Technical Assistance Report

US Route 7/Ferry Road Pedestrian Crossing Feasibility Study

December 2014

Prepared for:

CCRPC
Town of Charlotte, Vermont

Prepared by:

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About this Report

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Introduction

The following has been prepared to explore alternatives and develop recommendations to improve pedestrian safety at the intersection of US Route 7, Ferry Road and Church Hill Road in Charlotte, particularly for those crossing US Route 7 to travel between Charlotte’s West Village and the CCTA stop in the southeast quadrant of the intersection.

Existing Conditions

The intersection of US Route 7 and Ferry Road lies just east of the West Charlotte Village area, about 13 miles south of Burlington and 12 miles north of Vergennes. US Route 7 carries high volumes (11,200) of traffic north and south, while Ferry Road runs through the town of Charlotte past several important buildings including the town offices, town library, post office, fire department, and village store before terminating at a ferry crossing to New York State. A base map on the following page shows the project area.

Transit Services

The transit stop, located on the southeast corner of the intersection of US Route 7/Ferry Road/Church Hill Road (see following page) is serviced by a partnership between the Chittenden County Transportation Authority (CCTA) from Monday through Friday and the Addison County Transit Resources (ACTR) on Saturdays. The stop is part of the Burlington-Middlebury LINK Express Commuter Route. From Monday through Friday, buses from Middlebury to Burlington make two morning stops, and stop by request in the afternoon and evening. From Burlington to Middlebury, buses do not stop in the morning and will stop in the afternoon by request. On Saturdays, there are four stops over the course of the day in each direction.
Study Area Map
Roadway Network
US Route 7 is a principal arterial, and is the primary north-south travel route along the west side of Vermont. In this area, the average annual daily traffic (AADT) is 11,200 vehicles per day. Ferry Road and Church Hill Road are classified as major collectors, under jurisdiction of the Town of Charlotte. The AADT on Church Hill Road is 1,900 and is 3,100 on Ferry Road east of Greenbush Road, and 1,700 west of Greenbush Road.

At its intersection with Ferry Road and Church Hill Road, the US Route 7 northbound approach has two lanes: a dedicated left turn lane (525 feet long) and a shared through/right turn lane. The US Route 7 southbound approach has a dedicated right turn lane (200 feet long) and a shared through/left turn lane. Ferry Road and Church Hill Road both have one-lane approaches. The posted speed limit on US Route 7 is 50mph, while Ferry Road and Church Hill Road have posted speed limits of 25mph and 35mph, respectively.

US Route 7 is about 56 feet wide on either side of the intersection, and Church Hill Road’s width varies somewhat, but is typically about 30 feet wide. The width of Ferry Road also varies slightly through the study area, but is typically 26 feet wide, with 11 foot travel lanes and two foot shoulders as shown in the cross section below.

Existing Cross Section of Ferry Road

The publicly owned right-of-way for Ferry Road and Church Hill Road is four rods wide (66 feet). US Route 7 has a 132 feet right-of-way north of the intersection, and 102 feet wide south of the intersection. The approximate right-of-way limits are shown on the base map on the following page.
Intersection Existing Conditions
Traffic and Pedestrian Volumes
Traffic counts were conducted on September 21st, 2012. The graph below shows the traffic count on each intersection approach. There is a morning peak of traffic from 7:00 to 8:00 AM, and an afternoon peak from 5:00 to 6:00 PM.

Hourly Traffic Volumes by Approach

In order to analyze the intersection operations, the count data was adjusted using the nearby continuous counter P6D132, on US Route 7 in Charlotte, to reflect the average weekday morning peak hour, and the 2013 Design Hour Volume (DHV), which is typically an afternoon peak hour. The DHV is traffic volume during the 30th highest hour of the year, and is used for traffic analysis and design. The adjusted 2013 AM peak hour and DHV turning movements at the intersection are shown below.
Pedestrians were not counted in the 2012 count, but data is available from a CCRPC count conducted from 7:00 AM to 7:00 PM on July 2nd, 2008. Results are summarized in the graphs below showing hourly crossings over Route 7.

### Route 7 Crossings by Hour

![Graph showing pedestrian crossings by hour]

Truck traffic was also recorded at the intersection in the 2012 count, and summarized below. Medium trucks are single unit vehicles with 6 or more tires and include delivery vehicles and dump trucks, for example. Heavy trucks include all tractor trailers, and any other trucks with 3 or more axles.

<table>
<thead>
<tr>
<th>Approach</th>
<th>Truck Volumes (12 hour)</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>US Route 7 from Shelburne-Southbound</td>
<td>278, 282, 560</td>
<td>13.3%</td>
</tr>
<tr>
<td>Church Hill Rd from Hinesburg-Westbound</td>
<td>48, 12, 60</td>
<td>7.1%</td>
</tr>
<tr>
<td>US Route 7 from Ferrisburg-Northbound</td>
<td>325, 279, 604</td>
<td>13.2%</td>
</tr>
<tr>
<td>Ferry Rd from Wings Point Rd-Eastbound</td>
<td>61, 4, 65</td>
<td>4.5%</td>
</tr>
</tbody>
</table>

US Route 7 has high truck volumes, evidence of its role as a principal arterial and freight corridor through western Vermont. The numbers of heavy trucks on Ferry and Church Hill Roads are low, with few tractor trailers using these routes.

### Safety

The intersection of US Route 7 and Ferry Road has been determined by VTrans to be a High Crash Location (HCL), based on the crash rate over the most recent five years for which data is available (2008 through 2012). In that period, there were 24 crashes in the vicinity of the intersection, 8 of which resulted in injuries, and 16 with property damage only. VTrans provides the crash locations to the nearest 0.01 mile post along the roadway. The following page shows the crash locations and types of crashes.
Crash Diagram (Source: VTrans 2008-2012)
Many of these crashes are characteristic of conflicts between waiting left turns and oncoming through movements (rear ends, same direction sideswipes), and vehicles making left turns with an inadequate gap or visibility (left turn/through angle broadside). Isolated signalized intersections on high speed rural corridors can seem out of context and unexpected to drivers, and it is not unusual for them to be high crash locations. The visibility of the Route 7/Ferry Rd. traffic signal is diminished because it lies in a “sag” point of the roadway, such that the signal can be obscured by the background landscape (see Google Earth Street View photo, below). Improved advanced notification signage from the south, such as a flashing beacon, could be helpful in alerting approaching traffic.

![Google Earth Street View photo](image)

**Operations**

The signal at US Route 7 and Ferry Road is actuated, meaning it will not change for eastbound and westbound traffic unless triggered by an approaching vehicle. The northbound and southbound green phase increases during the PM peak hour in order to accommodate for the increase in vehicular traffic. The signal cycle includes a 4 second yellow phase and 4 seconds of all red clearance.

A Level of Service (LOS) analysis was conducted for the morning and afternoon peak hour. LOS is a qualitative measure of intersection performance that is reported on a scale of A through F. LOS for signalized intersections is the weighted average vehicle delay for all approaches. The table below shows the delay associated with each letter grade for LOS.

<table>
<thead>
<tr>
<th>LOS</th>
<th>Signalized Intersection Delay</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>≤10 sec</td>
<td>Free flow traffic</td>
</tr>
<tr>
<td>B</td>
<td>10-20 sec</td>
<td>Nearly free flow traffic</td>
</tr>
<tr>
<td>C</td>
<td>20-35 sec</td>
<td>Stable, uncongested traffic flow</td>
</tr>
<tr>
<td>D</td>
<td>35-55 sec</td>
<td>Approaching congested flow, nearing capacity</td>
</tr>
<tr>
<td>E</td>
<td>55-80 sec</td>
<td>Unstable congested traffic flow, operating at capacity</td>
</tr>
<tr>
<td>F</td>
<td>≥80 sec</td>
<td>Severe traffic congestion, forced flow, overcapacity</td>
</tr>
</tbody>
</table>
The LOS was analyzed for the AM and PM peak hour conditions of the intersection. Results are summarized in the table below.

### 2013 Design Hour Level of Service Analysis Results

<table>
<thead>
<tr>
<th></th>
<th>LOS</th>
<th>Delay</th>
<th>V/C</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM Peak</td>
<td>B</td>
<td>18.5</td>
<td>0.76</td>
</tr>
<tr>
<td>PM Peak</td>
<td>B</td>
<td>17.3</td>
<td>0.74</td>
</tr>
</tbody>
</table>

The intersection levels of service meet the VTrans LOS guidelines to maintain LOS “C” or better during the peak hours.

**Charlotte Town Plan – 2013**

The Charlotte Town Plan contains several initiatives to improve the area’s bicycle and pedestrian safety and to establish multi-modal connections to existing and future infrastructure, particularly the intersection of US Route 7 and Ferry Road. The Plan states that pedestrian and bicycle safety will be given “special attention” at this intersection, and alterations should include provisions for bicycles and pedestrians such as wide shoulders on local roads. The Plan also promotes the establishment of park and ride lots in West Charlotte and East Charlotte Village, and explores strategies for safe pedestrian crossings between Ferry Road and Church Hill Road.

> p. 112
> 6. Improvements to the intersection of US Route 7 and F5 are the responsibility of the State of Vermont. Though major improvements have been implemented, the Town, with the help of the State, will monitor this intersection to ensure that safety problems are rectified. In addition, the Town will control land development in the vicinity to minimize traffic congestion and safety problems at this location. Pedestrian and bicycle safety will be given special attention when improvements are considered for this intersection.

> p. 113
> 8. Wide shoulders (for bicycles and pedestrians) will be incorporated in major improvements to Class 2 highways in the Town, and improvements to Class 3 highways shall also accommodate bicycles and pedestrians.

> 14. The Town is encouraging moderate densities and mixed uses in the two villages. This development pattern should promote the potential for pedestrian and bicycle access between homes, commercial services, and current or prospective public transportation services, including bus, rail, or other public service.

> p. 114
> 5. The Town will improve pedestrian, bicycle and auto traffic safety throughout the Town, with specific attention in the West Village on Greenbush Road and Ferry Road. In the next year, accommodations for pedestrians will be made along Ferry Road between the Library and Greenbush Road.

> 6. The Town will explore the creation of park and ride lots in the West Charlotte and East Charlotte villages; these may also serve as transit stops.

> 8. The Town will explore tunnels under US Route 7 or other safe pedestrian crossings between Ferry Road and Church Hill Road, and between the former Galbreath property and the Scenic Overlook/Charlotte Park and Wildlife Refuge.
**Purpose and Need**

The purpose of this project is to provide safe pedestrian access between Charlotte’s West Village and the CCTA Transit Stop located at the southeast quadrant of the intersection of US Route 7 and Ferry Road.

The need exists because most of the residents of Charlotte’s West Village are within one half mile walk of the CCTA transit service, but barriers to walking include a lack of a crossing of US Route 7, and lack of pedestrian facilities along Ferry Road.

**Pedestrian Crossing Alternatives**

The following options for providing a crossing of US Route 7 have been considered.

**Bridge or tunnel** – The concept of a grade separated pedestrian crossing of US Route 7 in the vicinity of Ferry Road is mentioned in Charlotte’s 2013 Town Plan. This option would be extremely expensive and have significant right-of-way and environmental impacts. Therefore, a thorough evaluation of at-grade crossing alternatives is warranted before further consideration of grade-separated options.

**Crosswalk and pedestrian signal** – A crosswalk immediately south of the intersection of US Route 7 and Ferry Road could provide a substantially safer condition for pedestrians accessing the CCTA transit stop, as pedestrians would have sufficient time to cross with appropriate signalization. It would also provide the most direct connection from Charlotte’s West Village to the CCTA stop. This alternative would include a marked crosswalk over US Route 7, and push button-activated pedestrian countdown signals at the end of each crosswalk. The crosswalk would also include features such as audible and tactile signals to comply with the Americans with Disabilities Act (ADA).

Two variations on this alternative are presented below, and primarily differ on how pedestrians waiting to cross are accommodated.

A) **Pedestrian shoulders.** There is sufficient shoulder width of at least 5 feet in width in the vicinity of the intersection for pedestrians to wait to cross. Additional width for pedestrians could be provided by reducing the corner radius of the pavement markings to a 40 feet radius.

B) **Sidewalk.** A small section of sidewalk can be constructed at the southwest corner of the intersection, and from the southeast corner to the Church Hill entrance of the corner property.

These are schematically illustrated on the following page.
Alternative A: Pedestrian Crossing on Shoulder

Alternative B: Pedestrian Crossing on Sidewalk
Traffic Impact Analysis
Providing a signalized pedestrian crossing at this intersection will affect the traffic operations. The impact on the intersection level of service has been evaluated with the following assumptions:

- Crossing distance of US Route 7 is 70 feet, which takes 20 seconds of crossing time at 3.5 feet per second.
- Three options for the signal operations are evaluated:
  - The crossing could be concurrent with the east-west signal phase,
  - a leading pedestrian interval (i.e. pedestrians get a 5 second “head start” in crossing) or
  - an exclusive pedestrian phase (i.e. all red signal for traffic while pedestrians cross).
- For purposes of this analysis, it was assumed that the pedestrian signal was actuated for 10 crossings during the peak hour. This is substantially more pedestrians than currently cross at this location, and represents an “aspirational” scenario with growth in pedestrian activity and transit ridership.

Providing a pedestrian signal has the potential to affect the intersection LOS, as it will affect signal timing requirements. There are two options for the pedestrian signal to operate: concurrently with the east-west green phase, or as an exclusive pedestrian phase, i.e. all traffic stops during the pedestrian phase. These options were both evaluated for their effect on the intersection LOS during the morning and afternoon peak hours, and the following table summarizes the results.

### Level of Service Analysis Results

<table>
<thead>
<tr>
<th>Scenario</th>
<th>LOS</th>
<th>Delay (sec)</th>
<th>V/C*</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM Peak -Existing</td>
<td>B</td>
<td>18.5</td>
<td>0.75</td>
</tr>
<tr>
<td>AM Peak with Concurrent Pedestrian Phase</td>
<td>B</td>
<td>18.9</td>
<td>0.76</td>
</tr>
<tr>
<td>AM Peak with Leading Pedestrian Interval</td>
<td>B</td>
<td>19.0</td>
<td>0.77</td>
</tr>
<tr>
<td>AM Peak with Exclusive Pedestrian Phase</td>
<td>C</td>
<td>27.4</td>
<td>0.78</td>
</tr>
<tr>
<td>PM Peak - Existing</td>
<td>B</td>
<td>17.3</td>
<td>0.74</td>
</tr>
<tr>
<td>PM Peak with Concurrent Pedestrian Phase</td>
<td>B</td>
<td>18.1</td>
<td>0.75</td>
</tr>
<tr>
<td>PM Peak with Leading Pedestrian Interval</td>
<td>B</td>
<td>18.3</td>
<td>0.76</td>
</tr>
<tr>
<td>PM Peak with Exclusive Pedestrian Phase</td>
<td>C</td>
<td>23.8</td>
<td>0.76</td>
</tr>
</tbody>
</table>

* Volume to Capacity Ratio

The change to vehicular levels of service is negligible with a concurrent pedestrian phase or leading pedestrian interval. An exclusive pedestrian phase will result in a more noticeable change in this analysis scenario, although LOS will remain well within acceptable levels, and will provide a safer condition for pedestrians as there will be no potentially conflicting turning traffic. VTrans consultation will be required to determine which of these options is feasible to implement with the available signal controller equipment.
Environmental Impacts
There is potential for wetlands impacts from the construction of the sidewalk in Alternative B. The wetland in the southwest corner of the intersection will likely be considered a Class 2 wetland, as it is hydrologically connected with a wetland on the Vermont Significant Wetland Inventory. Therefore, a wetlands general permit would be required for construction in the buffer area. It is unlikely that this option would result in direct impacts to the wetland.

Cost Estimate
Cost estimates for each alternative are presented below.

**Alternative A: Pedestrian Shoulder Crossing Cost Estimate**

<table>
<thead>
<tr>
<th>Item#</th>
<th>Description</th>
<th>Quantity</th>
<th>Unit</th>
<th>Unit Cost</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>900.620</td>
<td>Countdown Pedestrian Signals</td>
<td>2</td>
<td>each</td>
<td>$10,000.00</td>
<td>$20,000.00</td>
</tr>
<tr>
<td>646.466</td>
<td>Durable Recessed 8 inch white line</td>
<td>160</td>
<td>feet</td>
<td>$1.50</td>
<td>$240.00</td>
</tr>
<tr>
<td>900.620</td>
<td>Modifying traffic signal</td>
<td>1</td>
<td>each</td>
<td>$5,000.00</td>
<td>$5,000.00</td>
</tr>
<tr>
<td>606.504</td>
<td>Durable Crosswalk Marking-US Route 7</td>
<td>70</td>
<td>feet</td>
<td>$8.00</td>
<td>$560.00</td>
</tr>
<tr>
<td>-</td>
<td>Mobilization</td>
<td>1</td>
<td>each</td>
<td>$2,000.00</td>
<td>$2,000.00</td>
</tr>
</tbody>
</table>

Total Construction: $27,800.00
Contingency (20%): $5,600.00
Design, Management, Inspection (25%): $8,400.00
Grand Total: $41,800.00

**Alternative B: Sidewalk and Crossing Cost Estimate**

<table>
<thead>
<tr>
<th>Item#</th>
<th>Description</th>
<th>Quantity</th>
<th>Unit</th>
<th>Unit Cost</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>900.620</td>
<td>Countdown Pedestrian Signals</td>
<td>2</td>
<td>each</td>
<td>$10,000.00</td>
<td>$20,000.00</td>
</tr>
<tr>
<td>616.21</td>
<td>Vertical Granite Curb</td>
<td>50</td>
<td>feet</td>
<td>$50.00</td>
<td>$2,500.00</td>
</tr>
<tr>
<td>618.10</td>
<td>Concrete Sidewalk</td>
<td>100</td>
<td>sq yds</td>
<td>$75.00</td>
<td>$7,500.00</td>
</tr>
<tr>
<td>203.30</td>
<td>Earth Borrow</td>
<td>20</td>
<td>cu yds</td>
<td>$12.00</td>
<td>$240.00</td>
</tr>
<tr>
<td>301.15</td>
<td>Gravel Sub-base</td>
<td>25</td>
<td>cu yds</td>
<td>$30.00</td>
<td>$750.00</td>
</tr>
<tr>
<td>203.35</td>
<td>Gravel Backfill for Slope Stabilization</td>
<td>20</td>
<td>cu yds</td>
<td>$15.00</td>
<td>$300.00</td>
</tr>
<tr>
<td>900.620</td>
<td>Modifying traffic signal</td>
<td>1</td>
<td>each</td>
<td>$5,000.00</td>
<td>$5,000.00</td>
</tr>
<tr>
<td>606.504</td>
<td>Durable Crosswalk Marking-US Route 7</td>
<td>70</td>
<td>feet</td>
<td>$8.00</td>
<td>$560.00</td>
</tr>
<tr>
<td>-</td>
<td>Landscaping Allowance</td>
<td>1</td>
<td>each</td>
<td>$250.00</td>
<td>$250.00</td>
</tr>
<tr>
<td>-</td>
<td>Mobilization</td>
<td>1</td>
<td>each</td>
<td>$2,000.00</td>
<td>$2,000.00</td>
</tr>
</tbody>
</table>

Total Construction: $39,100.00
Contingency (20%): $7,900.00
Design, Management, Inspection (25%): $11,800.00
Grand Total: $58,800.00
Alternatives Summary
The two alternatives are compared in the table below.

<table>
<thead>
<tr>
<th>Pedestrian Access and Safety</th>
<th>Alternative A: Shoulders</th>
<th>Alternative B: Sidewalk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor-Moderate: Shoulders do not provide separation from traffic.</td>
<td>Good: Sidewalk at corner provides safer area for pedestrians to wait while crossing.</td>
<td></td>
</tr>
<tr>
<td>Environmental Impact</td>
<td>None: project is entirely on existing pavement.</td>
<td>Possible: Impact to wetlands buffer area; conditional use permit will likely be required.</td>
</tr>
<tr>
<td>Cost</td>
<td>$41,800</td>
<td>$58,800</td>
</tr>
</tbody>
</table>

Alternative B is recommended for its improved safety for pedestrians.

**Ferry Road Pedestrian Alternatives**
Pedestrian travel should also be accommodated along Ferry Road. The Town has been considering sidewalks in the West Village area, and conducted a scoping study in 2007. However, the project has not advanced since then. Two options to improve pedestrian safety and access along Ferry Road are described below. In the short term, Ferry Road could be re-striped to provide additional space for pedestrians on the shoulders. In the longer term, alternatives include the construction of a sidewalk, as described in the 2007 scoping study.

**Expand Pedestrian Shoulder/Remove Centerline**
Currently, a narrow paved shoulder is available. The travel lanes along Ferry Road are typically 11 feet, and the paved shoulders are 2 feet wide. The following guidance is provided in the Vermont State Design Standards for urban collectors, which is intended to apply in village areas like Charlotte’s West Village:

**5.5 Lane and Shoulder Widths for Urban Collectors**
On urban and village Collectors, lane widths may vary from 9 to 11 feet, and there should be appropriate offsets to curb. The 9-foot widths are appropriate in highly restricted areas having little or no truck traffic. The 11-foot lane widths are generally used on all higher speed, free-flowing Collectors. Lane and shoulder widths within Historic Districts should be compatible with the historic character of the District.

Shoulders are desirable on urban and village Collectors, and should be provided where feasible to facilitate maneuvering space for immobilized vehicles, safety for the pedestrian in areas where sidewalks are not provided, safe accommodation of bicycles, speed-change lanes for vehicles turning into driveways, and storage space for plowed snow. Despite these advantages, the width of shoulders in urban and village areas may be restricted because of available right-of-way, adjacent development and other constraints.

The Town can consider re-striping Ferry Road to have narrower 10 foot lanes which will provide additional shoulder width for pedestrians. The narrower lanes can also have speed-reducing effect, further increasing the safety and comfort of pedestrians.
As additional measure to help reduce travel speeds is to remove the roadway centerline on Ferry Road. This has been found to be effective at reducing speeds, and may contribute to a higher level of driver attention, thereby increasing safety. Research in the United Kingdom has found that removing the roadway centerline on narrow rural roads, combined with providing wider shoulder areas for biking and walking, has resulted in reduced speeds and reduced crashes. According to the Manual for the Uniform Traffic Control Devices (MUTCD), a centerline is required for roads with volumes of greater than 6,000 AADT, and recommended for urban collectors with an AADT greater than 4,000. The AADT on Ferry Road was 3,100 in 2011. Attached to this report are excerpts from the MUTCD that provide guidance. The following figure shows the dimensions proposed for consideration on Ferry Road.

**Alternative Cross Section for Ferry Road**

![Alternative Cross Section for Ferry Road](image)

**Bicycle Advisory Lanes/ Suggestion Lanes**

This technique has been widely used in Europe, especially the UK and Netherlands, to improve conditions for bicycling and walking on low volume narrow rural roads and residential streets. Research conducted on this technique has found that both speeds and crashes were reduced on several rural roads in Wiltshire, UK (see attached report). In addition, the observations showed that without centerlines, drivers provided more room for pedestrians or cyclists on the edge of the road. The following photos show typical treatments in the UK, and a before/after example on a road that is substantially narrower than Ferry Road.
Example of Advisory Bike Lanes
Wiltshire, UK

Transition to centerline striping where sight distance is limited

Before condition (Wiltshire, UK)

After: Advisory Bike Lanes

This technique may not be consistent with the MUTCD depending on specifics of the application. Several jurisdictions in Minnesota are currently testing and evaluating bicycle advisory lanes. Thus far, successful experiments have been conducted in Edina, Richfield and Minneapolis. This treatment may eventually be included in the MUTCD, but further experiments would be helpful to document their effectiveness.

Ferry Road may be an ideal candidate site to test and evaluate bicycle advisory lanes due to its straight alignment, excellent sight distance, moderate volume, and community interest in improving the village for walking and bicycling. Greenbush Road may also be appropriate to consider for the same reasons. More information on the MUTCD experimentation is attached.

The cross section shown below could be considered for bicycle advisory lanes on Ferry Road. This shows optional colored pavement on the bicycle lanes, and illustrates the yielding behavior that vehicles use to pass opposing traffic.
Potential Cross Section of Bicycle Advisory Lanes on Ferry Road

Sidewalk
The Town has considered a sidewalk along Ferry Road, based on a study conducted by D&K in 2007, which provides sufficient technical information for an application for state or federal funding. More recently, further planning and design work has been considered. The project cost estimates should be updated to reflect current year construction costs before applying for funding. The graphic below shows the proposed extent of the village sidewalk network included in that study.

Conceptual Alignment from the 2007 Scoping Study
Ferry Road Alternatives Analysis
In the short term, restriping of Ferry Road to provide wider shoulders could substantially improve accessibility and safety for bicyclists and pedestrians. The cost will depend on the desired durability of the markings, and could range from $1,500 to $8,000. Lower durability markings will be less expensive initially, but will require more frequent repainting.

In the long term, a sidewalk network through Charlotte’s West Village is recommended. A cost estimate of $195,000 was provided in the 2007 Scoping report. This estimate can be updated to current year costs, and should be amended to include engineering, local project management, and construction inspection.

Recommendations
Final recommendations will be developed after public meetings, review by the Town and CCRPC, and consultation with VTrans.

Complete Streets Reporting
The CCRPC, in collaboration with its member municipalities, state and local partners, have historically taken a multimodal approach to transportation planning. The Vermont Legislature sought to further encourage these best practices with the passing of Complete Streets Legislation (Act 34) which became effective on July 1, 2011. Its purpose is to ensure the needs of all transportation users, regardless of their age, ability or preferred mode of transportation, be considered in all transportation projects. By developing a range of alternatives that would improve conditions for walkers and bikers, this project is in compliance with the complete streets legislation. A Complete Streets reporting form is provided as an attachment.

Attachments
- Complete Streets Reporting Form
- MUTCD Excerpts
- Roadway Centerline Removal Information
- Advisory Bicycle Lanes Information
**MUTCD Excerpts**

The following are excerpts from the Manual on Uniform Traffic Control Devices (MUTCD), 2009, and pertain to the use of center lines and edge lines.

Page 349:

**Standard:**

09 Center line markings shall be placed on all paved urban arterials and collectors that have a traveled way of 20 feet or more in width and an ADT of 6,000 vehicles per day or greater. Center line markings shall also be placed on all paved two-way streets or highways that have three or more lanes for moving motor vehicle traffic.

**Guidance:**

10 Center line markings should be placed on paved urban arterials and collectors that have a traveled way of 20 feet or more in width and an ADT of 4,000 vehicles per day or greater. Center line markings should also be placed on all rural arterials and collectors that have a traveled way of 18 feet or more in width and an ADT of 3,000 vehicles per day or greater. Center line markings should also be placed on other traveled ways where an engineering study indicates such a need.

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**Section 3B.07 Warrants for Use of Edge Lines**

**Standard:**

01 Edge line markings shall be placed on paved streets or highways with the following characteristics:

A. Freeways,
B. Expressways, and
C. Rural arterials with a traveled way of 20 feet or more in width and an ADT of 6,000 vehicles per day or greater.

**Guidance:**

02 Edge line markings should be placed on paved streets or highways with the following characteristics:

A. Rural arterials and collectors with a traveled way of 20 feet or more in width and an ADT of 3,000 vehicles per day or greater.

B. At other paved streets and highways where an engineering study indicates a need for edge line markings.

03 Edge line markings should not be placed where an engineering study or engineering judgment indicates that providing them is likely to decrease safety.

**Option:**

04 Edge line markings may be placed on streets and highways with or without center line markings.

05 Edge line markings may be excluded, based on engineering judgment, for reasons such as if the traveled way edges are delineated by curbs, parking, or other markings.

06 If a bicycle lane is marked on the outside portion of the traveled way, the edge line that would mark the outside edge of the bicycle lane may be omitted.

07 Edge line markings may be used where edge delineation is desirable to minimize unnecessary driving on paved shoulders or on refuge areas that have lesser structural pavement strength than the adjacent roadway.

**Option:**

03 Center line markings may be placed on highways with or without edge line markings.

More information on MUTCD experiments can be found at:

http://www.fhwa.dot.gov/environment/bicycle_pedestrian/guidance/design_guidance/mutcd_bike.cfm

http://mutcd.fhwa.dot.gov/reqdetails.asp?id=1197
Roadway Centerline Removal

The following text discusses benefits of removing the road centerline as a traffic calming feature, from the Alameda County Public Works Department:

Removing the roadway centerline striping "softens" the appearance of a roadway, altering motorist perception, and creating a more residential and local visual character for the roadway. With the elimination of centerline delineation, motorists tend to drive closer to the center of the roadway, sharing lanes with opposing traffic and creating roadside area for pedestrians and on-street parking.

Typically, centerline striping is installed on roadways with horizontal and vertical curves in order to separate motorists to improve traffic safety. Unfortunately, striping provides motorists with a sense of security of the travel lane, as well as, delineates major travel thoroughfares for those looking for "shortcuts."

By removing centerlines where not needed for safety, several neighborhood benefits may be achieved:

- Eliminates roadway visual identification as a bypass routes
- Creates the appearance of a minor residential roadway
- Allows motorists to drive towards the center of the roadway
- Reduces the potential for hit-parked-vehicle type collisions thereby encouraging residents to park on the roadway and not on the sidewalk area providing improved access and safety for pedestrians
- Typically reduces motorist speeds by eliminating clearly defined travel lanes, creating a shared roadway

Centerlines will remain where necessary to guide motorists around horizontal or vertical curves. While this traffic calming measure may lose its effectiveness to everyday users over time, its impact should be effective on occasional users.

IMPLEMENTATION GUIDELINES

The County is currently implementing this measure as a part of the on-going pavement maintenance program (slurry seal, chip seal, overlay, and reconstruction projects.) Rather than removing striping for specific roadways, it may be better to wait for a pavement rehab project or reschedule pavement rehab to include the subject roadway

For more information:  http://www.acgov.org/pwa/programs/traffic/measures.htm#1A

Advisory Bicycle Lanes Information

The following pages include:

- a memorandum reporting on a research trial of bicycle advisory lanes from Wiltshire, UK. http://www.bikewalk.org/2006conference/vconference/presentations/TomBertulis2.doc
- a technical analysis of Bicycle Advisory Lanes by Peter Furth, Professor of Civil Engineering at Northeastern University.