Blair Park Traffic Calming Study

Williston, Vermont

Prepared for:

Chittenden County Regional Planning Commission

Town of Williston, Vermont

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This study is the result of the support and strong interest of the Project Committee members. Much of the background, history, local input, existing conditions, and consensus documented in the study are attributed to the Committee member's involvement. The study's quality and success is due to their contributions.

Disclaimer

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1.0 INTRODUCTION

The Town of Williston and the Chittenden County Regional Planning Commission (CCRPC) are seeking to address resident concerns regarding vehicle speeds at Blair Park. Blair Park Road is a loop road connected to US 2 at Harvest Lane and to VT 2A by way of Paul Street as shown in Figure 1. The southeastern segment of the loop is believed to be part of a "cut through" route used by motorists to travel between VT 2A and US 2. Residents of a senior living community on the north side of the loop walk the loop regularly for exercise as do employees of businesses in Blair Park. Sidewalks are present along sections of the Blair Park loop however, where there are gaps pedestrians walk in the street. A 2015 scoping study recommended new sidewalk construction to provide a continuous sidewalk around the loop and a pedestrian connection to US 2. (There is presently a sidewalk connection to VT 2A.) The study investigates speeding issues, assesses the need for traffic calming measures on the Blair Park loop and makes recommendations.

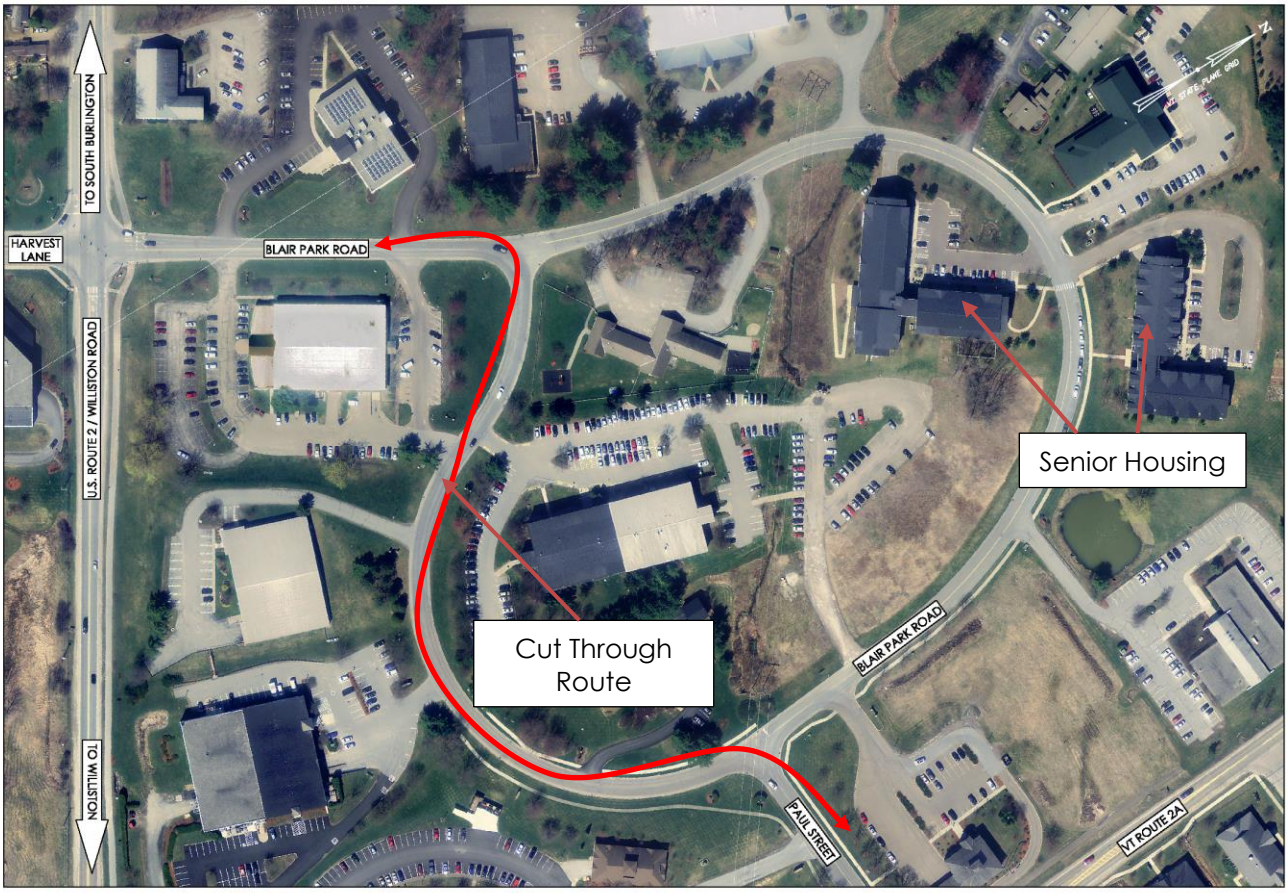

Figure 1 Project Study Area

1.1 STUDY PROCESS

A multi-step planning process was completed that included the following major steps listed below.

- Project Initiation
- Data Collection and Quantification of Existing Conditions
- Purpose and Need Statement
- Development and Evaluation of Traffic Calming Measures
- Selection of Preferred Measures
- Documentation

During the project initiation phase the project committee and consultant team met and a work plan was developed. A project committee included representation from the Williston Department of Public Works and the CCRPC. Data were collected, including speed measurements, to define existing roadway and traffic conditions. Alternative strategies to address speeding concerns were developed and evaluated by the project committee. Final recommendations were made by the consultant team based on the study findings and comments received from the project committee.

2.0 PROJECT PURPOSE AND NEED STATEMENT

A Purpose and Need Statement defines the broad goals of the project and the specific needs to be addressed by the project. The Purpose and Need Statement is used to justify the expenditure of public funds for the project. It is also used to measure the potential benefits associated with alternative plans or strategies. The Purpose and Need Statement for this project incorporated issues identified by the project committee. The Purpose and Need Statement approved by the project committee is provided below.

2.1 PURPOSE

The purpose of this study is to assess the need for traffic calming measures in Blair Park and, if warranted, to recommended measures to calm traffic.

2.2 NEED

- Perceived travel speeds are significantly above the posted speed limit.
- Excessive speeds may diminish the comfort level for pedestrians travelling within or adjacent to the roadway.
- Excessive speeds may contribute to greater crash frequency and crash severity.

3.0 EXISTING CONDITIONS

Existing conditions within the Blair Park were defined through a combination of records review and field research as described below.

3.1 ROADWAY CHARACTERISTICS

Roadway characteristics were compiled through a review of record plans as part of the Blair Park Pedestrian Facility Scoping Study. This Town owned and maintained local roadway is located within a 60-feet right-of-way. The pavement width along the roadway is approximately 30 feet and is curbed on both sides. There are existing sections of five-foot wide concrete sidewalk adjacent to the road. The sidewalk is generally separated by a grass strip of varying widths. The posted speed limit through Blair Park is 25 miles per hour. There is a section of on-street parking at the northern end of the loop by Falcon Manor and Eagle Crest, the two senior housing facilities referenced above. The roadway is constructed of bituminous concrete pavement. The horizontal alignment of the roadway is generally circular with a tangent section connecting the loop to US 2. The vertical alignment is generally level although there is a slight downward slope heading the clockwise direction in the southeast section of the loop.

Other than the speed limit signs, traffic controls in Blair Park are limited to a few Stop signs and a crosswalk. Where Paul Street meets Blair Park Road at a T-type intersection Paul Street is under Stop sign control. At the other T-type intersection in the park where the loop road enters the extension of Blair Park Road to US 2, Stop sign control is provided on the loop (westbound) approach. The Stop signs help slow cut-through traffic traveling southwest through the park. On the north part of the loop there is a crosswalk connecting the two senior housing communities. It is identified by warning signs.

3.2 LAND USE AND ZONING

Most of the project study area is located within the Town's Business Park zoning district with a small section in the Industrial West zoning district. Blair Park is within the Town's State-Designated Growth Center. Figure 2 identifies land use zoning districts at and adjacent to the study area.

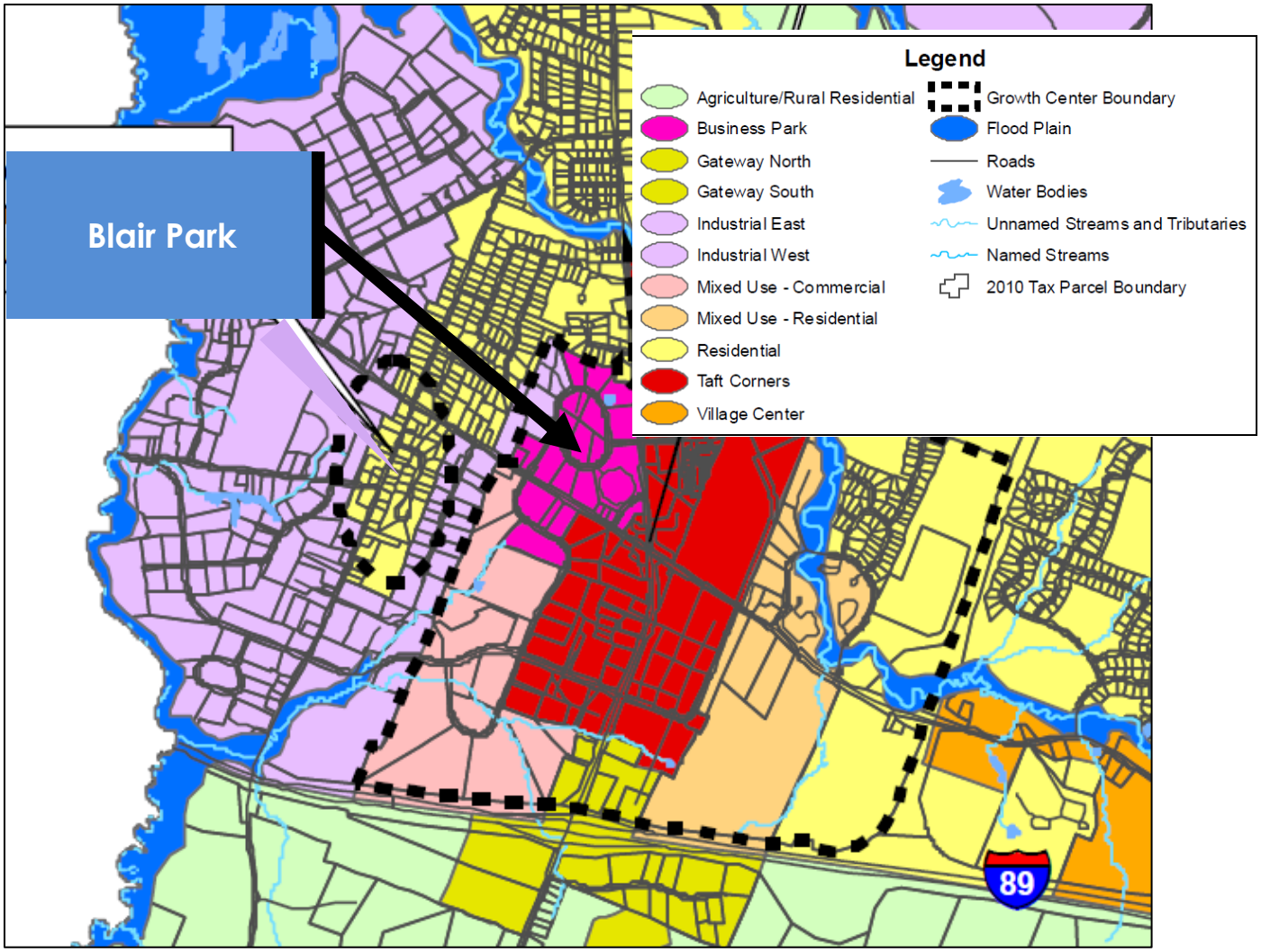

Figure 2: Williston – Future Land Use Plan

3.3 PEDESTRIAN FACILITIES

Through the Town's development review process, Williston often requires developers to include sidewalks as part of their development plans. This requirement has resulted in the construction of several sidewalk segments in Blair Park. However, there is no continuous walkway around the loop and there is no connection to US 2. The 2016 Blair Park Pedestrian Facility Scoping study recommended new sidewalk construction to address these gaps in the network. Figure 3 locates the existing and proposed sidewalks in Blair Park.

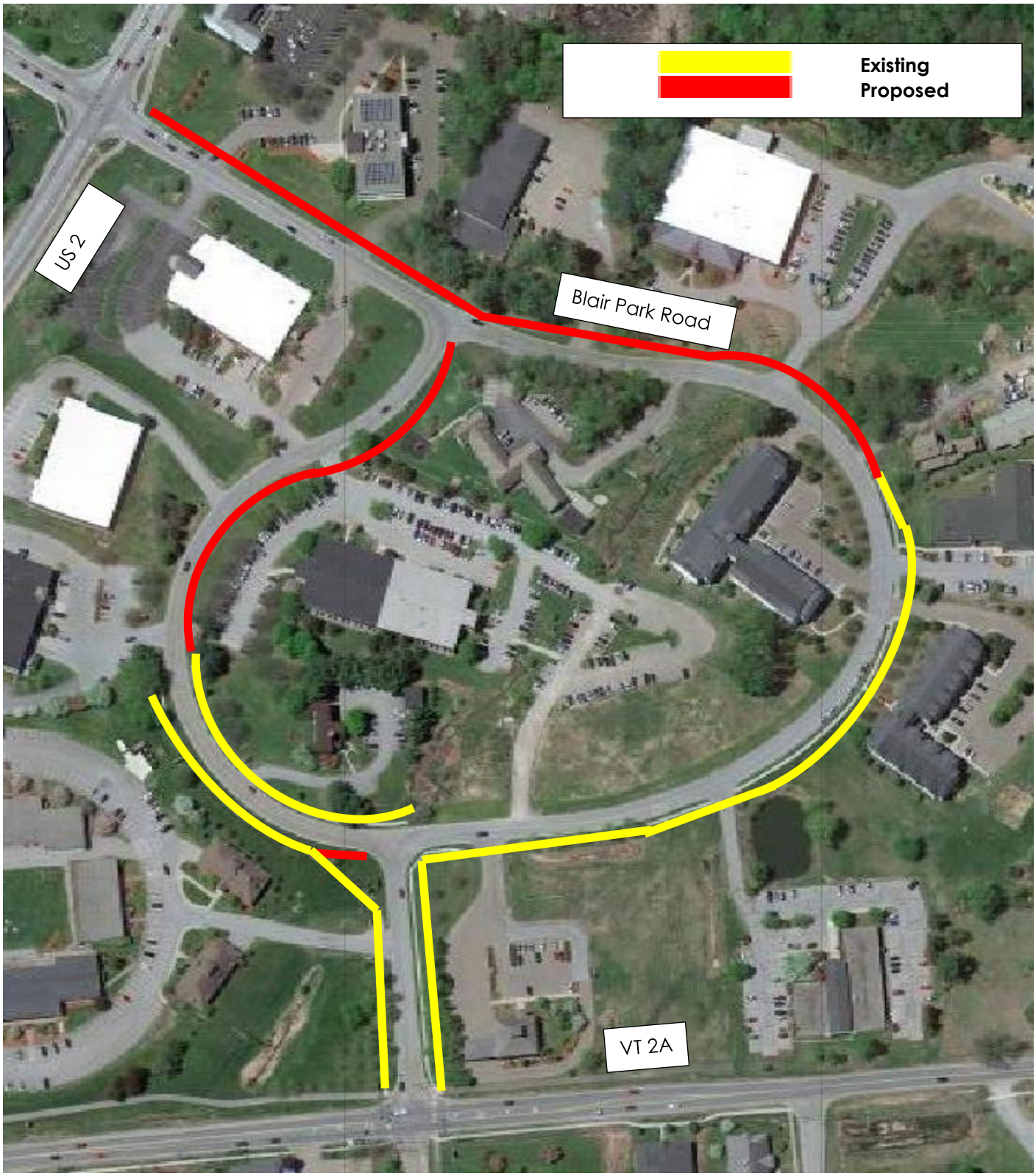

Figure 3: Existing and Proposed Sidewalks

3.4 TRANSIT SERVICE

Green Mountain Transit (GMT) operates three bus routes that service various locations in the Town of Williston and roadways adjacent to Blair Park. Figure 4 shows the following routes:

- Williston Route (identified as 1 on the map) operates on US 2, adjacent to Blair Park, and runs continuously on weekdays between the hours of 6:15 am and 12:05 am.
- The Williston Village Route (identified as 1V on the map) operates on US 2, adjacent to Blair Park with two morning runs on weekdays between the hours of 6:30 am and 8:32 am and three afternoon runs between 12:30 pm and 6:25 pm.
- The Williston/Essex Route (identified as 1E on the map) operates on VT 2A, adjacent to Blair Park and runs continuously on weekdays between the hours of 7:00 am and 7:20 pm.

Bus stops for transit riders accessing Blair Park are located on VT 2A at Paul Street and on US 2 at Blair Park Road.

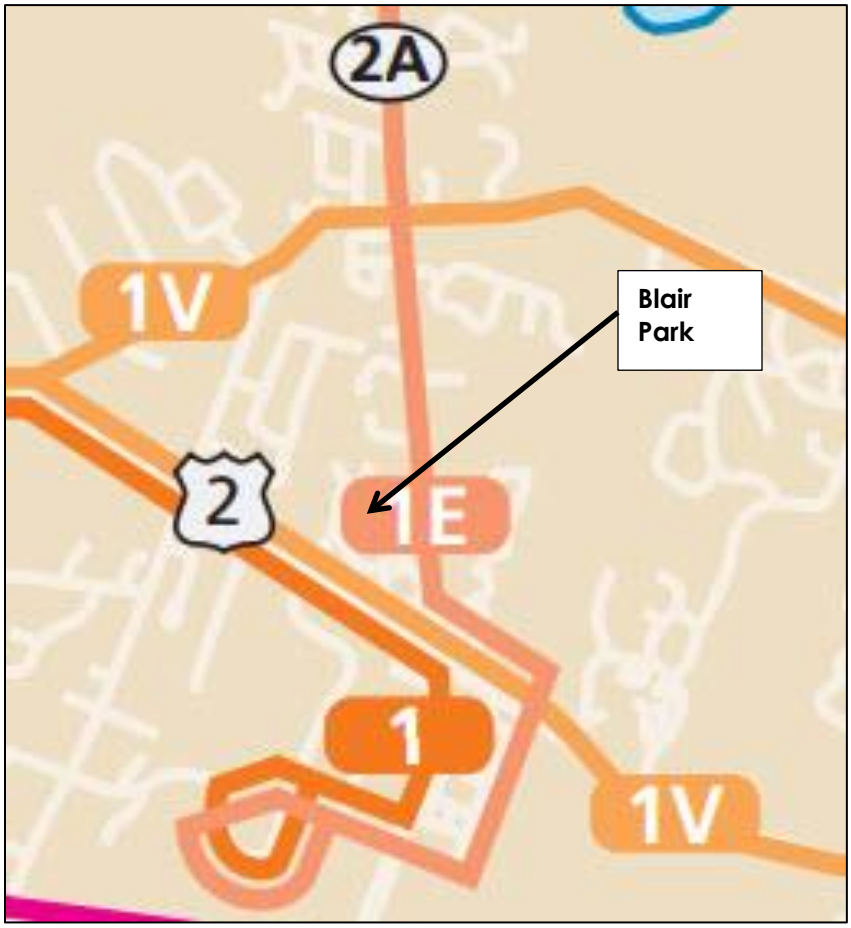

Figure 4: GMT Bus Route Map in Williston

3.5 VEHICULAR TRAFFIC VOLUMES

Traffic volume data for the study area were collected from the VTrans traffic volume database to establish existing morning and evening peak hour travel demands. Peak period vehicle turning movement counts were conducted in June 2017 at the Blair Park Road/US 2/Harvest Lane and Paul Street/VT 2A/Zepher Street intersections. Volume counts were also taken in October 2016 on Blair Park Road just west of the senior housing communities. The reported volumes are shown in Figures 5 and 6 for weekday AM and PM commuter peak hours respectively. As shown, 605 vehicles enter or exit the loop during the AM peak hour. Most of this traffic is either cut through traffic or traffic destined to the south side of the loop as only 75 vehicles pass through the north side of the loop. Volumes are higher during the PM peak hour with 930 vehicles entering or exiting the loop. Again, the northern end of the loop experiences relatively light volumes carrying only 100 vehicles per hour. Heavy vehicles comprise approximately two percent of the vehicles entering/exiting Blair Park.

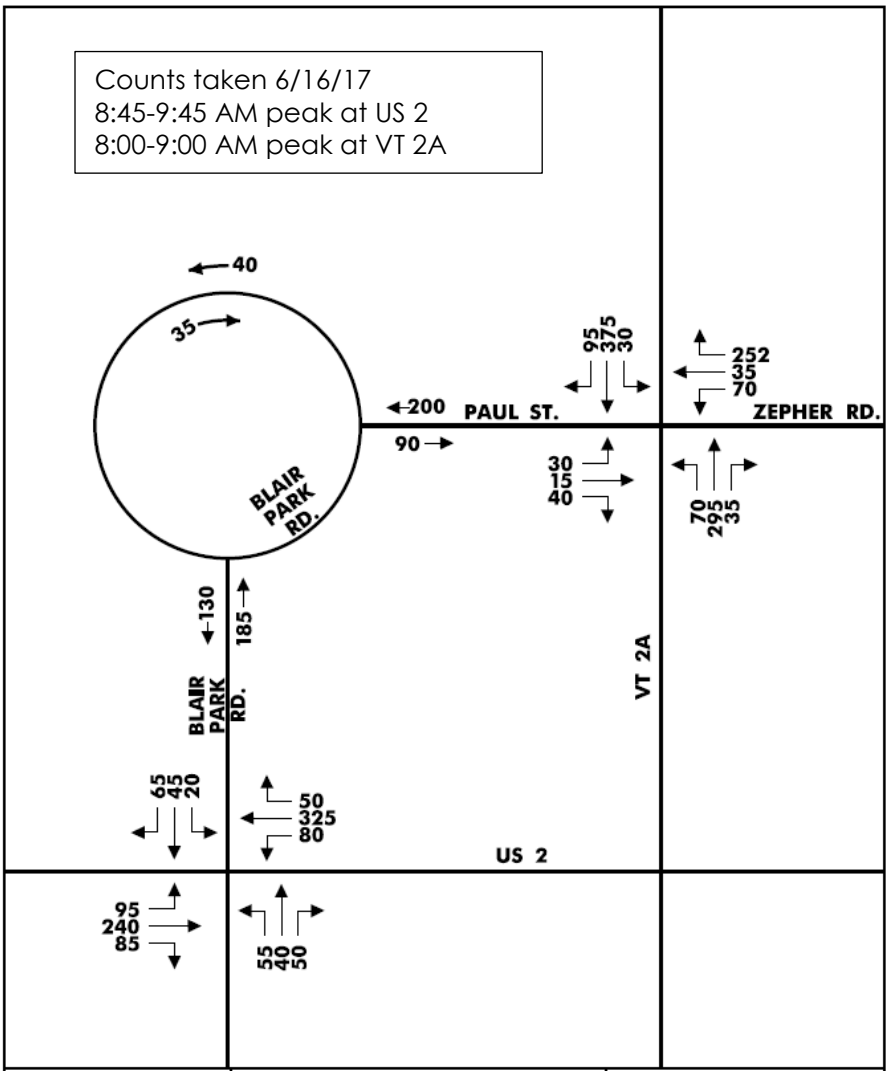

Figure 5 Existing AM Peak Traffic Volumes

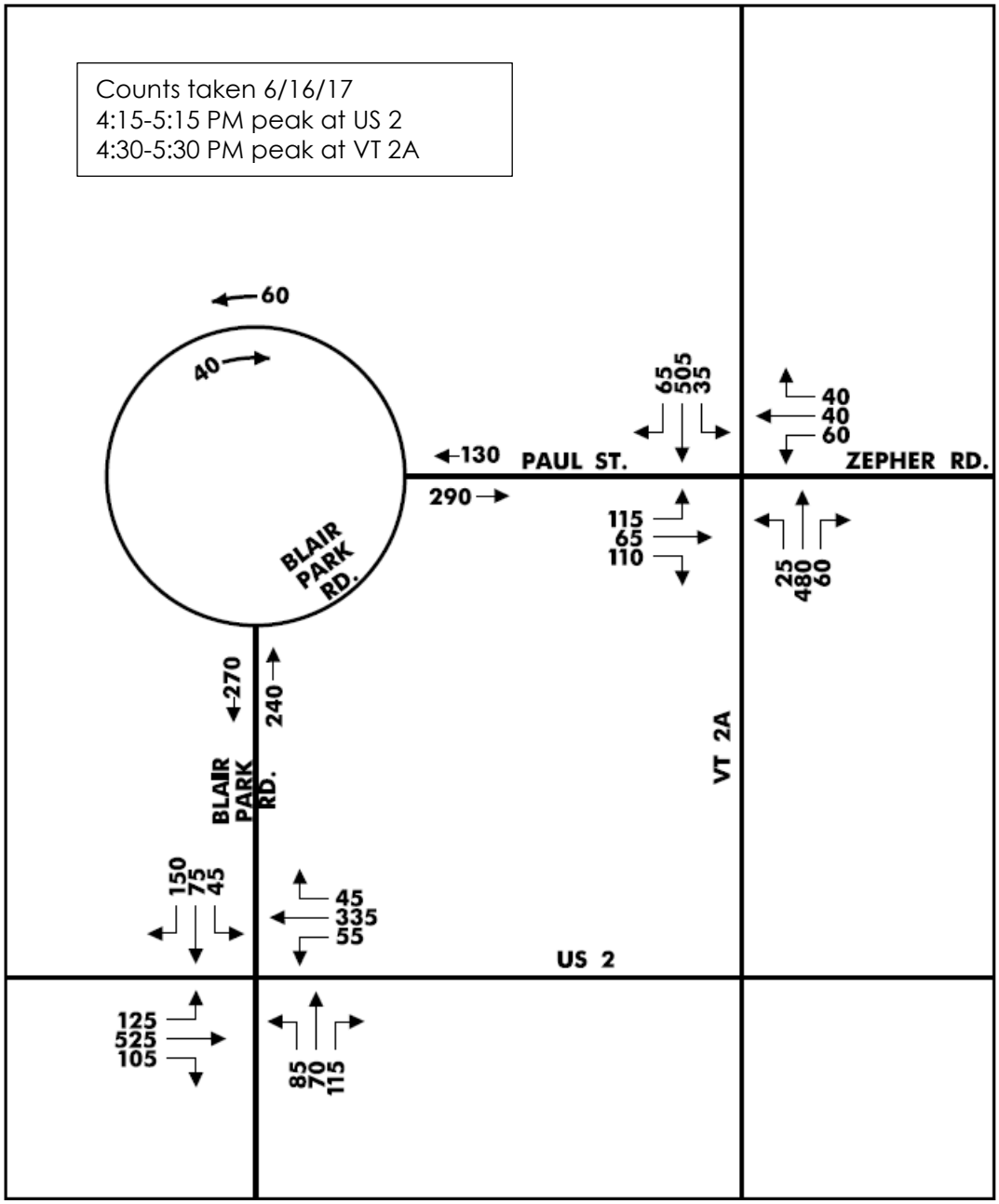

Figure 6 Existing PM Peak Traffic Volumes

3.6 VEHICLE SPEEDS

Vehicle travel speeds were also recorded by direction along the Blair Park loop at two locations concurrent with the traffic volume counts. Measurements taken just west of the senior housing communities indicate general compliance with the posted speed limit of 25 mph. As shown in Table 1, the reported 85th percentile speed in each direction is 28 mph. The pace speed range is from 20 to 30 mph accounting for 74 percent of the speed observations. Significantly lower speeds were measured on the south side of the loop. The 85th percentile speeds ranged from 18 to 19 mph and the pace speed range was 11 to 20 mph. The south side survey was completed in late October/early November 2017 and provided results that were comparable to surveys conducted in September 2017

Location/Direction	85th Percentile Speed (mph)	Pace Speed (10 mph range)
North Side of Loop[1]		
Eastbound	28	20-30
Westbound	28	20-30
South Side of Loop[2]		
Eastbound	19	11-20
Westbound	18	11-20

[1] Speeds measured 10/11/2017.

[2] Speeds measured 10/22/17 through 11/3/17.

Table 1 Observed Travel Speeds

3.7 SAFETY

The crash history for the study area was investigated using the Vermont Agency of Transportation (VTrans) crash database. The database was queried to identify crashes reported on Blair Park Road or Paul Street for the five-year period from October 17, 2012 through October 17, 2017. Only four crashes were reported for this time period. Of these, only two crashes occurred on Blair Park Road. The other two crashes occurred in parking lots for businesses with access to Blair Park Road. One crash was a rear end collision with snow on the road adjacent to the Eagle Crest senior living community. The other crash was a same direction, sideswipe collision. The exact location of the crash was not reported. It did occur during the day under dry roadway conditions. Excessive speed was not noted as a contributing factor for any of the reported crashes.

4.0 EXISTING DATA ANALYSIS

The existing traffic, speed and crash data were reviewed to identify existing issues. Conditions on the north and south sides of the Blair Park Loop were considered separately.

4.1 SOUTH SIDE OF LOOP

The south side of the loop carries heavier traffic volumes than the north side of the loop but does so without experiencing operational or safety problems. The collected speed data indicates approximately 200 to 265 peak hour vehicles on the south side of the loop compared to only 75 to 100 peak hour vehicles on the north side of the loop. The speed data, the result to two separate surveys conducted by the CCRPC indicates that 85th percentile speeds are well below the posted speed limit. There is a low incidence of crashes on this roadway segment and no data to suggest that speed was a contributing factor to any reported crashes. Based on this review traffic calming measures are not warranted on this roadway section.

4.2 NORTH SIDE OF LOOP

As noted above, the north side of the loop carries much lighter traffic volumes than the south side of the loop. Recorded speeds are somewhat higher than those measured on the south side of the loop but generally in line with the posted speed limit. Again, no speed related crashes were reported over a five-year period. Consequently, traffic calming measures are not warranted on the north side of the loop.

There is an existing crosswalk between the two senior living communities on the north side of the loop. Consideration was given to enhancing this crosswalk. Enhancements could take the form of a raised crosswalk, curb extensions and/or illuminated warning signs. However, comparisons to VTrans standards for enhanced crosswalk treatments indicates that these treatments are not warranted at this location. The *Vermont Agency of Transportation Guidelines for Pedestrian Crossing Treatments, January 2015 Update, Figure 11* does not suggest the use of enhanced crosswalk treatments on roadways carrying less than 3000 vehicles per day. The north site of the loop carries fewer than 1000 vehicles per day.

4.3 RECOMMENDATIONS

Based on the above findings, installation of traffic calming measures in Blair Park is not necessary and not recommended. Traffic conditions in Blair Park should be monitored periodically, (every two or three years), as the park continues to develop and proposed sidewalks are installed. These changes could impact vehicle speeds and traffic volume levels. Potential traffic calming measures that could be considered in the park should conditions change are presented in Appendix A.

APPENDIX A

Traffic Calming Measures

1.0 TRAFFIC CALMING MEASURES

Alternative strategies, including traffic calming measures, were developed and evaluated for Blair Park. These strategies are not warranted under existing conditions but may be considered should conditions change in the future.

1.1 TRAFFIC CALMING DEFINITION

The Institute of Transportation Engineers defines traffic calming as follows:

> *"Traffic calming is the combination of mainly physical measures that reduce the negative effects of motor vehicle use, alter driver behavior and improve conditions for non-motorized street users."*

Specifically excluded from this definition are route diversion strategies, traffic control devices (such as STOP signs) and streetscaping. For Blair Park, route diversion strategies were not considered as any diverted traffic would likely have negative impacts along the alternative route. (Diverting traffic from the south side of the Blair Park loop to the north side of the loop would be undesirable given the presence of the two senior living communities on the north side of the loop. Likewise, diverting traffic from the south side of the loop through the US 2/VT 2A intersection would likely have congestion impacts at this location.) Traffic control devices and streetscaping were considered as alternatives to traffic calming measures.

Three categories of alternatives were considered. Two categories meet the above definition of traffic calming measures. The third category includes traffic control and streetscaping options. Traffic calming measures, as noted above, include physical roadway treatments that slow traffic through either horizontal or vertical deflections. Forces of horizontal or vertical acceleration on the vehicle and its passengers as they traverse a traffic calming device discourage speeding. The two traffic calming categories include horizontal and vertical elements. Included in the horizontal elements category are median treatments and curb extension treatments that are more typically considered pedestrian improvements but may result in some horizontal deflection of vehicle travel paths.

1.2 VERTICAL ELEMENTS

1.2.1 Speed Humps

Proposal: Under this alternative two 3-inch to 4-inch high speed humps would be installed approximately 500 feet apart on the southeast section of Blair Park Road. Approximate locations for the installations are noted in Figure 1. Associated warning signs would be installed at the edge of the roadway. In advance of the speed humps. Figure 2 provides an illustration of a typical installation.

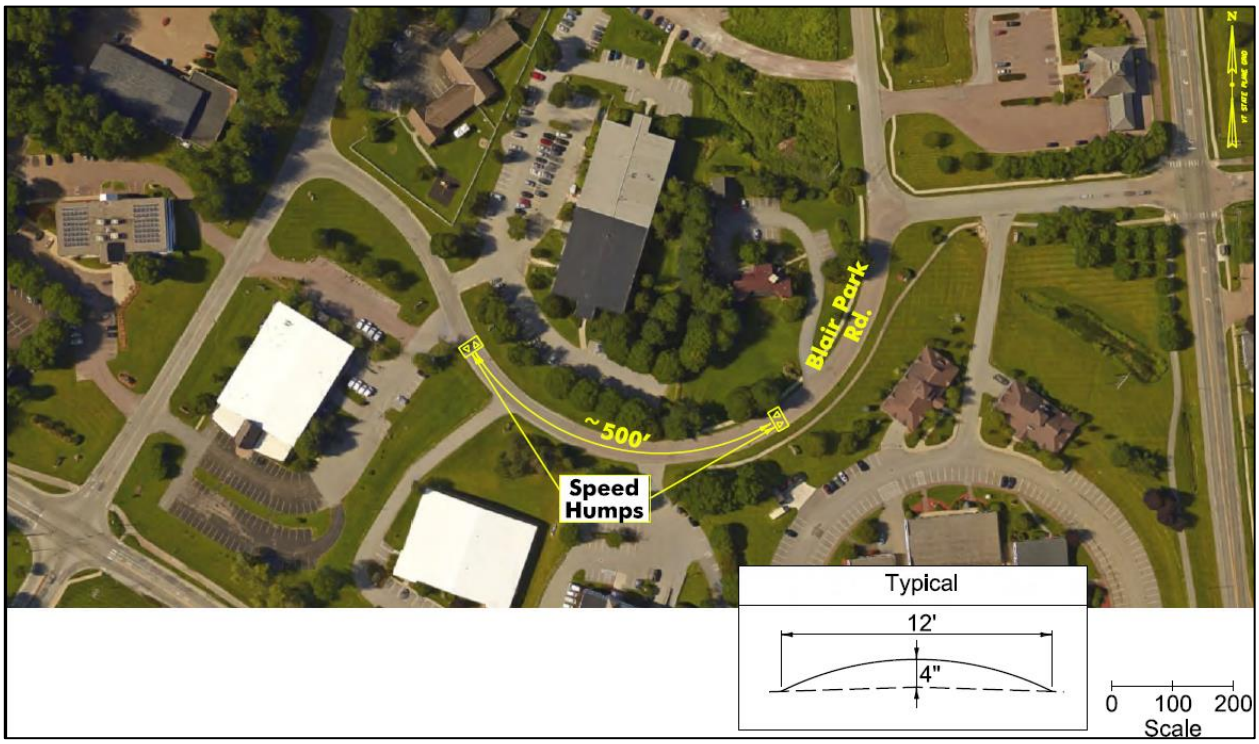

Figure 1 Approximate Locations for Speed Humps

Source: NACTO Urban Street Design Guide
Figure 2 Typical Speed Hump

Guidance: Speed humps are parabolic shaped devices or pavement sections that result in a vertical deflection of a vehicle's travel path. Typical heights may range from three too to four inches with ramp lengths of three to six feet. Per the *North Association of City Transportation Officials (NACTO) Urban Street Design Guide, (2003)* speed humps should be placed no more than 500 feet apart to be effective.

Effectiveness: Per the *NACTO Urban Street Design Guide,* speed humps, properly applied, can reduce travel speeds to the 20 to 25 mph range. The *Highway Safety Manual (HSM)* published by the American Association of State Highway and Transportation Officials in 2010 defines relationships between roadway treatments and crash rates. The *HSM (Table 13-48)* indicates that speed humps may reduce crashes by 40 percent.

Costs: $30,000-35,000 typical for design and construction of two permanent speed humps across a 30 feet wide roadway.

Comments: Rubber, temporary speed humps can be purchased for approximately $1500 each and installed on a trial basis to determine optimum spacing between humps. Speed humps, if not fully extended to the roadway curb, may not affect stormwater management.

1.2.2 Speed Cushion

Proposal: Under this alternative two 3-inch to 4-inch high speed cushions would be installed approximately 500 feet apart on the southeast section of Blair Park Road. Approximate locations for the installations would be the same as noted for speed humps in Figure 1 above. Associated warning signs would be installed at the edge of the roadway. In advance of the speed cushions. Figure 3 provides an illustration of a typical installation.

Figure 3 Typical Speed Cushion

Guidance: Speed cushions are speed humps with cut outs provided to allow for larger vehicles to pass through rather than drive over the speed humps. The cut outs allow for faster travel by emergency vehicles and more comfortable travel in transit vehicles and school buses.

Effectiveness: Speed cushions should be as effective in reducing travel speeds as similar speed hump installations.

Costs: Estimated design and construction costs, $30,000-35,000, would be comparable to the costs of speed hump installation. Maintenance costs may be slightly higher as the cut outs would accelerate deterioration.

Comments: Coordination with the fire department is recommended to assess impacts on emergency vehicle response times. No school or transit bus routes operate on this roadway segment.

1.2.3 Raised Crosswalk

Proposal: Under the crosswalk linking the two senior communities at the north end of Blair Park Road would be elevated. The raised crosswalk would be at approximately 3.0 to 3.5 inches high approaching the elevation of the two sidewalks it connects. Similar to the speed humps, ramps are provided sloping up the crosswalk and signage is provided on

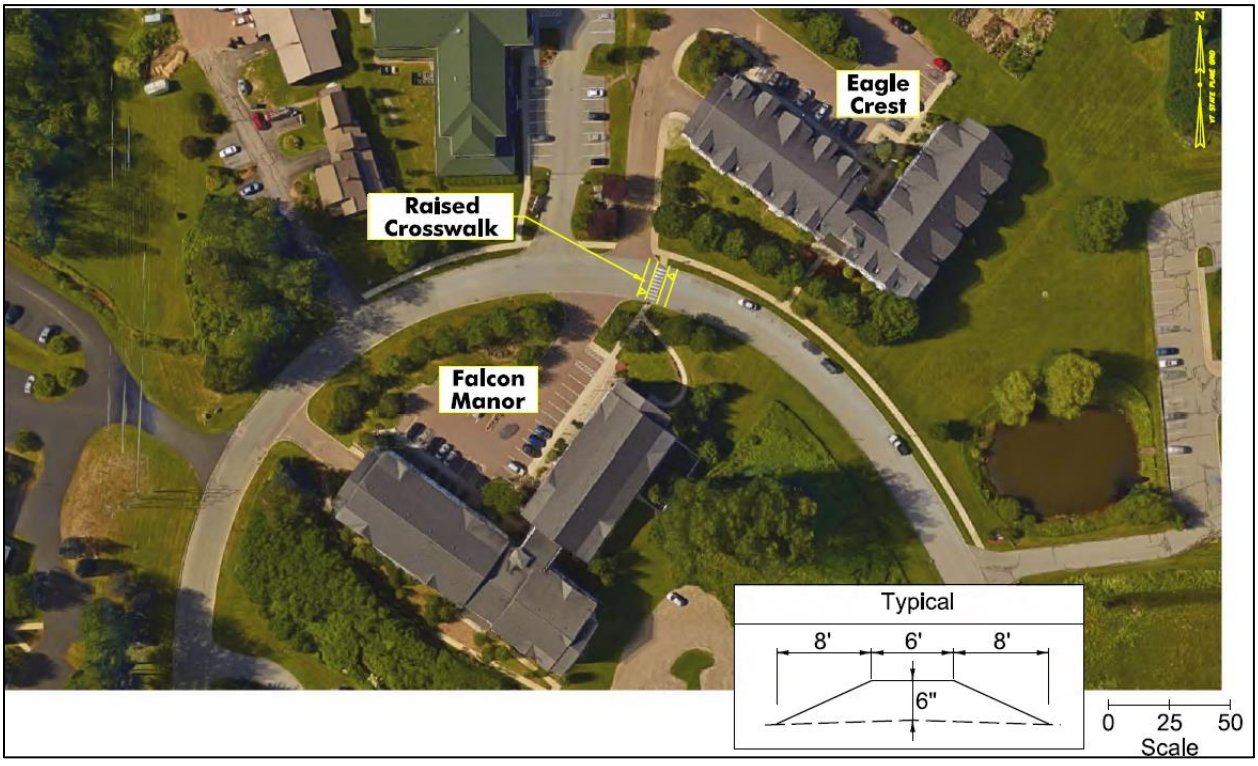

Figure 4 Location of Existing Crosswalk

the roadside edge to alert drivers of its presence. Unlike the top of the speed humps, the raised crosswalk provides a safe, level walking surface. The location of the existing crosswalk that would be replaced is shown in Figure 4. A typical installation is illustrated in Figure 5.

Figure 5 Typical Raised Crosswalk

Guidance: Raised crosswalks can be used at isolated or midblock crosswalks. Ramp slopes should be no more than 1:10 and no less than 1:25. Paver blocks or other distinctive materials can be used to raise driver awareness. Similarly, adequate lighting should be provided. Curb extensions are often provided in conjunction with raised crosswalks.

Effectiveness: An extensive study raised crosswalks cited in the NACTO Urban Street Design Guide indicated that speed tables reduced 85th percentile vehicle speeds by nine miles per hour. The *HSM* report (Section 131.9.1.2) that raised crosswalks "appears to reduce injury crashes" and may "have an overall positive effect on crash occurrence they are designed to reduce vehicle operating speed".

Costs: Estimated design and construction costs, $15,000-20,000, would be comparable to the costs of a single speed hump installation.

Comments: Curb extension could also be considered at this location pending an analysis of potential drainage impacts.

1.3 HORIZONTAL ELEMENTS

A second category of traffic calming measures considered are horizontal measures. These treatments alter vehicle travel paths to the left or right such that forces of lateral acceleration discourage speeding. Treatments considered are described below.

1.3.1 Chicane

Proposal: Under this alternative, up to two chicanes would be constructed on the southeast section of Blair Park Road at the approximate locations shown in Figure 6. Associated advance warning signs would be installed at the edge of the roadway. Figure 7 provides an illustration of a typical installation.

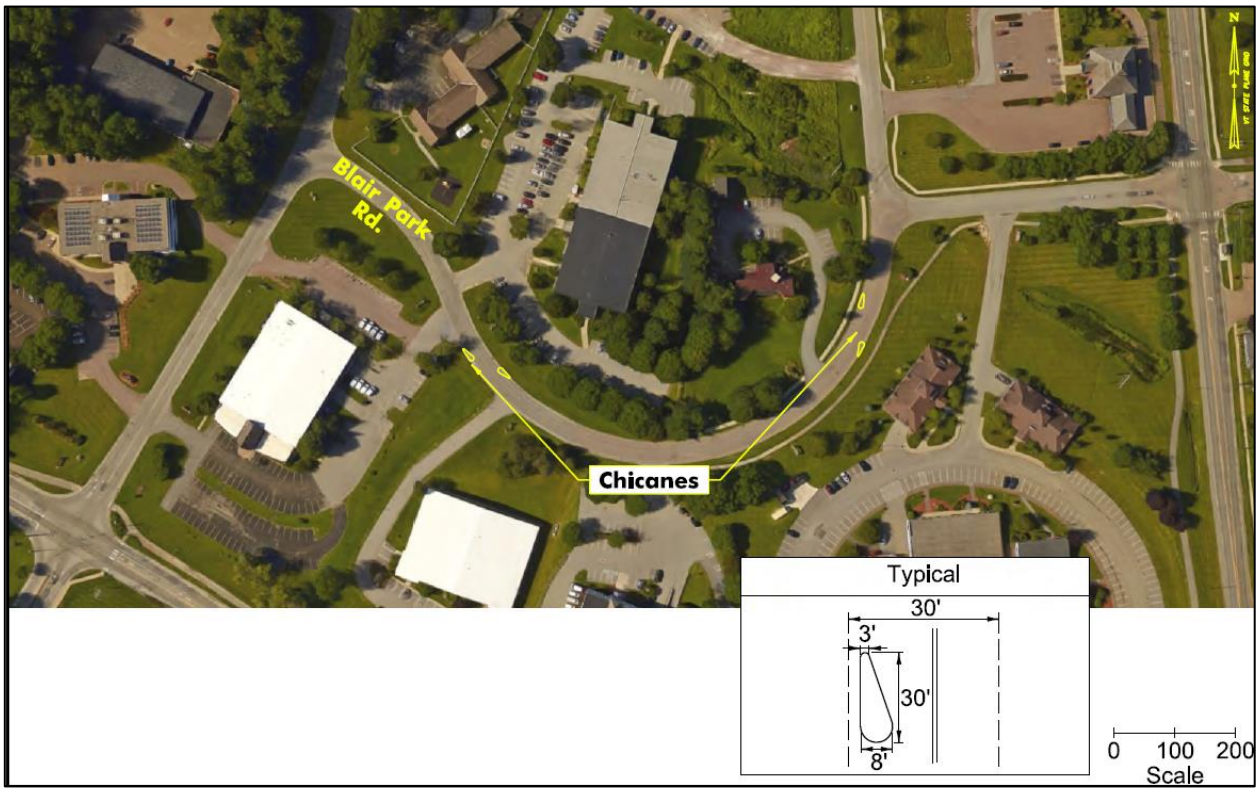

Figure 6 Approximate Location for Chicanes

Figure 7 Typical Chicane

Guidance: References provided in the NACTO *Urban Street Design Guide* describe chicanes as follows. "Chicanes are a series of two or three curb bulbs, placed on alternating sides of the street and staggered to create a curved one-lane segment of roadway. Chicanes help reduce vehicular speeds by requiring motorists to maneuver through the curb bulbs, one vehicle at a time. The spacing between the curb bulbs and the distance they extend into the roadway determine how easily motorists will be able to maneuver through the chicanes."

Effectiveness: References provided in the NACTO *Urban Street Design Guide* indicate drops in speeds of 18 to 35 percent for vehicles traveling through the devices. Speeds were observed to drop 28 percent on the roadway segments leading to the devices. The *HSM* does not report on the effectiveness of chicanes with respect to crash reduction however, as with other treatments, lower vehicle speeds generally result in fewer and less severe crashes.

Costs: Estimated design and construction costs are $40,000-50,000.

Comments: The chicane design should consider the location of existing catch basins and/or leave a gap between the curb extension and the existing curb to address stormwater flows. Some travel delays expected on higher volume roadways as motorists yield to oncoming traffic in single lane section.

1.3.2 Center Median Island

Proposal: Under this alternative, up to five center median islands would be constructed on the southeast section of Blair Park Road at the approximate locations shown in Figure 8. The islands would each be 40 feet long and eight feet wide. Figure 9 provides an

illustration of a typical installation noting indicating the associated travel path deflections.

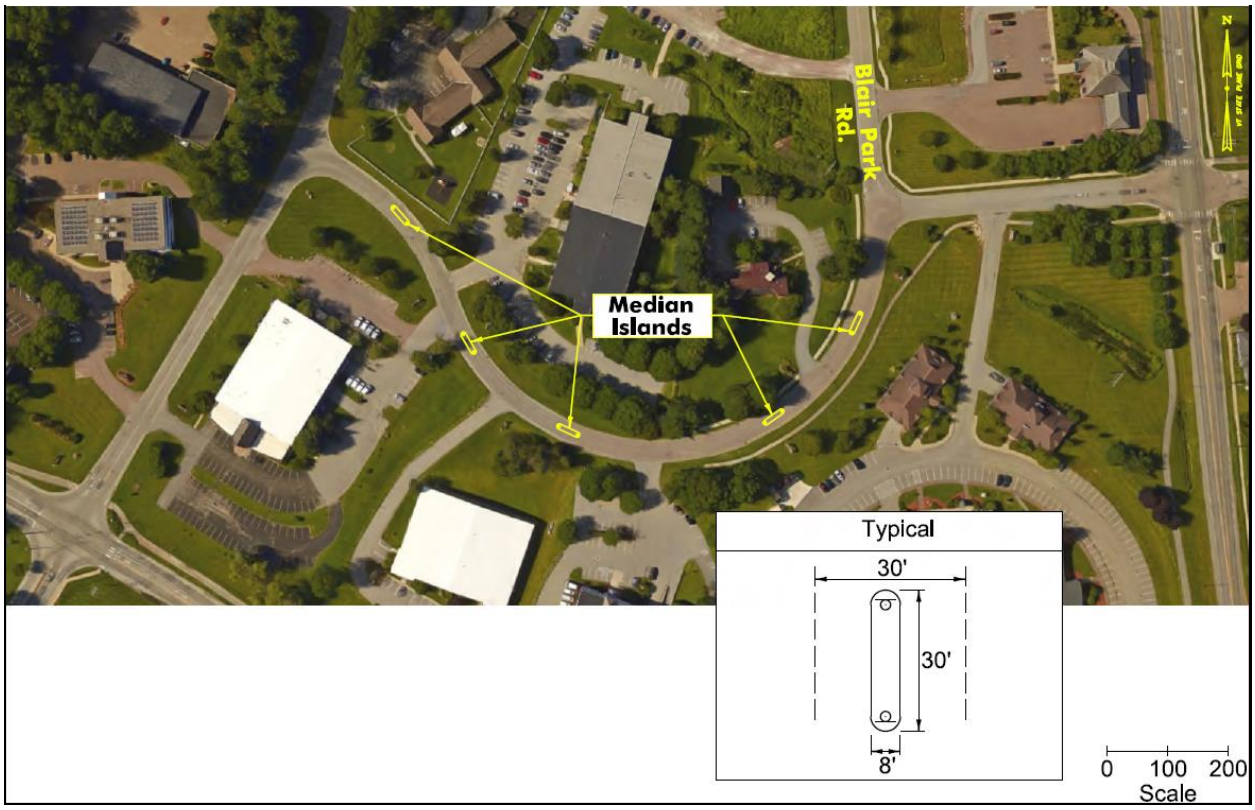

Figure 8 Location of Median Islands

Figure 9 Typical Center Median

Guidance: Medians are typically used at mid-block pedestrian crossings. They should be at least four-feet wide to provide a safe pedestrian refuge. Wider medians are preferred where feasible as they will provide greater deflection of the vehicle travel path and likely lower speeds.

Effectiveness: References provided in the NACTO *Urban Street Design Guide* indicate drops in speeds of two to five miles per hour at a location studied in Maryland. The *HSM* reports that the crash effects of median modifications are unknown. Again, any treatment that lowers vehicle speeds will generally experience fewer and less severe crashes.

Costs: Estimated design and construction cost for five islands is $45,000-50,000.

Comments: The proposed median islands would not require cut-outs for pedestrian passage as they are not located at crossings.

1.3.3 Chokers

Proposal: Under this alternative, up to three chokers would be constructed on the southeast section of Blair Park Road at the approximate locations shown in Figure 10. Figure 11 provides an illustration of a typical installation.

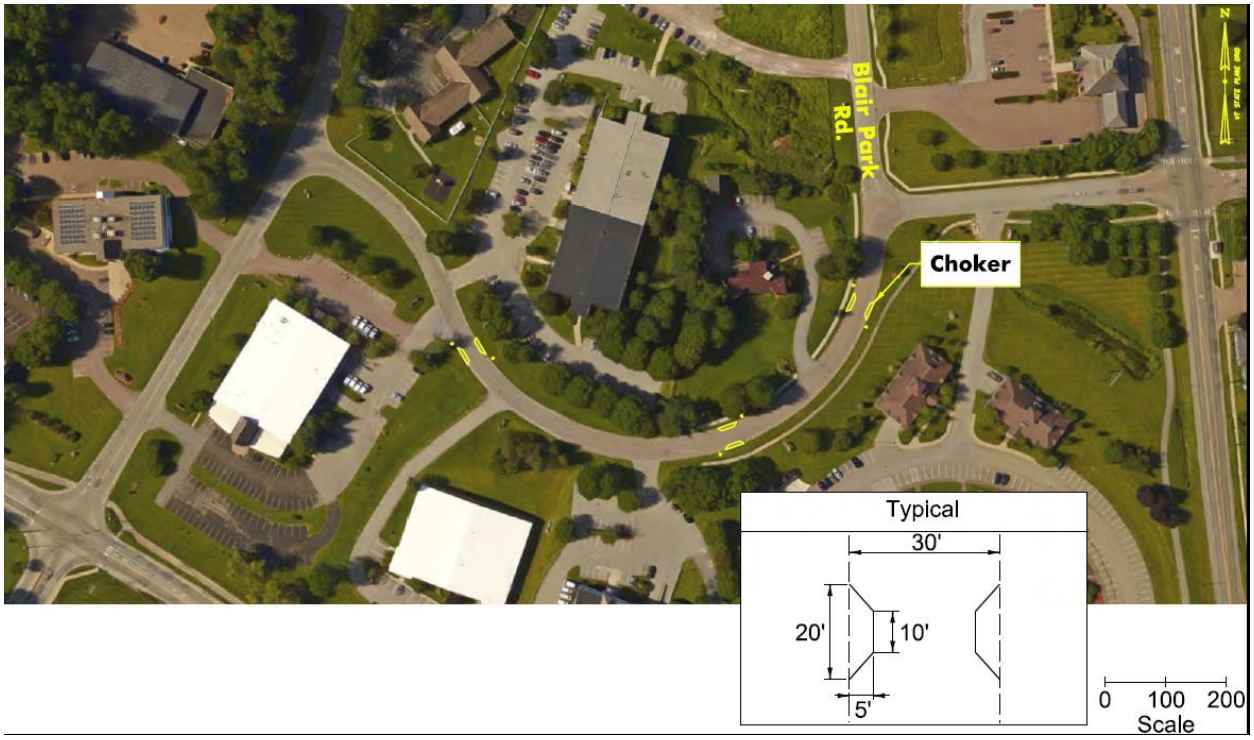

Figure 10 Approximate Locations of Chokers/Curb Extensions

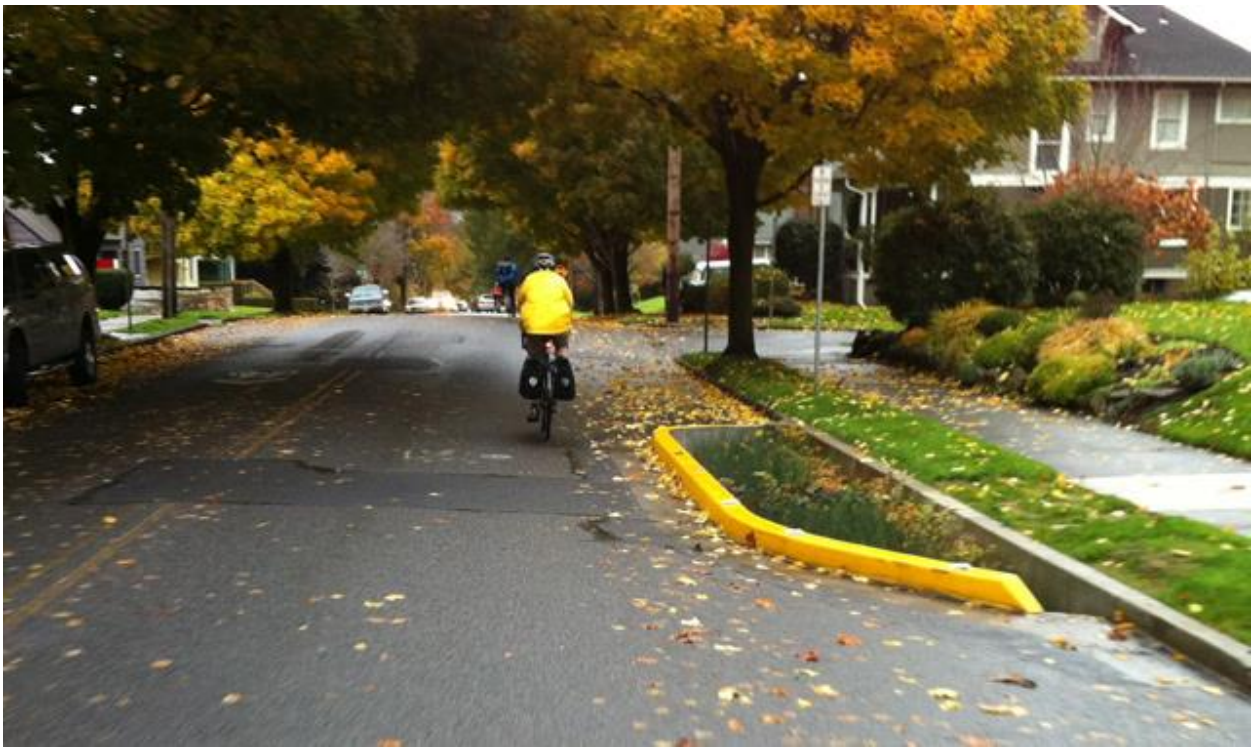

Figure 11 Typical Choker (one side)

Guidance: Chokers are curb extensions extending into the roadway at a mid-block location. The narrowing of the travel lanes associated with the choker causes drivers to slow down.

Effectiveness: References provided in the NACTO *Urban Street Design Guide* indicate that the resultant travelway width effects speeds. When the travelway between the chokers was approximately 20 feet there was no drop in vehicle speeds. When narrowed to only 16 feet there was a measurable drop in speeds. The *HSM* reports that the crash effects of curb extensions or chokers are unknown. Again, any treatment that lowers vehicle speeds will generally result in fewer and less severe crashes.

Costs: Estimated design and construction costs are $35,000-40,000.

Comments: As with the chicane, the design should consider the location of existing catch basins and/or leave a gap between the curb extension and the existing curb to address stormwater flows.

1.4 ROADSIDE ELEMENTS

The last category of traffic calming measures considered are roadside treatments. These actions include installations along the edge of the roadway to affect driver behavior.

1.4.1 Speed Feedback Signs

Proposal: Under this alternative, speed feedback signs would be installed on the southeast section of Blair Park Road at the approximate location shown in Figure 12.

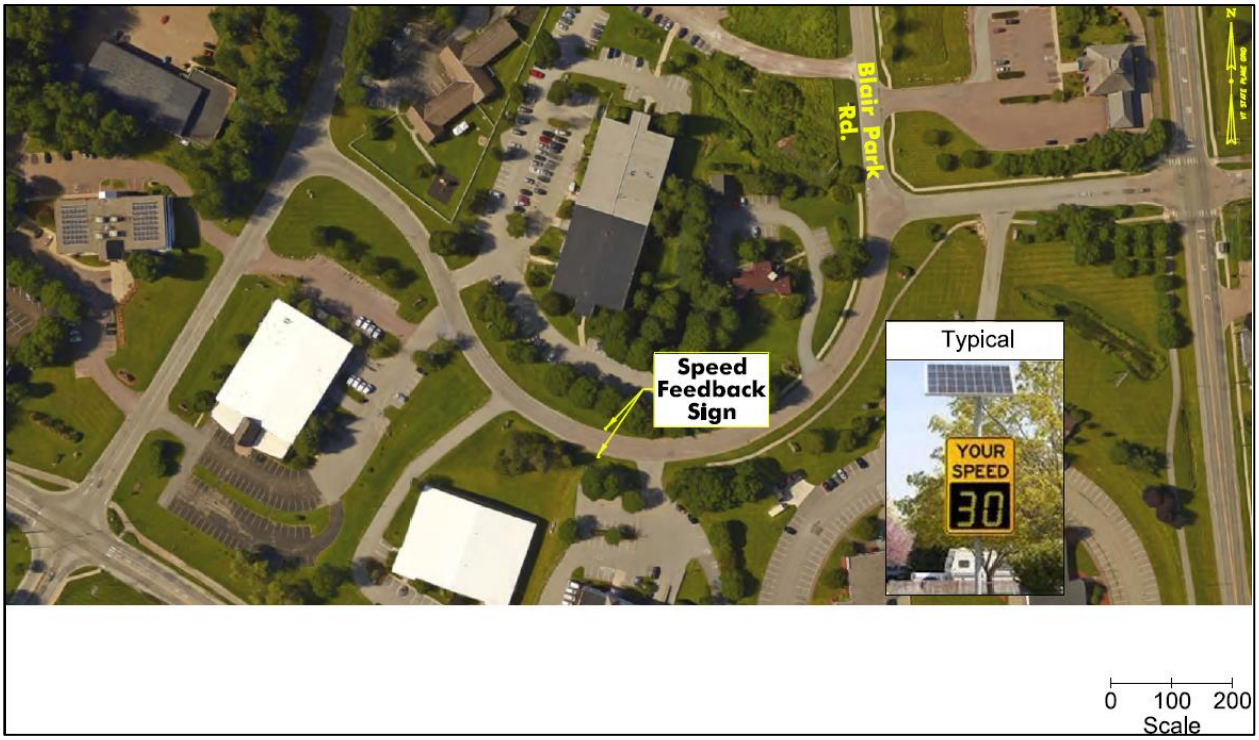

Figure 12 Location of Speed Feedback Sign

Associated signs would alert drivers of their speed. A typical sign is shown in Figure 13.

Figure 13 Typical Speed Feedback Sign

Guidance: Speed feedback signs can use red flashing numbers to alert drivers of their driving speed. The signs typically include a posting of the speed limit. The signs may also be used to collect and save speed data.

Effectiveness: Research studies have found speed reductions ranging from 4.4 to 5.1 miles per hour for new installations. The reductions measure one-year later were not as significant. The *HSM* does not report on the effectiveness of speed feedback signs with respect to crash reduction. Again, any treatment that lowers vehicle speeds will generally result in fewer and less severe crashes.

Costs: Estimated equipment and installation costs are $10,000-15,000.

Comments: Periodic police enforcement is required to maintain the effectiveness of the signs over time.

1.4.2 Roadside Vegetation

Proposal: Under this alternative, up to one dozen new trees would be planted along the southeastern section of Blair Park Road to create the sense of a more confined space. Potential tree planting locations are shown in Figure 14. Figure 15 presents before/after images of tree plantings used in driving simulators to study the effects of roadside vegetation on driver behavior.

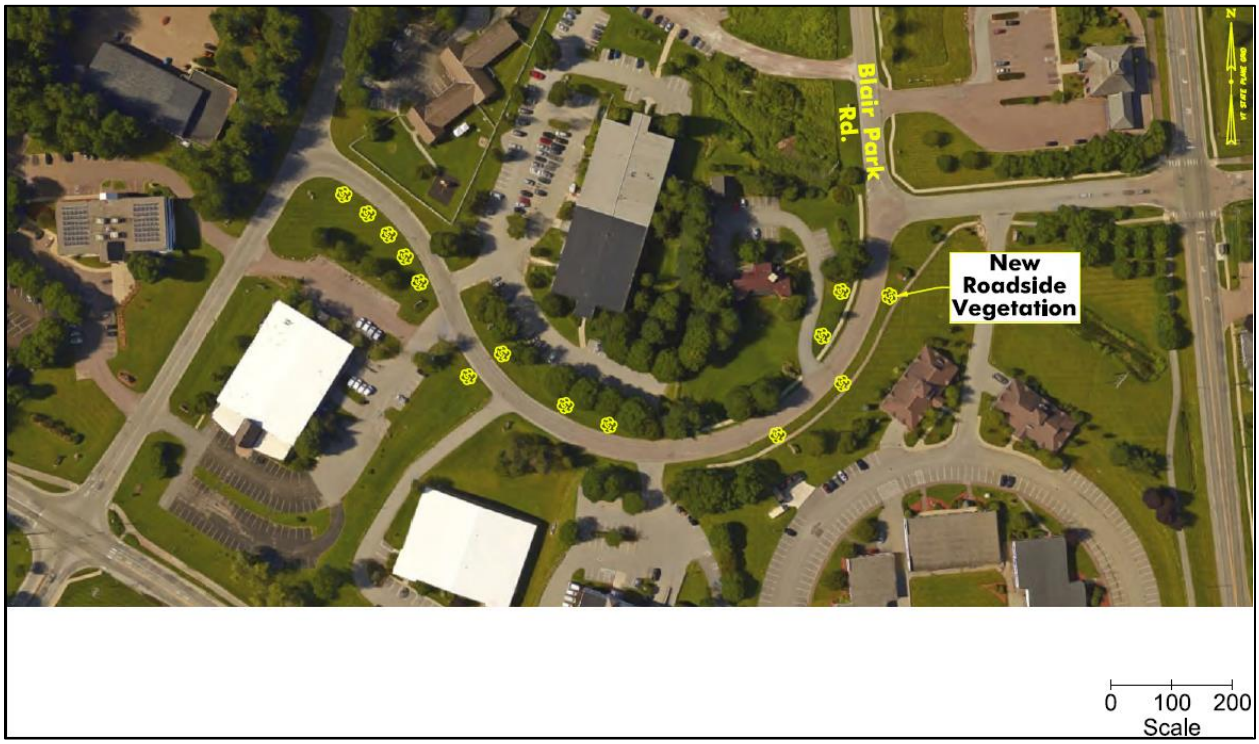

Figure 14 Tree Planting Locations

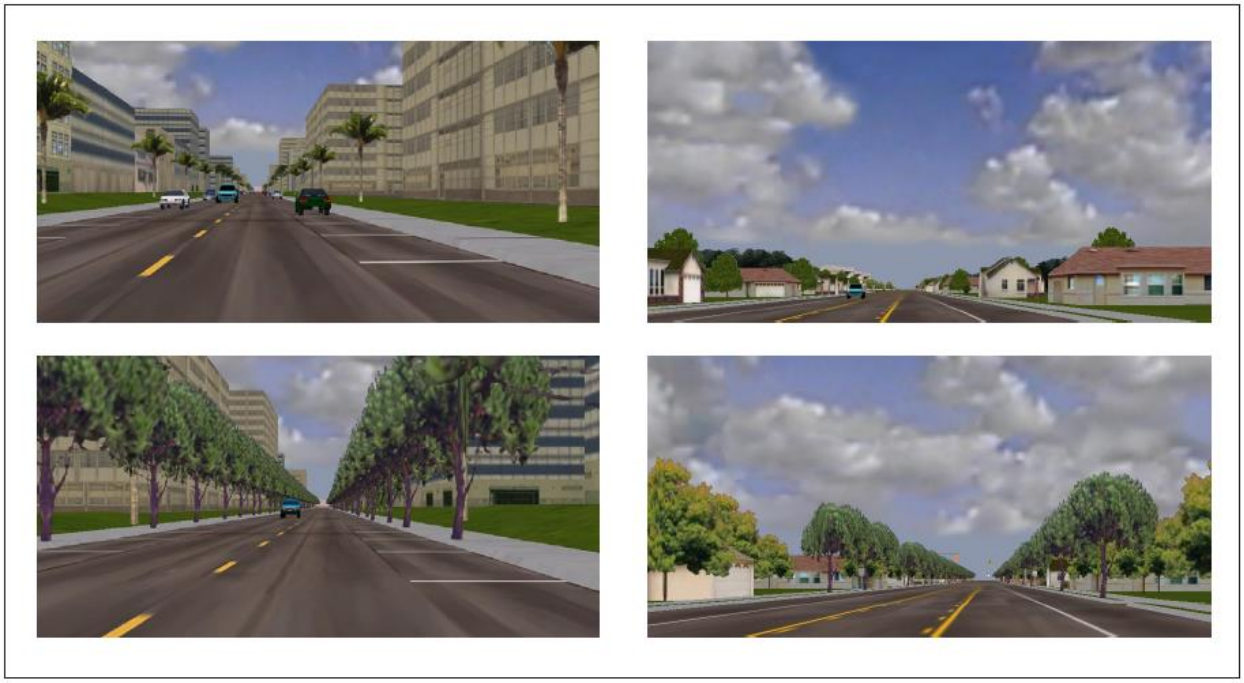

Figure 15 Visual Impacts of Roadside Plantings

Guidance: Vegetation growing proximate to the roadway edge affects driver behavior.

Effectiveness: Research studies, including field measurements and the use of driving simulators, indicate that motorists tend to drive more slowly when trees are planted along the roadway edge. Some studies have noted speed reductions of three miles per hour. The *HSM* reports that the crash effects of adding roadside vegetation are unknown.

Costs: $15,000-20,000 for tree purchase and planting assuming 15 to 20 2-inch caliper trees are planted.

Comments: Increased tree plantings raise the potential for more severe outcomes should run-off-road crashes occur.

1.4.3 Install Illuminated Crosswalk Warning Signs

Proposal: Under this alternative illuminated crosswalk warning signs would be installed at the existing crosswalk between the two senior communities on the north side of Blair Park Road. These may be accompanied by a curb extension as noted in Figure 16. Figure 17 shows a typical installation. The signs are comparable to rectangular rapid flashing beacons (RRFB's) that have been installed in many communities around Chittenden County. RRFB's, while effective, are no longer approved for funding by the Federal Highway Administration.

Figure 16 Possible Crosswalk Treatment

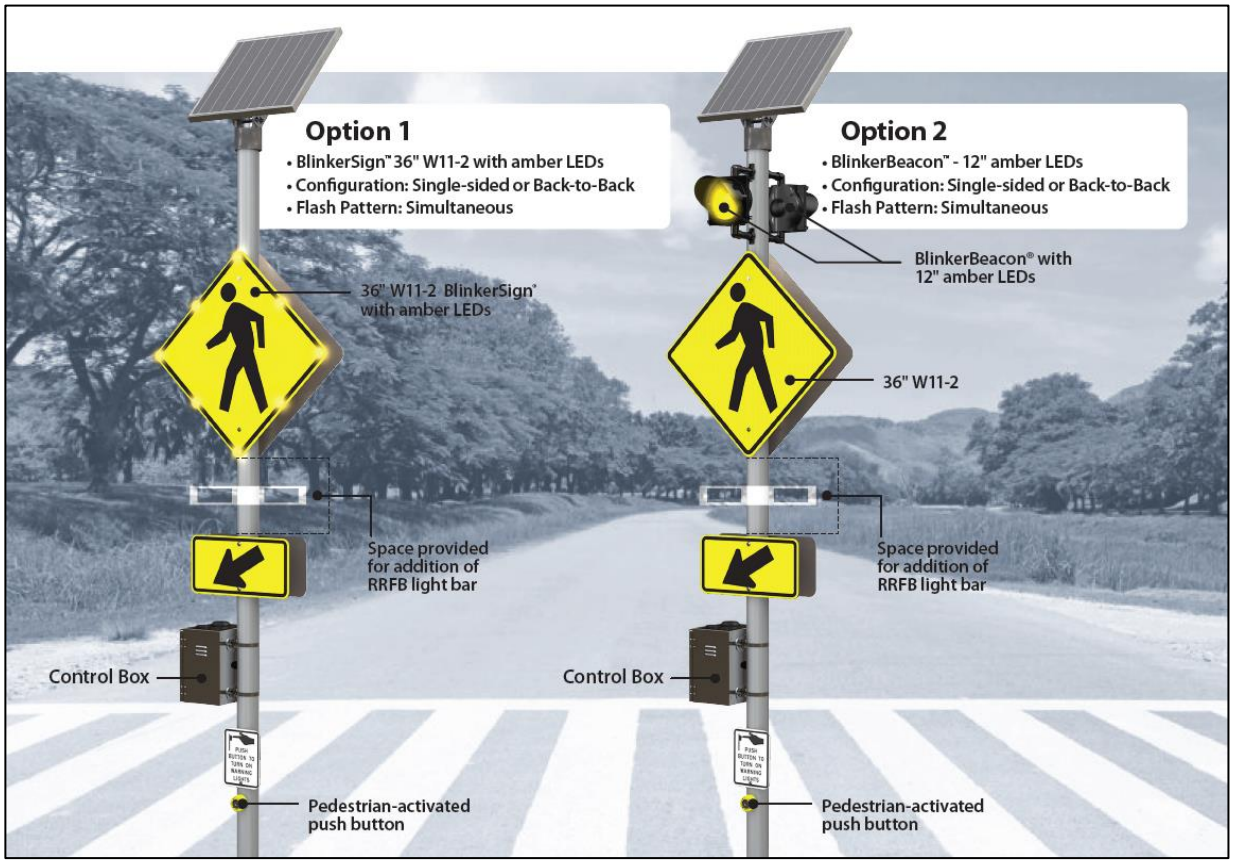

Figure 17 Typical Illuminated Crosswalk Warning Signs

Guidance: The MUTCD notes that signs and other measures should be used at uncontrolled crosswalk locations to draw drivers' attention to the crosswalk. Crosswalk warning signs are provided at this location. Illuminated signs provide a higher level warning to drivers.

Effectiveness: Manufacturers of illuminated warning signs cite studies indicating significantly increased compliance with drivers yielding to pedestrians in crosswalks. This yielding action will reduce overall travel speeds. The *HSM* does not report on the effectiveness of this treatment with respect to crash reduction. For similar treatments, installing pedestrian-activated flashing yellow beacons with overhead signs (Section 13A.9.1.4) the crash effect is not certain although there is evidence that pedestrian fatalities may decrease.

Costs: $15,000 typical for purchase and installation. Add $5000 for curb extension.

Comments: A curb extension could also be provided at this location on the north side of the road downstream of the existing on-street parking. This would shorten the crossing distance for pedestrians and make pedestrians waiting to cross more visible to drivers.

1.5 ALTERNATIVES SUMMARY

The benefits and costs associated with each of the above alternatives are summarized in a table to facilitate direct comparisons between alternatives. Color coding is used in the table, Figure 18, to assist with these comparisons. In the table, yellow shading indicates that proposed conditions with the measure in place will be comparable to existing conditions. In other words, the proposal may offer little or no benefit with respect to the performance criteria. A light green color indicates proposed conditions that are somewhat better than existing conditions and more significant benefits are indicated in a darker green color. The same color scheme is used to compare construction costs with the lowest cost actions highlighted in dark green. The more expensive actions are shaded orange and red.

As shown in Figure 18, all of the proposed actions are expected to have at least some positive effect on reducing travel speeds and/or reducing crash rates. The vertical elements suggested generally offer benefits that are comparable to those afforded by the horizontal elements however, the vertical elements provide these benefits at lower cost. The roadside elements may be the least expensive options but also may be the least effective in lowering speeds. The forecasts of speed reductions provided are only approximations as they are based on before/after studies done at locations that may or may not share similar characteristics to the Blair Park location. For example, when baseline speeds are already close to the posted speed limits the suggested actions may result in only nominal reductions in speeds.

	POTENTIAL IMPACTS			
	BENEFITS		COSTS	
Category/Suggested Action*	Speed Reduction	Vehicular Crashes	Construction	Comments
VERTICAL ELEMENTS				
Speed Humps	20 -25 MPH Target Speed	40% Reduction in Crashes	$30-35,000	
Speed Cushions	20 -25 MPH Target Speed	40% Reduction in Crashes	$30-35,000	Compatible with Emergency Vehicles
Raised Crosswalk	9 MPH Speed Reduction	Some Crash Reduction Possible	$15-20,000	Aids Pedestrians
HORIZONTAL ELEMENTS				
Chicanes	18-35% Reductions in Speeed	Some Crash Reduction Possible	$40-50,000	Traffic Delays Expected
Center Median Islands	2-5 MPH Speed Reduction	Some Crash Reduction Possible	$45-50,000	
Chokers	Some Speed Reduction Possible	Some Crash Reduction Possible	$35-40,000	
ROADSIDE ELEMENTS				
Speed Feedback Sign	4-5 MPH Speed Reduction	Some Crash Reduction Possible	$10-15,000	Also Requires Police Enforcement
Roadside Vegetation	3 MPH Speed Reduction	Unknown Benefits	$15-20,000	"Run Off Road" Crashes More Severe
Illuminated Crosswalk Warning Signs	Some Speed Reduction Possible	Fewer Crashes with Pedestrians	$15-20,000	Curb Extension also Recommended

* Italics and pink shading indicates actions for the north side of Blair Park. Other proposals are for the south side.

Legend				
Much Worse than Do Nothing	Somewhat Worse than Do Nothing	Comparable to Do Nothing	Somewhat Better than Do Nothing	Much Better than Do Nothing
>$35,000	$30,000-$35,000	$25,000 -$30,000	$15,000-$20,000	< $15,000

Figure 18 Alternatives Summary Table