph speed limit applies to the entire length of the Shelburne Road corridor in the study area. On-street parking is prohibited along the entire corridor.

Most intersections have older traffic signal equipment that is mounted to overhead cables.

Intersection and Segment Details

I-189 Interchange, Swift Road and Queen City Park Road

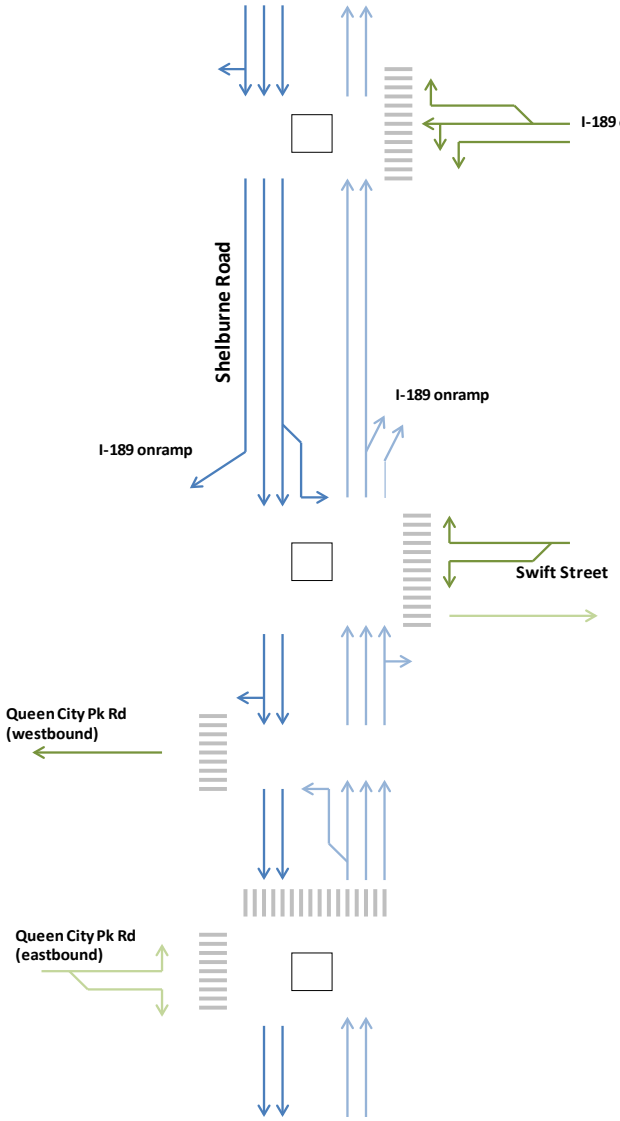
Originally envisioned to continue into central Burlington, I-189 instead terminates at Shelburne Road (Exhibit 2.9). All I-189 westbound traffic traveling south on Shelburne Road exits to a two-lane offramp, with both lanes becoming left-turn lanes at the Shelburne Road intersection. Westbound traffic that is traveling north towards Burlington is using an exclusive right turn lane added 400 feet prior to the intersection. A through movement is also allowed from the middle lane into the shopping center opposite the intersection. Shelburne Road has three southbound lanes and two northbound at this location. While southbound Shelburne Road traffic may turn right into the shopping center, left turns for northbound traffic are prohibited.

Shelburne Road crosses the unused I-189 right-of-way on a five lane overpass. The outside southbound lane is an exit only lane that provides access to eastbound I-189 via a loop ramp. A 170 foot left turn pocket is provided for Shelburne Road southbound traffic at Swift Street, which is immediately adjacent to the Interstate ramps.

Three northbound travel lanes are provided on Shelburne Road at the Swift Street intersection. The inside lane accommodates traffic continuing northbound on Shelburne Road only; the middle lane allows traffic to continue on Shelburne Road or exit to the I-189 eastbound onramp; the outside lane is restricted to vehicles destined for the onramp or turning right onto Swift Street.

I-189 off-ramp approaching Shelburne Road

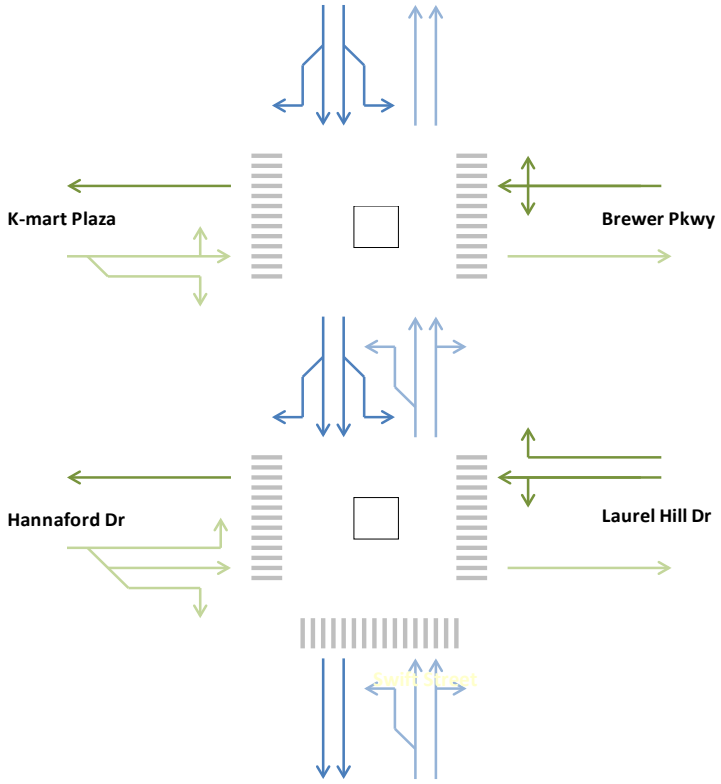
Exhibit 2.9: I-189 Interchange, Swift Street, Queen City Pkwy



K-mart Plaza/Brewer Pkwy and Hannaford Dr/Laurel Hill

The cross streets of K-mart Plaza/Brewer Parkway and Hannaford Drive/Laurel Hill Drive provide access to large scale commercial uses on the west side of the corridor, and residential neighborhoods to the east. Shelburne Road maintains a five-lane cross section through these intersections (including a left turn lane), but adds right turn pockets in the southbound direction at each intersection (Exhibit 2.10).

Exhibit 2.10: K-mart Plaza/Brewer Pkwy and Hannaford Drive/Laurel Hill Drive

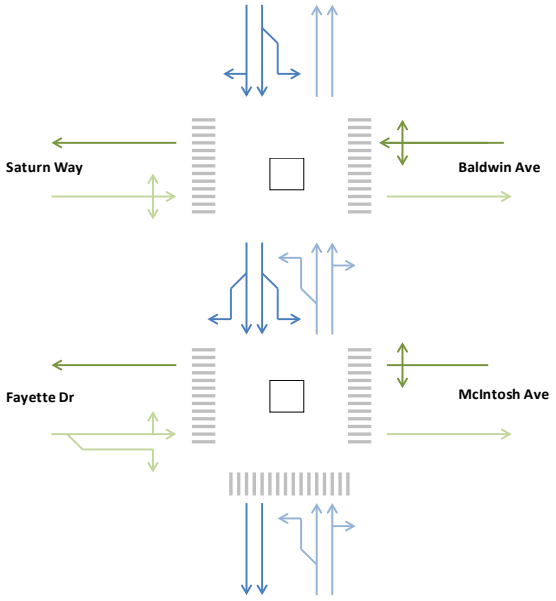


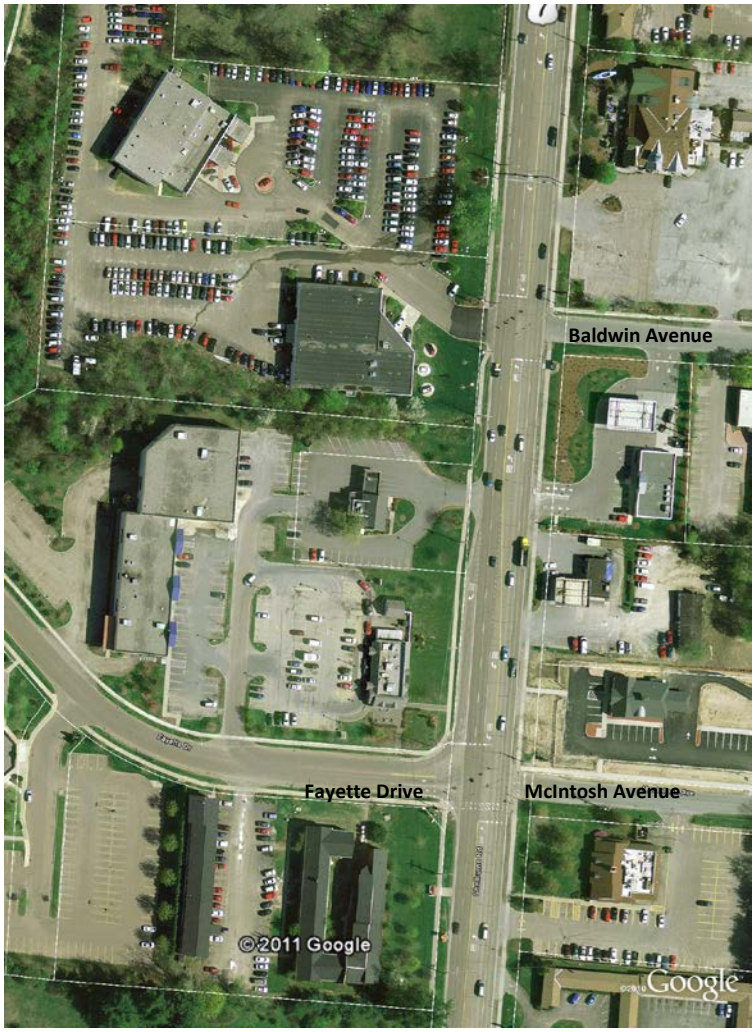
Saturn Way/Baldwin Avenue and Fayette Drive/McIntosh Avenue

Similar to prior intersections, these cross streets also provide access to large scale commercial uses on the west side of the corridor, and predominately residential neighborhoods to the east. In addition, Fayette Drive serves a large multi-family housing development.

Shelburne Road maintains a five-lane cross section through these intersections (including the center left turn lane), but adds a right turn pocket in the southbound direction at Fayette Drive. Side streets are limited to one lane, except for the eastbound leg of Fayette Avenue, with separates left/through movements from right turns (Exhibit 2.11).

Exhibit 2.11: Saturn Way/Baldwin Avenue and Fayette Drive/McIntosh Avenue





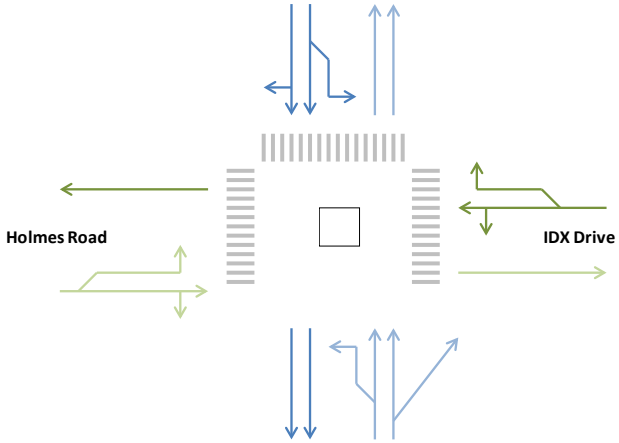
Holmes Road/IDX Drive

The Holmes Road/IDX Drive intersection (Exhibit 2.12) is located some 1400 feet south of Fayette Drive/McIntosh Avenue, the nearest signalized intersection. In 2007, this section of Shelburne Road extending from Imperial Drive (400 feet to the north of Holmes Road/IDX Drive) south into Shelburne was reconstructed to include onstreet bicycle lanes, a raised median that consolidates left turns to specific locations, upgraded traffic signals, improved street lighting, bus pullouts and shelters, reconstructed sidewalks and landscaping improvements.

Northbound traffic turning right onto IDX Drive avoids the signal and exits prior to the intersection providing a place for larger trucks to make a U-turn.

Reconstructed Segment of Southbound Shelburne Road at Holmes Road/IDX Drive

Exhibit 2.12: Holmes Road/IDX Drive



Current Traffic Volumes and Operating Conditions

Traffic Volumes

Traffic patterns on Shelburne Road are influenced by both commuter traffic and inter-regional trips on US Route 7. Annual Average Daily Traffic (AADT) estimates reported by VTrans along Shelburne Road range from 31,500 to 34,800 vehicles (Exhibit 2.13). Because much of the traffic on the corridor accesses I-189, volumes on Shelburne Road decrease north of the I-189 interchange. Historically, AADT has increased at an average rate of about 1.4 percent per year on the corridor (Exhibit 2.14).

Several commuting patterns are evident during the morning (AM) and afternoon (PM) peak periods. During the AM, heavy traffic is present on the I-189 offramps, with commuters continuing southbound on Shelburne Road to work in South Burlington or northbound towards Burlington. An inbound commute also occurs on northbound Shelburne Road, as commuters from South Burlington, Shelburne and other communities to the south travel into the greater Burlington area for work. Southbound traffic volumes are slightly higher than northbound during the AM (I-189 to Holmes Road/IDX Drive).

During the afternoon, very heavy northbound movements occur, much of which is destined for the I-189 onramp. Southbound movements are heaviest to the north, with traffic volumes decreasing as traffic exits the corridor at various points in South Burlington. Northbound traffic flow is about 10 percent higher than southbound during the PM peak.

Exhibit 2.13: Daily and Peak Hour Corridor Traffic Volumes

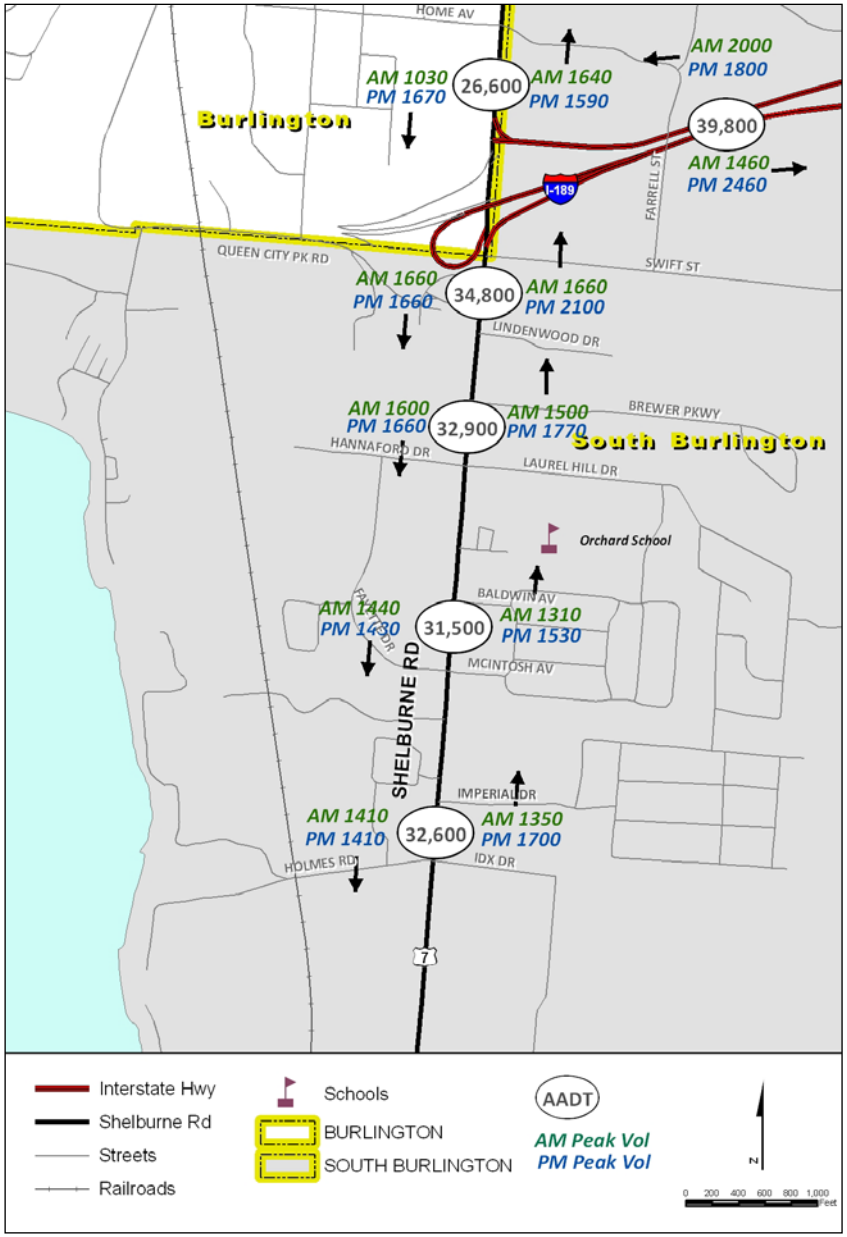
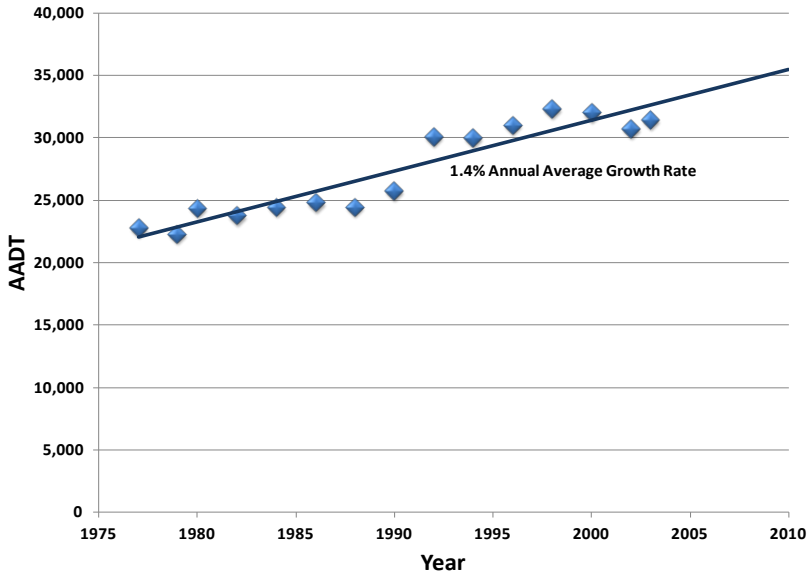


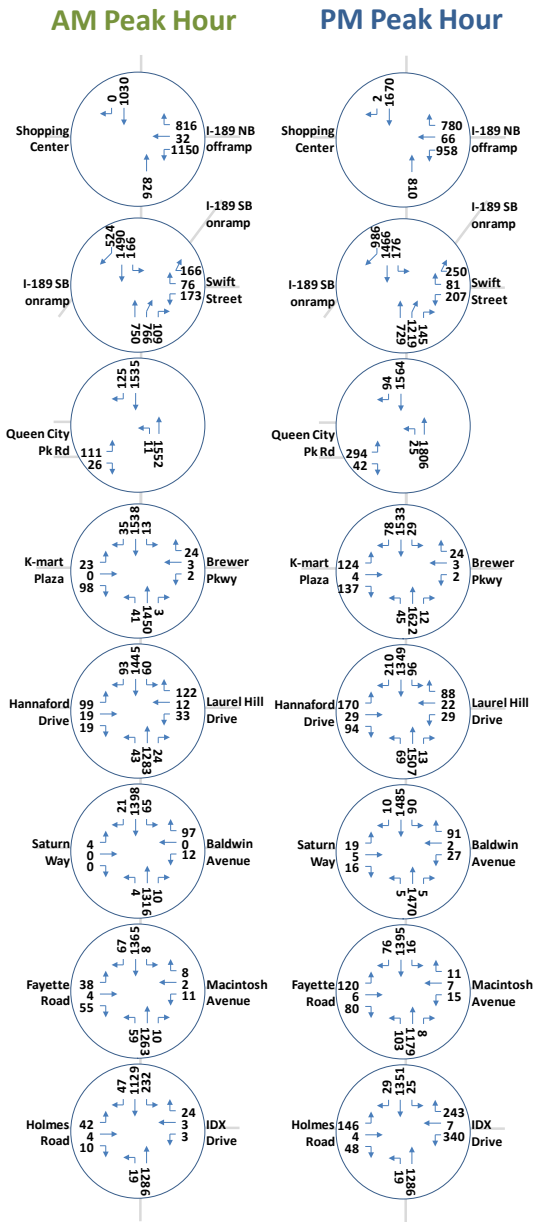
Exhibit 2.14: Historic Daily Traffic Volume on Shelburne Road



Note: Measured at Baldwin Road

Turning movement details for both the AM and PM peak hours are shown in Exhibit 2.15 for major corridor intersections. These volumes are estimated from available turning movement count data provided by the CCRPC (collected between 2009 and 2011 for most intersections), which were balanced and adjusted to establish a consistent estimate for 2011. The PM peak, which experiences the highest overall traffic volumes on the corridor, has been adjusted to reflect the 30th highest hour – or the Design Hour – per VTrans' procedures. AM peak volumes were then adjusted similarly, so that they reflect morning peak conditions for a similarly busy period.

Exhibit 2.15: Peak Hour Turning Movements



In addition to through movements on Shelburne Road, notably heavy traffic movements occur at the following locations:

- I-189 offramp (especially AM)
- I-189 onramps (especially PM)
- Swift Street (especially PM)
- Left turn from Queen City Pkwy to northbound Shelburne Road (PM)
- Eastbound left turns from Hannaford Drive, Fayette Avenue, and Holmes Road onto northbound Shelburne Road (PM)
- Southbound left turn to IDX Drive (AM) and the corresponding right turn from IDX drive onto northbound Shelburne Road (PM).

AM and PM Peak Hour Operating Conditions

Current traffic conditions along Shelburne Road were evaluated for the AM and PM peak hours using SimTraffic, which is the traffic simulation component of the Synchro/SimTraffic traffic analysis software package. Microsimulation of traffic flow along the corridor was deemed necessary to fully account for the effects of traffic lane changes, queuing and close intersection spacing near the I-189 interchange, which would not be captured using the deterministic modeling methods presented in the Highway Capacity Manual (HCM). Microsimulation results are compiled in Appendix B.

Estimates of average vehicle delay at signalized intersections were compiled from the microsimulation modeling results and translated to Level of Service (LOS) using the ranges established by the 2010 HCM:

LOS A	Less than 10 seconds of delay per vehicle
LOS B	10 to < 20 seconds
LOS C	20 to < 35 seconds
LOS D	35 to < 55 seconds
LOS E	55 to < 80 seconds
LOS F	80 seconds or more delay per vehicle

Level of Service (LOS)

Level of Service, or LOS, is a standard measure of operational effectiveness for transportation facilities. LOS is defined by the Highway Capacity Manual, published by the Transportation Research Board (current edition: 2010). LOS is graded from LOS **A** (best conditions) to LOS **F** (very poor conditions), and for signalized intersections is based on the estimated average vehicle delay for traffic at the intersection. LOS A represents little to no delay, or uncongested conditions, whereas LOS F indicates very congested conditions with long delays. In urbanized areas such as along Shelburne Road, LOS conditions of D or better are generally considered satisfactory during the peak hours. LOS E conditions indicate an intersection that is operating at or near peak capacity, while intersections operation at LOS F cannot effectively serve peak demand.

Exhibits 2.16 through 2.18 show intersection LOS for the AM and PM peak hours. Congestion is essentially limited to the I-189 offramp during the AM peak, but more widespread during the PM, when northbound movements leading to the I-189 onramp are especially congested.

Exhibit 2.16: Current AM and PM Peak Hour LOS Results (By Approach and Intersection Total)

I-189 EB offramp	WB off	NB	SB US 7	Intersection Total
AM Peak	F	B	C	**E**
PM Peak	D	B	C	**D**

Swift St	WB	NB	SB	Intersection Total
AM Peak	D	B	B	**B**
PM Peak	F	B	B	**F**

Queen City Park Rd	EB	NB	SB	Intersection Total
AM Peak	D	B	A	**A**
PM Peak	D	F	A	**E**

K-mart Plaza/ Brewer Pkwy	EB	WB	NB	SB	Intersection Total
AM Peak	C	C	A	A	**A**
PM Peak	D	C	D	C	**C**

Hannaford Dr/ Laurel Hill Dr	EB	WB	NB	SB	Intersection Total
AM Peak	D	C	B	B	**B**
PM Peak	F	E	F	C	**F**

Saturn Way / Baldwin Rd	EB	WB	NB	SB	Intersection Total
AM Peak	E	B	A	A	**A**
PM Peak	D	D	D	A	**C**

Fayette Dr/ McIntosh Ave	EB	WB	NB	SB	Intersection Total
AM Peak	C	C	A	A	**A**
PM Peak	D	D	B	A	**B**

Holmes Rd/ IDX Dr	EB	WB	NB	SB	Intersection Total
AM Peak	D	B	B	B	**B**
PM Peak	D	C	B	B	**B**

Notes: NB = Northbound Shelburne Rd; SB = Southbound Shelburne Rd; WB = Westbound cross street, EB = Eastbound cross street

Results have been updated subsequent to issuance of the draft Existing Conditions Technical Memorandum.

Exhibit 2.17: Current AM Peak Hour LOS Map

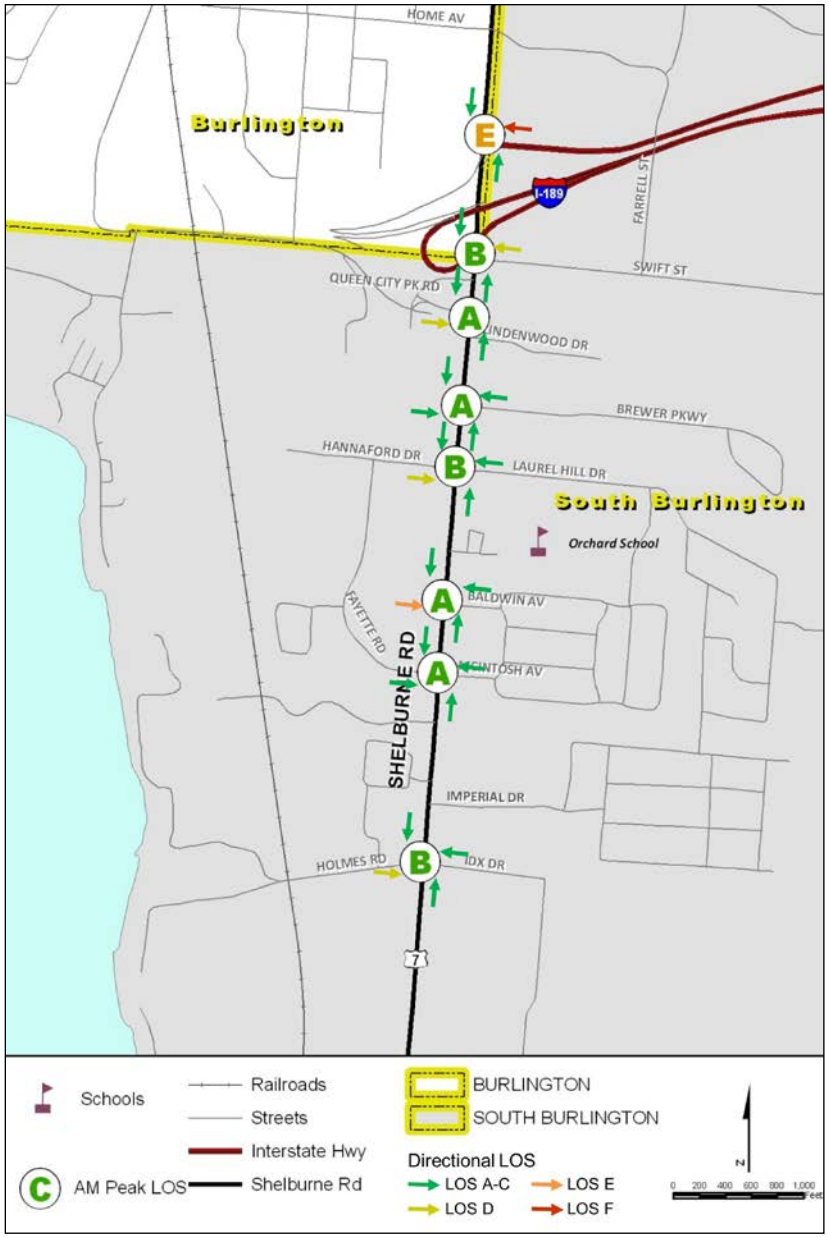
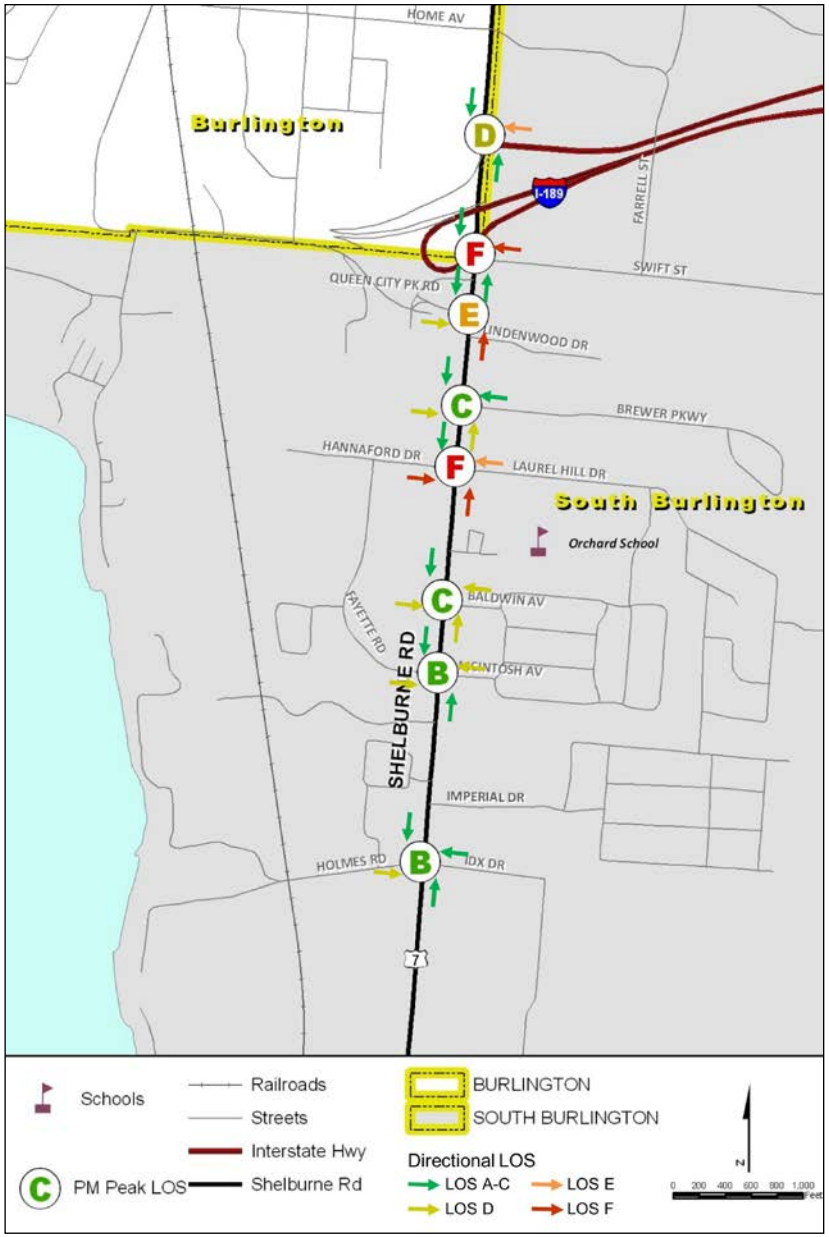


Exhibit 2.18: Current PM Peak Hour LOS Map



Corridor-wide, three primary traffic operations issues have been identified. These are:

- Congestion on the I-189 offramp, particularly during the AM peak.
- Congestion on northbound Shelburne Road during the PM peak, which is in part related to traffic positioning as it approaches the I-189 onramp.
- Cross street congestion at Swift Street and Hannaford Road, and cross street delays elsewhere due to long cycle lengths (especially during the PM peak).

Locations with LOS D, E or F conditions – for the intersection as a whole or for specific approaches – are described below. As applicable, information regarding queuing and blocking of traffic movements (summarized in Exhibits 2.19 and 2.20) are also described.

I-189 offramp

During the AM peak, heavy traffic on the offramp causes LOS E conditions (approaching LOS F) with severe queuing. Average queuing on the offramp exceeds 2000 feet during the AM peak hour, and nearly approaches a mile in length at its peak. Shelburne Road northbound and southbound movements operate without problems.

During the PM peak, ramp traffic experiences LOS D conditions with more moderate, but still considerable queuing. Shelburne Road traffic again operates at LOS B or C. Overall, the intersection operates at LOS D during the afternoon peak.

I-189 onramps/Swift Street

Traffic on Shelburne Road operates at favorable LOS during both the AM and PM peaks (LOS B and C), but Swift Street experiences congestion, especially during the PM peak (LOS F). As with all study area intersections, the signal phasing is set to favor movements on Shelburne Road, rather than the intersecting side streets. At Swift Street, this is particularly evident during the PM peak, when an 18 second phase is dedicated to movements from Swift Street (out of a 106 second total cycle).[1] Right turning vehicles are also served by a second phase of up to 19 seconds that operates concurrently with the southbound left turn movement from Shelburne Road onto Swift Street. The additional green time for right-turning vehicles cannot be fully utilized however, as queuing from the adjacent left turn lane blocks right-turning traffic 81 percent of the time during the PM peak.

Traffic on northbound Shelburne Road chooses lane position in advance of the I-189 interchange

Queen City Parkway

Eastbound Queen City Parkway operates with moderate congestion (LOS) at the Shelburne Road intersection during both the AM and PM

[1] Actual green time available for any given phase is less than the total phase length, which includes time allocated to yellow indictors as well as "all red" sequences during phase changes.

peak. Traffic flows freely on Shelburne Road during the AM peak. During the PM peak, northbound traffic experiences severe congestion (LOS F), which is a result of high traffic volumes and lane positioning in advance of the I-189 interchange. Traffic destined for I-189 stacks in the outside (right) lane at the intersection, while through traffic is directed to the inside (left) lane. Traffic simulation results show congestion and associated queuing extending back to Baldwin Avenue, which is consistent with field observations.

K-mart Plaza/Brewer Parkway

This intersection operates at LOS A conditions overall during the AM peak, with traffic on the side streets (K-mart Plaza and Brewer Parkway) experiencing longer delays (LOS C) due to the relatively short allocation of green time and a lack of protected turn phasing for left turning vehicles.

During the PM peak, the intersection operates at LOS C conditions, but the aforementioned northbound congestion on Shelburne Road is evident (LOS D for the northbound approach). The eastbound movement from K-mart Plaza also operates at LOS D during the PM peak.

Hannaford Drive/Laurel Hill Drive

The Hannaford Drive approach is congested during both AM (LOS D) and PM peaks (LOS F), primarily as a result of congestion associated with eastbound left turns. In addition to the short signal phasing allocated to the cross streets, the lack of protected phases for left turns and congestion on northbound Shelburne Road are contributing factors. During the PM peak, queuing for left turns on Hannaford Drives blocks other eastbound movements 71 percent of the time.

The intersection as a whole operates at LOS F during the PM peak. This is primarily a result of congestion on northbound Shelburne Road as well as that on the Hannaford Drive approach.

Saturn Way/Baldwin Avenue

The intersection operates well during the AM peak (LOS A); the LOS E conditions reported for Saturn Way are a result of only occasional traffic on that approach during the morning coupled with the long cycle length. During the PM peak, northbound congestion (LOS E) is present on Shelburne Road, and the intersection as a whole operates at LOS D. LOS D conditions for the westbound Baldwin Avenue approach are essentially a function of the long signal cycle length, rather than congestion.

Fayette Drive/McIntosh Avenue

Overall, this intersection operates well during both the AM peak (LOS A) and PM peak (LOS B). Two specific movements do exhibit longer delays, however. Westbound McIntosh Avenue operates at LOS D during the AM peak, largely a result of the intersection's long cycle length, rather than congestion. In the afternoon, eastbound Fayette Drive operates at LOS F, primarily due to a high number of left turning vehicles and lack of a protected left turn phase for this movement.

Holmes Road/IDX Drive

All approaches of the Shelburne Road intersection with Homes Road/IDX Drive operate at LOS B or C during both peaks, with the exception of the westbound approach of Holmes Road, which operates at LOS D. As noted for the prior two intersections, delay here is largely associated with the long cycle lengths on the corridor, though queuing on the left turn from Holmes Road to northbound Shelburne Road does indicate some congestion. The issue is more severe in the PM peak, when queuing in the left turn lane blocks movements in the adjacent through/right lane 29 percent of the time. Nonetheless, because Holmes Road is lightly traveled, only 15 vehicles are affected during the peak hour.

Exhibit 2.19: Current AM Peak Hour Queuing

	Location and Lane Group	Storage Length	Avg Queue	95% Queue	Percent of Time Lane is Blocked	Queue Penalty
I-189 WB offramp						
WB	Left	N/A	1218'	2053'	N/A	
	Left/Through	N/A	1296'	2101'	31% blocks adjacent right turn lane.	257 veh
	Right	400'	408'	512'	4% exceeds storage.	27 veh
NB	Through	573'	144'	272'		
SB	Through/Right	854'	160'	216'		
Swift St						
WB	Left	130'	130'	218'	13% exceeds storage.	31 veh
	Right	N/A	139'	290'	8% blocks access to adjacent left turn.	14 veh
NB	Through	338'	137'	210'		
	Through/onramp to I-189	338'	160'	207'		
	Onramp to I-189/Right to Swift St	338'	160'	217'		
SB	Left	170'	116'	193'	2% exceeds storage.	13 veh
	Through	573'	171'	298'	3% blocks access to adjacent left turn lane.	5 veh
Queen City Park Rd						
EB	Left	N/A	94'	176'	N/A	
	Right	380'	16'	44'		
NB	Through	699'	133'	357'		
SB	Through	179'	93'	184'	1% blocks upstream intersection.	16 veh
K-mart Plaza/Brewer Pkwy						
EB	Left/Trough	N/A	20'	53'	N/A	
	Right	285'	44'	85'		
WB	Left/Through/Right	N/A	22'	54'	N/A	
NB	Left	100'	25'	59'		
	Through/Right	389'	87'	285'	3% blocks upstream intersection. 6% blocks access to adjacent left turn lane.	37 veh 2 veh

	Location and Lane Group	Storage Length	Avg Queue	95% Queue	Percent of Time Lane is Blocked	Queue Penalty
SB	Left	90’	13’	45’		
	Through	664’	114’	233’	7% blocks access to left turn lane. 7% blocks access to right turn lane.	1 veh 3 veh
	Right	110’	4’	31’		
Hannaford Dr/Laurel Hill Dr						
EB	Left	N/A	71’	119’		
	Through	175’	12’	37’		
	Right	175’	8’	31’		
WB	Left/Through	N/A	34’	74’	< 1% blocks access to right turn lane.	0 veh
	Right	95’	56’	103’	3% exceeds storage.	2 veh
NB	Left	200’	35’	71’		
	Through/Right	962’	137’	322’	2% blocks access to left turn lane.	1 veh
SB	Left	100’	44’	99’	2% exceeds storage.	12 veh
	Through	389’	206’	335’	<1% blocks upstream intersection. 20% blocks access to left turn lane. 21% blocks access to right turn lane.	8 veh 12 veh 19 veh
	Right	100’	23’	84’		
Saturn Way/Baldwin Ave						
EB	Left/Through/Right	N/A	5’	27’	N/A	
WB	Left/Through/Right	N/A	55’	105’	N/A	
NB	Left	130’	3’	20’		
	Through/Right	470’	63’	171’	1% blocks access to left turn lane.	0 veh
SB	Left	135’	35’	74’		
	Through/Right	962’	109’	292’	3% blocks access to left turn lane.	2 veh
Fayette Dr/McIntosh Ave						
EB	Left/Through	N/A	34’	73’	N/A	
	Right	200’	16’	38’		

	Location and Lane Group	Storage Length	Avg Queue	95% Queue	Percent of Time Lane is Blocked	Queue Penalty
WB	Left/Through/Right	N/A	20’	56’	N/A	
NB	Left	145’	30’	78’		
	Through/Right	1368’	93’	242’	1% blocks access to left turn lane.	1 veh
SB	Left	110’	5’	32’		
	Through	470’	91’	211’	3% blocks access to left turn lane. 1% blocks access to right turn lane.	0 veh 0 veh
	Right	190’	8’	31’		
Holmes Rd/IDX Dr						
EB	Left	65’	41’	82’	6% exceeds storage	1 veh
	Through/Right	N/A	16’	55’	1% blocks access to left turn lane.	0 veh
WB	Left/Through	N/A	6’	24’		
	Right	75’	17’	47’		
NB	Left	165’	20’	61’		
	Through	N/A	201’	353’	9% blocks access to left turn.	2 veh
SB	Left	220’	136’	236’	3% exceeds storage.	17 veh
	Through/Right	1411’	141’	341’	< 1% blocks access to left turn.	1 veh

Notes: N/A = Not applicable; Upstream intersections not present or external to study area.
NB = Northbound Shelburne Rd; SB = Southbound Shelburne Rd;
WB = Westbound cross street, EB = Eastbound cross street

Results have been updated subsequent to issuance of the draft Existing Conditions Technical Memorandum.

Exhibit 2.20: Current PM Peak Hour Queuing

	Location and Lane Group	Storage Length	Avg Queue	95% Queue	% Blocked	Queue Penalty
I-189 WB offramp						
WB	Left	N/A	427'	1084'	N/A	
	Left/Through	N/A	457'	1128'	5% blocks access to right turn lane.	37 veh
	Right	400'	246'	464'	2% exceeds storage.	12 veh
NB	Through	573'	127'	233'		
SB	Through/Right	854'	286'	454'		
Swift St						
WB	Left	130'	197'	233'	77% exceeds storage.	256 veh
	Right	N/A	2104'	3115'	31% blocks access to left turn lane.	64 veh
NB	Through	338'	147'	209'		
	Through/onramp to I-189	338'	173'	188'		
	Onramp to I-189/Right to Swift St.	338'	178'	197'		
SB	Left	170'	142'	218'	8% exceeds storage.	62 veh
	Through	573'	181'	329'	10% blocks access to left turn lane.	17 veh
Queen City Park Rd						
EB	Left	N/A	198'	334'	N/A	
	Right	380'	22'	53'		
NB	Through	699'	697'	832'	17% blocks upstream intersection.	251 veh
SB	Through	179'	131'	211'	9% blocks upstream intersection.	144 veh
K-mart Plaza/Brewer Pkwy						
EB	Left/Through	N/A	96'	157'	N/A	
	Right	285'	72'	131'		
WB	Left/Through/Right	N/A	30'	71'	N/A	
NB	Left	100'	38'	97'	< 1% exceeds storage.	2 veh
	Through/Right	389'	364'	525'	20% blocks upstream intersection. 39% blocks access to left turn lane.	324 veh 17 veh

	Location and Lane Group	Storage Length	Avg Queue	95% Queue	% Blocked	Queue Penalty
SB	Left	90’	26’	72’		
	Through	664’	235’	646’	6% blocks upstream intersection. 21% blocks access to left turn lane. 19% blocks access to right turn lane.	91 veh 6 veh 15 veh
	Right	110’	19’	87’		
Hannaford Dr/Laurel Hill Dr						
EB	Left	N/A	872’	1922’	75% blocks access to through and right turn lanes.	92 veh
	Through	175’	140’	354’		
	Right	175’	52’	142’	2% exceeds storage.	3 veh
WB	Left/Through	N/A	67’	152’	10% blocks access to right turn lane.	8 veh
	Right	95’	62’	124’	7% exceeds storage.	4 veh
NB	Left	200’	100’	220’	5% exceeds storage.	38 veh
	Through/Right	962’	706’	1286’	15% blocks upstream intersection. 38% blocks access to left turn lane.	225 veh 26 veh
SB	Left	100’	99’	154’	33% exceeds storage.	221 veh
	Through	389’	464’	389’	8% blocks upstream intersection. 15% blocks access to left turn lane. 18% blocks access to right turn lane.	113 veh 14 veh 37 veh
	Right	100’	40’	115’		
Saturn Way/Baldwin Ave						
EB	Left/Through/Right	N/A	31’	92’	N/A	
WB	Left/Through/Right	N/A	74’	135’	N/A	
NB	Left	130’	7’	46’		
	Through/Right	470’	258’	564’	11% blocks upstream intersection. 24% blocks access to left turn lane.	141 veh 1 veh
SB	Left	135’	47’	107’	< 1% exceeds storage.	1 veh
	Through/Right	962’	176’	378’	4% blocks access to left turn lane.	4 veh

	Location and Lane Group	Storage Length	Avg Queue	95% Queue	% Blocked	Queue Penalty
Fayette Dr/McIntosh Ave						
EB	Left/Through	N/A	88’	161’		
	Right	200’	33’	75’		
WB	Left/Through/Right	N/A	34’	76’	N/A	
NB	Left	145’	56’	128’		
	Through/Right	1368’	179’	448’	13% blocks access to left turn lane.	13 veh
SB	Left	110’	12’	46’		
	Through	470’	163’	329’	< 1% blocks upstream intersection.	3 veh
					8% blocks access to left turn lane.	2 veh
					1% blocks access to right turn lane.	2 veh
	Right	190’	22’	100’		
Holmes Rd/IDX Dr						
EB	Left	65’	70’	106’	22% exceeds storage.	12 veh
	Through/Right	N/A	51’	135’	2% blocks access to left turn lane.	3 veh
WB	Left/Through	N/A	69’	184’	2% blocks access to right turn lane.	4 veh
	Right	75’	83’	118’	23% exceeds storage.	11 veh
NB	Left	165’	20’	62’		
	Through	N/A	168’	459’	3% blocks access to left turn lane.	1 veh
SB	Left	220’	18’	49’		
	Through/Right	1411’	222’	409’	4% blocks access to left turn lane.	1 veh

Notes: N/A = Not applicable; Upstream intersections not present or external to study area.
NB = Northbound Shelburne Rd; SB = Southbound Shelburne Rd;
WB = Westbound cross street, EB = Eastbound cross street

Results have been updated subsequent to issuance of the draft Existing Conditions Technical Memorandum.

Forecast Future (2035) Traffic Conditions

The CCRPC's regional travel demand model was used to estimate changes in traffic volumes over time. The CCRPC model estimates future year traffic volumes based on forecast changes in population and employment throughout the greater Burlington region.

Two future year (2035) scenarios were considered:

- 2035 No Build, which presumes population and job growth over time, but no new transportation facilities.
- 2035 with Champlain Parkway, which modifies the No Build by presumes that the separately proposed Champlain Parkway has been constructed.

The Champlain Parkway is a separately proposed, independent project that has been granted federal environmental clearance for construction. At the time of this study, it is still uncertain when or whether the Champlain Parkway will proceed to construction, however. Hence, both scenarios were considered for this study. The proposed Parkway would extend from I-189 at Shelburne Road into central Burlington, as shown in Exhibit 2.21. Much of the traffic that today travels between the I-189 corridor and Burlington using the interchange at Shelburne Road would instead continue on the new Parkway into central Burlington. More information on the project is available on the project website: http://www.champlainparkway.org

Regional Growth Projections

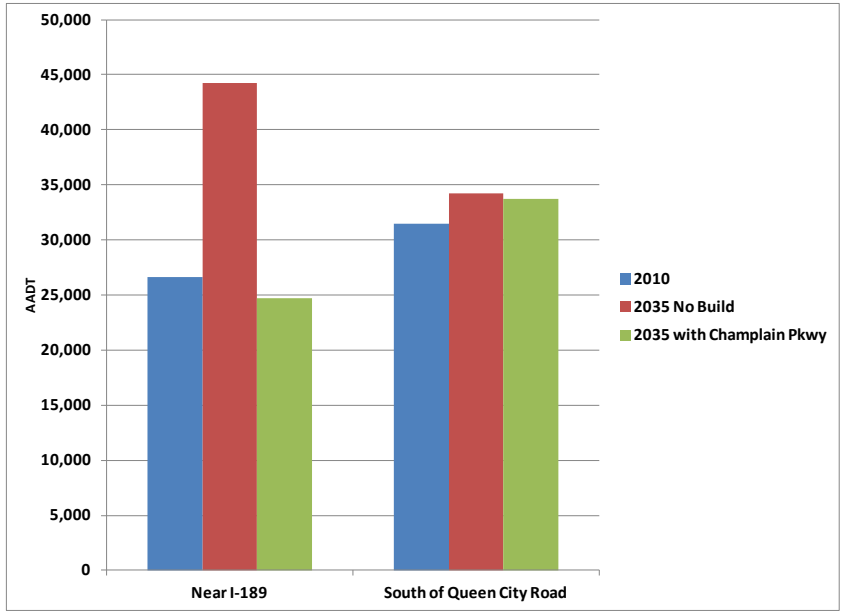
Near the I-189 Interchange, projected traffic volumes are heavily influenced by whether the Champlain Parkway has been constructed. Under the No Build scenario, the model predicts that population and employment growth in the region, in the context of no major expansion of transportation facilities, will lead to considerable growth in traffic movements between I-189 and Burlington. This results in projected traffic growth on Shelburne Road of more than 60 percent

Exhibit 2.21: Proposed Champlain Parkway.

Source: http://www.champlainparkway.org/

by 2035 compared to today in the vicinity of the I-189 interchange (equivalent to a 2.1 percent annual growth rate). Conversely, if the Champlain Parkway is constructed, many of the trips to and from central Burlington will continue on that new route, rather than exit I-189 at Shelburne Road. Completion of the Parkway would significantly reduce traffic volumes on the I-189 ramps at Shelburne Road, and as a result, on Shelburne Road itself. About 60 percent less traffic is forecast to use Shelburne Road near the I-189 interchange if the Parkway is completed than if it is not, with volumes dropping to levels slightly lower than experienced today (Exhibit 2.22).

Exhibit 2.22: Projected Traffic Growth on Shelburne Road



In addition to affecting volumes on Shelburne Road, the decision to implement the Champlain Parkway would also significantly affect traffic using the I-189 ramps.

South of Queen City Park Road, projected traffic volumes are similar whether the Champlain Parkway is extended or not. Traffic is expected to increase by about 8 to 10 percent by 2035, or approximately 0.3 percent annually.

Operational Assessment

Exhibits 2.23 and 2.24 compare the intersection LOS existing conditions and both year-2035 scenarios for the AM and PM peaks respectively. During the morning, forecast conditions in 2035 worsen near the I-189 interchange under the No Build scenario, but actually improve relative to existing conditions under the 2035 with Champlain Parkway scenario. This is due to the diversion of some traffic from the I-189 offramp, which is heavily congested in the morning today, to the Champlain Parkway.

During the afternoon peak, conditions deteriorate throughout the corridor under the 2035 No Build scenario. Five of the corridor's eight intersections are forecast to operate at LOS E or F conditions, with intersections to the south being affected by congestion originating in the vicinity of the I-189 interchange. Under the 2035 with Champlain Parkway scenario, forecast traffic conditions are generally similar to today.

The forecast concentration of traffic on Shelburne Road is so great under the 2035 No Build that poor traffic operations could not be effectively addressed by capacity expansion or improved operating efficiency. The recommendations described in Chapter 3 therefore focus on improving traffic conditions in balance with other corridor objectives, rather than attempting to fully accommodate the projected demand associated with the 2035 No Build scenario.

Exhibit 2.23: AM Peak Level of Service Comparison

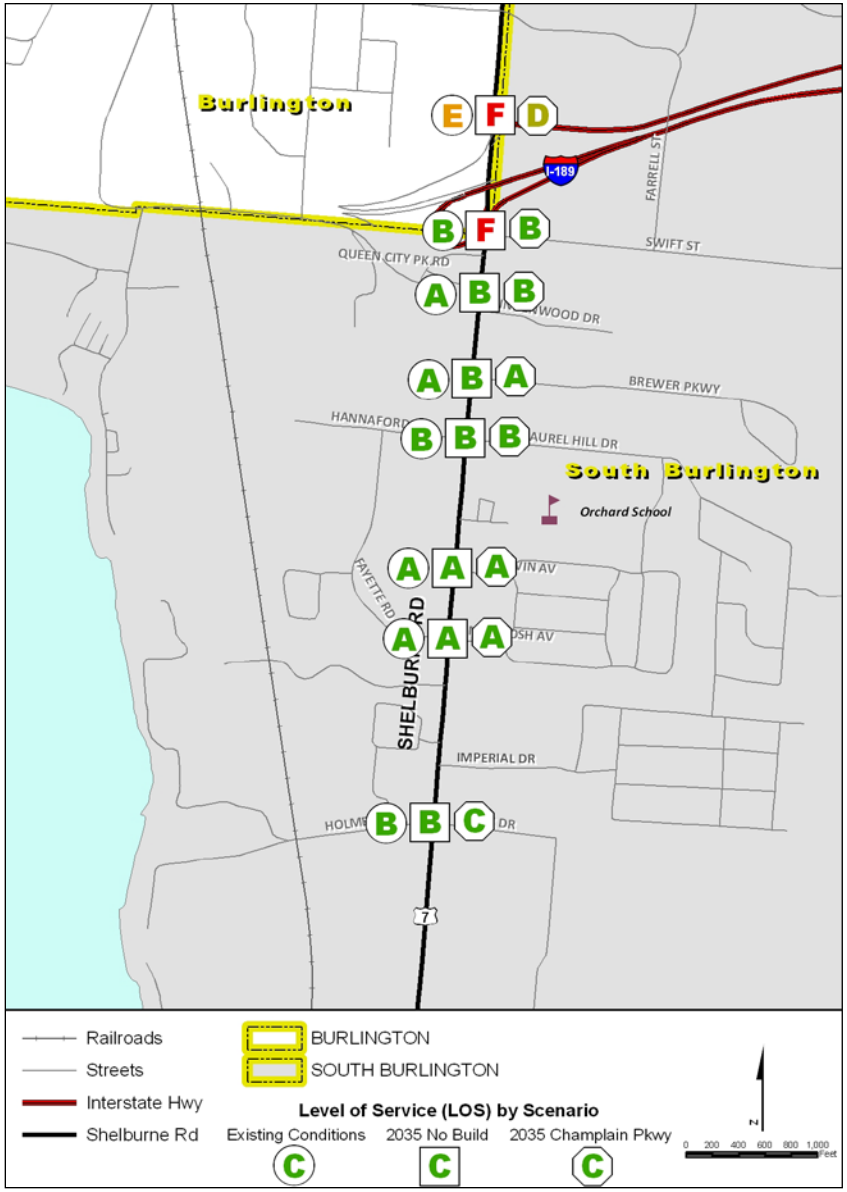
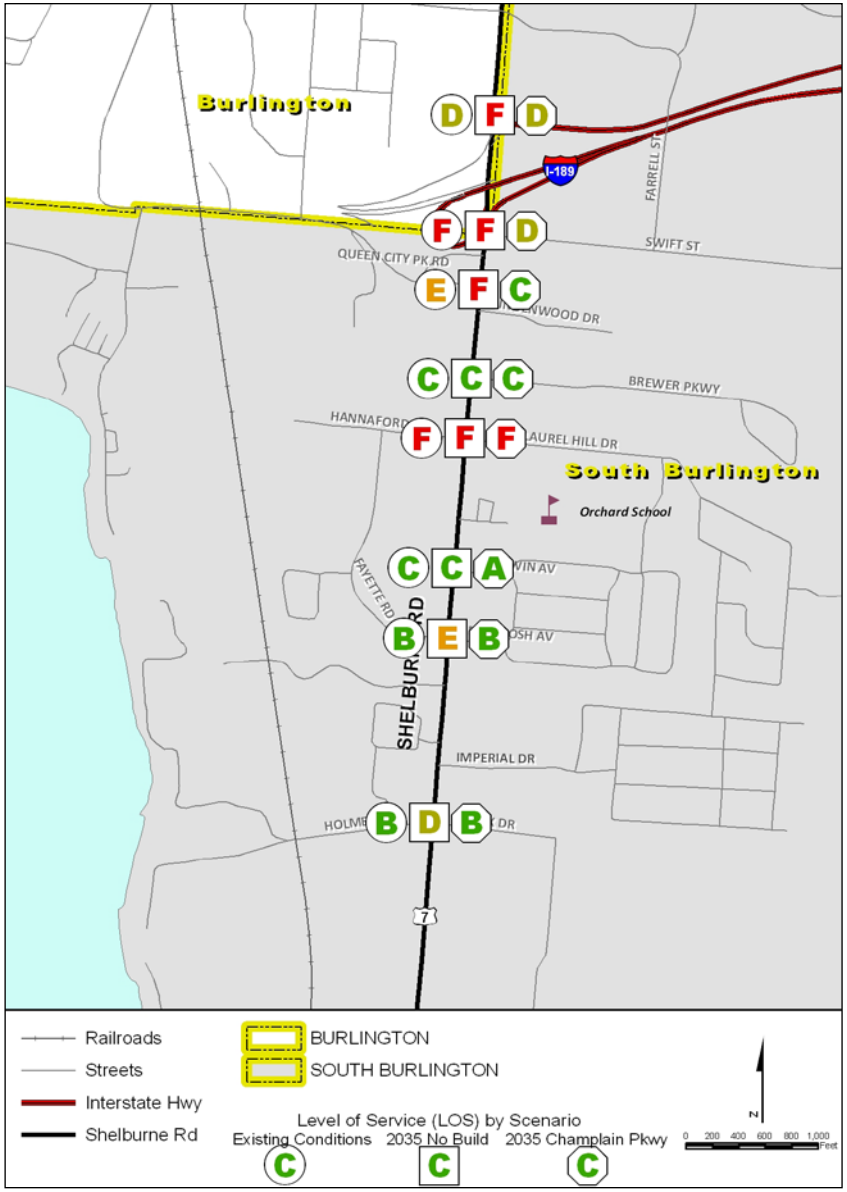


Exhibit 2.24: PM Peak Level of Service Comparison



Transit

Existing Transit Services

Within the City of South Burlington, Shelburne Road is served by two different public transportation services, one local and the other a regional express service.

Route 6

Route 6 is a fixed route local service operated by the Chittenden County Transportation Authority (CCTA), as shown in Exhibit 2.25. This service begins in Downtown Burlington, then travels south along Shelburne Road/US Route 7 through the City of South Burlington and the Town of Shelburne, terminating in southern Shelburne at the Shelburne Museum (a limited number of runs extend farther south to the Vermont Teddy Bear Company). The fare for this service is in line with CCTA's local fare structure, with a single ride costing $1.25, ten-ride tickets costing $10.00, and a monthly pass costing $42.00. Service operates six days a week Monday-Saturday, starting at approximately 6:00am each day and extending to approximately 11:00pm on weekdays and 8:30pm on Saturdays. Service operates as frequently as every 15 to 20 minutes during the morning commute, and typically 30 minutes other times. CCTA's single Sunday route uses Shelburne Road in Burlington, but does not extend into South Burlington. Ridership on Route 6 averages 815 users daily.

The Middlebury LINK Express

This service operates between Downtown Burlington and the Town of Middlebury in Addison County, serving intermediate destinations that include Ferrisburgh, Vergennes, and New Haven. This service follows US Route 7 for its entire distance, and therefore operates on Shelburne Road through South Burlington. On weekdays, the route is operated by CCTA, while on Saturdays it is operated by Addison County Transit Resources (ACTR), which provides shuttle and

Exhibit 2.25: CCTA Route 6

Source: CCTA (2011)

paratransit service in Addison County (which is located to the south of Chittenden County). Service frequencies are very limited, with the weekday service operating only during the peaks and the Saturday service providing four trips in each direction spread across the day, more in line with an intercity bus service. The fare for the LINK service is $4 each way on both weekdays and Saturdays. Ridership is 75 users daily.

Bus Stops

Within the study area, there are currently six bus stops in each direction, each of which is marked with a sign. Bus pull-outs are not typically provided at bus stops, meaning that buses must stop in the right-most travel lane, creating potential conflicts between transit vehicles and general traffic. Exhibit 2.26 indicates the location of each stop, along with whether a sign and/or shelter are present, while Exhibit 2.27 shows a map of bus stop locations.

Most stops are paired with a stop for bus service traveling in the opposite direction, with two exceptions:

- The southbound stop at K-Mart/Brewer Parkway does not have a corresponding northbound stop. Instead, the nearest northbound stop is located 480 feet to the south at Laurel Hill Drive. The K-Mart/Brewer Parkway intersection also lacks a pedestrian crosswalk across Shelburne Road, meaning that a corresponding northbound stop (if one were provided) may be of limited usefulness.
- The northbound Imperial Drive bus stop near Tumblebrook Drive does not have a corresponding southbound stop, and the nearest southbound stops are more than 600 feet away at Fayette Drive to the north, or Holmes Road to the south. This segment of Shelburne Road also lacks pedestrian crossings.

Exhibit 2.26: Bus Stops on Shelburne Road

	Southbound		Northbound	
Major Cross Street	Location[1]	Sign or Shelter?	Location[1]	Sign or Shelter?
Queen City Parkway	Near side	Sign	N/A[2]	Shelter and Sign
K-Mart/ Brewer Pkwy	Far side	Sign		
Hannaford/ Laurel Hill Dr	Far side[3]	Sign	Near side	Sign
Saturn Way/ Baldwin Ave	Far side	Sign	Near side	Shelter and sign
Fayette Dr/ McIntosh Ave	Far side	Shelter and sign	Near side	Sign
Imperial Dr			N/A[4]	Sign
Holmes Rd/ IDX Dr	Far side	Sign	Far side	Shelter and sign

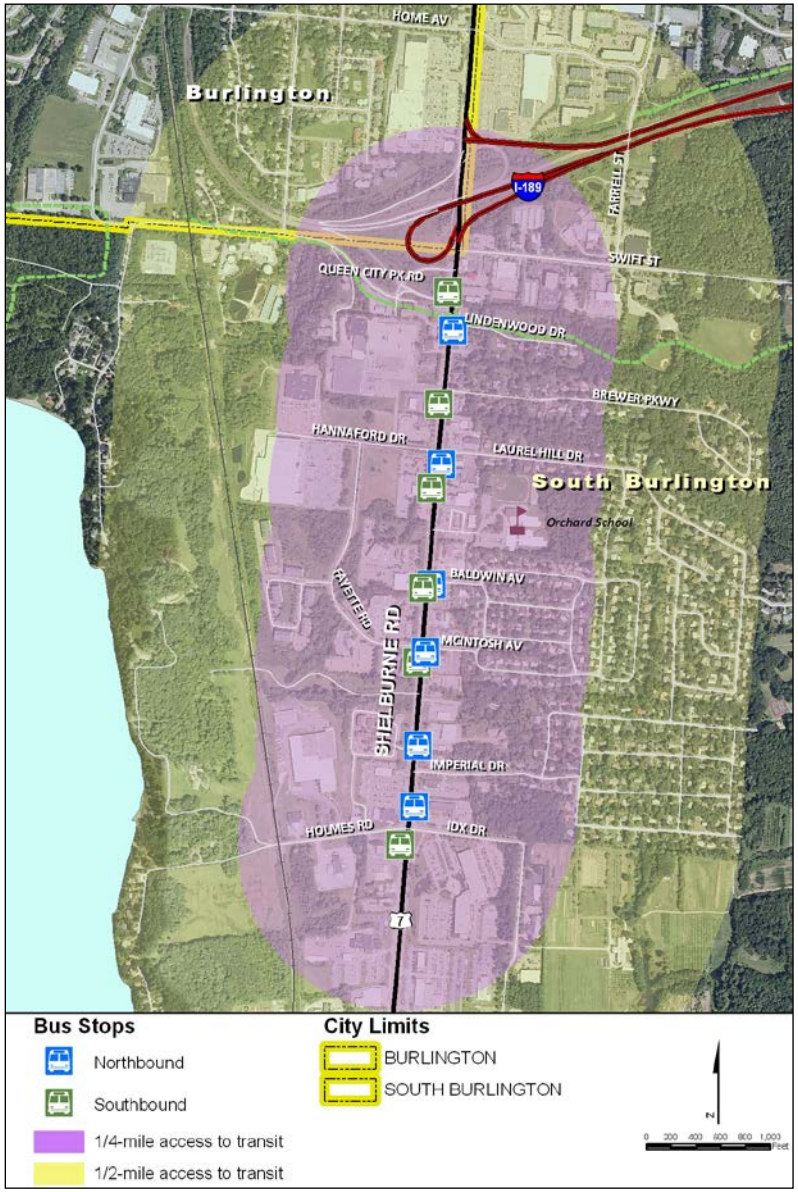
1 Denotes near or far side of signalized intersection (N/A = not located at signalized intersection)

2 Located at Lindenwood Drive.

3 Located one block south.

4 Located near Tumblebrook Drive.

Exhibit 2.27: Map of Bus Stops on Shelburne Road in South Burlington



Also shown in Exhibit 2.27 are the areas along the corridor that are located within ¼-mile (highlighted in purple) and ½-mile (yellow) of a bus stop. The current stop locations provide good coverage of the corridor itself, as all uses abutting the corridor are within a ¼-mile walk of a bus stop. Bus stops are not as accessible to many of the residential areas west of the corridor due to their distance from Shelburne Road. While most of these residences are located within ½-mile of existing bus stops, some potential bus riders may be unwilling to walk the longer distances needed to access bus service, particularly in inclement weather.

Walking and Bicycling

Pedestrian Accommodations

Sidewalks are provided continuously along both sides of Shelburne Road within the study corridor. These have generally been installed piecemeal over the years, sometimes concurrent with new development. As a result, while sidewalk widths are a consistent five to six feet, the sidewalk placement and alignment is quite discontinuous. Sidewalks are separated from traffic by a planting strip that varies in width depending on location. The planting strip helps to provide separation from traffic, since on-street parking is not allowed and traffic therefore travels next to the curb. It also can be used, along with shoulders, for snow storage. In some areas, the planting strip is only two to

Sidewalks meander and are not consistently located to form a direct path

four feet wide, which limits its effectiveness as a buffer to traffic and is too narrow to support attractive, well maintained landscaping. A minimum six foot planting strip width is recommended for this context by the Institute of Transportation Engineer's (ITE's)/Congress for New Urbanism's *Designing Walkable Urban Thoroughfares: A Context Sensitive Approach* handbook.

All intersections have curb ramps to accommodate wheelchair users and others with assistive devices, though many of these are in poor condition and not designed to current Americans with Disability Act (ADA) specifications. Many ramps lack aprons on either side of the ramp or tactile indicators that alert sight-impaired pedestrians that they are standing at an intersection.

Some curb ramps are in poor condition and have outdated configurations.

Major intersections tend to have wide turning radii, which allows vehicles to make right turns at higher rates of speed and is therefore of concern to crossing pedestrians. This also increases the width of the intersection and thus the in-road distance that pedestrians must cross. Driveway cuts are frequent and of widely varying conditions and design throughout the corridor. Together, these factors contribute to an overall feeling that the corridor is not accommodating to the pedestrian.

Crossing Shelburne Road

Currently, Shelburne Road is a barrier to pedestrians, who must cross five or more lanes of traffic and are confronted by over 32,000 vehicles traveling the corridor daily. Observed pedestrian activity on the corridor is very low, despite the fact that Shelburne Road serves a variety of uses that should be conducive to walking (bus riders, school children, shoppers and residents).

A key issue along the corridor is a lack of convenient, safe pedestrian crossings. Within the mile-long corridor, only four crossing locations are provided today, and only a single crosswalk of Shelburne Road is provided at each location (see prior Exhibits 2.9 - 2.12 for crosswalk placement details). These are:

- Queen City Parkway
- Hannaford Plaza, which is located 1200 feet south of Queen City Parkway
- Fayette/McIntosh, located 1550 feet south of Hannaford Plaza.
- IDX Drive, located 1400 feet south of Fayette/McIntosh.

The distance between crosswalks – 1200 to 1550 feet – is more than twice as long as the maximum distance recommended in ITE's *Designing Walkable Urban Thoroughfares* handbook (600 feet maximum). This is a considerable impediment not only to the convenience of pedestrians, but also a safety concern. Dangerous jaywalking is more likely to occur if pedestrians are not provided crossing opportunities at reasonable frequency.

Specific concerns related to the lack of pedestrian crossings of Shelburne Road include:

- Inability for bus riders to access corresponding stops on opposite side of street for return trip.
- School children cannot walk between multi-family housing west of the corridor and the Orchard School to the east.
- The South Burlington Rec Path crossing at Queen City Parkway is not well integrated with the trail.
- Shoppers and business patrons discouraged from walking between uses; more likely to use car even for short trips.

- Lack of environment conducive to walking degrades viability as a mixed-use commercial district.

Contextual Barriers to Walking

The corridor has a very suburban highway feel, which is not a pleasant environment for walking for many of the reasons described above. Measures to improve crossings, better separate pedestrians from traffic, and improve the visual character of the corridor can help improve this context. Another aspect that discourages walking along the corridor is the design orientation of uses along the corridor. Businesses and other uses on Shelburne Road are typically set far back from the roadway, and access is directed to off-street parking areas rather than the sidewalk or street front. Oftentimes, pedestrian access is indirect or in some cases absent altogether.

Bicycling

Bicycle facilities on and near the corridor are shown in Exhibit 2.28. South of the study corridor, Shelburne Road has been improved to include on-street bicycle lanes. Today, these lanes end abruptly as they approach Imperial Drive, and from that point north Shelburne Road's configuration is not well suited to accommodate bicyclists, given a lack of shoulder, heavy traffic volumes, and frequent turning vehicles. Bike riders have reported – and field observations confirmed – that cyclists typically ride on the sidewalk north of Imperial Drive. Sidewalk bicycle riding is problematic due to potential conflicts between pedestrians and bicycles, exacerbated here by the narrow width (five to six feet) of sidewalks along the corridor. Further, turning vehicles may not expect faster moving bicycle traffic on the sidewalk.

A regional multi-use trail – the South Burlington Rec Path – crosses the corridor in the north at Queen City Parkway. Bicycle travel between this trail and the on-road bicycle lanes south of the study area is impeded by the lack of bicycle accommodations on Shelburne Road north of Imperial Drive. In addition, the indirect connection of the Rec Path, east of Shelburne Road, to the Queen City Parkway crossing is problematic and potentially unsafe. It requires bicyclists to travel either in traffic or on the sidewalk crossing two busy driveways at Dattilio's gas station.

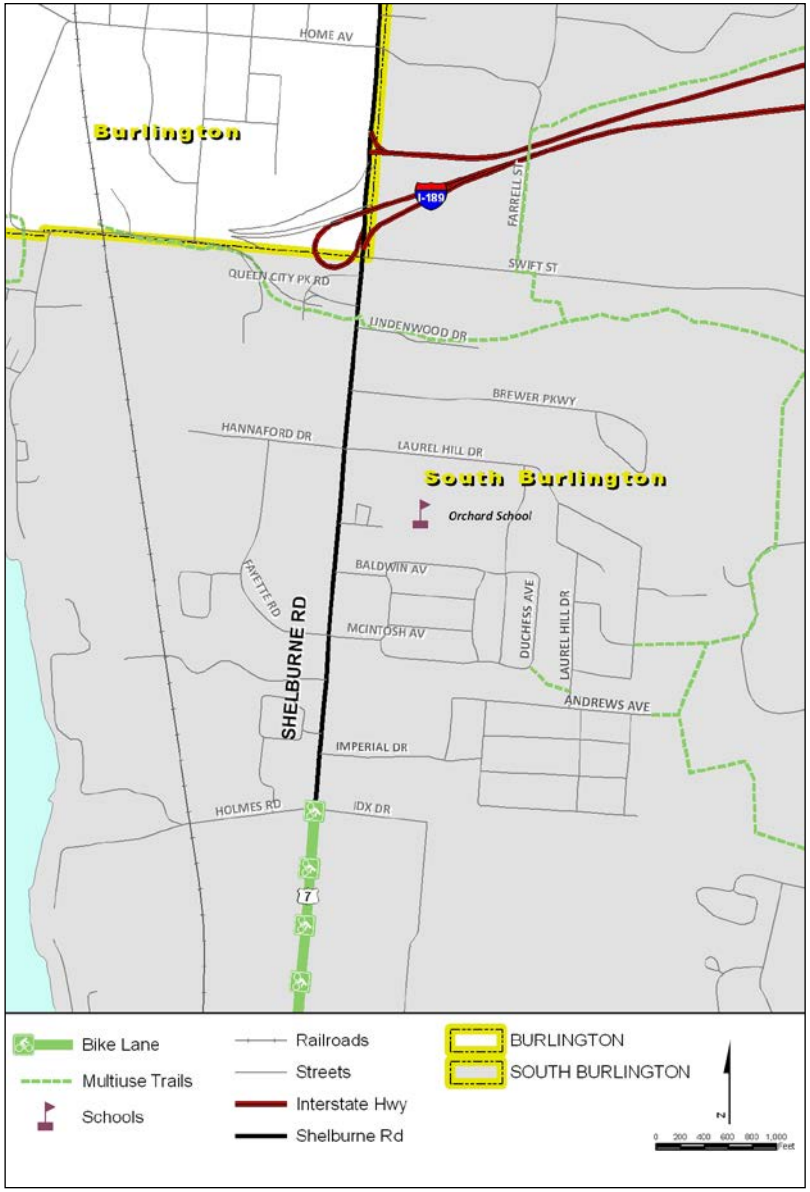
The regional multi-use trail system also includes other segments to the east of the corridor. Access to these has been improved by the completion of short connecting segments between residential streets in the vicinity of Duchess Avenue, Laurel Hill Drive and Andrews Avenue.

Absent bike lanes, shoulders and alternate routes, bicyclists often ride on the sidewalk

Because of the lack of continuity in the street grid, bicyclists do not have many choices for using local streets as an alternative to traveling on the corridor. The multi-use trails and neighborhood streets to the east do provide some alternative route options, but are circuitous. West of the corridor, bicyclists report using Fayette Drive and making their way through parking lots and private ways to access the multiuse trail at Queen City Parkway.

Short connecting segments have improved bicycle connections east of Shelburne Road

Exhibit 2.28: Bicycle Facilities



Corridor Crash History

High Crash Locations

VTrans identifies High Crash Locations (HCLs) statewide. Both intersections and segments are considered. In order to be designated a HCL segment or intersection, a location much have experienced five or more crashes over a five year period, and crashes must occur at higher frequency than the average rate for similar roadways statewide.

The HCL listing, when this study was being developed, covered the period 2003-2007. One intersection and one segment on the study corridor are identified as HCLs (Exhibits 2.29 and 2.30). A review of the most recent HCL listing (2006-2010) confirms that both locations are still classified as HCLs.

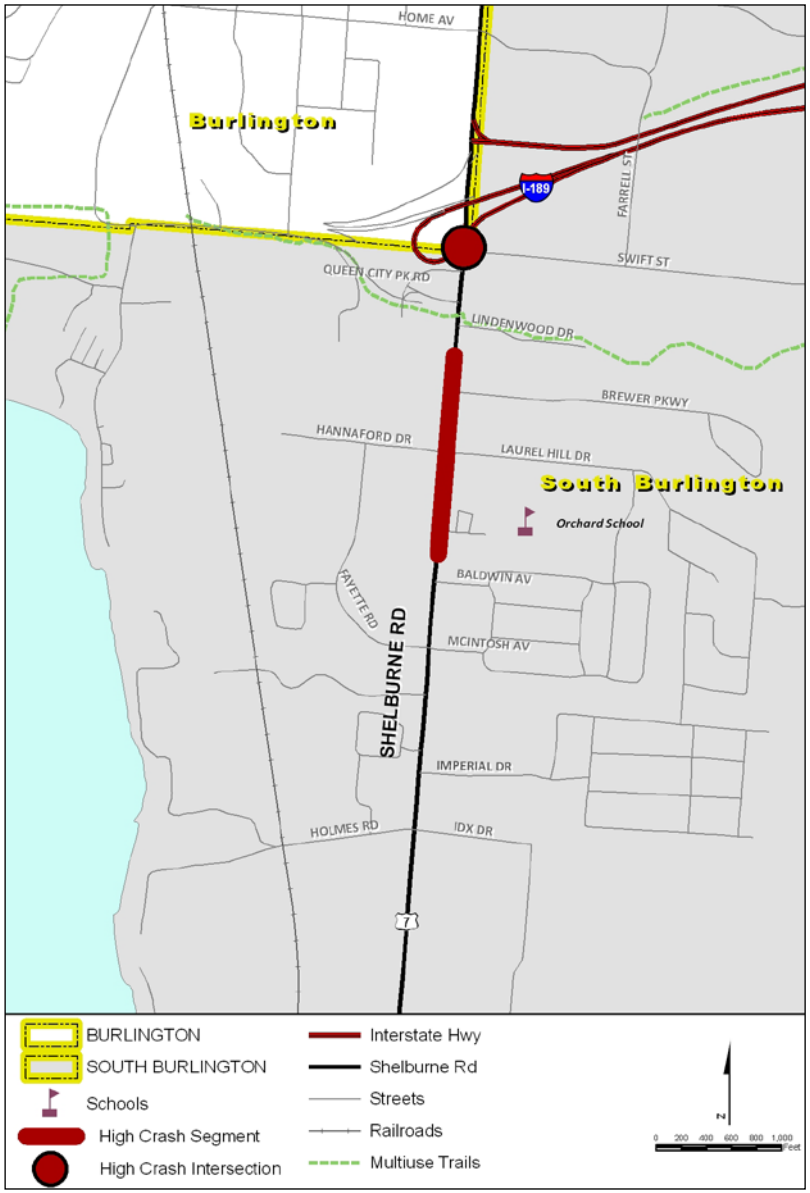
The Actual/Critical Ratio compares the crash rate for these locations to the average rate for comparable facilities statewide. A ratio over 1.0 indicates higher than average frequency of crashes for both locations. The average cost of crashes indicates that crashes at the Swift Street intersection tend to be more severe (result in more damage) than along the HCL segment between Baldwin Road and Queen City Parkway.

Exhibit 2.29: High Crash Location Details (2003-2007)

Location	Type	Crashes	Injuries	Actual/ Critical Ratio	Severity (Avg. Cost)
Swift Street	Intersection	58	14	1.056	$18,976
South of Queen City Pkwy to North of Baldwin Rd	Segment	169	22	1.104	$13,588

Source: VTrans (2011)

Exhibit 2.30: Mapped High Crash Locations (2003-2007)



Data Source: VTrans (2011)

Crash Frequency and Types

Even though VTrans' most recent HCL listing was not available during the development of this study, crash data was available and was used for the period 2006-2010. To gauge how crash types and frequency vary along the corridor, these data were grouped and compared for four general corridor segments (Exhibits 2.31 and 2.32). Crashes occur at much higher frequencies north of Hannaford/Laurel Hill Drive, where higher densities of cross streets and driveways are present, congestion is more common, and lane maneuvers are necessary to access the northbound onramp to I-189.

Rear end crashes are predominant in the corridor. These types of crashes often occur more frequently in congested settings, or where vehicles enter or exit the roadway in heavy traffic. Sideswipe crashes are elevated near I-189, likely reflective of the lane changing required approaching the I-189 onramp northbound. Broadside crashes are also higher here, which could be associated with red light running at Swift Street and/or the I-189 offramp.

Exhibit 2.31: All Crashes on Shelburne Road (2006-2010)

Segment	Crashes	Injuries	Crash Rate (CPMVM)
I-189 - Swift Street	241	34	14.83
Swift Street - Hannaford/Laurel Hill Dr	217	26	14.33
Hannaford/Laurel Hill Dr - Fayette Dr/McIntosh Ave	133	22	9.64
Fayette Dr/McIntosh Ave - Holmes Rd/IDX Dr	78	12	5.02

Data Source: VTrans (2011)

Notes: (1) Crash rates reported as crashes per million vehicle miles.
(2) Crash rates estimated using representative daily traffic volumes for corresponding segment.
(3) Includes all crashes occurring at intersections and along segments.

Exhibit 2.32: Crash Types on Shelburne Road (2006-2010)

Segment	Rear End	Sideswipe	Broadside	Other
I-189 - Swift Street	42%	24%	22%	12%
Swift Street - Hannaford/Laurel Hill Dr	65%	16%	12%	7%
Hannaford/Laurel Hill Dr - Fayette Dr/McIntosh Ave	65%	10%	14%	11%
Fayette Dr/McIntosh Ave - Holmes Rd/IDX Dr	53%	6%	21%	20%

Data Source: VTrans (2011)

Crashes Involving Pedestrians or Bicyclists

Crashes involving pedestrians or bicyclists are especially of concern because of vulnerability and susceptibility to severe injuring. From 2006-2010, eleven crashes involving bicyclists and four involving pedestrians occurred along the corridor. All four pedestrian crashes occurred between Saturn Way/Baldwin Road and Fayette Drive/McIntosh Ave, and two of these resulted in fatalities. Three of the bicycle crashes occurred on the overpass at I-189.

Other Potential Safety Issues

A number of potential safety concerns for pedestrians, bicyclists and motorists on the corridor were identified by staff review of the corridor and through the public outreach process:

- Very limited opportunities for pedestrians to safely cross Shelburne Road.
- Red light running, especially near I-189.
- Lane positioning northbound on Shelburne Road is problematic approaching I-189.
- Lack of well-organized or managed access to many parcels; frequency of driveways; improper use of two-way left-turn lanes.
- Little or no space between the curb and vehicle lane for bicyclists to ride. Heavy traffic volumes and high speeds compound the situation.
- Stop and go congestion.
- Traffic signals are mounted on a single overhead cable; visibility could be improved by mast arm mounting and upgrading signal heads.
- Pedestrians and bicyclists in conflict with traffic entering the I-189 onramps.

Chapter 3: Recommendations and Implementation Plan

Corridor recommendations have been developed by the study team with participation of the project steering committee and public, who helped to define problems and identify potential solutions. Three categories of recommendations have been developed:

- **Corridor Reconstruction**: A long-term, full reconstruction of the highway to incorporate bicycle, pedestrian and access management features while improving the appearance and contextual relationship with the surrounding community.
- **Near- and Medium-term Actions**: Improvements to Shelburne Road that are recommended in advance of a full corridor reconstruction, particularly if such reconstruction is deferred well into the future.
- **Independent Actions**: Off-corridor and other recommendations that can be implemented independent of corridor reconstruction.

Further study will be needed to advance plans to reconstruct the corridor, but this study has identified a conceptual cross section and elements recommended for inclusion as part of the corridor redesign. Separate scoping studies are recommended for the southern and northern sections of the corridor:

- Scoping for the southern segment of the corridor between Holmes Road/IDX Drive to approximately Queen City Park Road involves fewer constraints and potential design variations. The scoping study would advance the conceptual design for the corridor and investigate potential impacts to natural areas and adjacent parcels. This segment could potentially advance to construction ahead of the northern segment.
- The northern segment – extending from approximately Lindenwood Drive to I-189 – has unique right-of-way constraints and could include major realignment of connecting cross streets. A separate scoping study on this segment is therefore recommended. The scoping study should include more detailed study of potential realignment of corridor cross streets to consolidate and create better separation between intersections between Queen City Park Road and I-189. Preliminary ideas are identified in this study, but more detailed assessment of feasibility, right-of-way impacts, and traffic operations is needed. Further, this effort needs to be coordinated with design of new ramps for the proposed Champlain Parkway.

A number of near- or medium-term improvements to the highway itself are recommended in advance of a full reconstruction. These include projects of modest cost that could be implemented quickly, as well as some larger-scale improvements that could address key issues identified by the study in advance of a full corridor reconstruction. The decision of whether to advance larger scale, more costly recommendations should be tied to the anticipated timeframe for implementing full corridor reconstruction, which requires additional planning, design and securing funding.

Some recommendations are independent actions that could be implemented without consideration of the long-term evolution of the corridor. These include programmatic actions and off-corridor improvements.

A key finding of this study is that improvements to the highway itself can only go so far in addressing congestion. Capacity expansion beyond a five-lane cross section, with the exception of northbound approaching the I-189 ramps, is not recommended due to impacts to adjacent properties, degradation of the pedestrian and bicycling environment, and limited operational effectiveness of wider cross sections. From a demand standpoint, the lack of alternate routes – whether for longer-distance trips passing through the study area or local trips to area businesses and residences – concentrates traffic on Shelburne Road. Investments in the transportation network to decentralize local circulation and provide additional regional travel

routes are warranted. Further, efforts to manage peak traffic volumes by improving transit options, creating more walkable communities, and planning growth in ways that minimize additional motor vehicle trips will be important as well.

Chapter Organization

Each action recommended by the study is presented in the Implementation Matrix (Exhibit 3.19) at the end of this chapter, and is identified by name and an ID number. The independent, near-term and medium-term recommendations, which are organized by topic, are described first, followed by the recommendations for long-term reconstruction of the corridor.

Near-term/Medium-term and Independent Actions

This section describes recommendations that could be implemented prior to, or independently of full reconstruction of the corridor. Recommended near-term/medium-term actions were selected for their potential to improve safety, user accommodation and travel efficiency ahead of a full reconstruction of the corridor, which is likely ten or more years away from possible implementation.

Pedestrians

Pedestrian actions that could be implemented prior to, or independent of, corridor reconstruction are presented in Exhibit 3.1 and mapped in Exhibit 3.2.

Difficulty crossing Shelburne Road and the quality of the pedestrian environment along the corridor are two key issues affecting walkability today. Options for improving crossings were selected primarily for their potential to reduce the distance between pedestrian crossings on the corridor and improve the safety of pedestrians.

Exhibit 3.1: Pedestrian Recommendations

ID	Strategy	Implementation Details
Pedestrian Improvement Program		
P1a	Additional crosswalks at signalized intersections	• Kmart Plaza/Brewer Pkwy (south leg) • Saturn Dr/Baldwin Ave (both legs)
P1b	Pedestrian countdown timers	• All intersections (all crosswalks)
P1c	Leading pedestrian interval (LPI)	• Highest priority locations: o Holmes Rd/IDX Dr (north leg) o Proposed crosswalk at Kmart Plaza/Brewer Pkwy (south, west legs) o Hannaford Plaza (south, west legs) o Swift St (east leg) • Other locations: o Proposed crosswalks at Baldwin Ave (north, south legs) o Fayette Drive/McIntosh Ave (south, west legs) o Queen City Park Rd (if relocated to south leg)
P1d	Turn restrictions and regulatory signs	• Blank-out signs or No Right Turn on Red signs at locations with LPIs.
Lindenwood Path and Crossing Improvements		
P2a	New walkway/multiuse path segment connecting Kmart lot to Shelburne Rd	• Likely medium to longer-term. • Implement in support of T3, or as an alternative to P3.
P2b	Crosswalk and median refuge at Lindenwood Dr	• Implement in conjunction with P2a. • Alternative to P3. • Recommend inclusion of Ped Hybrid Beacon depending on outcome of VTrans' VT 15 pilot test (fall 2012).
Other Pedestrian Actions		
P3	Relocation of Queen City Crossing Improvements	• Alternative to P2a-b. • Could be implemented near-term or as part of a full corridor reconstruction.

ID	Strategy	Implementation Details
P4	Crosswalk and median refuge at Imperial Dr	• Include pedestrian refuge in center median.
O1	Enhanced maintenance program	• More frequent re-painting of lane markings, street sweeping, etc.

Several actions comprise a **pedestrian crossing improvement program** aimed at improving the safety, comfort and convenience of pedestrian crossings. Today, pedestrians only have opportunities to cross Shelburne Road using marked crosswalks at four locations; Queen City Park Road, Hannaford Drive/Laurel Hill Drive, Fayette Drive/McIntosh Avenue, and Holmes Road/IDX Drive. As a result, the spacing between crossing opportunities ranges from 1200 to 1550 feet along the corridor. **Additional pedestrian crossings at signalized intersections (P1a)** are recommended. In addition to striping marked crosswalks, signals would need to be upgraded to incorporate pedestrian signal heads and curb ramps would need to be reconstructed to allow access to new crosswalks.

Initially, a new crossing is recommended on the south leg of Shelburne Road at Kmart Plaza/Brewer Parkway, and on both legs of Shelburne Road at Baldwin Avenue. A new east-west crosswalk at Swift Street is not recommended prior to corridor reconstruction due to the volume of turning motor vehicle traffic, signal timing requirements, and lack of pedestrian attractors on the west side of the corridor at this location.

The Hannaford Drive/Laurel Hill Drive and Fayette Drive/McIntosh Avenue intersections have crosswalks on the south leg of Shelburne Road, but not the north leg. In both cases, the crosswalks are not provided on the north leg due to wider crossing distances resulting from the southbound right turn lanes provided at these locations, as well as more conflicting left turning vehicles. As part of the longer-term reconstruction of the corridor, consideration should be given to eliminating the southbound right turn lanes – particularly at Kmart Plaza and Fayette Drive – and providing crosswalks on all four legs of each signalized intersection.

Pedestrian Countdown timers (P1b) are recommended at all signalized intersections. Existing signal controller equipment may need to be upgraded at some intersections to accommodate them.

Leading pedestrian intervals (P1c) are recommended to allow pedestrians to start across an intersection before motorists are given a green indication. Pedestrians receive a walk signal three to five seconds before adjacent travel lanes receive a green indicator. The highest priority locations are those where high volumes of turning traffic conflict with pedestrian movements:

- North crosswalk at IDX Drive/Holmes Road
- South (proposed) and west crosswalks at Kmart Plaza/Brewer Parkway
- South and west crosswalks at Hannaford Plaza/Laurel Hill Drive
- East crosswalk at Swift Street

Implementation at Hannaford Drive/Laurel Hill Drive and at Swift Street would be more problematic due to signal timing requirements necessary to service the heavy movements at these locations, and may require implementation of longer signal cycle lengths.

Leading pedestrian intervals (LPI) could also be implemented at other corridor locations where signal timing parameters could accommodate them without significantly affecting traffic flow, but conflicting turning movements are more modest. These secondary priority locations are:

- North and south crosswalks at Baldwin Avenue
- South and west crosswalks at Fayette Drive/McIntosh Avenue

The crosswalk at Queen City Park Road could be converted to use a concurrent pedestrian phase, with a leading pedestrian interval, if it is relocated to the south leg (see P3).

Some intersections may currently use signal controller equipment that would require upgrades to implement leading pedestrian intervals.

Turn restrictions and regulatory signs (P1d) are recommended to reduce conflicts between pedestrians and turning motor vehicles. Eliminating right turns on red (RTOR) reduces potential conflicts between turning vehicles and pedestrians crossing in front of the stopped vehicle and, if an exclusive pedestrian phase or LPI is present, crossing the perpendicular street as well. However, RTOR should only be prohibited in specific cases, including when visibility is limited, geometric conditions dictate, pedestrian volumes are heavy, or when exclusive pedestrian phases are provided.

On the Shelburne Road corridor, many side streets and some Shelburne Road movements depend on RTOR to efficiently move traffic. RTOR prohibition is therefore only recommended at those locations where intersection configurations and/or traffic patterns merit their consideration and they could be implemented without markedly affecting traffic operations:

- Southbound Shelburne Road at Holmes Road
- Northbound Shelburne Road at McIntosh Avenue
- Northbound and southbound Shelburne Road at Saturn Way/Baldwin Avenue, if crosswalks are added to this intersection as recommended under P1a
- Northbound Shelburne Road at Laurel Hill Drive
- Northbound Shelburne Road at Brewer Parkway

Locations where LPIs are installed do merit some protection from right turning traffic. Manual on Uniform Traffic Control Devices (MUTCD) sign R10-15 could be installed at LPI locations to remind drivers to be aware of pedestrian traffic when making right turns:

- Northbound Shelburne Road at Swift Street
- Queen City Park Road, if crosswalk is relocated to south leg
- Southbound Shelburne Road at Hannaford Plaza
- Eastbound Hannaford Plaza
- Southbound Shelburne Road at Fayette Drive
- Eastbound Fayette Drive
- Westbound IDX Drive
- Westbound Baldwin Avenue

Reminder of Pedestrians Crossing (MUTCD R10-15)

Source: MUTCD, 2009 Edition

Over the longer-term, Blank-out signs, which prohibit RTOR when conflicting LPI pedestrian phases are active only, could be implemented as part of traffic signal system upgrades.

Lindenwood path and crossing improvements would provide access between proposed commuter parking near the Kmart lot (see T2b) and bus routes on Shelburne Road, as well as provide an option for relocating the existing multiuse path that currently crosses Shelburne Road at Queen City Park Road. These may be mid-term to longer-term improvements given the need for new right-of-way. Implementation may be possible along the property line of parcels on the west side of the corridor without disrupting current uses, but implementation during future redevelopment of these properties may be more likely. The option to establish a street connection (in the long-term) connecting the Kmart lot to Shelburne Road at Lindenwood Drive should be preserved, as such a connection could potentially enable partial or full relocation of Queen City Park Rd (see later section on Long-term Corridor Reconstruction. Exhibit 3.15B shows an example).

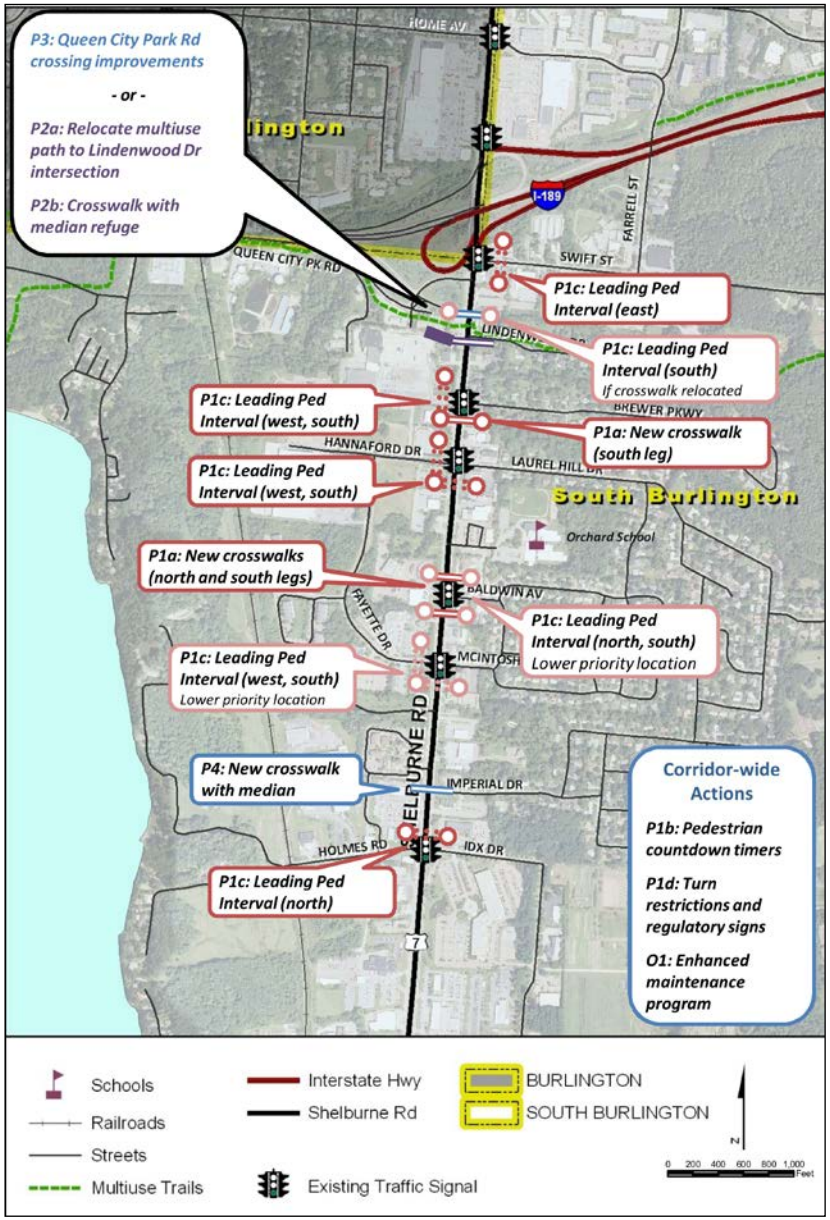
Two elements would comprise these improvements; a **new walkway/multiuse path segment connecting the Kmart lot to Shelburne Rd (P2a)**, and a **new crosswalk and median refuge at Lindenwood Dr (P2b)**. Together, they would provide access to both sides of Shelburne Road and provide a direct, uninterrupted

connection for the multiuse path to Lindenwood Drive. Given the higher amount of likely usage, a Pedestrian Hybrid Beacon could be considered as part of the crossing improvement. It would operate on an actuated-coordinated basis, with the pedestrian and bicycle crossing movement only serviced when called. Activation would not be immediate, but delayed as necessary to maintain coordination with corridor traffic signals. VTrans will soon implement the state's first Pedestrian Hybrid Beacon on VT 15 across from Fanny Allen in Colchester, and should that initial implementation prove successful, its application should be considered here as well.

As an alternative to implementing a new crossing at Lindenwood Drive, the **Queen City Park Road crossing improvements (P3)** recommended in the 2005 Shelburne Road/Queen City Park Road Scoping Report could be implemented. These involve relocating the Queen City Park Road crosswalk to the south side of the intersection, reconfiguring the existing driveway on the east side of the intersection, and constructing an 8-foot wide path connection on the east side of the roadway between Queen City Park Road and Lindenwood Drive. This would provide a more direct crossing for path users than exists today at this location and eliminate the need for an exclusive pedestrian phase in the traffic signal timing (instead replaced with a leading pedestrian interval, as described for P1c). This alternative would provide a less direct connection than the Lindenwood crossing improvements would, and is also complicated by the location and configuration of abutting uses near Queen City Park Road.

No crosswalks (or traffic signals) are provided crossing Shelburne Road between Fayette Drive/McIntosh Avenue and Holmes Road/IDX Drive, a distance of 1400 feet. Establishing a pedestrian crossing at Imperial Drive is recommended to reduce this distance and improve walking access to the adjacent neighborhood. The intersection does not meet warrants for installation of a full traffic signal and is unlikely to in the foreseeable future.

Exhibit 3.2: Location of Recommended Pedestrian Actions



Chapter 4F of the 2009 MUTCD provides guidelines for consideration of a Pedestrian Hybrid Beacon (also known as a "HAWK" signal). For current conditions, a peak pedestrian demand of 20 or more pedestrians crossing Shelburne Road per hour would merit consideration of a Pedestrian Hybrid Beacon, which is unlikely at this location unless future nearby development increases pedestrian activity. Therefore, a **median pedestrian refuge with marked crosswalks (P4)** is instead recommended crossing the south leg of Shelburne Road at the Imperial Drive intersection. The median refuge would allow pedestrians to cross only one direction of travel at a time and provide refuge while waiting to cross the opposing direction of traffic. Future incorporation of a Pedestrian Hybrid Beacon could be considered should pedestrian activity increase to merit implementation.

Finally, increased maintenance of the corridor could benefit all users. Ensuring that crosswalk markings are maintained and easily visible is important for pedestrian safety, while street sweeping and pavement maintenance are critical for bicycle safety. An **enhanced maintenance program (O1)** is therefore recommended.

Bicycles

Near-term/medium-term and independent actions to improve conditions for bicyclists are presented in Exhibit 3.3 and mapped in Exhibit 3.4.

Shelburne Road is currently not wide enough to retrofit with bicycle lanes or shoulders. Near-term recommendations therefore focus on developing bicycle accommodations on alternate routes and completing missing links. Addition of bicycle lanes to Shelburne Road is recommended as part of the longer-term reconstruction of the corridor. Together, these improvements would offer bicycle accommodations that provide options for cyclists with a wide range of abilities and different tolerance levels for riding with traffic.

Exhibit 3.3: Bicycle Recommendations

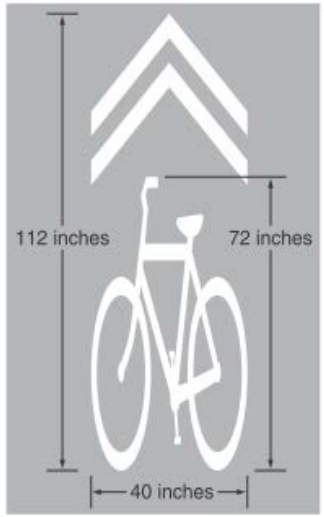
ID	Strategy	Implementation Considerations
Queen City Crossing Improvement Program		
P3	Queen City Crossing Improvements	• Described previously under pedestrian improvements.
B1	Construct two-stage bicycle queue box at path crossing (east side)	• Location depends on whether P2a-b or P3 is implemented.
Lindenwood Path and Crossing Improvement Program		
P2a	New walkway/multiuse path segment connecting Kmart lot to Shelburne Rd	• Described previously under pedestrian improvements.
P2b	Crosswalk and median refuge at Lindenwood Dr	• Described previously under pedestrian improvements.
B1	Construct two-stage bicycle queue box at path crossing (east side)	• Location depends on whether P2a-b or P3 is implemented.
Fayette Dr Bike Route		
B2a	On-street bike route on Fayette Dr	• Shelburne Road to Hannaford Dr • Bike route signs and "Sharrows". • Connect to multiuse path near Queen City Park Rd by continuing on new roadway proposed for R2a.
B2b	Study feasibility of multiuse path on Fayette Dr corridor	• East side of street appears to have better feasibility. • Long-term upgrade for B2a.
B2c	Interim cycle track Imperial Dr to Fayette Dr	• Widen existing sidewalks to provide contiguous bicycle route connecting to B2a.
Other Bicycle Actions		
B3	Signed Bike Routes in neighborhoods	• In Orchard neighborhood to direct bicyclists to Rec Path.

ID	Strategy	Implementation Considerations
B4	Connection between IDX Dr and Rec Path.	• Either as a new path segment or coordinated with proposed extension of IDX Dr (R2b). • Could instead link IDX Dr to Imperial Dr or other neighboring streets to provide this connection.
B5	Revisit prior study of feasibility of regional shared rail/trail	• Longer-term • Convene working group.
B6	Update street design standards to include bike lanes on all arterials and collector streets.	• Could be part of a broader "Complete Streets" ordinance.

A key missing link in the regional bike system is the connection between the existing multiuse path at Queen City Park Road and Lindenwood Drive. As described previously under pedestrian actions, two options for addressing this connection have been identified (P2a-b, or P3). To facilitate bicycle use of either crossing, a **two stage bicycle queue box (B1)** or similar, protected landing area should be constructed for bicycles on the east side of Shelburne Road at the crossing location that provides adequate space for bicyclists to stop and wait to cross the roadway. See Exhibit 3.16 later in this report for an illustration.

Because Shelburne Road is not presently conducive to cycling, establishment of a parallel **Fayette Drive Bicycle Route** is recommended. These improvements would have value even after bicycle facilities are established on Shelburne Road, since some riders will not be comfortable riding there. The first step would be to **sign an on-street bike route on Fayette Drive (B2a)**. Fayette Drive is a low volume, low speed street that is well suited for use by bicyclists. In addition to bicycle route signage, installation of Shared Lane Markings ("Sharrows") should be considered on segments adjacent to on-street parking to show cyclists where to safely ride to avoid opening car doors and remind drivers that bicyclists riding in the travel lane should be expected. This route should continue to the multiuse path at Queen City Park Road via a new street extended through the Kmart parking area (R2a), described in the following section. Wayfinding and route marking to draw cyclists' attention to the route should be incorporated in the design of the facility. This includes not only identification of the route, but also destinations and linkages. Currently, Fayette Drive is not heavily developed so there are few intersecting cross streets or driveways. Because conditions are favorable, study of the **feasibility of a two-way multiuse path (B2b)** as a potential longer-term replacement for the proposed on-street bicycle route on Fayette Drive is recommended as well.

Shared Lane Marking



Source: MUTCD, 2009 edition

To connect existing bike lanes on Shelburne Road to the proposed Fayette Drive bicycle route, an **interim cycle track (B2c)** consisting of five feet of asphalt pavement adjacent to the existing sidewalk is recommended on both sides of Shelburne Road between Homes Road/IDX Drive and Fayette Drive. Accessible ramps designed to allow bicycles to transition from bike lanes to the raised track would be needed, as would a landing area at the Fayette Drive crosswalk where bicyclists could stop and wait for the traffic signal. Arrows should be painting to indicate the correct direction of travel.

East of Shelburne Road, a system of **"Bike Route" signs (B3)** is recommended to direct bicyclists to entrances to the multiuse path system to the east. This system may be designed with participation of local/regional groups such as the South Burlington Rec Path Committee and Local Motion. It would include guide signs directing riders from Laurel Hill Drive, Baldwin Avenue, McIntosh Avenue

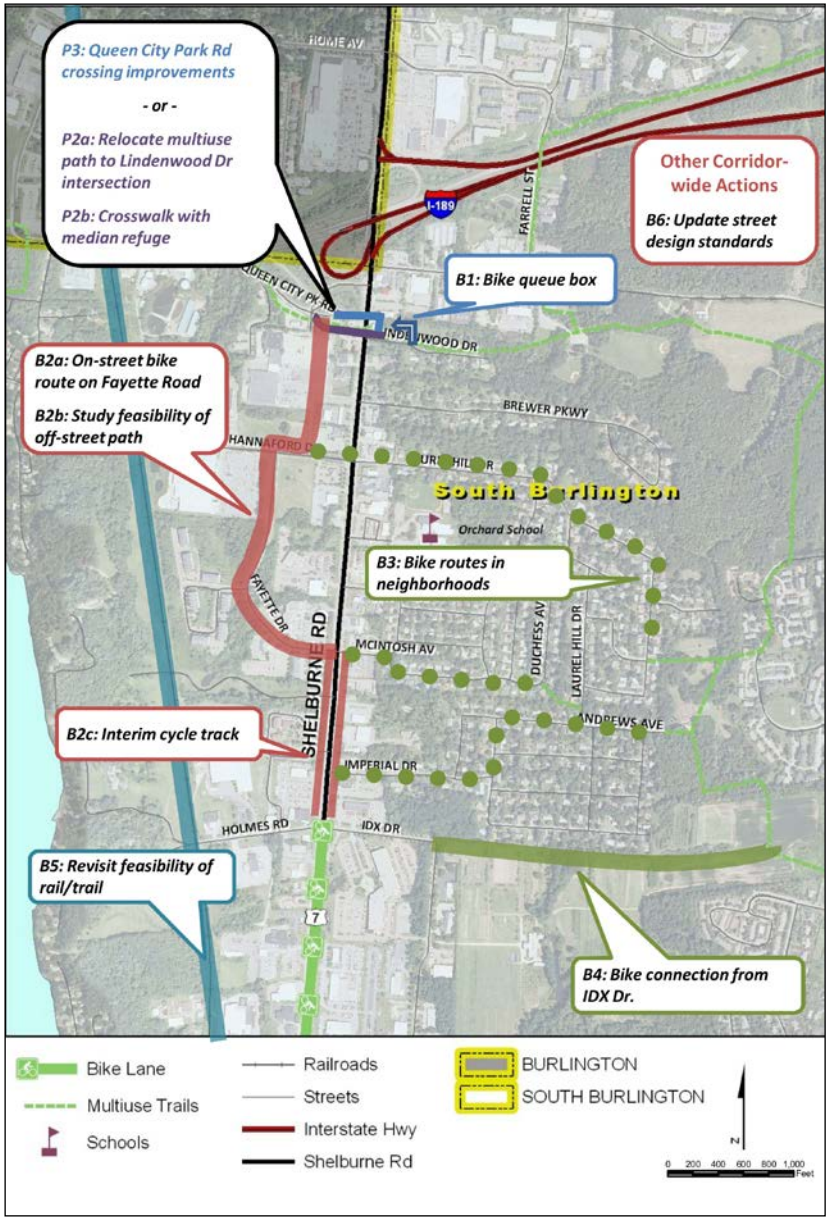
and/or Imperial Drive through the Orchard Park neighborhood to the South Burlington Rec Path.

A longer-term improvement would be establishment of a bike/pedestrian **connection between IDX Drive and the multiuse path system (B4)** east of Shelburne Road. This could be accomplished either by construction of a new bicycle/pedestrian path from IDX Drive to the Rec Path, or by establishing a connection in conjunction with an extension of IDX Drive to connect to Spear Street (see R5 under Roadway Congestion and Safety).

Interest has been expressed in establishing a regional multiuse trail along the rail corridor west of Shelburne Road. Although multiuse paths along active rail corridors have been established elsewhere, they are not common and the process is often lengthy and involves detailed study and negotiation. However, such a trail would be a significant community asset, and **revisiting the 2004 Champlain Path Feasibility Study of a shared rail/trail (B5)** is recommended. This would initially involve convening a working group likely comprised of representatives from VTrans, Vermont Railway, community groups and regional/local agencies to review the prior study and further explore the possibility of co-locating a shared rail/trail in the corridor.

To ensure that future streets are designed to accommodate bicyclists, the **City's street design standards should be updated (B6)** to include bike lanes or other bicycle accommodations on all arterials and collector streets. This effort could be part of a more comprehensive "Complete Streets" ordinance.

Exhibit 3.4: Location of Recommended Bicycle Actions



Roadway Congestion and Safety

Near-term/medium-term and independent actions related to congestion and safety are shown in Exhibit 3.5 and mapped in Exhibit 3.6.

Congestion on the corridor was found to be primarily related to the very high levels of peak period demand, particularly concentrated at the I-189 interchange. Congestion is forecast to increase as the region continues to grow, and capacity and operational solutions to Shelburne Road will only be one part of a multifaceted approach to provide mobility in the context of this growth. Further, enhancement of other travel modes and implementation of regional transportation solutions elsewhere will be important. For example, completion of the Champlain Parkway will provide a significant new route for I-89 traffic traveling to Burlington which has the potential to improve travel conditions on Shelburne Road to a greater degree than any feasible capacity or operation improvement to the corridor itself.

To ensure that the corridor is being operated as efficiently as possible, several actions related to **traffic signal timing upgrades** are recommended:

- Continue the **ongoing traffic signal timing program (R1a)** involving VTrans and local agencies to periodically collect traffic data and update traffic signal timing parameters along the corridor. This currently occurs on a periodic basis (typically every four years).
- **Upgrade to video detection (R1b)** per current VTrans plans. Video detection may prove more reliable than induction loop technologies currently in place.
- Retime corridor signals to **implement a 120-second cycle length (R1c)**, which would allow for better accommodation of pedestrian clearance intervals and more options for accommodating side street movements.
- **Consider implementation of permitted-protected phasing for side streets (R1d)**, specifically eastbound left turns from Kmart Plaza and Hannaford Drive intersections. These serve much higher volumes than the corresponding westbound movements. This may require 120-second cycle lengths to operate effectively.
- **Implementation of Adaptive Signal Control (R1e)**, which adjusts signal timing in real time in response to traffic conditions, could improve traffic flow and reduce congestion on the corridor. This would require new controller equipment, and implementation may be complicated by the location and angle of video detection equipment. Over the longer-term, upgrading traffic signals to poles and mast arms would eliminate this issue.

Work with CCTA to implement and monitor **transit signal priority (T4)**, described later in the Transit section.

Road network improvements to **develop the street grid** are needed to reduce the reliance on Shelburne Road for all trips and lower concentrations of traffic at the I-189/Swift Street intersection. These include:

- Improve local circulation by formalizing a **public street connecting Hannaford Drive to Queen City Park Road (R2a)**, which in conjunction with Fayette Drive would create a secondary north-south route west of Shelburne Road. Drivers currently drive through the Kmart parking lot to complete this movement.
- This secondary north-south route could potentially be extended further to the south. A first step would be to **identify a new street on the Official Map from Fayette Drive to the south (R2c),** connecting to Holmes Road and possibly extending further to the south from there.

- Over the long-term, **extend IDX Drive (R2b)**, which is identified on the City's official map, to connect to Spear Street to create additional east-west connections. This is the only real opportunity to create east-west connections on the east side of the corridor. This extension would traverse land that is part of the University of Vermont's Horticultural Research Center, and would require coordination with the University to identify a suitable alignment that protects the functionality and character of the facility.

The current east-west connection, Swift Street, experiences considerable congestion and queuing during peak periods. Extending the **left turn lane on Swift Street (R3)** would help to manage the queuing and reduce its contribution to congestion. The lane is currently approximately 130 feet long, and should be extended to 250 to 300 feet to increase storage for left turning traffic and reduce queuing impacts to right-turning traffic in the adjacent lane.

The higher density of development and frequency of driveways on the corridor may warrant a reduction in the speed limit, particularly for northern sections of the corridor. The City Council could, if it so chooses, request that VTrans conduct a **speed study to assess a potential reduction of speed limit to 30 mph (R4)**. However, the current speed limit, 35 mph, is typical for a corridor with the demand and physical characteristics present on Shelburne Road.

In advancing the long-range reconstruction of the corridor, two separate scoping studies are recommended. The **south segment scoping study (R5)** would cover the corridor between Holmes Road/IDX Drive and Queen City Park Road. There are fewer design challenges and potential variations on this segment of the corridor, and it could likely be in position to advance to construction ahead of the north segment.

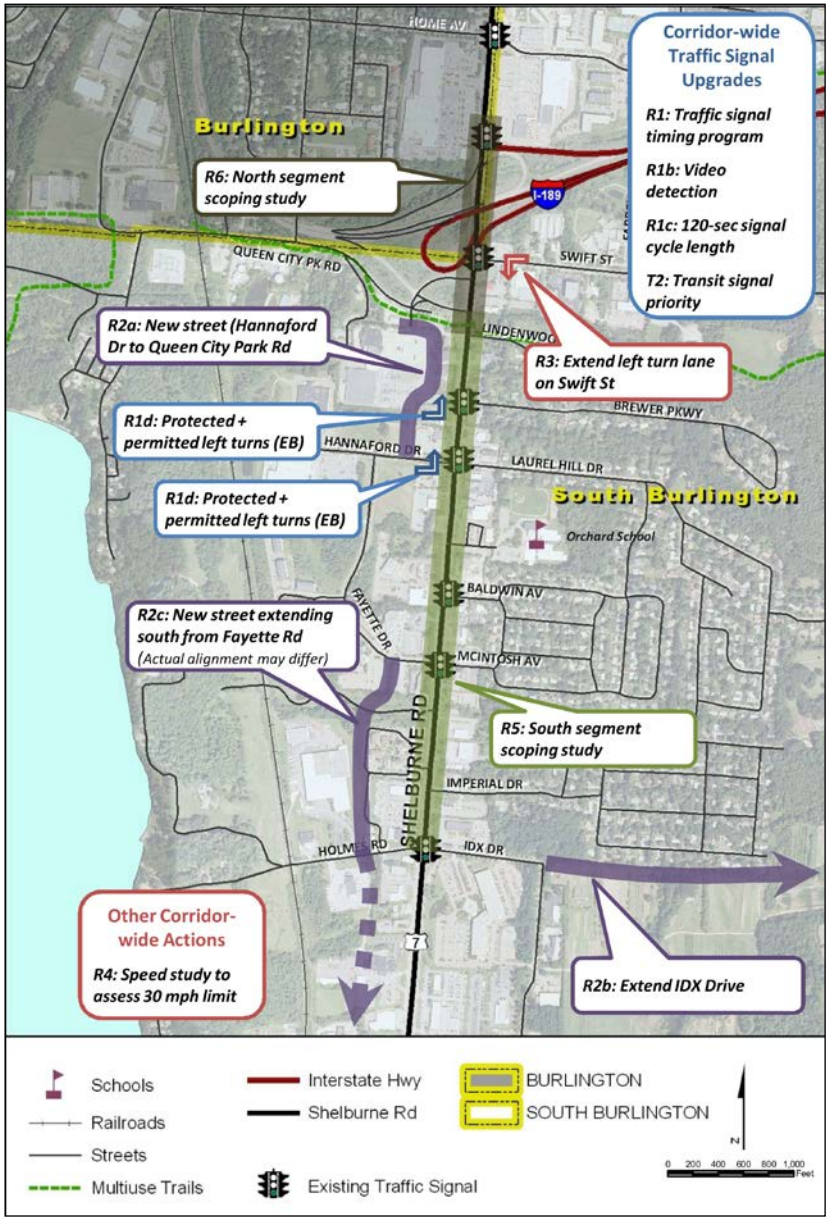
As described later for long-term reconstruction of the corridor, a more detailed, coordinated examination of options for reconfiguring the I-189 eastbound ramps in conjunction with alignment revisions to Swift Street and Queen City Park Road is needed. This **north segment scoping study (R6)** should occur upon resolution of the potential extension of the Champlain Parkway and look at options for best incorporating ramp connections between Shelburne Road and the new extension.

Exhibit 3.5: Roadway Congestion and Safety Recommendations

ID	Strategy	Implementation Details
Traffic Signal Upgrades		
R1a	Ongoing traffic signal timing program	• Continue ongoing efforts to update traffic signal timing periodically.
R1b	Video detection	• Will be implemented in summer 2012
R1c	Implement 120-second cycle length	• Needed to provide minimum pedestrian clearance at several intersections.
R1d	Implement protected + permitted left turns on side streets	• Kmart Plaza (EB) • Hannaford Dr (EB)
R1e	Implement Adaptive Signal Control	• Requires new signal controller equipment. • Would use video detection (R1b) as input source • May not be fully effective until long-term upgrade of traffic signals to incorporate mast arms.
T4	Transit signal priority	• Upcoming pilot project being implemented elsewhere on corridor.
Develop Street Grid		
R2a	New street connecting Hannaford Dr to Queen City Park Rd	• Update Official Map to show location (Kmart parking lot). • Could be implemented either with or in advance of redevelopment of site. • Include bike lanes.

ID	Strategy	Implementation Details
R2c	Extend IDX Dr to Spear St (Long Term)	• Currently on Official Map. • Likely a longer-term project.
R2c	Identify new street on Official Map from Fayette Dr south	• Identify route and add to Official Map.
Other Roadway Actions		
R3	Extend left turn lane on Swift St	• Could be constructed in current ROW, but requires reconstructing south side sidewalk.
R4	Speed study to assess potential for 30 mph limit	• Most likely applicable north of Baldwin Ave • South Burlington City Council would need to initiate request.
Long-term Corridor Reconstruction		
R5	Southern segment reconstruction	• Holmes Rd/IDX Dr to Queen City Park Rd. • Likely able to advance to construction more quickly than north segment.
R6	Northern segment reconstruction	• Lindenwood Dr to I-189. • Coordinated with Champlain Parkway project.

Exhibit 3.6: Location of Recommended Roadway Congestion and Safety Actions



Transit and Transportation Demand Management

Transit and travel demand recommendations are shown in Exhibit 3.7 and mapped in Exhibit 3.8.

The primary route serving Shelburne Road today – CCTA's Route 6 – operates at 15 to 30 minute headways during the morning peak, and typically every 30 minutes during the afternoon peak and off-peak periods. Increasing the frequency to **15-minute peak headways on Route 6 (T1)** during both the morning and afternoon would improve the convenience of using transit. Bus riders would not have to adjust their schedules to match availability of service, but instead could rely on frequent service at regular intervals. More trips may also allow for better connections to other routes, thereby expanding the regional reach of bus service to the corridor.

Most transfers today occur at the Cherry Street Station in downtown Burlington. Establishing **a satellite station at the vicinity of Shelburne Road/Farrell Street/Home Ave intersection (T2a),** north of the study area, would allow riders to transfer to Routes 86 (Montpelier LINK Express) and possibly Route 5 without having to ride into downtown Burlington. While this location would not directly reduce auto trips by capturing drivers before they enter the Shelburne Road corridor, it could improve transit options and reduce travel times for some users. Also, the *Go Chittenden County* (regional TDM program) team, which includes representatives from VTrans, CCRPC, CCTA, Car Share Vermont, Local Motion, CATMA and others, is currently working to develop a multimodal facility at this location. This facility would provide park-and-ride opportunities, parking for Car Share Vermont, CCTA transfers and long term bicycle parking.

Providing means for people to access transit on the corridor is an important consideration. Neighboring residents may walk to bus stops along the corridor, but those who live further away from bus routes require other options to access transit. The parking lot at Kmart includes more spaces than are needed for current uses, and the northwest corner of the lot is located far from these uses. **Formalizing commuter parking in the Kmart parking lot (T2b)** would provide an area for commuters to meet to form carpools or park while accessing bus services on Shelburne Road. Ideally, bus routes would deviate into the lot from Shelburne Road using Queen City Park Road and Kmart Plaza, though this would add approximately three to five minutes to each bus trip. Alternatively, pedestrian connections to Shelburne Road at Lindenwood Drive (P2a) and (P2b) could provide access to bus stops on the corridor. The other pedestrian crossing improvements recommended would also improve pedestrian access between bus stops on opposite sides of the roadway elsewhere along the corridor. By **establishing park-and-ride lots elsewhere (T2c)**, trips could be captured closer to home and before they enter the most congested segments of the corridor. These could be leased-lot arrangements, which are low cost and rely on existing surplus parking areas.

Bus shelters at stops along the corridor provide shelter from weather and create a more comfortable waiting area for riders. They are provided more commonly northbound (three locations) than southbound (only at Fayette Drive) on the corridor, which reflects the traditional commuting pattern of workers from outlying areas traveling to the center city for work. Adding **additional bus shelters (T3)** would improve waiting conditions for bus riders. While shelters at all stops would be of value to riders, a frequent distribution and balance of shelters could be achieved by constructing new shelters at either Kmart Plaza/Brewer Parkway or Hannaford Drive/Laurel Hill Drive, Saturn Way/Baldwin Avenue, and Holmes Road/IDX Drive in the southbound direction, and at Hannaford Road/Laurel Hill Drive or a new location near Kmart Plaza/Brewer Parkway northbound. These should be designed to be easily relocated when long-term reconstruction of the corridor occurs. Additionally, should a pedestrian crossing be established at Imperial Drive, as proposed by (P4), an additional southbound stop would complement the northbound stop at that location.

To improve transit travel times and reliability during congested time periods, CCTA is **implementing transit signal priority (T4)** on a pilot basis within the region, including on Shelburne Road south of the study area. If successful, this technology could be extended to the segment north of Holmes Road/IDX Drive, though its implementation would require upgrading traffic signal equipment to enable transit priority.

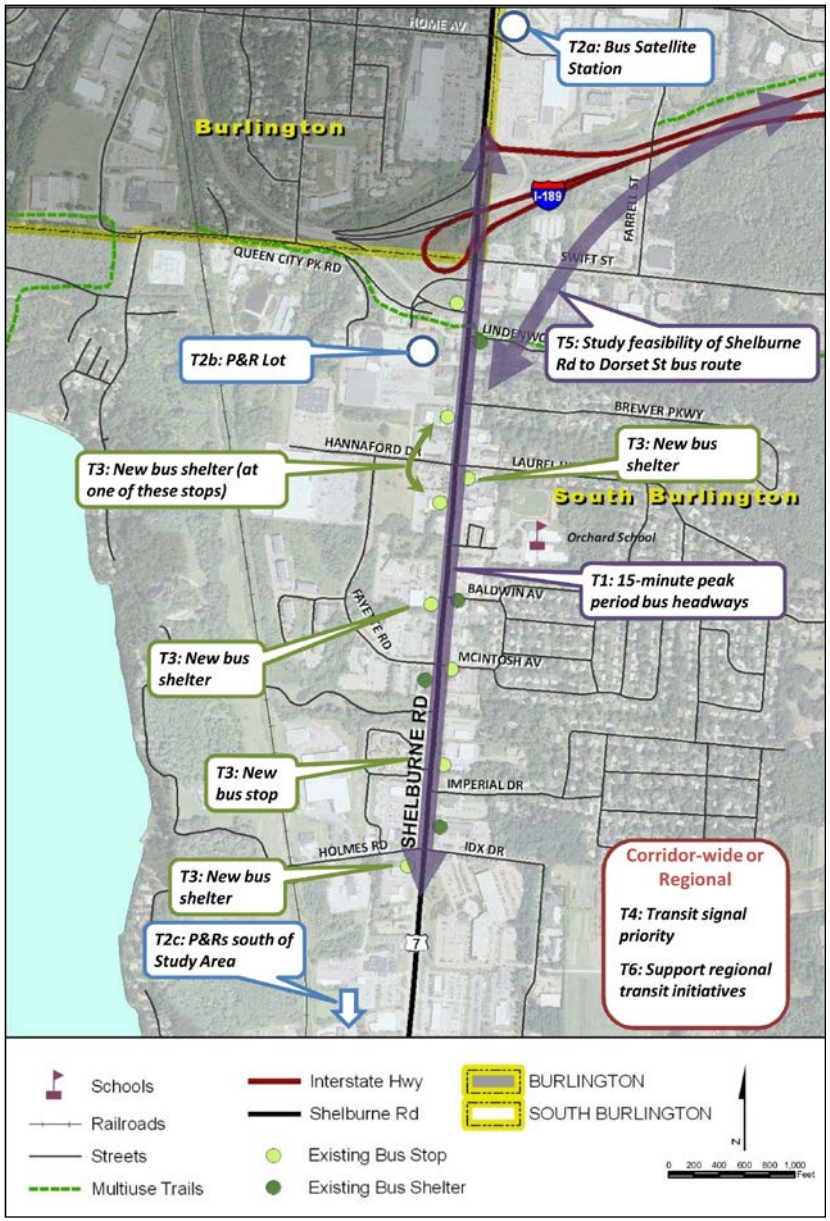
Over the longer term, the study also recommends that the City, CCRPC and CCTA **study the feasibility of a new bus route linking the Shelburne Road and Dorset Street corridors (T5)**. This would directly link southern and eastern portions of South Burlington, two primary areas which are not well connected by either transit or streets today. This community connector could use either Swift Street or I-189 to link the different areas.

The City should remain actively engaged and **support regional transit and travel demand management initiatives (T6)**, including efforts to improve transportation options and inform commuters, residents and visitors of travel options.

Exhibit 3.7: Transit and Travel Demand Recommendations

ID	Strategy	Implementation Details
Transit Service Improvements		
T1	15-minute peak period headways on Rt 6.	• Both AM and PM Peak periods.
Access to Transit Improvements		
T2a	Establish satellite station in the vicinity of the Farrell St/Home Ave intersection.	• Outside of study area. • Coordinate with City of Burlington. • The *TDM/Go Chittenden County* team is currently working on a multimodal facility at this location.
T2b	Formalize commuter parking in Kmart lot.	• Primarily for rideshare, but could provide access to buses if implemented with P2a and P2b.
T2c	Establish park and ride lots elsewhere.	• Investigate lease-lot opportunities for use of existing under-utilized parking lots. • Capture auto trips south of the study area.
Other Transit Actions		
T3	Construct additional bus shelters.	• Kmart Plaza/Brewer Pkwy or Hannaford Dr/Laurel Hill Dr (both dir) • Saturn Way/Baldwin Ave (southbound) • Holmes Rd/IDX Dr (southbound) • Imperial Dr (southbound) if pedestrian crossing constructed (P4). • Need to be re-locatable or deferred until long-term reconstruction of Shelburne Rd.
T4	Implement transit signal priority.	• Upcoming pilot project being implemented elsewhere on corridor.
T5	Study feasibility of new connector route linking southern and eastern portions of South Burlington	• Route along I-189 or Swift St • Possibly serve Dorset St, Williston Rd and Burlington Airport.
T6	Support regional transit and travel demand initiatives (expanded service, reduced headways, P&R lots).	

Exhibit 3.8: Location of Recommended Transit Actions



Access Management and Land Use Regulations

Recommended land use actions are shown in Exhibit 3.9.

The longer-term reconstruction of the corridor provides an opportunity to improve access management by physically revising parcel access and how left turns are accommodated along the corridor. To reduce the impacts of new development with regard to roadway safety and mobility, the plan recommends that the City **review and incorporate access management techniques in South Burlington's development regulations (LU1)**. These efforts should be coordinated with VTrans' access management guidelines and resources, and could include elements such as:

- Joint-use driveways
- Interior lot cross-connections
- Redirecting access to side and rear streets.

The City of South Burlington is developing a master plan with form-based development codes for the City Center and Williston Road areas, which are intended to establish a more walkable, interconnected community of mixed uses over time. While the characteristics of the Shelburne Road corridor are different, the City Center work provides a good foundation for exploring zoning changes here as well. Zoning in the vicinity of the Shelburne Road corridor should be reviewed and updated to encourage mixed-use development that fosters a more walkable, bikeable and transit-oriented environment. This could be accomplished formally through a **Land Use Master Plan Incorporating Form-based Zoning (LU2).**

Design guidelines for the Shelburne Road Corridor (LU3) could be developed in conjunction with the Land Use Master Plan as proposed by (LU2). These could also begin to establish desired streetscape characteristics for the long-term reconstruction of the corridor, establishing visual elements such as lighting, street furniture, and other urban design and landscaping elements.

Exhibit 3.9: Access Management and Land Use Recommendations

ID	Strategy	Implementation Details
LU1	Incorporate access management in dev regs	• Review and modify zoning regs and be proactive during development review process.
LU2	Land Use Master Plan incorporating form-based zoning	• Use to establish focal point(s) with desired character. Could include LU1 and LU3 as a single, coordinated effort.
LU3	Develop design guidelines for the Shelburne Road Corridor	• Geared toward future development, but may also include streetscape recommendations.

Long-term Corridor Reconstruction

Incremental upgrades to the existing highway would not effectively transform Shelburne Road in a manner that fully addresses the goals identified during the study process. This is in large part due to the need for a wider cross section than exists today and the inconsistency of corridor elements currently (e.g. sidewalks, curb lines, channelization, and driveways) due to the piecemeal development of the corridor over time.

Analysis of current and future demand confirms the need for two travel lanes in each direction with a center turn lane. Additional lane capacity is recommended only near the I-189 interchange.

Reconstruction of the corridor could best advance as two separate, but coordinated efforts. This is recommended because transportation solutions for the north segment near the I-189 interchange are more complicated, require additional study, are costly and potentially involve greater impacts. To the south, the issues are more straight-forward, and this segment could potentially advance to construction ahead of the north segment.

South Segment (Holmes/IDX Drive to Queen City Park Road)

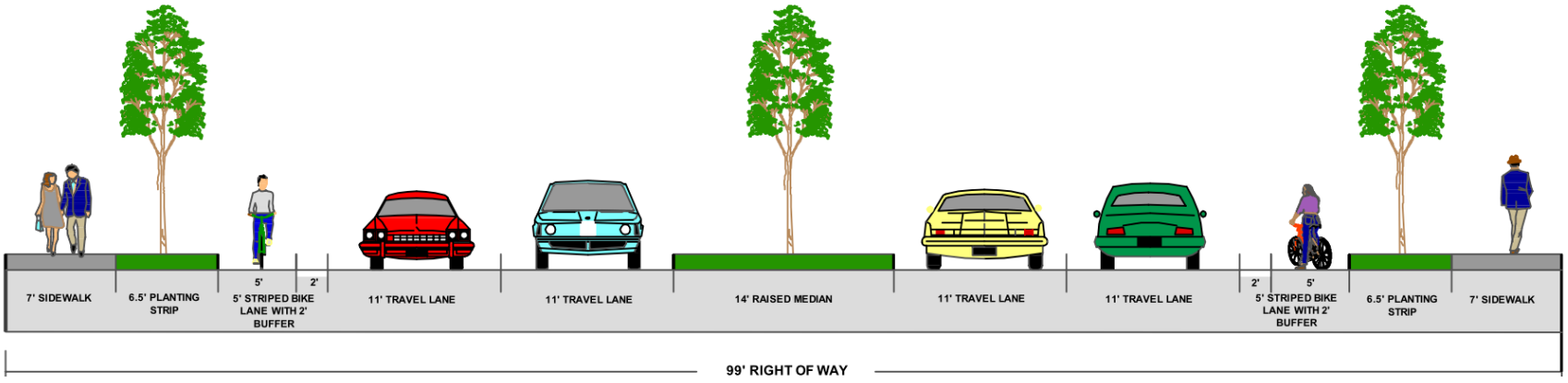
A basic five lane cross section is required to accommodate existing and projected vehicular demand south of Queen City Park Road. Exhibit 3.10 illustrates a recommended conceptual cross section that matches the existing 99-foot right-of-way and incorporates the following elements:

- Two 11-foot travel lanes in each direction.
- A 14-foot center median, which provides space for a left turn lane at intersections and a landscaped raised median elsewhere.
- Buffered bicycle lanes, which consistent of 5-foot wide bicycle lanes that are separated from travel lanes by a 2-foot painted buffer area.

Buffered Bike Lane

Source: NACTO Urban Bikeway Design Guide, April 2011 Ed

Exhibit 3.10: Recommended Cross Section (Typical)



- A roadside zone of 14-feet, which is proposed to include a 7-foot sidewalk and 6.5-foot landscaped planting strip. The planting strip adjacent to sidewalks provides space to accommodate curb ramps at intersections and bus shelters at transit stops along the corridor.

The center median serves multiple purposes. Most visibly, the median provides an opportunity to dramatically improve the visual appearance of the corridor. Functionally, it would help manage access by consolidating left turns and reducing the number of locations where conflicting turning movements occur, and may also have a traffic calming effect that helps to moderate travel speeds. The median would also provide refuge for pedestrians crossing Shelburne Road at any midblock or unsignalized crosswalk. VTrans design standards require a 2-foot offset to vertical curbs, or a 1-foot offset to sloped curbs. Bicycle lanes provide the necessary offset to the outside of the roadway, while the offset would be accommodated within the 14-foot median area to the inside (resulting in an actual width of 10 to 12 feet for the raised median). Reducing the width of the interior lane to 10.5 feet could be considered as well as a means of further moderating travel speeds and decreasing the amount of median space needed to provide curb offsets.

Left turns would be provided at intersections with cross streets. Right turn lanes – provided today southbound at Kmart Plaza, Hannaford Drive, and Fayette Drive – are not recommended as part of the long term reconstruction, with the possible exception of Hannaford Drive, where right turning traffic is prevalent. Exhibit 3.11 shows how both right and left turn lanes could be accommodated within the proposed cross section. When provided, right turn lanes would share space with the bicycle lane, similar to as shown in the photo in Exhibit 3.12.

Reconstruction of the corridor would present the opportunity to reconfigure access to abutting parcels. During the scoping and design process, opportunities to consolidate driveways, create interior lot cross-connections, and redirect access to side and backage roads for existing developments should be explored.

Exhibit 3.11: Cross Sections with Left Turn Lane (top) and Left and Right Turn Lanes (bottom)

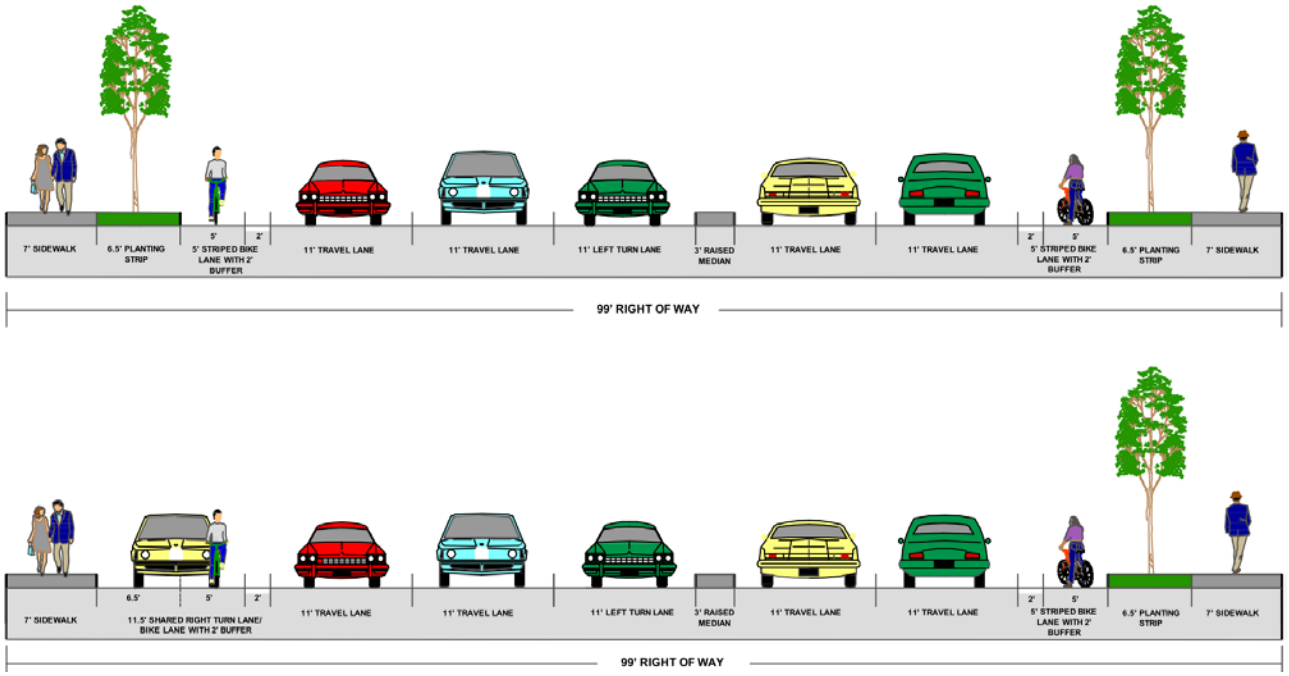


Exhibit 3.12: Example of Shared Right Turn/Bike Lane

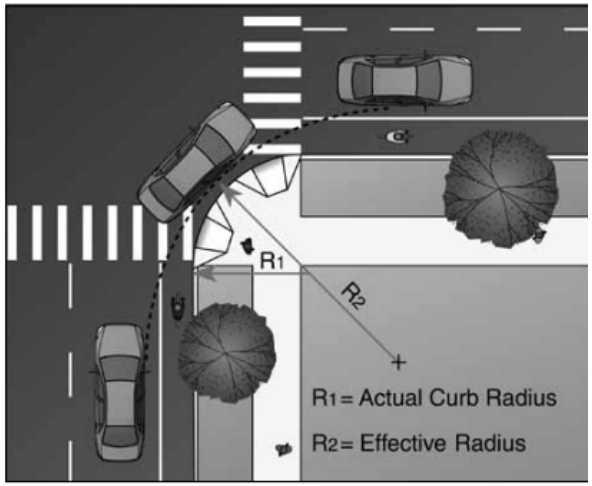
Source: NACTO Urban Bikeway Design Guide, April 2011 Edition

Improving the pedestrian realm is a key aspect of the study. Pedestrian elements recommended for incorporation into a reconstruction of the corridor include:

- New sidewalks of consistent width and alignment separated from the roadway by planting strips.
- A center median that provides refuge for pedestrians crossing at slower speeds (applicable at locations where the center median is not used for a left turn lane) or at non-signalized crossing locations.
- Establishment of consistent, upgraded landscaping and streetscape elements throughout corridor.
- Consideration of using decorative pavement (colored or textured) for crosswalks.
- Establishment of crosswalks on all legs of signalized intersections, as practical. Heavy turning movements may preclude installation of a crosswalk on the north leg of Shelburne Road at Hannaford Drive.
- Improved street lighting at intersections, possibly being incorporated as part of traffic signal upgrades (Exhibit 3.13).
- A mix of pedestrian-scaled and overhead lighting that provides adequate lighting for sidewalks.
- Reduced curb radii at intersections. Using a smaller radius shortens pedestrian crossing distances and reduces the speed of turning vehicles. Establishment of bicycle lanes on the corridor provides additional clearance for larger turning vehicles, which allows for a larger effective radius than the actual physical radius (Exhibit 3.14).
- ADA compliant curb ramps at all intersections, with ramps directed toward the receiving crosswalk.

Exhibit 3.13: Upgraded Traffic Signals incorporating Street Lighting

Exhibit 3.14: Bike lanes increase the effective turning radius.



Source: Designing Walkable Urban Thoroughfares: A Context Sensitive Approach, ITE/Congress for New Urbanism (2010)

A coordinated landscape/streetscape plan should be developed as part of the scoping effort. This would define the overall appearance of the corridor and establish specific design elements, including street lighting, plantings, and street furniture (e.g. - benches, trash/recycling receptacles, bus shelters).

Pedestrian elements recommended for the near- and medium-term should also be incorporated into the corridor design:

- Pedestrian countdown timers (P1b).
- Leading pedestrian intervals (P1c).
- Turn restrictions and regulatory signs (P1d).

Transition at Lindenwood Drive/Queen City Park Road

If the south segment is constructed in advance of the north segment, a transition from the proposed cross section to the existing cross section would need to occur between Lindenwood Drive and Queen City Park Road.

The most challenging aspect of the transition will be adequate termination of the bicycle lanes. If access to the multiuse path is relocated from Queen City Park Road to Lindenwood Drive as proposed by (P2a) and (P2b), then the bike lanes can begin at that location and incorporate a two-stage bike box described earlier (B1) to allow northbound bikes to cross Shelburne Road and access the path. If the path crossing is instead maintained at Queen City Park Road, the northbound bike lane (or other accommodations for northbound bicyclists) should continue to Queen City Park Road, where a two-stage bike box (B1) should be provided. Space constraints from existing development near Queen City Park Road will likely preclude continuing the 2-foot buffer though this section, and also preclude a southbound bike lane for a short distance south of Queen City Park Road. Bicycle route signs and Sharrows may instead be used for this short missing segment in the interim period until north segment reconstruction is completed.

North Segment (Lindenwood to I-189)

The north end of the corridor (north of approximately Lindenwood Drive) presents several challenges related to traffic accessing I-189, right-of-way constraints, and cross street alignments. Further study of this area is necessary to determine how best to accommodate heavy traffic movements while incorporating the recommended elements described for the reconstructed corridor. This effort should take into account the design of the planned Champlain Parkway, which would activate the constructed but unused offramp from eastbound I-189 to Queen City Park Road.

The specific challenges and options for further consideration that have been identified by this study are described below.

Proximity of Swift Street to I-189 onramp

The Swift Street intersection to I-189 is one of the primary drivers of congestion on Shelburne Road and is also a High Crash Location. Swift Street and I-189 provide the only east-west access in South

Burlington north of Allen Road, which concentrates traffic at this location.

Options for widening Swift Street are limited due to right-of-way constraints. Also, widening would not address the issue of concentrating traffic to a single intersection near the interstate ramps. Extending the length of the left turn lane on Swift Street (R3), as proposed for the near-term/medium-term, will increase the efficiency of the intersection by providing additional storage and reducing queuing impacts to right turning vehicles.

Traffic operations approaching Swift Street would also be improved by extending the three lane segment on northbound Shelburne Road to begin further south - prior to the Queen City Park Road intersection - which would increase the throughput at that intersection and provide a longer segment for lane selection approaching I-189. Space constraints by existing developments near Queen City Park Road may preclude this option, as discussed in greater detail later.

Even with these two actions, the proximity of the intersection and offramp coupled with very high traffic volumes would continue to be problematic. Three major realignment concepts (Exhibit 3.15 A-C) have been identified that could considerably improve traffic operations on this segment:

- Grade separate the northbound onramp to I-189 under Swift Street (Concept A). The northbound onramp would diverge from Shelburne Road north of Queen City Park Road, and dip under Swift Street in a cut/tunnel section. To accommodate onramp traffic from Swift Street, the southbound onramp would be reconfigured so that traffic from Swift Street can travel straight through the Shelburne Road intersection and enter onramp. This would greatly improve traffic flow and improve the bicycling and pedestrian environment by grade-separating traffic bound for I-189, but would be the most costly approach.

Exhibit 3.15A: Long-term Realignment Concept A

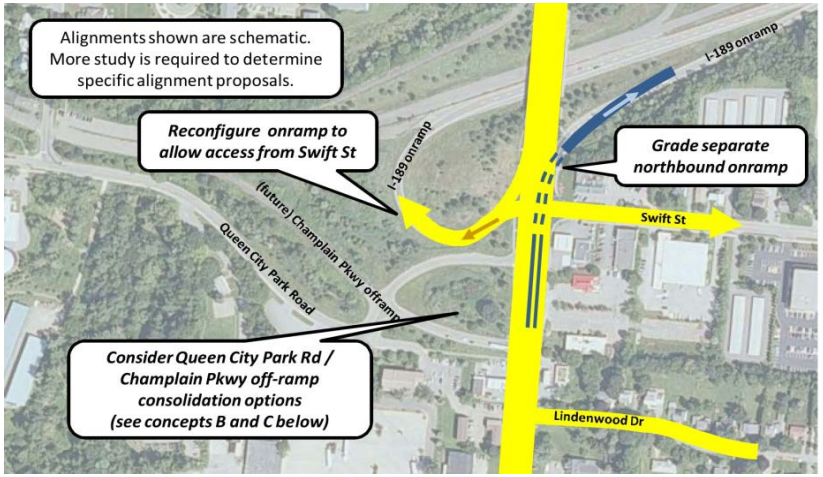


Exhibit 3.15B: Long-term Realignment Concept B

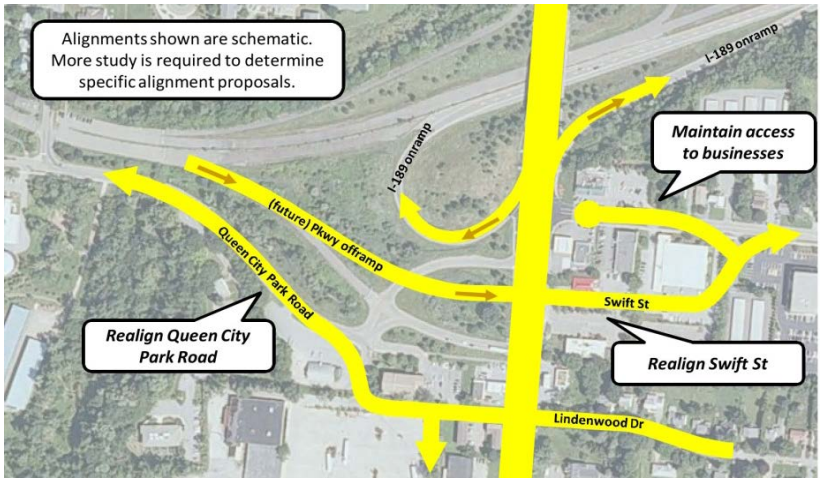
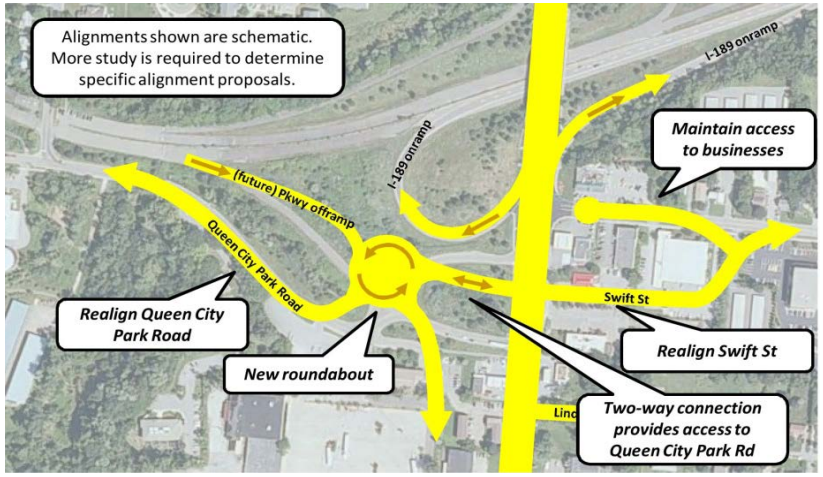


Exhibit 3.15C: Long-term Realignment Concept C



- Realign Swift Street to intersect Shelburne Road further to the south to improve intersection spacing (Concept B). Align with the new eastbound offramp from the Champlain Parkway to create a four-leg intersection. Both directions of Queen City Park Road would be consolidated to a single intersection further to the south (Possible at Lindenwood Drive).

- Similar to the previous concept, realign Swift Street to intersect Shelburne Road further to the south to improve intersection spacing (Concept C). Realign Queen City Park Road to the north to meet Swift Street at a four-leg intersection. The new eastbound offramp from the Champlain Parkway would intersect Queen City Park Road to the west of the corridor, possibly as a roundabout (rather than the scissor interchange currently proposed).

- Each of these concepts would involve major reconstruction of the north segment of Shelburne Road and intersecting roadways, which would be costly and could result in impacts to adjacent parcels and undeveloped areas. Nonetheless, their potential to address traffic flow, improve safety, and create opportunities to better incorporate bicycle and pedestrian improvements into the interchange area merits further consideration.

Junction of Queen City Park Road/new offramp from Champlain Parkway/Shelburne Road

As mentioned above, the spilt intersection of Queen City Park Road could be consolidated into a single intersection, either at its current location or relocated to the north or south to form 4-leg intersections with either Swift Street or Lindenwood Drive. This would reduce the number of intersections on the north segment of the corridor, as well as reduce crossing traffic movements. Further, consolidating and potentially relocating Queen City Park Road would create improved opportunities for incorporating the new eastbound offramp from I-189 into a corridor redesign, and could also allow for a more direct multiuse path connection.

Path crossing at Queen City Park Road

The proposed near-term/interim path crossing solution of implementing previously recommended improvements at Queen City Park Road (P3) would be inconsistent with the long-term corridor plan for bike lanes on either side of the roadway (rather than a single two-way segment on the east side of the roadway). There are several ways this could be addressed:

- Continue on-street bike lanes to Queen City Park Road, but also provide a widened multiuse path segment on the east side of Shelburne Road as proposed in the 2005 scoping study. The short path segment would allow path users to cross Shelburne Road and continue to Lindenwood Drive without interfering with on-street bike riders. This would require additional right-of-way to the east and involve taking currently developed parcels.
- A new multiuse path segment could be constructed linking Queen City Park Road to Lindenwood Drive on new right-of-way behind parcels fronting the east side of Shelburne Road. This would

provide a direct connection for the path and eliminate the need to ride for a short distance adjacent to Shelburne Road. Right-of-way would need to be acquired to provide this new link.

- The recommended approach is to relocate the multiuse path to meet Shelburne Road across from Lindenwood Drive, as proposed by near-term/medium-term action (P2a-b). As mentioned previously, a variation on the latter option would be to relocate Queen City Park Road to meet Shelburne Road across from Lindenwood Drive, and incorporate bike and pedestrian accommodations.

For any of these approaches, a two-stage turn accommodation would be necessary to allow northbound bicyclists to turn across traffic to access the path west of the corridor. This would involve creating a queue box for bicyclists to stop and wait for an opportunity to cross the corridor (Exhibit 3.16). The queue box should be protected from traffic and located between the through bike lane and adjacent sidewalk. The curb could be dropped to street level for the entire queue box area, allowing access for cyclists.

Exhibit 3.16: Examples Two-stage Bicycle Queue Box

Source: NACTO Urban Bikeway Design Guide, April 2011 Edition

Built Environment Constraints near Queen City Park Road

Existing development on either side of Shelburne Road immediately south of Queen City Park Road encroaches upon the apparent Shelburne Road right-of-way, constraining the effective width to slightly greater than 80 feet, rather than the full 99 foot right-of-way. Incorporating the proposed cross section through this segment would therefore require acquisition of one or both of these properties. A modified cross section that maintains sidewalks and bike lanes could potentially be provided within the available space by eliminating the center median (and prohibiting left turns) through this segment, coupled with other actions to relocate the Queen City Park Road intersection and adjacent path crossing.

If Queen City Park Road is maintained at its present location, extension of the third northbound lane beyond the intersection is recommended. This cross section (Exhibit 3.17) requires an additional eight feet of right of way, for a total of 107 feet. One or both parcels adjacent to the corridor on the south side of the intersection (two gas stations) would need to be acquired to provide sufficient room to accommodate the widened section. North of the existing Queen City Park Road intersection, land to the west of the corridor is undeveloped and owned by VTrans.

Relocation of Queen City Park Road to the north or south as described previously may eliminate the need to provide a third northbound lane through this constricted area, though provision of bike lanes and a center median alone would likely require some property acquisition.

Pedestrian and Bicycle System Continuity and Safety at the I-189 Ramps

Termination of proposed bicycle lanes could occur at one of two locations; the multiuse path crossing (either at its current Queen City Park Road location or relocated to Lindenwood Drive), or continuing across I-189 into Burlington.

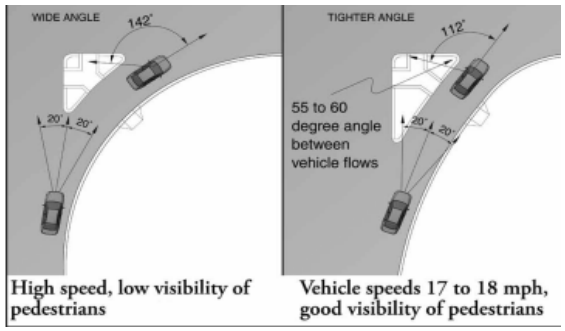
Terminating the proposed bicycle lanes at the multiuse path intersection (either at its present or relocated alignment) would provide a logical transition point to the regional path system, and

may be the preferred option should plans to continue bike lanes north of the study not materialize.

Continuing bicycle lanes across I-189 could be accomplished on the existing overpass through rechannelization of lane stripping to establish bike lanes. More problematic is improving the pedestrian and bicycle crossings of the onramps to I-189. These are particularly of concern northbound, where the dual right turn lane complicates bicycle maneuvers and the ramp design encourages motor vehicles to accelerate as they enter the ramp. Reconfiguring the northbound onramp as a single lane is not feasible due to the very high level of demand for this movement. Recommendations for improving the bicycle and pedestrian crossing therefore include:

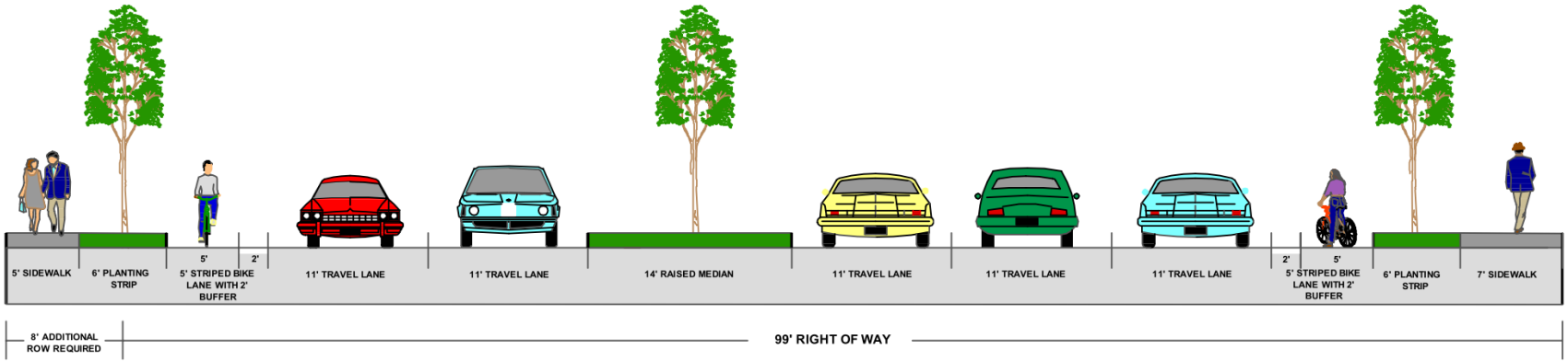
- Realign the off-ramp so that it curves less approaching the sidewalks, but then at a shaper angle after the crosswalk (Exhibit 3.18). This design will slow turning traffic and improve visibility of crossing pedestrians and bicyclists.
- Relocate the existing crosswalks closer to Shelburne Road, improve warning signs, and provide a widened sidewalk receiving area and bike lane on the opposite (north) side. Crossings should occur before vehicles turn the corner and start to accelerate onto I-189. A slight skew could be introduced to move the crosswalk closer to Shelburne Road while still providing a reasonable short crossing with good visibility.

Exhibit 3.18: Increase angle of on-ramps



Source: Designing Walkable Urban Thoroughfares: A Context Sensitive Approach, ITE/Congress for New Urbanism (2010)

Exhibit 3.17: Cross Sections with Three Northbound Lanes (between Queen City Park Road and Swift Street)



Next Steps

Implementation of a reconstructed corridor involves several steps, beginning with detailed scoping of the corridor and identification of funding to complete design and construction work. More detailed conceptual design of the corridor would occur during the scoping process, followed by preliminary and final design, right-of-way acquisition, and construction. The south and north corridor segments could advance separately or jointly, though it's likely that the south segment design could be finalized and ready for construction sooner than the north segment.

Implementation Matrix

Exhibit 3.19 summarizes the recommended elements of the Shelburne Road corridor study and describes important aspects associated with their implementation:

- Related actions: Other recommendations that should be implemented in conjunction with, or directly affect the implementation of, the recommended action.
- Alternative actions: Actions that could be implemented instead of the recommendation.
- Implementing agencies: Those agencies expected to have direct involvement in the implementation of an action. The expected lead agency is listed first.
- Comments and next steps: Summary important notes and identification of next steps in advancing the action.
- Potential funding sources: Lists the agency, or if known the specific funding source, that would most likely facilitate or procure funding for implementation of the action.

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Exhibit 3.19: Implementation Matrix

ID	Strategy	Implementation Details	Related Actions	Implementing Agencies [1]	Next Steps /Comments
Pedestrian Projects and Actions					
Pedestrian Improvement Program					
P1a	Additional crosswalks at signalized intersections	• Kmart Plaza/Brewer Pkwy (south leg) • Saturn Dr/Baldwin Ave (both legs)		SBur, VTrans, CCRPC	The City will work with the CCRC and VTrans to develop a Pedestrian Improvement Project that includes Strategies P1a - P1d and identify appropriate funding sources for the project such as Enhancement Grants, etc.
P1b	Pedestrian countdown timers	• All intersections (all crosswalks)		SBur, VTrans, CCRPC	
P1c	Leading pedestrian interval (LPI)	• Highest priority locations: o Holmes Rd/IDX Dr (north leg) o Proposed crosswalk at Kmart Plaza/Brewer Pkwy (south, west legs) o Hannaford Plaza (south, west legs) o Swift St (east leg) • Other locations: o Proposed crosswalks at Baldwin Ave (north, south legs) o Fayette Drive/McIntosh Ave (south, west legs) o Queen City Park Rd (if relocated to south leg)	P1d	SBur, VTrans, CCRPC	
P1d	Turn restrictions and regulatory signs	• Blank-out signs or No Right Turn on Red signs at locations with LPIs.	P1c	VTrans, SBur, CCRPC	
Lindenwood Path and Crossing Improvements					
P2a	New walkway/multiuse path segment connecting Kmart lot to Shelburne Rd	• Likely medium to longer-term. • Implement in support of T2b, or as an alternative to P3.	P2b, T2b	SBur, CCRPC	The *Shelburne Road/Queen City Park Road Crossing Scoping Study* (2005) should be updated to include and further

ID	Strategy	Implementation Details	Related Actions	Implementing Agencies [1]	Next Steps /Comments
P2b	Crosswalk and median refuge at Lindenwood Dr	• Implement in conjunction with P2a. • Alternative to P3. • Recommend inclusion of Ped Hybrid Beacon depending on outcome of VTrans' VT 15 pilot test (summer 2012).	P2a, T2b	VTrans, SBur, CCRPC	evaluate the Lindenwood crossing strategy.
Other Pedestrian Actions					
P3	Queen City Crossing Improvements	• Preferred alternative in 2005 Scoping Study. • Alternative to P2a-b.		VTrans, SBur, CCRPC	Could be implemented near-term or as part of a full corridor reconstruction.
P4	Crosswalk and median refuge at Imperial Dr	• Include pedestrian refuge in center median.		VTrans, SBur	

ID	Strategy	Implementation Details	Related Actions	Implementing Agencies [1]	Next Steps /Comments
Bicycle Projects and Actions					
Queen City Crossing Improvement Program					
P3	Queen City Crossing Improvements	• Described previously under pedestrian improvements.			
B1	Construct two-stage bicycle queue box at path crossing (east side)	NACTO Urban Bikeway Design Guide, April 2011 Edition	P2a-b,P3	VTrans, SBur	Location depends on whether P2a-b or P3 is implemented.
Lindenwood Path and Crossing Improvement Program					
P2a	New walkway/multiuse path segment connecting Kmart lot to Shelburne Rd	• Described previously under pedestrian improvements.			
P2b	Crosswalk and median refuge at Lindenwood Dr	• Described previously under pedestrian improvements.			
B1	Construct two-stage bicycle queue box at path crossing (east side)	• NACTO Urban Bikeway Design Guide, April 2011 Edition	P2a-b,P3	VTrans, SBur	Location depends on whether P2a-b or P3 is implemented.
Fayette Dr Bike Route					
B2a	On-street bike route on Fayette Dr	• Shelburne Road to Hannaford Dr • Bike route signs and “Sharrows”. • Connect to multiuse path near Queen City Park Rd by continuing on new roadway proposed for R2a.	R2a	SBur	The connection to the multiuse path near Queen City Park Rd is a longer-term strategy.
B2b	Study feasibility of multiuse path on Fayette Dr corridor	• East side of street appears to have better feasibility. • Long-term upgrade for B2a.		SBur, CCRPC	Initiate feasibility study.
B2c	Interim cycle track Imperial Dr to Fayette Dr	• Widen existing sidewalks to provide contiguous bicycle route connecting to B2a.		VTrans, SBur	Initiate scoping study following the implementation of B2a.

ID	Strategy	Implementation Details	Related Actions	Implementing Agencies [1]	Next Steps /Comments
Other Bicycle Actions					
B3	Signed Bike Routes in neighborhoods	• In Orchard neighborhood to direct bicyclists to Rec Path.		SBur	South Burlington Rec Path Committee to develop a plan.
B4	Connection between IDX Dr and Rec Path.	• Either as a new path segment or coordinated with proposed extension of IDX Dr (R2b). • Could instead link IDX Dr to Imperial Dr or other neighboring streets to provide this connection.	R2b	SBur, CCRPC	Initiate a scoping study.
B5	Revisit prior study of feasibility of regional shared rail/trail	• Champlain Path Feasibility Study (2004)		VTrans, CCRPC, Local Motion, Municipalities along the path and Vermont Railways	This is a regional, longer-term strategy. Convene a regional working group.
B6	Update street design standards to include bike lanes on all arterials and collector streets.	• Could be part of a broader "Complete Streets" ordinance.		SBur, CCRPC	Review and updated (as needed) the City's Street Design Standards.

ID	Strategy	Implementation Details	Related Actions	Implementing Agencies [1]	Next Steps /Comments
Roadway Projects and Actions					
Traffic Signal Upgrades					
R1a	Ongoing traffic signal timing program	• Continue ongoing efforts to update traffic signal timing periodically.		VTrans, SBur, CCRPC	
R1b	Video detection	• Will be implemented in summer 2012		VTrans	
R1c	Implement 120-second cycle length	• Needed to provide minimum pedestrian clearance at several intersections.		VTrans, SBur	VTrans should determine whether they will be implementing R1c-d.
R1d	Implement protected + permitted left turns on side streets	• Kmart Plaza (EB) • Hannaford Dr (EB)	R1c	VTrans, SBur	
R1e	Implement Adaptive Signal Control	• Requires new signal controller equipment. • Would use video detection (R1b) as input source • May not be fully effective until long-term upgrade of traffic signals to incorporate mast arms.	R1b	VTrans, SBur, CCRPC	Evaluate VTrans' pilot project outcomes at the VT 2A/VT 289 intersections in Essex. Develop a signal upgrade project for the Shelburne Road corridor north of IDX Dr.
T4	Implement transit signal priority.	• Upgrade traffic signal equipment to enable transit priority.		VTrans, CCTA	Evaluate results from the upcoming pilot project south of IDX Drive
Develop Street Grid					
R2a	New street connecting Hannaford Dr to Queen City Park Rd	• Could be implemented either with or in advance of redevelopment of site. • Include bike lanes.		SBur, CCRPC	Update Official Map to show location (through Kmart parking lot).
R2b	Extend IDX Dr to Spear St (Long Term)		B4	SBur, UVM	Currently on Official Map. Likely a longer-term project.

ID	Strategy	Implementation Details	Related Actions	Implementing Agencies [1]	Next Steps /Comments
R2c	Identify new street on Official Map from Fayette Dr south	• Identify route and add to Official Map.		SBur Planning Commission	
Other Roadway Actions					
R3	Extend left turn lane on Swift St	• Could be constructed in current ROW, but requires reconstructing south side sidewalk.		SBur	
R4	Speed study to assess potential for 30 mph limit	• Most likely applicable north of Baldwin Ave.		SBur, VTrans	South Burlington City Council would need to initiate a request to VTrans.
Long-term Corridor Reconstruction					
R5	Southern corridor segment reconstruction	• Holmes Rd/IDX Dr to Queen City Park Rd. • See detail recommendations under the *Long-term Corridor Reconstruction* section of this report		CCRPC, VTrans, SBur	Scoping of the southern segment. Likely to advance to construction more quickly than northern segment.
R6	Northern corridor segment reconstruction	• Lindenwood Dr to I-189 ramps. • Depends on Champlain Parkway's design. • See options/recommendations under the *Long-term Corridor Reconstruction* section of this report		CCRPC, VTrans, SBur	Scoping of the northern segment. Coordinated with Champlain Parkway project.

ID	Strategy	Implementation Details	Related Actions	Implementing Agencies [1]	Next Steps /Comments
Transit Projects and Actions					
Transit Service Improvements					
T1	15-minute peak period headways on Rt 6.	• Both AM and PM Peak Travel Times		CCTA, CCRPC	Identify funding.
Access to Transit Improvements					
T2a	Establish satellite station in the vicinity of the Farrell St/Home Ave intersection.	• Outside of study area. • Coordinate with City of Burlington. • The *TDM/Go Chittenden County* team is currently working on a multimodal facility at this location.		TDM/Go Chittenden County Team	The *TDM/Go Chittenden County* team will be implementing this strategy.
T2b	Formalize commuter parking in Kmart lot.	• Primarily for rideshare, but could provide access to buses if implemented with P2a and P2b.	P2a-b	SBur, CCRPC, CCTA, VTrans	
T2c	Establish park and ride lots south of the study area.	• Investigate lease-lot opportunities for use of existing under-utilized parking lots. • Capture auto trips south of the study area.		CCRPC, local towns, VTrans	Review the 2011 *Chittenden County Park-and-Ride & Intercept Facility Plan* recommendations
Other Transit Actions					
T3	Construct additional bus shelters.	• Kmart Plaza/Brewer Pkwy or Hannaford Dr/Laurel Hill Dr (both dir) • Saturn Way/Baldwin Ave (southbound) • Holmes Rd/IDX Dr (southbound) • Imperial Dr (southbound) if pedestrian crossing constructed (P4). • Need to be re-locatable or deferred until long-term reconstruction of Shelburne Rd.	P4, P2b	CCTA, SBur	Identify funding.

ID	Strategy	Implementation Details	Related Actions	Implementing Agencies [1]	Next Steps /Comments
T4	Implement transit signal priority.	• Upgrade traffic signal equipment to enable priority.		VTrans, CCTA	Evaluate results from the upcoming pilot project south of IDX Drive
T5	Study feasibility of new connector route linking southern and eastern portions of South Burlington	• Route along I-189 or Swift St • Possibly serve Dorset St, Williston Rd and Burlington Airport.		CCTA, CCRPC, SBur	Initiate feasibility study.
T6	Support regional transit and travel demand initiatives (expanded service, reduced headways, P&R lots).			CCTA, CCRPC, VTrans, SBur	
Land Use Projects and Actions					
LU1	Incorporate access management in dev regs	• Review and modify zoning regs and proactive during development review process.	LU2	SBur,	
LU2	Land Use Master Plan incorporating form-based zoning	• Use to establish focal point(s) with desired character. Could include LU1 and LU3 as a single, coordinated effort.	LU1, LU3	SBur	
LU3	Develop design guidelines for the Shelburne Road Corridor	• Geared toward future development, but may also include streetscape recommendations.	LU2	SBur, VTrans, CCRPC	
Other Actions					
O1	Enhanced maintenance program	• More frequent re-painting of lane markings, street sweeping, etc.		SBur, VTrans	

[1] Lead implementing agency listed first.

Appendix A: Public Outreach

Appendix B: Traffic Operations Analysis