TOOLE DESIGN

2 OLIVER STREET
SUITE 305
BOSTON, MA 02109

617.619.9910
TOOLEDESIGN.COM

MEMORANDUM

May 14, 2019

To: Peter Keating
Organization: Chittenden County Regional Planning Commission (CCRPC)
From: Ashley Haire, PhD, P.E.; Caleb Klick
Project: South Burlington Multi-site Pedestrian Crossing/Bicycle Access Scoping

Re: Concepts for Crossings on Williston Road and Kennedy Drive

---

The Chittenden County Regional Planning Commission (CCRPC) and the City of South Burlington (the City) initiated this scoping study to analyze and evaluate the feasibility of mid-block crossings in multiple locations in South Burlington, Vermont. Toole Design, the consultant, analyzed existing conditions and developed a series of concept design sketches for each location in the study area. The locations are as follows:

- Williston Road between Highway 116/Hinesburg Road and Kennedy Drive
  - Pillsbury Manor
  - Davis Parkway/Pine Tree Terrace
  - Mills Road and Airport Road
- Kennedy Drive between Dorset Street and Highway 166/Hinesburg Rd
  - Twin Oaks Drive

These sites are highlighted in red in Figure 1.The project team, including staff from CCRPC, the City, and Toole Design, conducted a site visit on October 11, 2018. Photos provided in this memorandum were taken during this site visit.

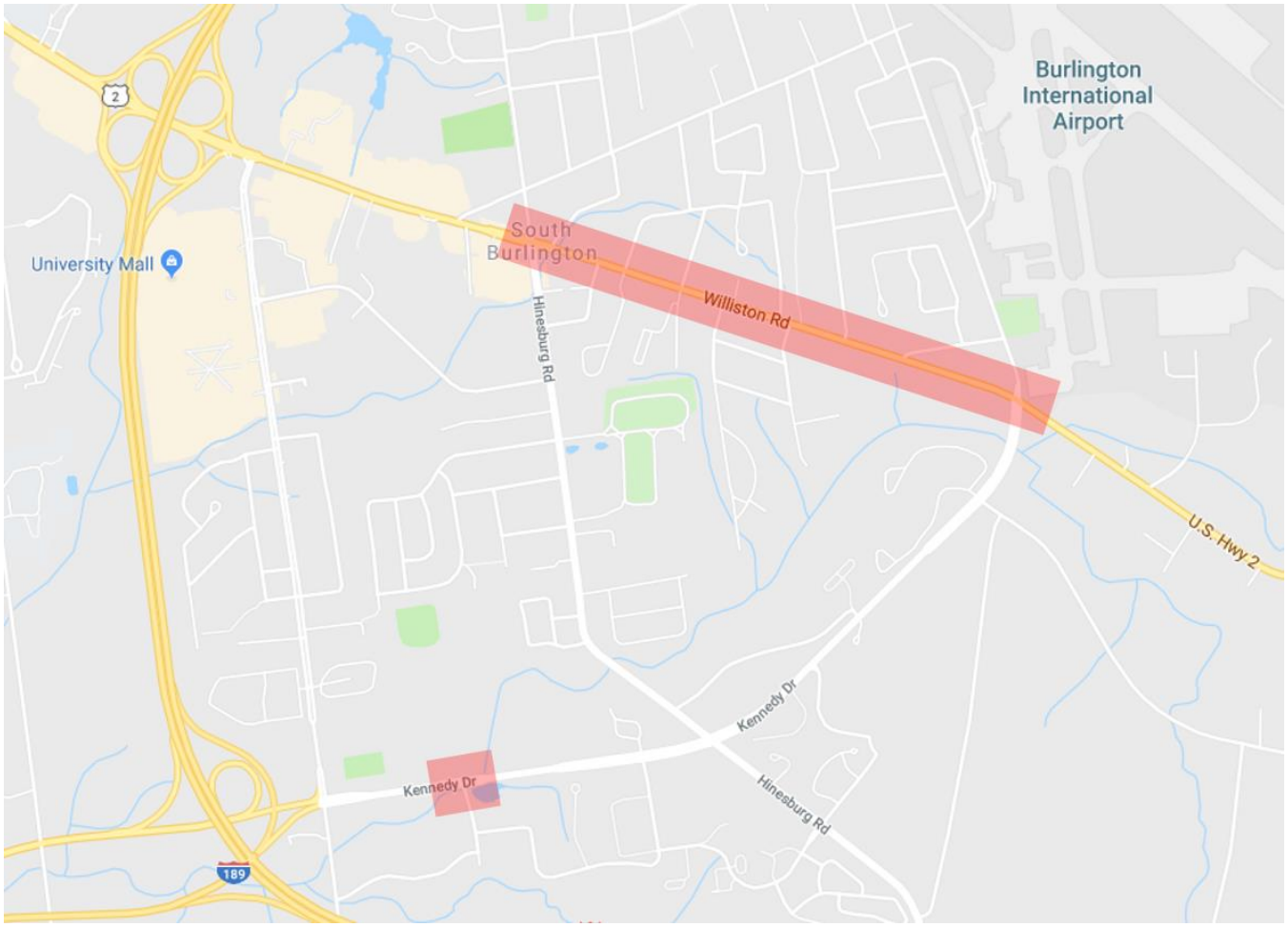


Figure 1. Location Map

This memorandum presents and describes sketch-level concept design treatments developed for these locations. An appendix is provided with design dimensions for the cross sections and other elements shown in Figures 4, 6, 10, and 11. Opinions of probable cost are noted for each location and summarized in a comparison table in the appendix[1].

[1] Opinions of probable cost were developed by identifying major pay items and establishing rough quantities, to determine a rough order of magnitude cost. Additional pay items have been assigned approximate lump sum prices based on a percentage of the anticipated construction cost. Planning-level cost opinions include a 20% contingency to cover items that are undefined or are typically unknown early in the planning phase of a project. Unit costs are based on 2012-2017 dollars and were assigned based on historical cost data from https://vtrans.vermont.gov/sites/aot/files/estimating/documents/5YearEnglishAveragedPriceList11.pdf, http://www.pedbikeinfo.org/cms/downloads/countermeasure%20costs_report_nov2013.pdf, https://safety.fhwa.dot.gov/saferjourney1/library/countermeasures/09.htm, other state departments of transportation, and other sources. Cost opinions do not include easement and right-of-way acquisition; permitting, inspection, or construction management; engineering, surveying, geotechnical investigation, environmental documentation, special site remediation, escalation, or the cost for ongoing maintenance. A cost range has been assigned to certain general categories such as utility relocations; however, these costs can vary widely depending on the exact details and nature of the work. The overall cost opinions are intended to be general and used only for planning purposes. Toole Design Group, LLC makes no guarantees or warranties regarding the cost opinion herein. Construction costs will vary based on the ultimate project scope, actual site conditions and constraints, schedule, and economic conditions at the time of construction.

Williston Road

Williston Road is a major arterial roadway through the northern part of South Burlington. The street serves a variety of residential and commercial land uses, with clusters of retail destinations between the I-89 interchange and Highway 116/Hinesburg Road and around the intersection with Kennedy Drive. Williston Road, also known as US Route 2, also serves traffic for Burlington International Airport, north of the intersection with Kennedy Drive. Traffic counts from August 2017 indicate ADT of roughly 17,500 vehicles per day. The current posted speed limit in this segment is 35 mph. Data from 2015 (prior to implementation of a 4-to-3 road diet) indicate 85th percentile speeds between 37 and 39 mph.

Marked pedestrian crossings are located at the signalized intersections at Highway 116/Hinesburg Rd and Kennedy Drive, but the 0.9-mile segment between these two intersections has no pedestrian crossings. Bus transit stops, residential uses, and retail destinations along this segment generate pedestrian activity and demand for crossing locations. However, without marked crossings, pedestrians must wait for a gap or for motorists to yield.

In the study area between Hinesburg Road and Kennedy Drive, 48 feet of pavement width is divided into two 6-ft conventional bike lanes, two 11-ft travel lanes, and a 14-ft center left turn lane.

Toole Design analyzed and developed concept designs for three locations along the 0.9-mile study segment of Williston Road: Pillsbury Manor (selected in early project scoping by CCRPC and City of South Burlington staff as a key crossing location), Pine Tree Terrace, and Mills Avenue (as proposed in the 2016 Chamberlin Neighborhood Land Use and Transportation Plan[2]).

Location 1: Williston Road at Pillsbury Manor

The first location chosen by CCRPC and City staff for consideration is Pillsbury Manor/Elsom Parkway (Figure 2). This location is adjacent to bus stops on each side of Williston Road and residents of the assisted care facility at Pillsbury Manor use the sidewalks for recreation. Figure 3 and Figure 4 show a pedestrian and two bicyclists using Williston Road at this location.

[2] Chamberlin Neighborhood Land Use and Transportation Plan. Chittenden County Regional Planning Commission and City of South Burlington. 2016. https://www.ccrpcvt.org/wp-content/uploads/2016/01/Chamberlin-Neighborhood-Final-Report-with-Appendices-June-2016.pdf

Figure 2. Williston Road at Pillsbury Manor/Elsom Parkway: Current Conditions (from Google Earth)

Figure 3. Eastbound pedestrian at Elsom Parkway curb ramp

Figure 4. Eastbound bicyclists on Williston Road at Elsom Parkway

The proposed design (Figure 5) for this location includes a 10-ft raised concrete median refuge on the west side of Elsom Parkway with 10-ft high-visibility crosswalks. The pedestrian access route through the median is at-grade with the travel lanes, which avoids the need for ramping within the median. This location was chosen to minimize impacts to motorists turning left onto Elsom Parkway. Rectangular rapid-flashing beacons (RRFBs*), with advanced yield lines and required regulatory signs (R1-5 from the MUTCD) are also recommended to enhance this crossing. This recommendation is consistent with Vermont Agency of Transportation's *Guidelines for Pedestrian Crossing Treatments*[3], in which Figure 11: Crosswalk Enhancement Options to Consider, recommends a pedestrian refuge island, RRFB, and advanced yield line and required regulatory signs for three-lane roadways with a 35mph speed limit and AADT exceeding 12,000 vehicles per day. Yield lines on the eastbound approach are recommended approximately 30 ft before the crossing; yield lines for the westbound approach should be placed prior to the intersection with Elsom Parkway to avoid creating a queue through the intersection.

*See Appendix for RRFB description

[3] Vermont Agency of Transportation. *Guidelines for Pedestrian Crossing Treatments*. January 2015 Update. https://vtrans.vermont.gov/sites/aot/files/highway/documents/ltf/Crossing%20Treatment%20Guidelines%20January_2015.pdf

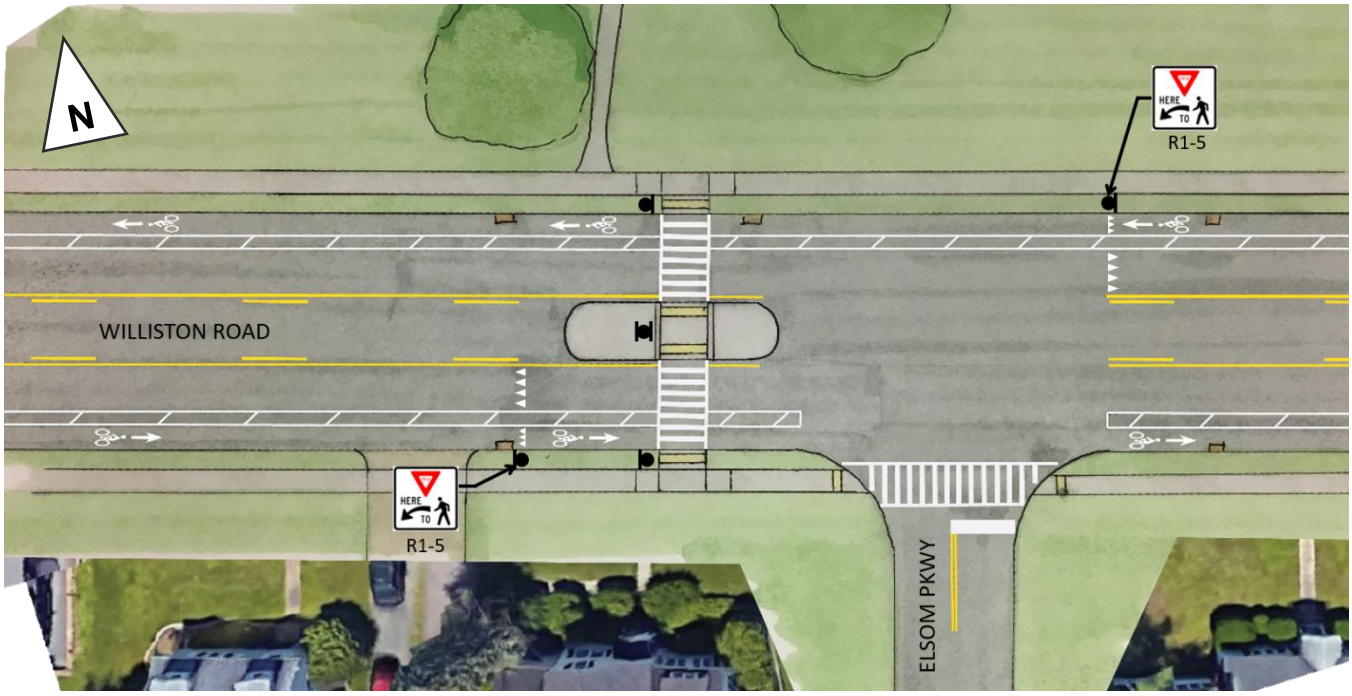


Figure 5. Williston Road at Pillsbury Manor/Elsom Parkway: Mid-block Pedestrian Crossing with RRFBs

The length of the raised refuge may vary from that depicted in Figure 5, depending on spatial needs for vehicle maneuvering by motorists turning left from Elsom Parkway or turning left into the driveway on the southwest corner; these dimensions should be evaluated in final design of this crossing.

The concept design maintains sidewalks at their current width. Curb ramps are transitioned within the sidewalk area. This design allows for ADA-compliant pedestrian access without the purchase of right-of-way from adjacent property owners. Toole Design further recommends that the westbound bus transit stop be relocated approximately 100 ft west to avoid interference with the pedestrian crossing.

Proposed lane widths are 10 feet, with a 12-ft center left-turn lane. Narrowing all motor vehicle lanes allows for 3-ft buffers to be added to the bike lanes (narrowed from 6 ft to 5 ft). The addition of the 3-ft bike lane buffers increases the effective width of the bike lanes from 6 ft to 8 ft (the bike lane buffer is included as dedicated bicycle space). Narrowing the travel lanes to 10 ft is recommended for managing speeds along this corridor, particularly in the vicinity of this and other crossings, but 11-ft or 12-ft travel lanes could be accommodated by adjusting the refuge and center left-turn lane width or bike lane and buffer widths.

Existing curb radii at Elsom Parkway are approximately 35 ft. To control motorist speeds, reduce crossing distances, and enable the crossing to be placed closer to the intersection of Elsom Parkway, Toole Design recommends that the curb radii at Elsom Parkway be reconstructed to a maximum of 20 ft. The smaller radius will slow motorists in making a right or left turn into or out of Elsom Parkway. To supplement the side street crossing, a 10-ft high-visibility crosswalk is recommended.

See Figure A-1 in the Appendix for a larger concept drawing with dimensions of cross section and other design elements. Opinion of probable cost for this design is $90,000.

An alternative crossing design for this location could offset the crossing through the median area. Offset crossings benefit safety by inducing pedestrians to turn within the median so that their field of view is directed towards oncoming traffic. A conceptual layout for an offset crossing at this location is provided in Figure 6. In this design, the crosswalk widths are 10 ft and the offset geometry is mirrored around a central axis through the 10-ft median.

The centerlines of the crosswalks are offset by 5 ft in this layout. The offset distance and length of the median island were minimized in order to preserve access to the driveway on the southwest corner.

A larger concept drawing of this offset crossing with dimensions is provided in Figure A-2 of the Appendix. Opinion of probable cost for this design is $90,000.

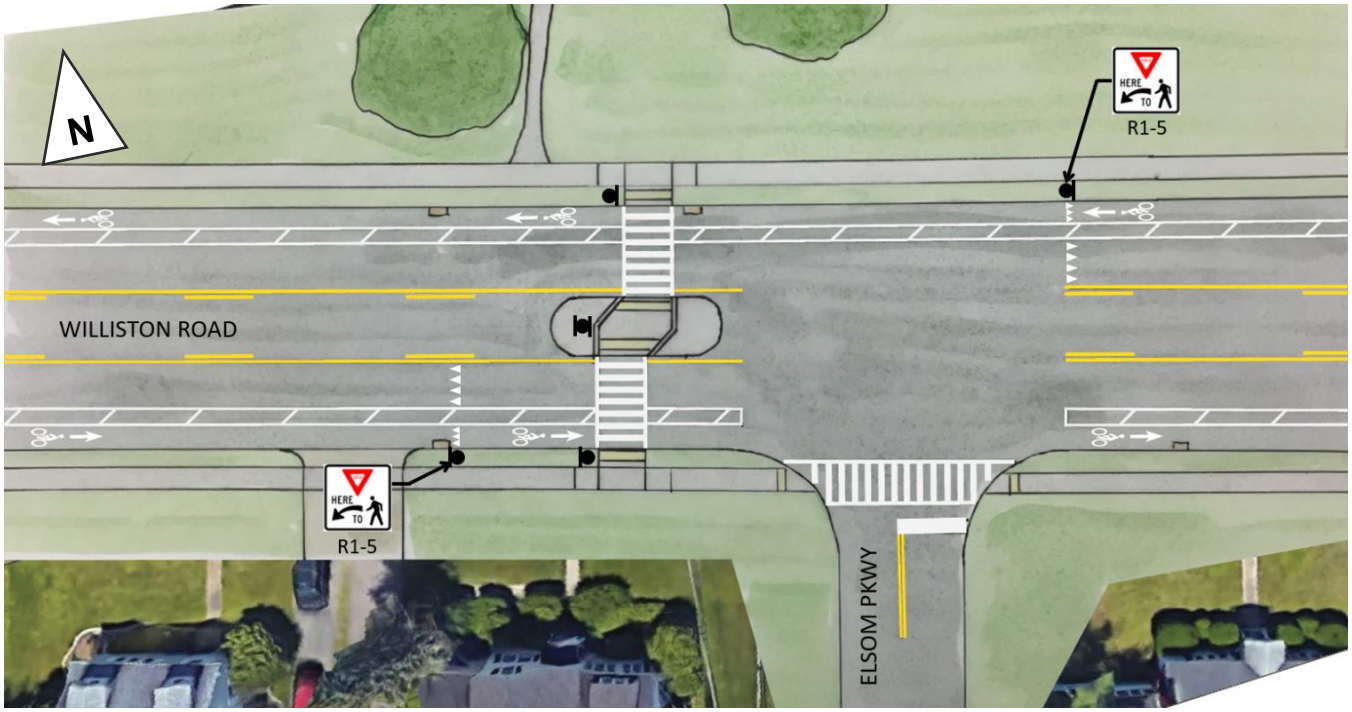


Figure 6. Williston Road at Pillsbury Manor/Elsom Parkway: Mid-block Offset Pedestrian Crossing with RRFBs

Location 2: Williston Road at Davis Parkway/Pine Tree Terrace

CCRPC and the City requested that Toole Design investigate other locations along Williston Road within the study area for additional pedestrian crossings. The first of the additional sites is proposed at Williston Road and Davis Parkway/Pine Tree Terrace. This location is approximately 900 ft from both the signalized intersection at Hinesburg Road and the crossing proposed in Location 1 at Pillsbury Manor/Elsom Parkway.

At this intersection, left-turn lanes are provided for motorists accessing Davis Parkway and Pine Tree Terrace (Figure 7). For eastbound Williston Road, a short queue storage area is provided for left-turning motorists; this queuing area is only slightly beyond the functional area of the intersection with Hinesburg Road, where the eastbound travel lanes drop from two to one in a 450-ft merging area and the westbound travel lane splits into two lanes on the intersection approach.

Bike lanes are provided on the east side of this intersection but not on the west side. Future analysis of the Williston Road/Hinesburg Road intersection will assess the feasibility of continuing the bike lanes from this point to the Hinesburg Road intersection.

Figure 7. Williston Road at Davis Parkway/Pine Tree Terrace: Current Conditions (from Google Earth)

The proposed crossing design for the Davis Parkway/Pine Tree Terrace location is illustrated in Figure 8. The proposed treatment focuses pedestrian crossing activity on the east side of the intersection. The primary reason for this location is to avoid the possible formation of eastbound queues that may back up towards the Hinesburg Road intersection. The eastbound queuing area is much shorter than that for the westbound direction, which includes the center left-turn lane and extends more than 400 ft to Gilbert Street.

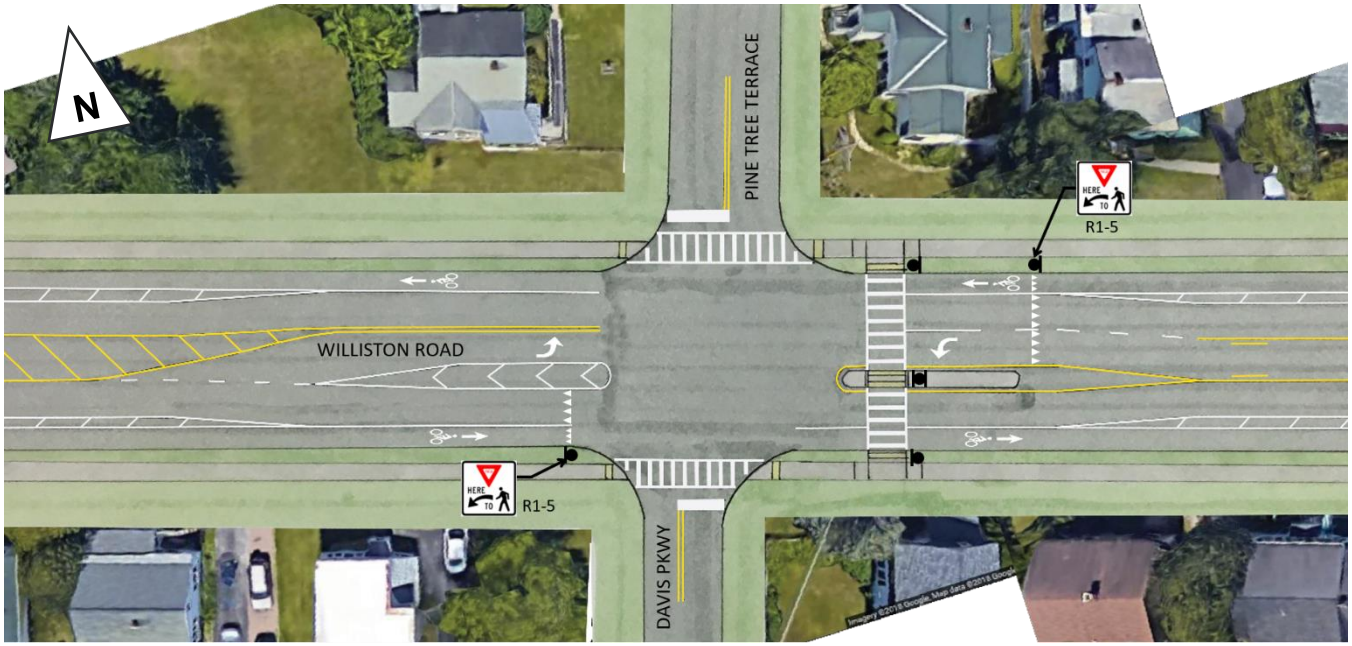


Figure 8. Williston Road at Davis Parkway/Pine Tree Terrace: Mid-block Pedestrian Crossing with RRFBs

This crossing treatment includes 10-ft travel lanes for all vehicular lanes and a 6-ft raised concrete median refuge on the east side of the intersection. High-visibility crosswalks are recommended to be at least 10 ft. The median cut-through serves the pedestrian access route and is at-grade with the adjacent travel lanes. As with the crossing treatment proposed at Pillsbury Manor, curb ramp transitions are accomplished within the sidewalk width, which minimizes impacts to adjacent properties. RRFBs with advanced yield lines and required regulatory signs are recommended for this crossing. This recommendation is consistent with Vermont Agency of Transportation's *Guidelines for Pedestrian Crossing Treatments*[4], in which Figure 11: Crosswalk Enhancement Options to Consider, recommends a pedestrian refuge island, RRFB, advanced yield lines, and required regulatory signs (R1-5 from the MUTCD) for three-lane roadways with a 35-mph speed limit and AADT exceeding 12,000 vehicles per day. Yield lines for the westbound approach are recommended 30 ft upstream of the crossing and eastbound yield lines should be placed prior to the intersection with Davis Parkway.

In order to accommodate bicyclists through this location, 5-ft bike lanes with 3-ft buffers are recommended on the approaches, with the 3-ft buffer transitioning to zero through the narrowest cross section area. This design maintains the 5-ft bike lanes through the intersection as conventional bike lanes. Past the queuing areas for the left-turn lanes, the bike lane buffer is restored.

Proper lane alignment through the intersection is maintained by offsetting the eastbound left-turn lane is by 8 ft using a striped channelizing median.

As with the Elsom Parkway location, curb radii at Pine Tree Terrace/Davis Parkway are currently about 35 ft. To control turning speeds, shorten crossing distances, and allow the crossing to be placed closer to the intersection, all four intersection corners are recommended to be reconstructed with maximum 20-ft radii.

See Figure A-3 in the Appendix for a larger concept drawing with dimensions of cross section and other design elements. Opinion of probable cost for this design is $130,000.

Location 3: Williston Road at Mills Avenue

Within the Williston Road study area, Toole Design identified a third crossing location in the vicinity of Mills Avenue or Airport Road. Comparing these two unsignalized intersections, Mills Road is the preferred location and is located about 1,200 ft east of the proposed crossing at Pillsbury Manor. While Airport Road is closer to pedestrian-generating retail locations, it may be used by drivers to avoid the signalized intersection of Williston Road and Kennedy Drive. Furthermore, the geometry of Airport Road as it intersects Williston Road could encourage high speeds, particularly for southbound right turns to westbound Williston Road.

A proposed crossing at Mills Avenue is consistent with the locational recommendations from the 2016 Chamberlin Neighborhood Land Use and Transportation Plan[5]. The Chamberlin Plan recommended a pedestrian signal at this site; however, pedestrian and bicycle volumes in this corridor are not currently high enough to warrant a full pedestrian signal. This location also provides a connection to the existing paved path that parallels Mills Avenue through a wooded area between Williston Road and Lynn Avenue (noted in Figure 9).

[4] Vermont Agency of Transportation. *Guidelines for Pedestrian Crossing Treatments*. January 2015 Update. https://vtrans.vermont.gov/sites/aot/files/highway/documents/ltf/Crossing%20Treatment%20Guidelines%20January_2015.pdf

[5] Chamberlin Neighborhood Land Use and Transportation Plan. Chittenden County Regional Planning Commission and City of South Burlington. 2016. https://www.ccrpcvt.org/wp-content/uploads/2016/01/Chamberlin-Neighborhood-Final-Report-with-Appendices-June-2016.pdf

Toole Design recommends a crossing treatment similar to that proposed at Elsom Parkway, consisting of a raised median refuge, offset crossing, and RRFB installation. Figure 9 shows a concept design for this crossing treatment. The crossing includes 10-ft high-visibility crosswalks and a 10 ft-wide raised median refuge with an offset crossing and 1-ft striping offsets. RRFBs with advanced yield lines and required regulatory signs (R1-5 from the MUTCD) are recommended for this crossing, as it, like the other proposed crossings in this corridor, meets the Vermont Agency of Transportation criteria noted previously. Yield lines and signage for both directions of traffic are proposed 30 ft upstream of the crossing.

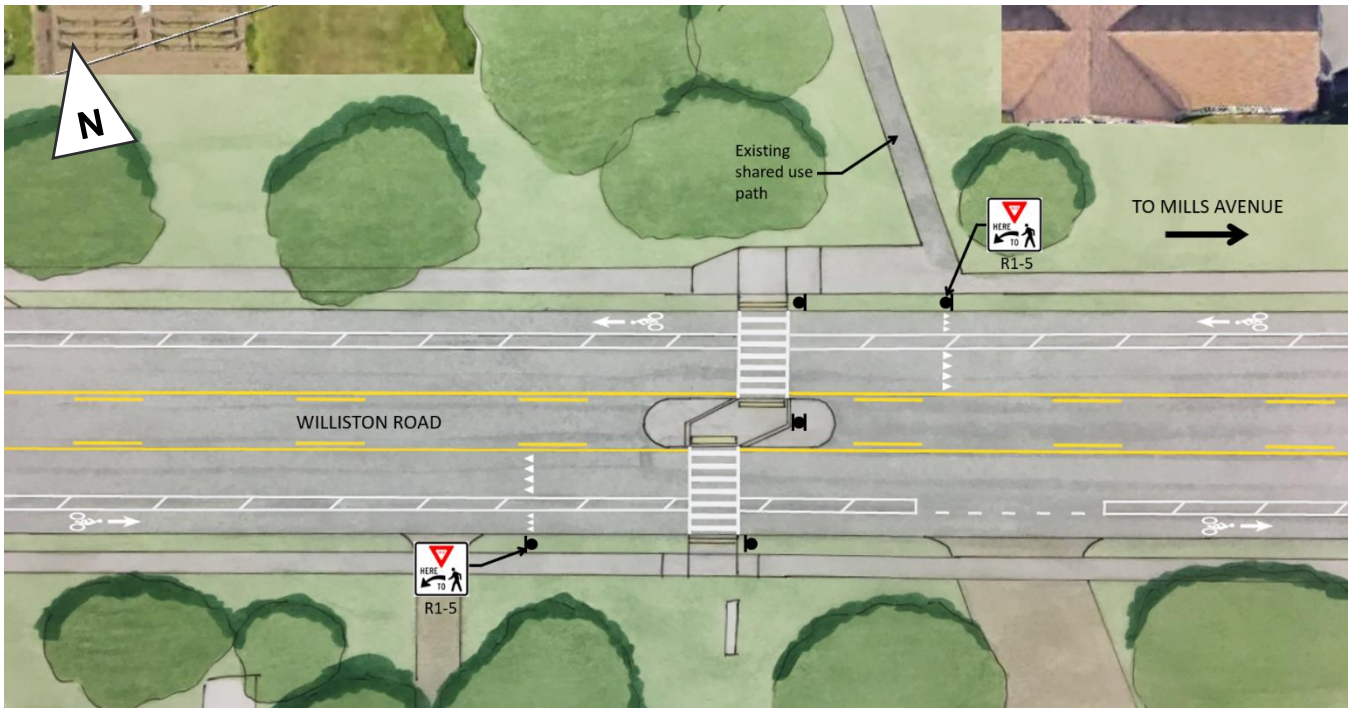


Figure 9. Williston Road West of Mills Avenue: Mid-block Pedestrian Crossing with RRFBs

While buffered bike lanes could be optional along other sections of this corridor, they are recommended at this crossing to provide adequate maneuvering width for bicyclists travelling westbound along Williston Road toward this crossing to turn right into the curb ramp and continue towards the shared use path (creating a U-turn movement for westbound bicyclists). For this reason and to establish sufficient width for pedestrians sharing this section of sidewalk with bicyclists, it is recommended that the sidewalk be widened to at least 10 ft between the crossing and the shared use path. The sidewalk can be tapered back to its existing width outside this section where bicycle use on the sidewalk less common. Opinion of probable cost for this design is $60,000, which does not include any right-of-way acquisition that may be required.

The distance between the crossing and shared use path is approximately 30 ft, in order to create maneuvering space and to avoid impacts to the driveway at the Ethan Allen Motel on the south side of Williston Road. As part of the final design for this crossing, turning radii for appropriately-selected design vehicles exiting the motel driveway and turning left onto Williston Road should be checked. Motel management should be consulted to identify the design vehicle for this driveway.

As an alternative to widening the sidewalk between the crossing and shared use path, a plaza could be built at the nexus between the shared use path and existing sidewalk. One possible layout for this plaza is shown in Figure 10. In addition to serving as a maneuvering space for pedestrians and bicyclists moving between the shared use path and the walking and bicycling facilities on Williston Road, the plaza could include seating areas

and landscaping (not shown in figure) and be a community space. Widening the sidewalk or constructing this plaza area may require acquiring additional right-of-way from adjacent property owners. This cost is not included in the opinion of probable cost for this design of $80,000.

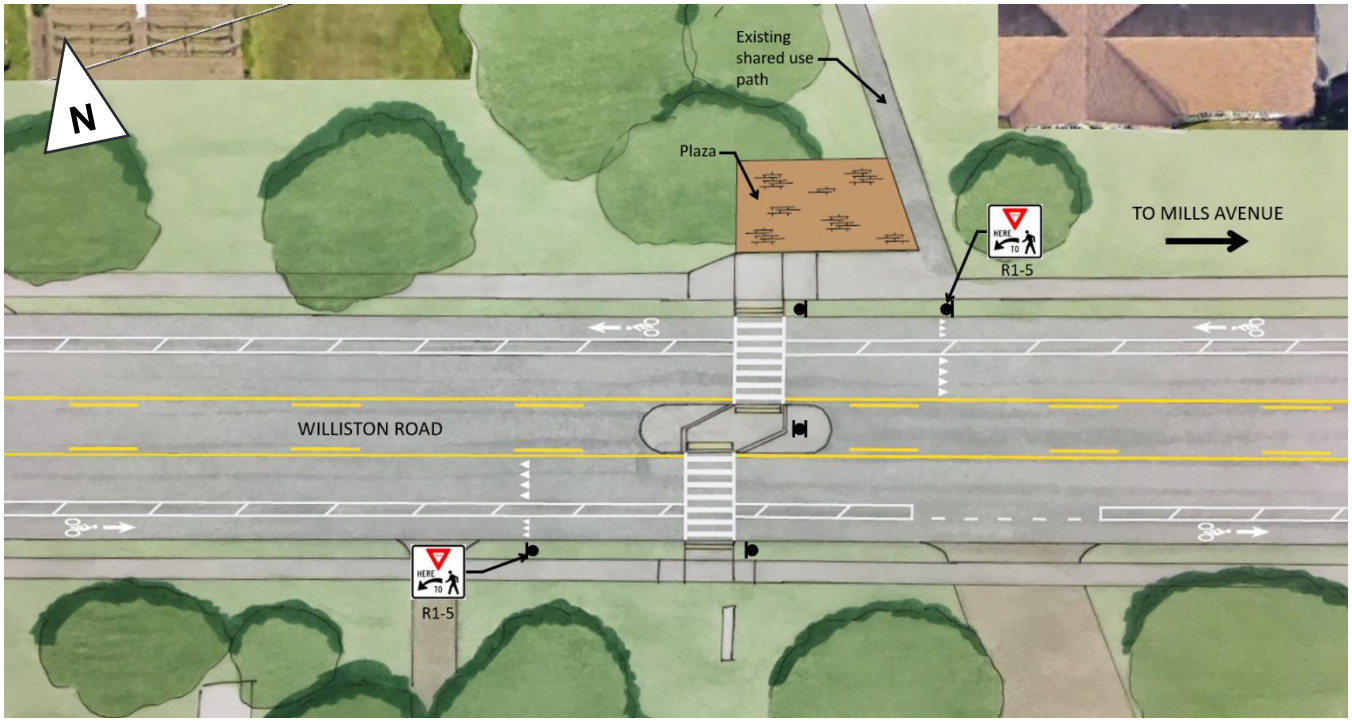


Figure 10. Williston Road West of Mills Avenue: Mid-block Pedestrian Crossing with RRFBs and Plaza

Larger dimensioned concept drawings of these crossing alternatives are provided in Figures A-4 and A-5 of the Appendix.

Williston Road Comparison Matrix

Table 1 provides a comparison matrix for the three Kennedy Drive/Twin Oaks Drive crossing.

Table 1. Williston Road Comparison Matrix

Location	Features	Opinion of Probable Cost[6]
Location 1: Pillsbury Manor	Straight Crossing or Offset Crossing 10-ft-deep median refuge with 1-ft striping offsets Creates two shorter crossings with center refuge High-visibility crosswalks RRFB for enhanced visibility Offset crossing encourages looking for oncoming traffic Reduced corner radii at Elsom Parkway slow motorist turning speeds and shorten side street crossing distances	Straight Crossing: $90,000 Offset Crossing: $90,000
Location 2: Davis Parkway/ Pine Tree Terrace	6-ft-deep median refuge (minimum to meet ADA requirements) with 1-ft striping offsets Creates two shorter crossings with center refuge High-visibility crosswalks RRFB for enhanced visibility Reduced corner radii at Davis Parkway and Pine Tree Terrace slow motorist turning speeds and shorten side street crossing distances	$130,000
Location 3: Mills Avenue	10-ft-deep median refuge with 1-ft striping offsets RRFB for enhanced visibility Creates two shorter crossings with center refuge High-visibility crosswalks RRFB for enhanced visibility Offset crossing encourages looking for oncoming traffic Provides connection to existing shared use path Option for plaza at junction with existing shared use path	Without plaza*: $60,000 With plaza*: $80,000 *Costs do not include right-of-way acquistion and other costs; see disclaimer

[6] Opinions of probable cost were developed by identifying major pay items and establishing rough quantities, to determine a rough order of magnitude cost. Additional pay items have been assigned approximate lump sum prices based on a percentage of the anticipated construction cost. Planning-level cost opinions include a 20% contingency to cover items that are undefined or are typically unknown early in the planning phase of a project. Unit costs are based on 2012-2017 dollars and were assigned based on historical cost data from https://vtrans.vermont.gov/sites/aot/files/estimating/documents/5YearEnglishAveragedPriceList11.pdf, http://www.pedbikeinfo.org/cms/downloads/countermeasure%20costs_report_nov2013.pdf, https://safety.fhwa.dot.gov/saferjourney1/library/countermeasures/09.htm, other state departments of transportation, and other sources. Cost opinions do not include easement and right-of-way acquisition; permitting, inspection, or construction management; engineering, surveying, geotechnical investigation, environmental documentation, special site remediation, escalation, or the cost for ongoing maintenance. A cost range has been assigned to certain general categories such as utility relocations; however, these costs can vary widely depending on the exact details and nature of the work. The overall cost opinions are intended to be general and used only for planning purposes. Toole Design Group, LLC makes no guarantees or warranties regarding the cost opinion herein. Construction costs will vary based on the ultimate project scope, actual site conditions and constraints, schedule, and economic conditions at the time of construction.

Kennedy Drive

Location 4: Kennedy Drive at Twin Oaks Drive

Kennedy Drive connects I-189, I-89, Hinesburg Road (Highway 116), Williston Road (US Route 2), and Burlington International Airport. Traffic count data from August 2017 show an ADT of 17,000 vehicles per day with an even split between eastbound and westbound traffic. Speeds on Kennedy Drive tend to be much higher than the posted speed of 40 mph; with 85th percentile speeds around 47.5 mph.

The existing marked crossings on Kennedy Drive are at the intersections with Dorset Street and Hinesburg Road. These crossings are approximately 3,600 ft apart. There are no marked pedestrian crossings between these intersections, but a 10-ft shared use path/sidepath is located along the northern side of the roadway for the entire study area. Bus transit stops are located along Kennedy Drive and transit patrons from the retail and residential areas to the south have difficulty crossing Kennedy Drive to access the bus stops. People riding bicycles or walking on the sidepath also create demand for a crossing at this site.

Toole Design was requested to develop pedestrian crossing treatments for the intersection of Kennedy Drive and Twin Oaks Drive. Three alternatives were developed for this location. Alternative 1, potentially lower-cost, maintains existing curblines as they are. Alternatives 2 and 3 modify the eastbound curbline to reduce the roadway pavement width. An aerial image of this location and its current conditions is provided in Figure 11.

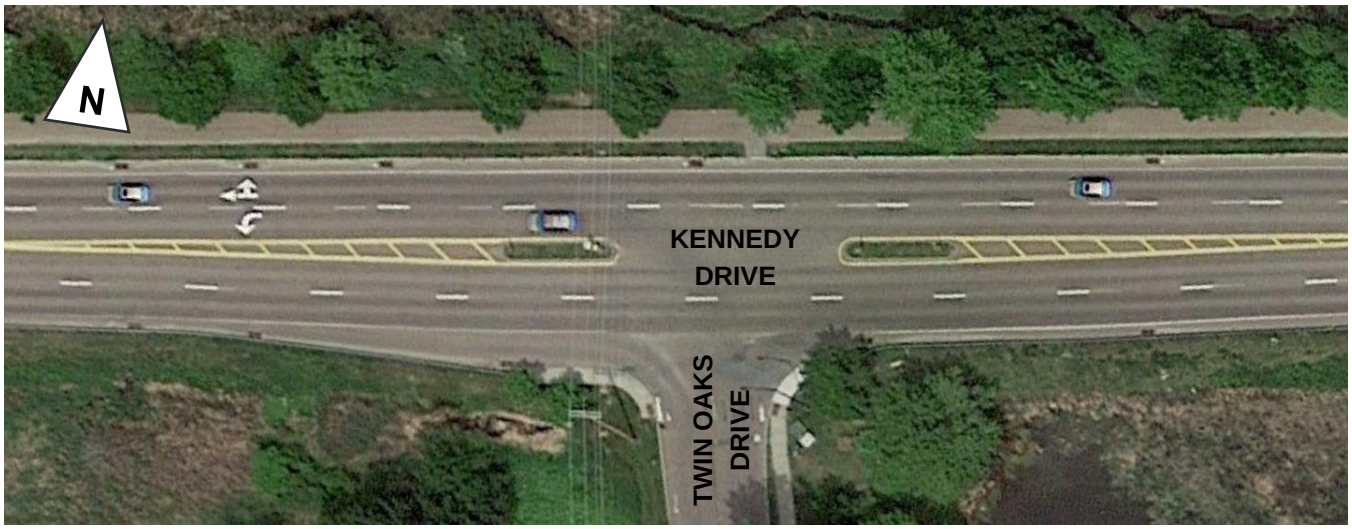


Figure 11. Kennedy Drive at Twin Oaks Drive: Current Conditions (from Google Earth)

When arriving at this location during the site visit on October 11, team members approached Twin Oaks Drive from the east and queued behind two other vehicles waiting for a gap in eastbound traffic to make the left turn. While allowing left-turning motorists to queue within the travel lane could have a traffic calming effect on other motorists approaching from the east, it also creates a safety issue with the threat of rear-end crashes. As a result, left-turning motorists may feel greater pressure to accept gaps in oncoming traffic that are too small, leading them to take the turn too quickly, and/or endangering pedestrians in the crosswalk across Twin Oaks Drive.

Access to the sidepath has been modified with a curb cut and asphalt ramp within the street buffer, but this ramp is not ADA accessible (see Figure 12). The greatest benefit of this curb cut and asphalt ramp is likely to bicyclists entering or exiting the sidepath. The proposed concepts include ADA-compliant access to the sidepath that can be used by pedestrians or bicyclists.

Figure 12. Asphalt and curb cut for accessing sidepath along north side of Kennedy Drive

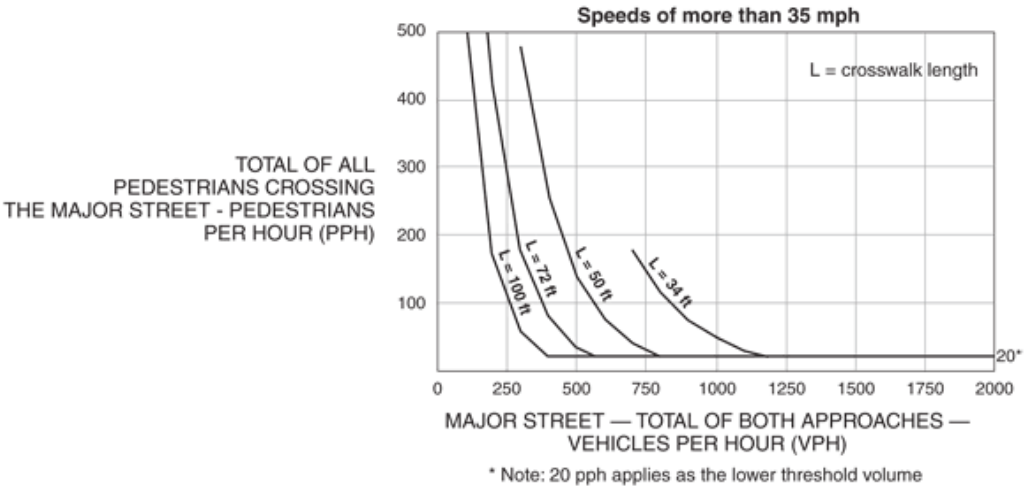
All three conceptual alternatives share some key design features. First, all alternatives propose adding a pedestrian crossing on the west side of the intersection (see Figure 13) to minimize conflicts turning left from Kennedy Drive. Second, in all alternatives a raised concrete median refuge is recommended on the west side of the intersection to provide a pedestrian refuge (10 ft wide in Alternative 1 and 12 ft wide in Alternatives 2 and 3). In the design phase, the geometry of the refuge should be checked for clearance by motorists turning left onto Kennedy Drive from Twin Oaks Drive. Third, all alternatives propose adding a westbound left-turn lane on Kennedy Drive to lessen the potential for rear-end crashes and reduce pressure on motorists to quickly make left turns. Fourth, in all alternatives the island on the east side is narrowed from 6 ft to 2 ft (with 1-ft striping offsets) and lengthened from its current length of 35 ft to 80 ft. Transitions and tapers can tie back to the existing striping upstream and downstream of both islands. Since the left-turn lane island is not intended for pedestrian use, it is not necessary to provide a pedestrian access route or refuge.

Figure 13. Proposed location of pedestrian crossing on west side of intersection

Like the other locations, RRFBs are recommended for all alternatives. This recommendation is again consistent with Vermont Agency of Transportation's *Guidelines for Pedestrian Crossing Treatments*[7], in which Figure 11: Crosswalk Enhancement Options to Consider, recommends advanced yield line and required regulatory signs, RRFB, and pedestrian hybrid beacon (PHB*) for four-lane roadways with a 40mph speed limit, raised median, and AADT exceeding 12,000 vehicles per day. Due to the higher speed limit here, this location may meet the requirements for a PHB rather than an RRFB. An engineering study to compare the pedestrians crossing per hour (PPH) versus vehicles per hour (VPH) would be necessary to determine if a PHB is warranted. According to the MUTCD:

> *For a major street where the posted or statutory speed limit or the 85th-percentile speed exceeds 35 mph, the need for a pedestrian hybrid beacon should be considered if the engineering study finds that the plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding total of all pedestrians crossing the major street for 1 hour (any four consecutive 15-minute periods) of an average day falls above the applicable curve in* Figure 4F-2 *for the length of the crosswalk.*

Figure 4F-2. Guidelines for the Installation of Pedestrian Hybrid Beacons on High-Speed Roadways



Source: MUTCD, Chapter 4F. https://mutcd.fhwa.dot.gov/htm/2009/part4/part4f.htm

Toole Design recommends that video data be collected to determine whether this location meets the warrant for installation of a PHB. Yield lines are shown in the following figures under the assumption that an RRFB would be implemented. Given the higher speeds on Kennedy Drive, it is recommended that yield lines and R1-5 signage be located 50 feet upstream of the crossing for the eastbound direction and prior to the Twin Oaks Drive intersection on the westbound approach.

In all alternatives, directional curb ramps are added to the southwestern corner of the intersection and 10-ft high-visibility crosswalks are installed across the western leg of Kennedy Drive and across Twin Oaks Drive. The median cut for the pedestrian access route is proposed to be at-grade with the adjacent travel lanes. Curb ramp

*See Appendix for PHB description

[7] Vermont Agency of Transportation. *Guidelines for Pedestrian Crossing Treatments*. January 2015 Update. https://vtrans.vermont.gov/sites/aot/files/highway/documents/ltf/Crossing%20Treatment%20Guidelines%20January_2015.pdf

transitions are accomplished within the sidewalk/sidepath width, minimizing impacts to adjacent properties. However, the parcel on the north side of the intersection is owned by the City, and this crossing may be a favorable location for a sidepath wayside with a larger landing area, seating, and amenities for bus passengers (if the bus stop were relocated from the near side of the intersection to the far side). It should be noted that relocations of utilities and/or drainage structures may be required as part of constructing the preferred design for this location; costs for these relocations are not included in the opinions of probable cost associated with each alternative cited in the text or in the cost summary table in the appendix.

Alternative 1 – Maintain Existing Curblines

The first alternative developed for the intersection of Kennedy Drive and Twin Oaks Drive keeps curblines as they currently are (Figure 14). Additional width for the left-turn lane was obtained by reducing the edgeline offset from 4 ft to 3 ft, which still accommodates the drainage grates (which extend 2.2 ft from the curb face), reducing lane widths to 10 ft, and narrowing the island on the east side from 6 ft to 2 ft.

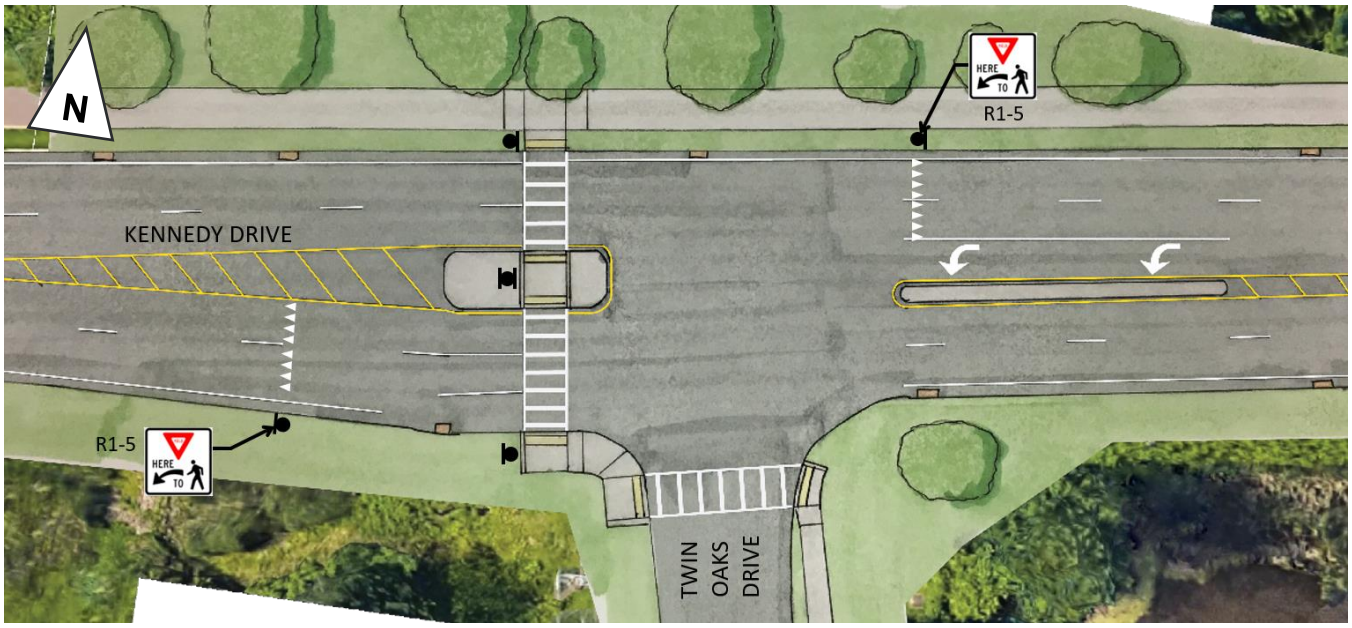


Figure 14. Kennedy Drive at Twin Oaks Drive: Mid-block Pedestrian Crossing with RRFBs, Maintaining Existing Curblines

Depending on right-of-way and utilities, the curb ramps and connecting sidewalk on the southwest corner could also be oriented to form a 90-degree bend in the opposite direction (i.e., not following the curb radius). This alignment is illustrated in Figure 17.

See Figure A-6 in the Appendix for a larger concept drawing with dimensions of cross section and other design elements. Opinion of probable cost for this alternative is $70,000.

Alternative 2 – Reduce Pavement Width on Eastbound Kennedy Drive

The design for Alternative 2 is identical to that for Alternative 1 with the exceptions of (a) a slightly wider 12-ft (rather than 10-ft) median and (b) reconstruction of the eastbound curb line on the south side of the intersection to narrow the roadway pavement width and eliminate the small eastbound right-turn area (see Figure 15). This deceleration area, which allows through vehicles to maintain their speed while right-turning motorists execute their turn, would not add to the safety of pedestrians using the new crossing, and could potentially present a multiple-threat crash risk (e.g., a right-turning motorist yielding to a pedestrian in the crossing while through motorists do not yield). This geometry may also improve the visibility of the RRFB assembly on the south side of the crossing

by moving it closer to the travel lanes. The need for this right-turn area should be assessed using video data to verify the frequency of its use and the influence on adjacent through-moving traffic. This space is currently less than a full lane width and its elimination may also benefit multimodal users of the corridor by controlling eastbound motorist speeds.

Under current conditions, the curb radius on the southwest corner is about 20 ft. The radius on the southeast corner, however, varies in its geometry, appearing as a compound curve and having an average radius of approximately 35 ft. It is recommended that curb radii at the intersection be reconstructed to no more than 20 ft. This design would require modifications to drainage structures and possibly other utilities but would benefit pedestrians by creating shorter crossings of both Kennedy Drive and Twin Oaks Drive.

This design also allows the Twin Oaks Drive crosswalk to be set back approximately 20 feet from Kennedy Drive. This setback provides greater perception time for motorists turning onto Twin Oaks Drive. It also creates queuing space for motorists to yield to pedestrians in the crosswalk, whether approaching the crosswalk from Kennedy Drive or from Twin Oaks Drive. With the setback, motorists can yield to pedestrians without blocking the crosswalk or traffic on Kennedy Drive. Motorists exiting Twin Oaks Drive can check for pedestrians as they approach, yield if necessary, and then pull forward to look for oncoming traffic on Kennedy Drive without blocking the crosswalk.

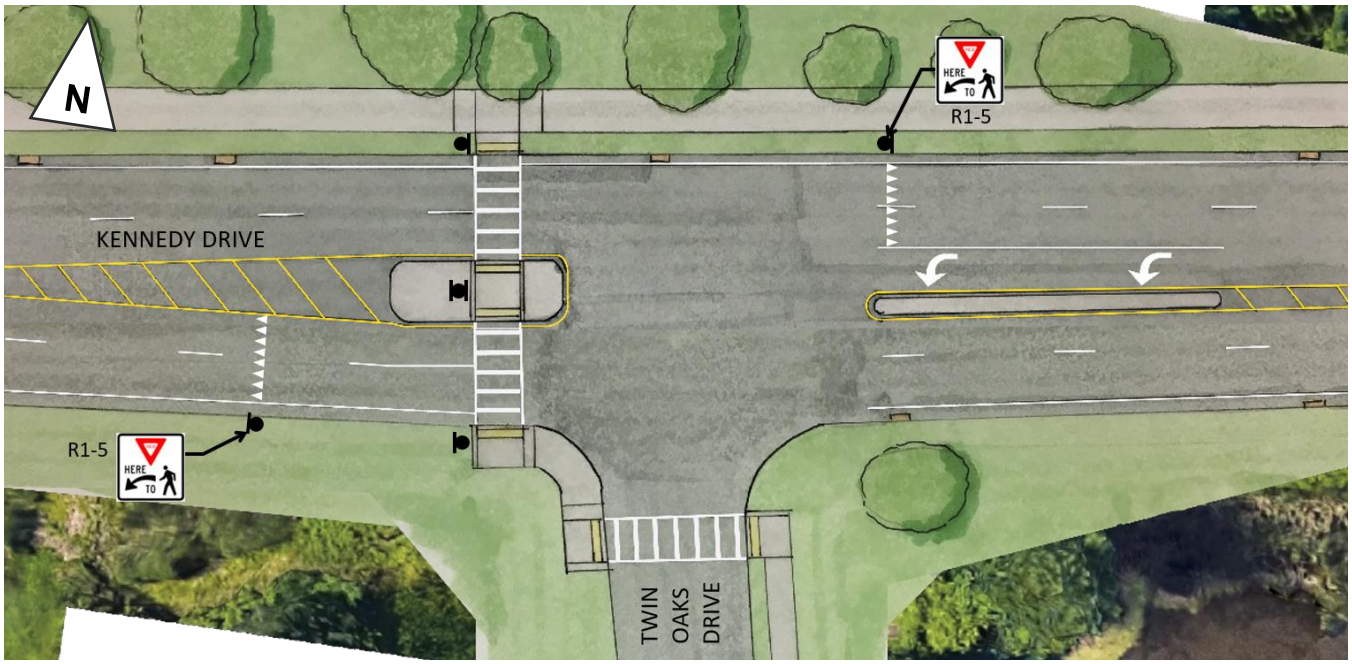


Figure 15. Kennedy Drive at Twin Oaks Drive: Mid-block Pedestrian Crossing with RRFBs, Relocating Eastbound Curblines

Rebuilding the curbline would also provide an opportunity to resolve a ponding issue on the southeast corner of the intersection, as shown in Figure 16. This ponding is not an issue for pedestrians in the proposed design since they are directed to the crossing on the west side of the intersection, but it can create safety issues for motorists by freezing or icing over in winter months and building up debris in all seasons.

Figure 16. Ponding issue on southeast corner of Kennedy Drive and Twin Oaks Drive

See Figure A-7 in the Appendix for a larger concept drawing with dimensions of cross section and other design elements. Opinion of probable cost for this alternative is $100,000.

Alternative 3 – Reduce Pavement Width on Eastbound Kennedy Drive with Offset Crossing

A variation on Alternative 2 could create an offset crossing at this location. Offset crossings benefit safety by inducing pedestrians to turn within the median so that their field of view is directed towards oncoming traffic. This alternative is shown in Figure 17.

In this offset crossing design, the crosswalks are 10 ft wide, with the offset mirrored around a central axis in the 12-ft median refuge. The crosswalks are offset by 10 ft, and the median geometry creates an alignment that could allow bicyclists to ride through the crossing without dismounting.

For the continuation of the 10-ft path on the southwest corner of the intersection, it is recommended that the minimum radius of the tightest bicyclist route be at least 5 ft (illustrated in red in Figure A-6 in the Appendix). For a 10-ft path, this radius would be located approximately 2.5 ft away from the edge of the path. A 5-ft radius is the minimum negotiable radius in which a bicyclist can navigate a corner without dismounting. A larger concept drawing with dimensions is provided as Figure A-8 of the Appendix. Opinion of probable cost for this alternative is $110,000.

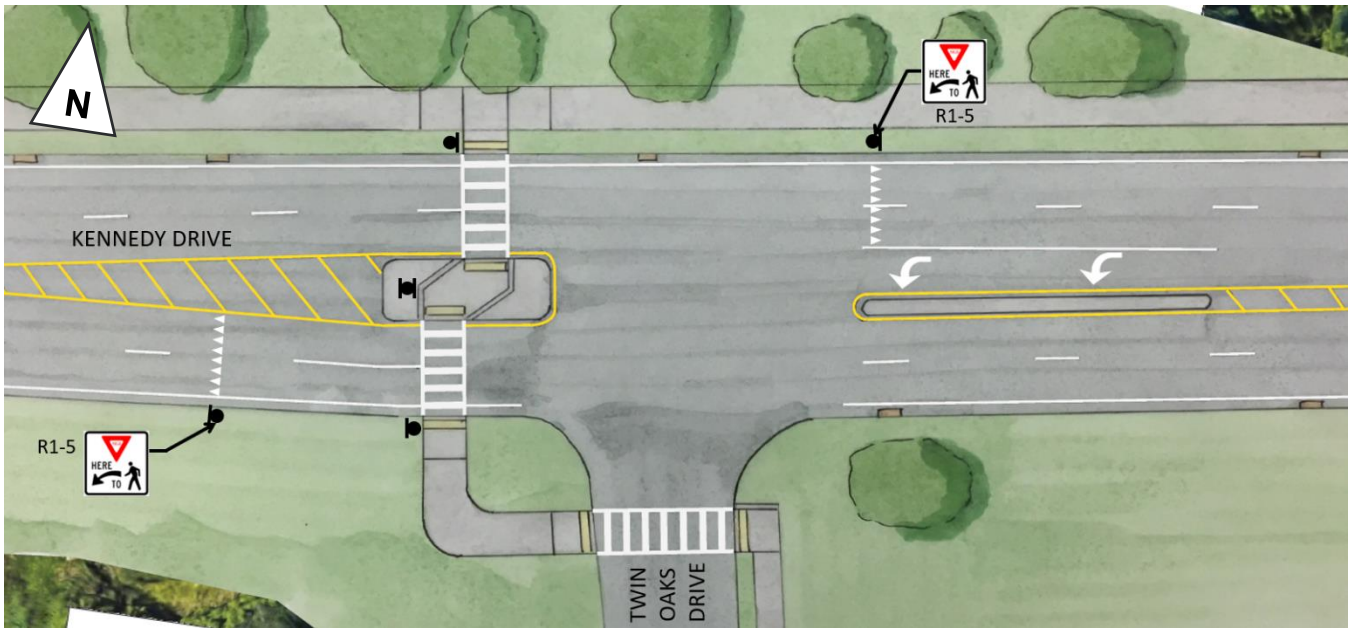


Figure 17. Kennedy Drive at Twin Oaks Drive: Mid-block Offset Pedestrian Crossing with RRFBs, Relocating Eastbound Curblines

Alternatives 2 or 3 are the recommended designs for pedestrian crossings at the Kennedy/Twin Oaks location.

Kennedy Drive/Twin Oaks Comparison Matrix

Table 2 provides a comparison matrix for the three Kennedy Drive/Twin Oaks Drive crossing.

Table 2. Kennedy Drive/Twin Oaks Comparison Matrix

Alternative	Features	Crossing Orientation	Opinion of Probable Cost[8]
Alt. 1: Maintain Existing Curblines	10-ft raised median refuge with 1-ft striping offsets Creates two shorter crossings with center refuge High-visibility crosswalks RRFB for enhanced visibility Preserves short eastbound Kennedy deleration area for right turns to Twin Oaks	Straight	$70,000
Alt. 2 (Straight Crossing) and 3 (Offset Crossing): Reduce Pavement Width on EB Kennedy Drive	12-ft raised median refuge with 1-ft striping offsets Creates two shorter crossings with center refuge High-visibility crosswalks RRFB for enhanced visibility Offset crossing in Alternative 3 encourages crossing bicyclists and pedestrians to look for oncoming traffic Shortens crossing distance and exposure by reducing pavement width May reduce eastbound speeds in corridor by eliminating deceleration area at Twin Oaks Reduced corner radii at Twin Oaks slow motorist turning speeds and shorten side street crossing distances Potential to resolve ponding issues	Straight or Offset	Straight Crossing: $100,000 Offset Crossing: $110,000

[8] Opinions of probable cost were developed by identifying major pay items and establishing rough quantities, to determine a rough order of magnitude cost. Additional pay items have been assigned approximate lump sum prices based on a percentage of the anticipated construction cost. Planning-level cost opinions include a 20% contingency to cover items that are undefined or are typically unknown early in the planning phase of a project. Unit costs are based on 2012-2017 dollars and were assigned based on historical cost data from https://vtrans.vermont.gov/sites/aot/files/estimating/documents/5YearEnglishAveragedPriceList11.pdf, http://www.pedbikeinfo.org/cms/downloads/countermeasure%20costs_report_nov2013.pdf, https://safety.fhwa.dot.gov/saferjourney1/library/countermeasures/09.htm, other state departments of transportation, and other sources. Cost opinions do not include easement and right-of-way acquisition; permitting, inspection, or construction management; engineering, surveying, geotechnical investigation, environmental documentation, special site remediation, escalation, or the cost for ongoing maintenance. A cost range has been assigned to certain general categories such as utility relocations; however, these costs can vary widely depending on the exact details and nature of the work. The overall cost opinions are intended to be general and used only for planning purposes. Toole Design Group, LLC makes no guarantees or warranties regarding the cost opinion herein. Construction costs will vary based on the ultimate project scope, actual site conditions and constraints, schedule, and economic conditions at the time of construction.

Appendix

RRFB Description*

Rectangular Rapid Flashing Beacons, or RRFBs, consist of two rapidly flashed rectangular-shaped yellow indications with an LED-array-based light source, and function as a pedestrian-actuated conspicuity enhancement. When actuated, the two yellow indications in each RRFB unit flash in a rapidly flashing sequence. RRFBs are normally dark, and initiate operation only upon pedestrian actuation, and cease operation at a predetermined time after the pedestrian actuation or, with passive detection, after the pedestrian clears the crosswalk. Even if a median refuge is present, pedestrians are given enough time to cross the entire crosswalk.

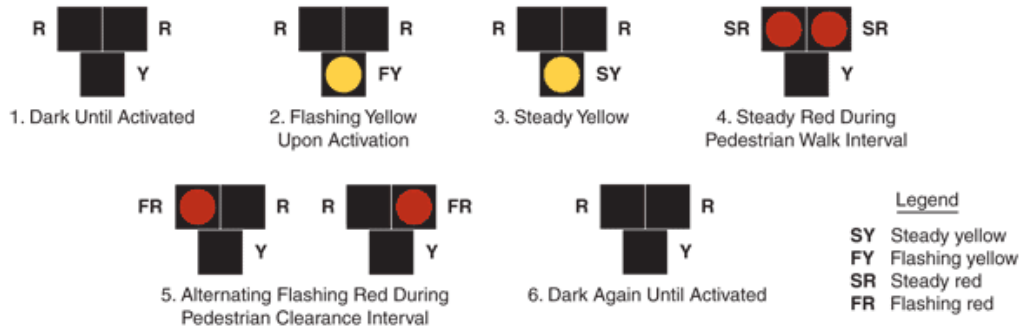
Example of an RRFB dark (left image) and illuminated during the flash period (center and right images) mounted with W11-2 sign and W16-7P plaque at an uncontrolled marked crosswalk.

Example of pedestrian pushbutton and R10-25 sign with pilot light for pedestrian actuation.

Pedestrian Hybrid Beacon Description**

Upon actuation by a pedestrian, a pedestrian hybrid beacon face shall display a flashing CIRCULAR yellow signal indication, followed by a steady CIRCULAR yellow signal indication, followed by both steady CIRCULAR RED signal indications during the pedestrian walk interval, followed by alternating flashing CIRCULAR RED signal indications during the pedestrian clearance interval (see Figure 4F-3). Upon termination of the pedestrian clearance interval, the pedestrian hybrid beacon faces shall revert to a dark (not illuminated) condition.

Figure 4F-3. Sequence for a Pedestrian Hybrid Beacon



*All content sourced from MUTCD Interim Approval 21.
https://mutcd.fhwa.dot.gov/resources/interim_approval/ia21/index.htm

**All content sourced from MUTCD Chapter 4 F. https://mutcd.fhwa.dot.gov/htm/2009/part4/part4f.htm

Design Dimensions for Proposed Treatments

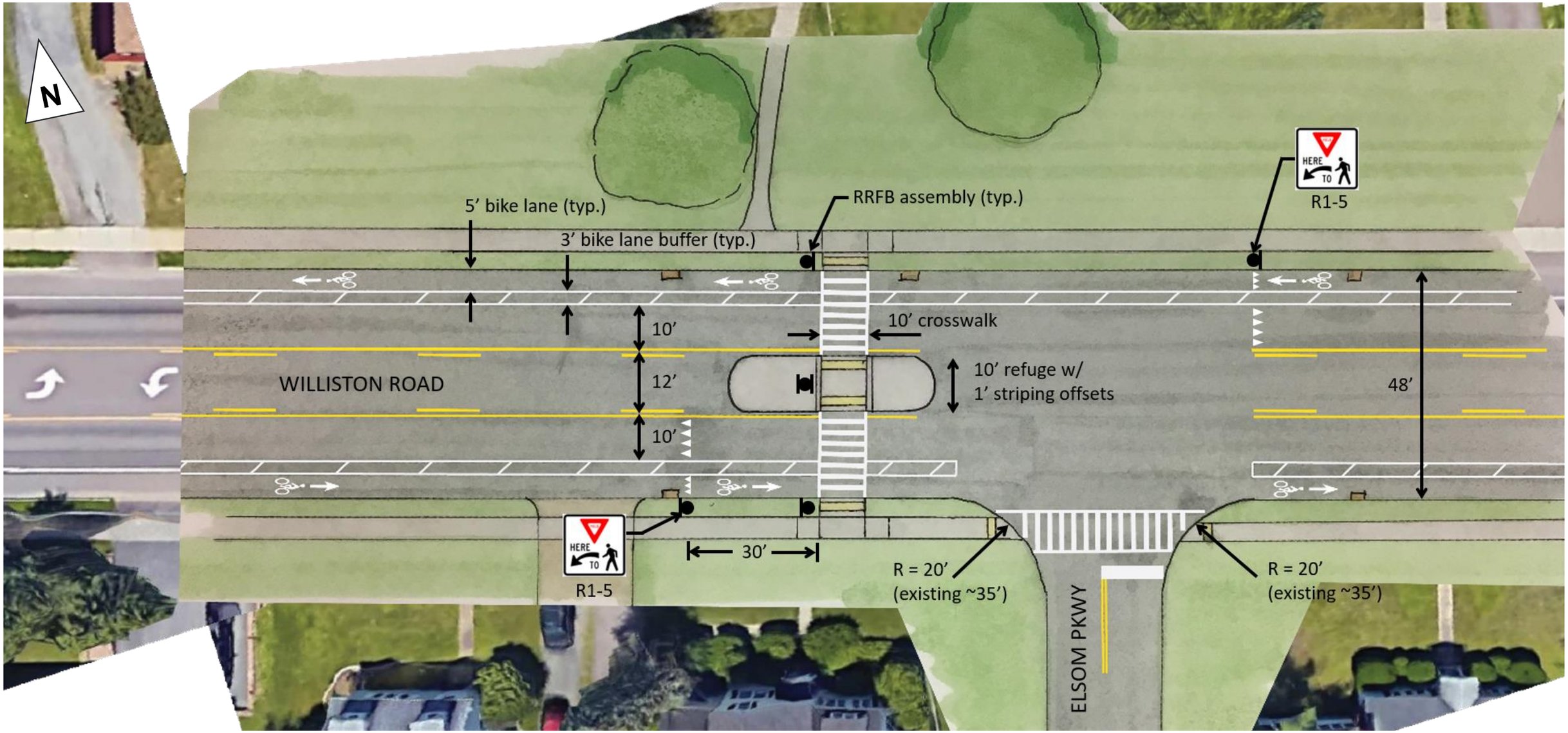


Figure A-1: Williston Road at Pillsbury Manor/Elsom Parkway: Mid-block Pedestrian Crossing with RRFBs (not to scale)

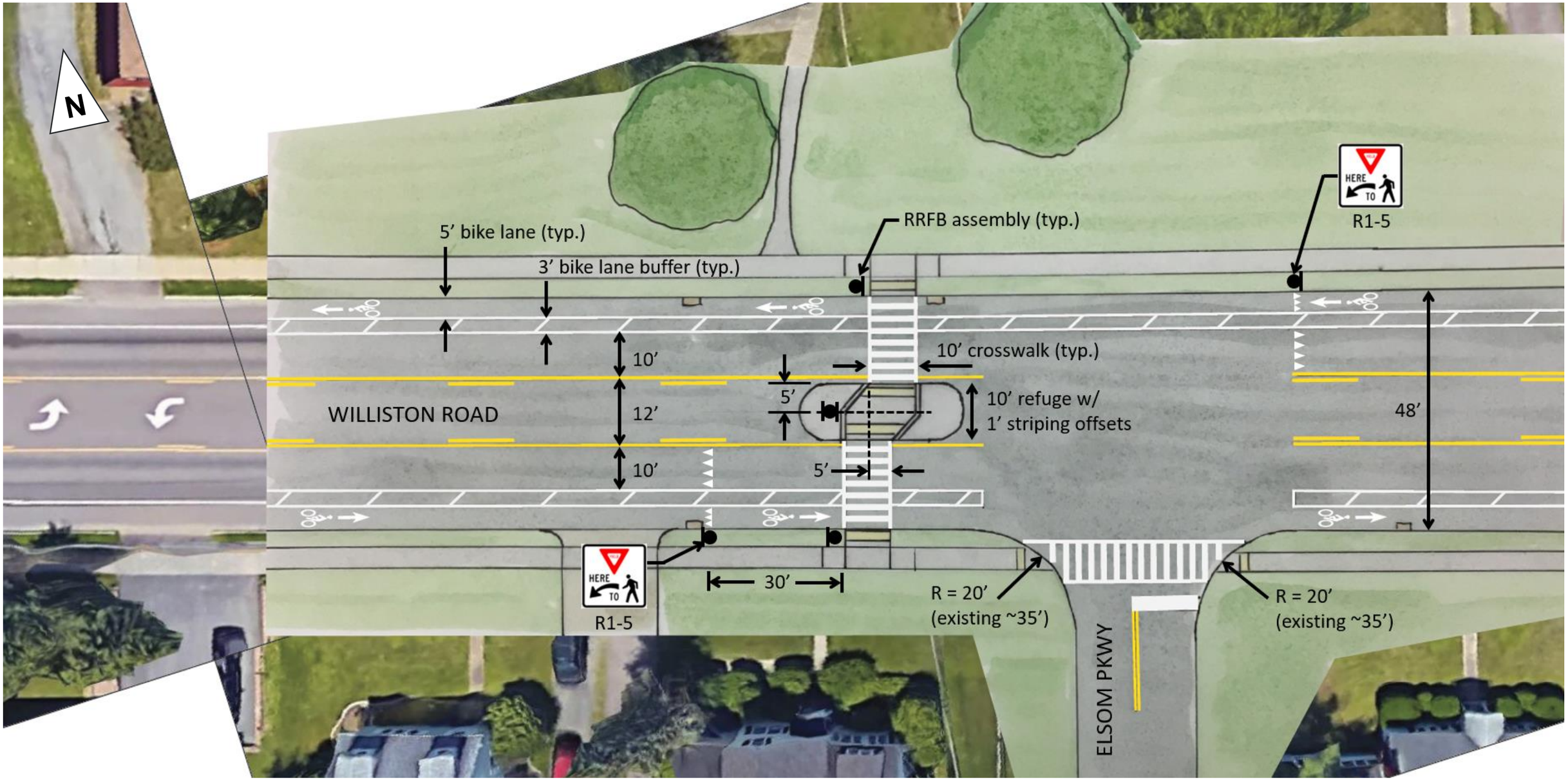


Figure A-2: Williston Road at Pillsbury Manor/Elsom Parkway: Mid-block Offset Pedestrian Crossing with RRFBs (not to scale)

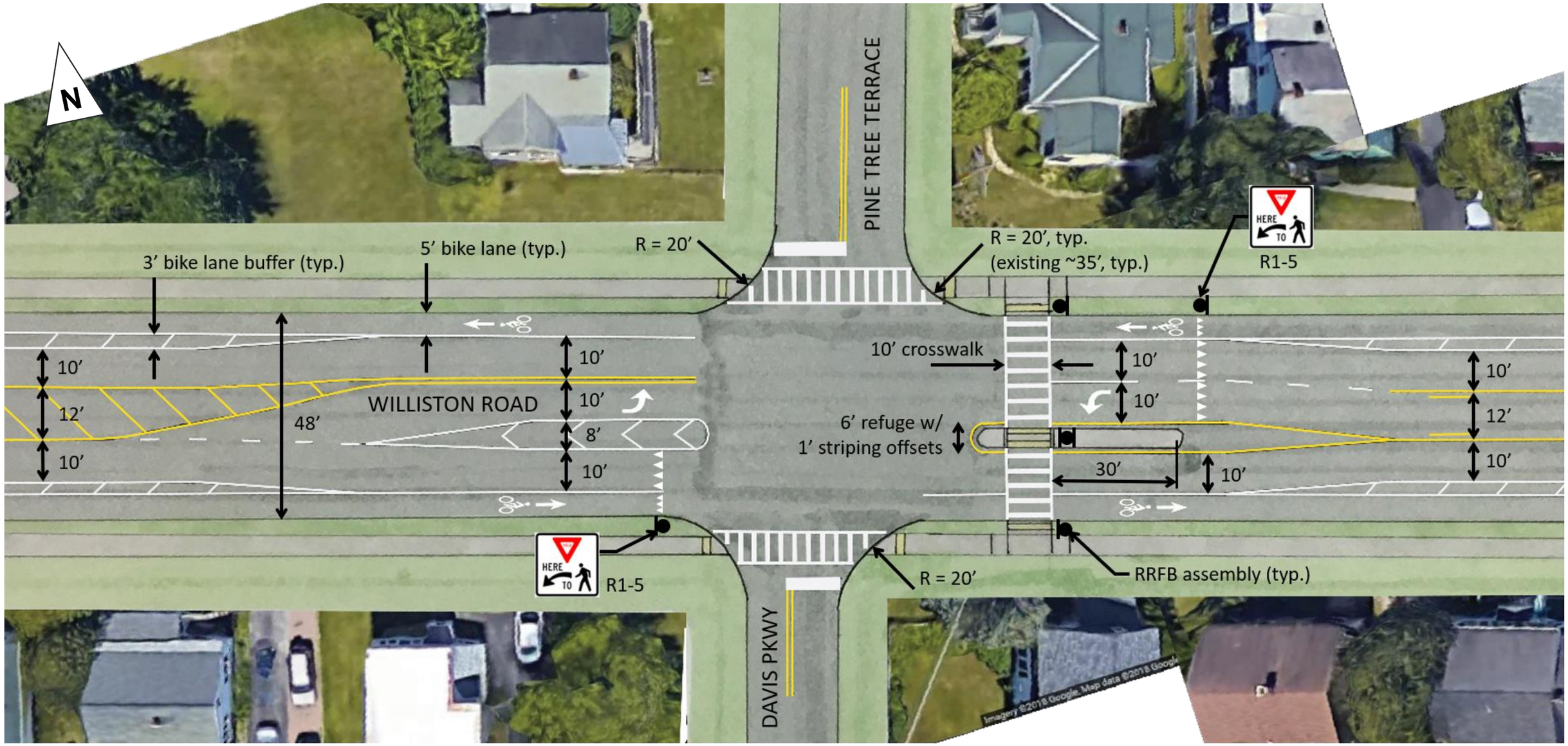


Figure A-3: Williston Road at Pine Tree Terrace: Mid-block Pedestrian Crossing with RRFBs (not to scale)

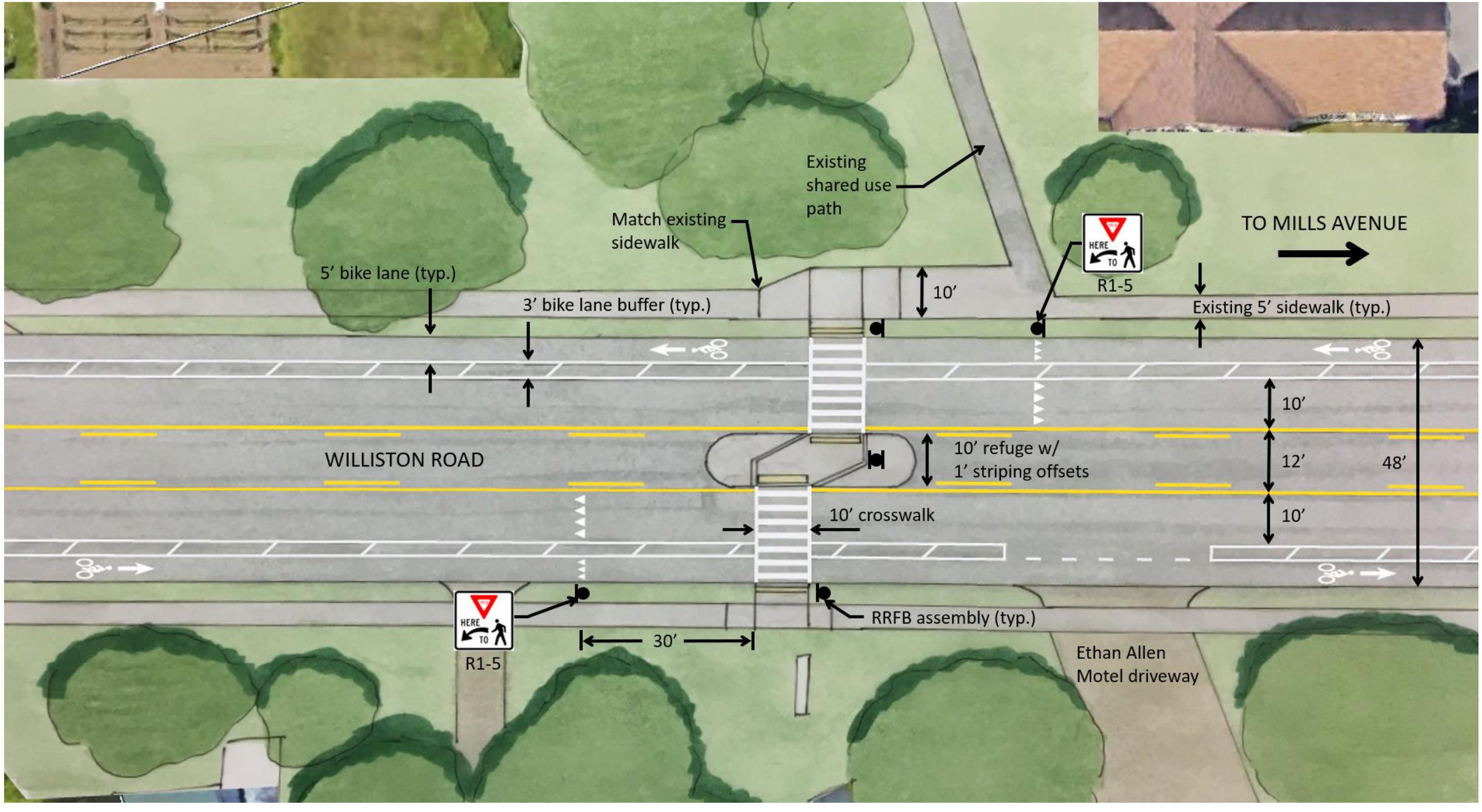


Figure A-4: Williston Road east of Mills Avenue: Mid-block Pedestrian Crossing with RRFBs (not to scale)

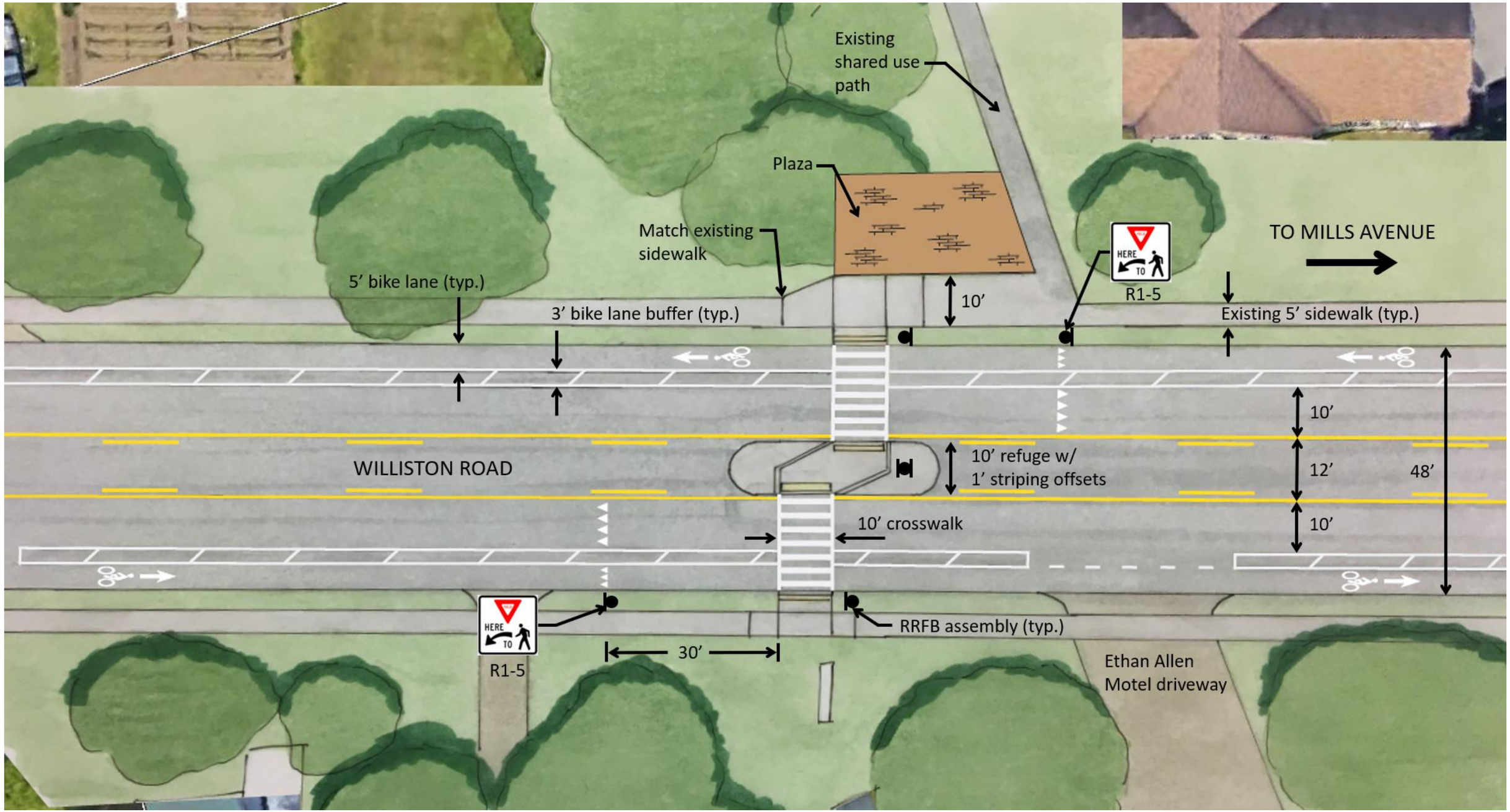


Figure A-5: Williston Road east of Mills Avenue: Mid-block Pedestrian Crossing with RRFBs and plaza (not to scale)

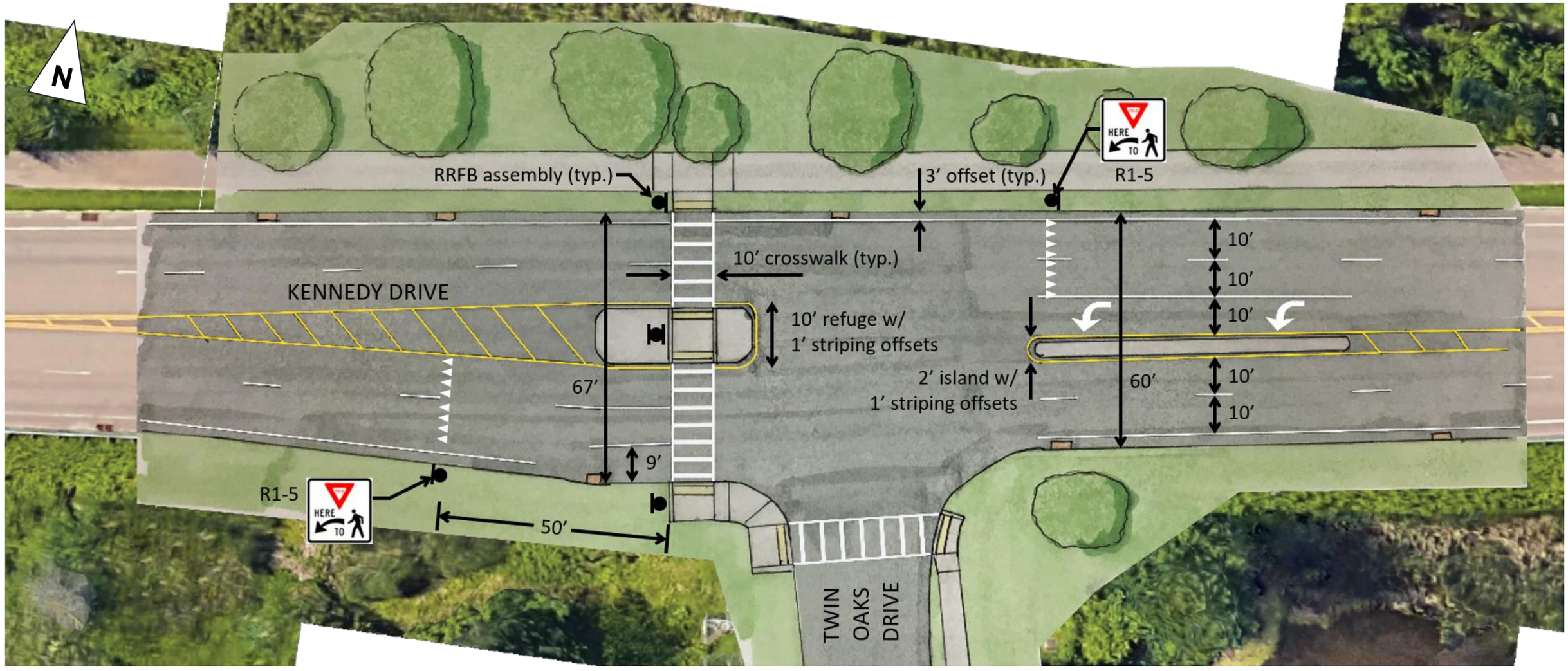


Figure A-6: Kennedy Drive at Twin Oaks Drive: Mid-block Pedestrian Crossing with RRFBs (Alternative #1, No Eastbound Curb Relocation) (not to scale)

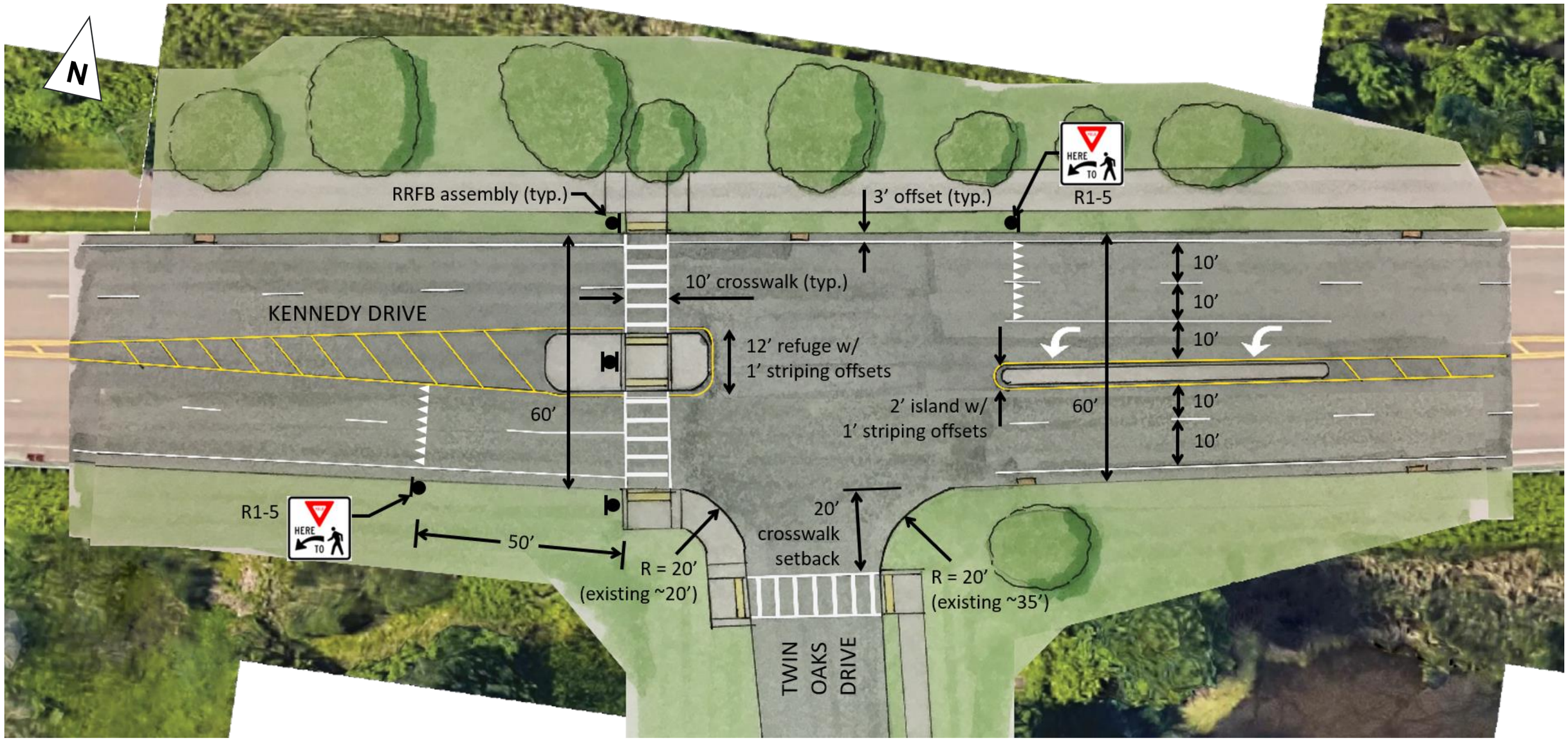


Figure A-7: Kennedy Drive at Twin Oaks Drive: Mid-block Pedestrian Crossing with RRFBs (Alternative #2, Relocation of Eastbound Curb) (not to scale)

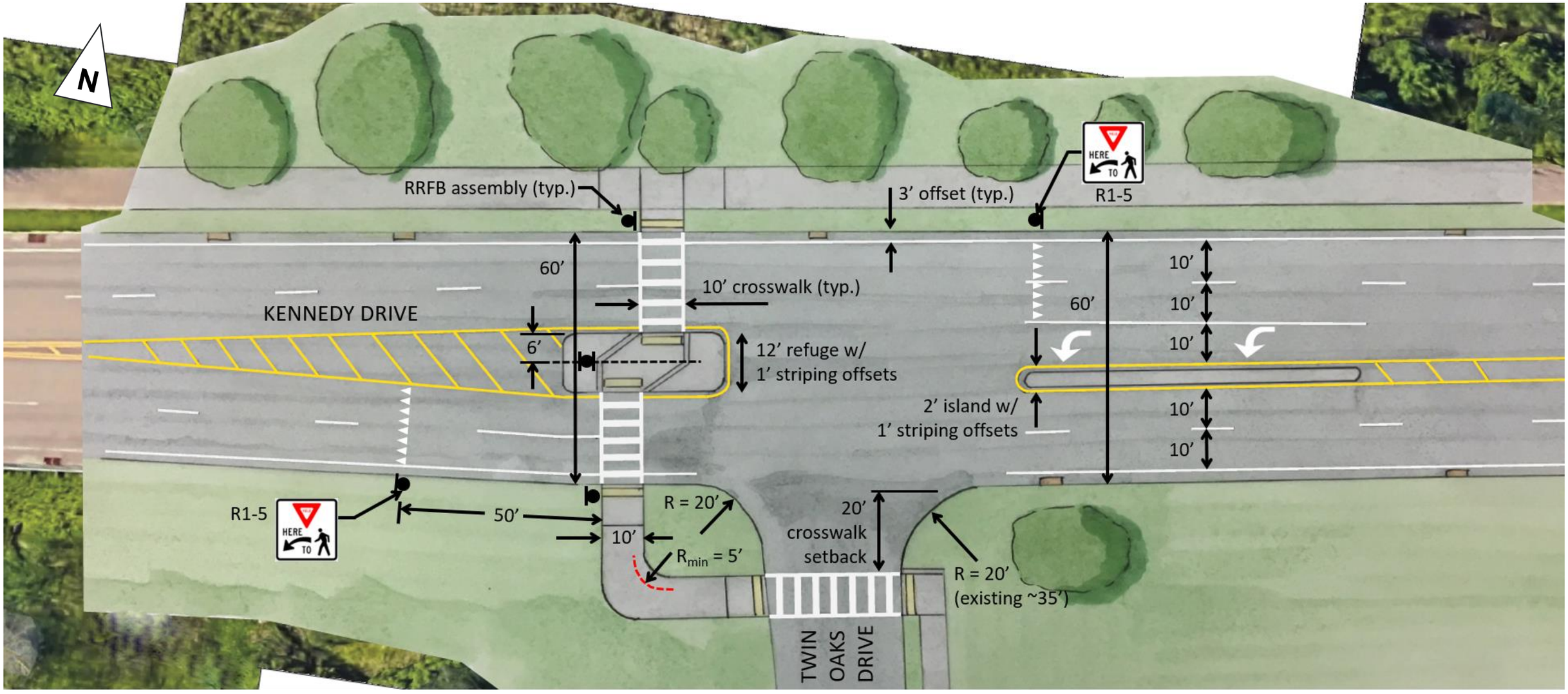


Figure A-8: Kennedy Drive at Twin Oaks Drive: Mid-block Offset Pedestrian Crossing with RRFBs (Alternative #3, Relocation of Eastbound Curb with Offset Crossing) (not to scale)

Crossing Concepts | South Burlington, VT
Preliminary Opinion of Probable Construction Cost

Prepared By: Toole Design
Date: April 2019

*Location 1: Williston Road at Pillsbury Manor (Straight Crossing)	Cost:	$90,000
*Location 1: Williston Road at Pillsbury Manor (Offset Crossing)	Cost:	$90,000
*Location 2: Williston Road at Davis Parkway/Pine Tree Terrace	Cost:	$130,000
*Location 3: Williston Road at Mills Avenue (no Plaza)	Cost:	$60,000
*Location 3: Williston Road at Mills Avenue (with Plaza)	Cost:	$80,000
Location 4: Kennedy Drive at Twin Oaks Drive (Alt. #1)	Cost:	$70,000
Location 4: Kennedy Drive at Twin Oaks Drive (Alt. #2)	Cost:	$100,000
Location 4: Kennedy Drive at Twin Oaks Drive (Alt. #3)	Cost:	$110,000

*Pavement marking cost has been omitted, as the limits of pavement marking changes have not been determind. Cost of proposed Williston Road pavement marking cross section is approximately $3.67 per linear foot.

Opinions of probable cost were developed by identifying major pay items and establishing rough quantities, to determine a rough order of magnitude cost. Additional pay items have been assigned approximate lump sum prices based on a percentage of the anticipated construction cost. Planning-level cost opinions include a 20% contingency to cover items that are undefined or are typically unknown early in the planning phase of a project. Unit costs are based on 2012-2017 dollars and were assigned based on historical cost data from https://vtrans.vermont.gov/sites/aot/files/estimating/documents/5YearEnglishAveragedPriceList11.pdf, http://www.pedbikeinfo.org/cms/downloads/countermeasure%20costs_report_nov2013.pdf, https://safety.fhwa.dot.gov/saferjourney1/library/countermeasures/09.htm, other state departments of transportation, and other sources. Cost opinions do not include easement and right-of-way acquisition; permitting, inspection, or construction management; engineering, surveying, geotechnical investigation, environmental documentation, special site remediation, escalation, or the cost for ongoing maintenance. A cost range has been assigned to certain general categories such as utility relocations; however, these costs can vary widely depending on the exact details and nature of the work. The overall cost opinions are intended to be general and used only for planning purposes. Toole Design Group, LLC makes no guarantees or warranties regarding the cost opinion herein. Construction costs will vary based on the ultimate project scope, actual site conditions and constraints, schedule, and economic conditions at the time of construction.

Crossing Concepts | South Burlington, VT

*Location 1: Williston Road at Pillsbury Manor (Straight Crossing)

Prepared By: Toole Design
Date: April 2019

DESCRIPTION	QTY	UNIT	UNIT PRICE	AMOUNT
Unclassified Excavation	19	CY	$20.50	$400
Concrete, Class C	6	CY	$308.40	$2,000
Subbase of Gravel	13	CY	$25.00	$400
Subbase Sand Borrow	6	CY	$20.00	$200
Vertical Granite Curb	90	LF	$36.00	$3,300
Accessible Ramps	2	EA	$3,300.00	$6,600
Detectable Warning Surface	80	SF	$46.00	$3,680
Traffic Signs & Posts	2	EA	$170.00	$340
RRFB	1	EA	$22,250.00	$22,250
Corner Radius Reduction (incl. 1 curb ramp)	2	EA	$15,000.00	$30,000
High Visibility Crosswalk	2	EA	$2,540.00	$5,080
			SUBTOTAL =	$74,300
			CONTINGENCY (20%) =	$14,860
			TOTAL =	$90,000

Crossing Concepts | South Burlington, VT

*Location 1: Williston Road at Pillsbury Manor (Offset Crossing)

Prepared By: Toole Design
Date: April 2019

DESCRIPTION	QTY	UNIT	UNIT PRICE	AMOUNT
Unclassified Excavation	19	CY	$20.50	$400
Concrete, Class C	6	CY	$308.40	$2,000
Subbase of Gravel	13	CY	$25.00	$400
Subbase Sand Borrow	6	CY	$20.00	$200
Vertical Granite Curb	95	LF	$36.00	$3,500
Accessible Ramps	2	EA	$3,300.00	$6,600
Detectable Warning Surface	80	SF	$46.00	$3,680
Traffic Signs & Posts	2	EA	$170.00	$340
RRFB	1	EA	$22,250.00	$22,250
Corner Radius Reduction (incl. 1 curb ramp)	2	EA	$15,000.00	$30,000
High Visibility Crosswalk	2	EA	$2,540.00	$5,080
			SUBTOTAL =	$74,500
			CONTINGENCY (20%) =	$14,900
			TOTAL =	$90,000

Crossing Concepts | South Burlington, VT

*Location 2: Williston Road at Davis Parkway/Pine Tree Terrace

Prepared By: Toole Design
Date: April 2019

DESCRIPTION	QTY	UNIT	UNIT PRICE	AMOUNT
Unclassified Excavation	3	CY	$20.50	$100
Concrete, Class C	3	CY	$308.40	$1,100
Subbase of Gravel	7	CY	$25.00	$200
Subbase Sand Borrow	3	CY	$20.00	$100
Vertical Granite Curb	90	LF	$36.00	$3,300
Accessible Ramps	2	EA	$3,300.00	$6,600
Detectable Warning Surface	80	SF	$46.00	$3,680
Traffic Signs & Posts	2	EA	$170.00	$340
RRFB	1	EA	$22,250.00	$22,250
Corner Radius Reduction (incl. 1 curb ramp)	4	EA	$15,000.00	$60,000
High Visibility Crosswalk	3	EA	$2,540.00	$7,620
			SUBTOTAL =	$105,300
			CONTINGENCY (20%) =	$21,060
			TOTAL =	$130,000

Crossing Concepts | South Burlington, VT

*Location 3: Williston Road at Mills Avenue (no Plaza)

Prepared By: Toole Design
Date: April 2019

DESCRIPTION	QTY	UNIT	UNIT PRICE	AMOUNT
Unclassified Excavation	7	CY	$20.50	$200
Concrete, Class C	7	CY	$308.40	$2,300
Subbase of Gravel	15	CY	$25.00	$400
Subbase Sand Borrow	7	CY	$20.00	$200
Vertical Granite Curb	110	LF	$36.00	$4,000
Accessible Ramps	2	EA	$3,300.00	$6,600
Detectable Warning Surface	80	SF	$46.00	$3,680
Traffic Signs & Posts	2	EA	$170.00	$340
RRFB	1	EA	$22,250.00	$22,250
Concrete Sidewalk	100	LF	$32.00	$3,200
High Visibility Crosswalk	1	EA	$2,540.00	$2,540
			SUBTOTAL =	$45,800
			CONTINGENCY (20%) =	$9,160
			TOTAL =	$60,000

Crossing Concepts | South Burlington, VT

*Location 3: Williston Road at Mills Avenue (with Plaza)

Prepared By: Toole Design
Date: April 2019

DESCRIPTION	QTY	UNIT	UNIT PRICE	AMOUNT
Unclassified Excavation	7	CY	$20.50	$200
Concrete, Class C	7	CY	$308.40	$2,300
Subbase of Gravel	15	CY	$25.00	$400
Subbase Sand Borrow	7	CY	$20.00	$200
Vertical Granite Curb	110	LF	$36.00	$4,000
Accessible Ramps	2	EA	$3,300.00	$6,600
Detectable Warning Surface	80	SF	$46.00	$3,680
Traffic Signs & Posts	2	EA	$170.00	$340
RRFB	1	EA	$22,250.00	$22,250
Concrete Sidewalk	100	LF	$32.00	$3,200
Brick Sidewalk (Plaza) (based on 5-ft sidewalk unit cost)	250	LF	$60.00	$15,000
High Visibility Crosswalk	1	EA	$2,540.00	$2,540
			SUBTOTAL =	$60,800
			CONTINGENCY (20%) =	$12,160
			TOTAL =	$80,000

Crossing Concepts | South Burlington, VT

Location 4: Kennedy Drive at Twin Oaks Drive (Alt. #1)

Prepared By: Toole Design
Date: April 2019

DESCRIPTION	QTY	UNIT	UNIT PRICE	AMOUNT
Unclassified Excavation	10	CY	$20.50	$200
Concrete, Class C	10	CY	$308.40	$3,000
Subbase of Gravel	19	CY	$25.00	$500
Subbase Sand Borrow	10	CY	$20.00	$200
Vertical Granite Curb	224	LF	$36.00	$8,100
Accessible Ramps	4	EA	$3,300.00	$13,200
Detectable Warning Surface	80	SF	$46.00	$3,680
Traffic Signs & Posts	2	EA	$170.00	$340
RRFB	1	EA	$22,250.00	$22,250
High Visibility Crosswalk	2	EA	$2,540.00	$5,080
Pavement Marking	1	LS	$500.00	$500
			SUBTOTAL =	$57,100
			CONTINGENCY (20%) =	$11,420
			TOTAL =	$70,000

Crossing Concepts | South Burlington, VT

Location 4: Kennedy Drive at Twin Oaks Drive (Alt. #2)

Prepared By: Toole Design
Date: April 2019

DESCRIPTION	QTY	UNIT	UNIT PRICE	AMOUNT
Unclassified Excavation	11	CY	$20.50	$300
Concrete, Class C	11	CY	$308.40	$3,500
Subbase of Gravel	22	CY	$25.00	$600
Subbase Sand Borrow	11	CY	$20.00	$300
Vertical Granite Curb	228	LF	$36.00	$8,300
Accessible Ramps	2	EA	$3,300.00	$6,600
Detectable Warning Surface	80	SF	$46.00	$3,680
Traffic Signs & Posts	2	EA	$170.00	$340
RRFB	1	EA	$22,250.00	$22,250
Corner Radius Reduction (incl. 1 curb ramp)	2	EA	$15,000.00	$30,000
High Visibility Crosswalk	2	EA	$2,540.00	$5,080
Pavement Marking	1	LS	$500.00	$500
			SUBTOTAL =	$81,500
			CONTINGENCY (20%) =	$16,300
			TOTAL =	$100,000

Crossing Concepts | South Burlington, VT

Location 4: Kennedy Drive at Twin Oaks Drive (Alt. #3)

Prepared By: Toole Design
Date: April 2019

DESCRIPTION	QTY	UNIT	UNIT PRICE	AMOUNT
Unclassified Excavation	11	CY	$20.50	$300
Concrete, Class C	11	CY	$308.40	$3,500
Subbase of Gravel	22	CY	$25.00	$600
Subbase Sand Borrow	11	CY	$20.00	$300
Vertical Granite Curb	238	LF	$36.00	$8,600
Accessible Ramps	2	EA	$3,300.00	$6,600
Detectable Warning Surface	80	SF	$46.00	$3,680
Traffic Signs & Posts	2	EA	$170.00	$340
RRFB	1	EA	$22,250.00	$22,250
Corner Radius Reduction (incl. 1 curb ramp)	2	EA	$15,000.00	$30,000
Concrete Sidewalk	100	LF	$32.00	$3,200
Concrete Sidewalk	178	SY	$15.00	$2,667
High Visibility Crosswalk	2	EA	$2,540.00	$5,080
Pavement Marking	1	LS	$500.00	$500
			SUBTOTAL =	$87,700
			CONTINGENCY (20%) =	$17,540
			TOTAL =	$110,000

Crossing Concepts | South Burlington, VT

Pavement Markings

Prepared By: Toole Design
Date: April 2019

WILLISTON ROAD CROSS SECTION

PAVEMENT MARKING	QTY	UNIT	UNIT PRICE	AMOUNT
BICYCLE LANE SYMBOL	0.005	EA	$180.00	$0.90
646.20 - 4 INCH WHITE LINE	1.00	LF	$0.26	$0.26
646.24 - 12 INCH WHITE LINE	0.10	LF	$1.00	$0.10
646.214 - 6 INCH WHITE LINE	1.00	LF	$0.16	$0.16
646.21 - 4 INCH YELLOW LINE	1.00	LF	$0.31	$0.31
646.21 - 4 INCH YELLOW LINE	0.33	LF	$0.31	$0.10
646.21 - 4 INCH YELLOW LINE	0.33	LF	$0.31	$0.10
646.21 - 4 INCH YELLOW LINE	1.00	LF	$0.31	$0.31
646.214 - 6 INCH WHITE LINE	1.00	LF	$0.16	$0.16
646.24 - 12 INCH WHITE LINE	0.10	LF	$1.00	$0.10
646.20 - 4 INCH WHITE LINE	1.00	LF	$0.26	$0.26
BICYCLE LANE SYMBOL	0.005	EA	$180.00	$0.90
			TOTAL =	$3.67

KENNEDY DRIVE CROSS SECTION

PAVEMENT MARKING	QTY	UNIT	UNIT PRICE	AMOUNT
646.20 - 4 INCH WHITE LINE	1.00	LF	$0.26	$0.26
646.20 - 4 INCH WHITE LINE	0.25	LF	$0.26	$0.07
646.21 - 4 INCH YELLOW LINE	1.00	LF	$0.31	$0.31
646.21 - 4 INCH YELLOW LINE	2.00	LF	$0.31	$0.62
646.21 - 4 INCH YELLOW LINE	1.00	LF	$0.31	$0.31
646.20 - 4 INCH WHITE LINE	0.25	LF	$0.26	$0.07
646.20 - 4 INCH WHITE LINE	1.00	LF	$0.26	$0.26
			SUBTOTAL =	$1.89
			Length of pavement marking work =	400
			TOTAL =	$500