

Orchard STREET Mobility Study

FINAL REPORT

The Orchard Street Mobility Study examined existing conditions and used data-driven analysis to develop traffic-calming recommendations for three high-interest segments along the 1.55-mile Orchard Street corridor in the City of New Haven. The proposed improvements to Orchard Street prioritize elements of a low-speed, low-volume (3,300 AADT) thoroughfare to provide an alternative to neighboring north-south corridors like Sherman Avenue/Parkway (8,900 AADT), and support the future development of a full Neighborhood Greenway.

Identified as a Neighborhood Greenway in the City’s Safe Routes for All Active Transportation Plan, Orchard Street is a north-south corridor that links five of the City’s seven equity Priority Neighborhoods, offering accessibility to multiple schools, green spaces, and employment hubs like Yale Hospital. The corridor also intersects many of the City’s primary east-west thoroughfares, including Davenport Avenue, Legion Avenue/N. Frontage Road, Whalley Avenue, George Street, Chapel Street, and Goffe Street, and is the first, continuous north-south “spine” west of Downtown.

The analysis herein includes a high-level crash analysis of incidents along the corridor within the last five years, which directly informed the identification of three high-interest segments, and subsequent design responses to increase safety. Following two public engagement events to receive feedback on the concept designs and other locations along the corridor for future consideration, the project team finalized a “toolkit” of traffic-calming and intersection design components which can be applied elsewhere along the corridor and form the foundation for further design and engineering analysis. Recommendations include both application of the toolkit along each high-interest segment, and additional considerations for future iterations of design work.



Crash Analysis

In the last five years, 10 serious and 3 fatal injuries were recorded along Orchard Street. Six out of thirteen (46%) of these crashes involved bicyclists or pedestrians.

SUMMARY

Between January 2019 and December 2023, the City of New Haven reported a total of 708 crashes along Orchard Street, between Munson Street and Davenport Avenue, for an average of 142 crashes per year. 10 serious injuries (4 pedestrians, 6 motor vehicles) and 3 fatal injuries (1 pedestrian, 2 motor vehicles) were reported. The vast majority of crashes included those operating motor vehicles, with 25 pedestrian-involved crashes and 5 bicyclist-involved crashes. For the purposes of the crash analysis, the corridor was divided into three segments:

- Segment #1 | Munson Street to Dickerman Street
- Segment #2 | Whalley Avenue to Gilbert Avenue
- Segment #3 | N. Frontage Road to Davenport Avenue

Of these segments, the .5-mile Segment #2 saw the most crashes since 2019, over 50% of the total and with the highest crash rate of the three. However, Segment #1 saw the most fatal crashes and serious injuries of the three.

SEGMENT	TOTAL CRASHES	SERIOUS INJURIES	FATAL INJURIES
#1	166	4	2
#2	388	4	1
#3	154	2	0

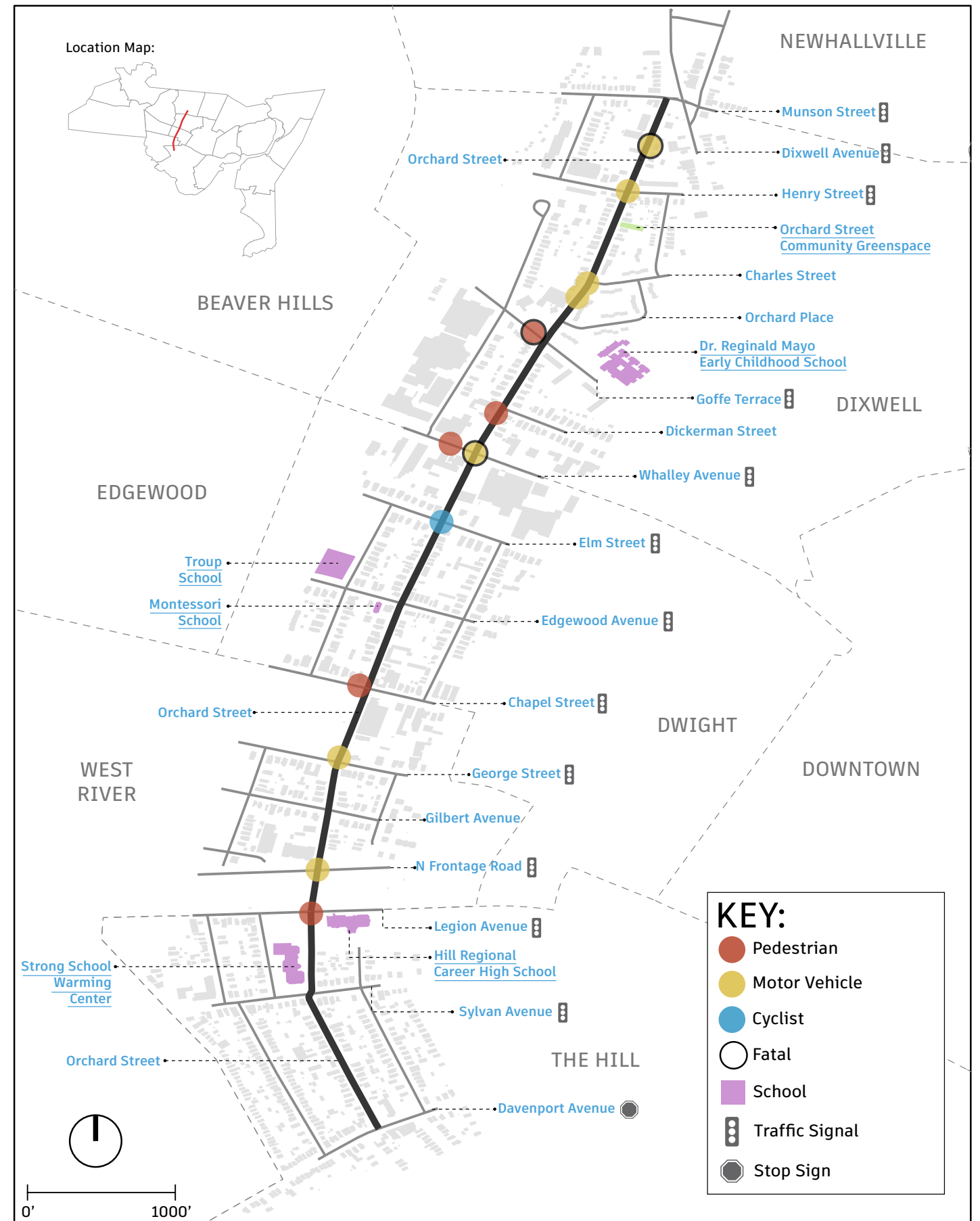
KEY STATISTICS

- It was along the longest block within Segment #1 (1,200') that the most fatal and serious injuries occurred.

- Over half of the bicycle and pedestrian crashes along the corridor occurred at intersections, with 66% of all crashes since 2019 occurring at intersections.
- Of the motor vehicle crashes, front-to-rear was the most common (34% of total crashes), followed by angle (28%) and sideswipe (22%).
- 75% the intersections along the corridor (12/16), including T-intersections, are in need of basic improvements, like high-visibility crosswalks.

Initial recommendations for the corridor based on the crash analysis are as follows:

- #1 | Focus on the Longest Block**
Focus on pedestrian safety and traffic calming particularly within Segment #1, as this is both the segment with the highest number of serious injuries and fatalities, and a high number of pedestrian crashes.
- #2 | Reduce Speeding + Unsafe Maneuvers**
Explore linear traffic-calming interventions for Segment #2 to reduce unsafe vehicle maneuvers and disproportionate impacts on non-motorized modes.
- #3 | Prevent Harm at Major Intersections**
Focus on getting all modes safely to and through the intersections at N. Frontage Road and Legion Avenue, as the crash rate decreases south of Legion Avenue within Segment #3.
- #4 | Install Basic Improvements Everywhere**
Upgrade all transverse crosswalks with high-visibility markings, and ensure crosswalks are freshly striped at every leg of every intersection.
- #5 | Consider Signal Timing Improvements**
Review signal operations and timing for all modes to improve safety outcomes. Select intersections may be appropriate for pedestrian and vehicular signal changes, such as leading pedestrian intervals, to reduce conflicts.



ORCHARD STREET CORRIDOR STUDY | FATAL AND SERIOUS INJURY CRASHES 2019-2023

Public Engagement

Two public gatherings, one in-person workshop and one virtual presentation, were hosted by the project team to seek feedback on design concepts.

SUMMARY

The project team hosted an in-person workshop on Tuesday, January 7th, 2025 to seek feedback on design concepts for three high-interest segments of Orchard Street, as well as ideas for other ways to make the entire corridor more safe and connected for people walking, bicycling, and driving. Simultaneously, the project team published an online survey for those who were not able to make it in person.

Key discussion items from the in-person workshop are as follows:

- Participants discussed the use of raised intersections within the high-interest segments for additional traffic calming, and to replace curb extensions where right-of-way was limited.
- For the block between Chapel and George Streets, it was suggested that increased pedestrian lighting is needed, especially for transit and shuttle riders.
- Connectivity and access to future bike share stations at N. Frontage Road and Legion Avenue were discussed.
- Signal improvements, like the addition of pedestrian signal heads, were mentioned for the intersection of Henry Street/Munson Street/Dixwell Avenue.

Following the in-person workshop, the project team refined the design concepts and presented the final draft concepts to the public via a virtual meeting on January 29th. Participants of this meeting stressed the importance of applying similar traffic safety features along the blocks between Elm Street and Chapel Street, and intersection improvements at the Elm Street and Edgewood Avenue intersections.



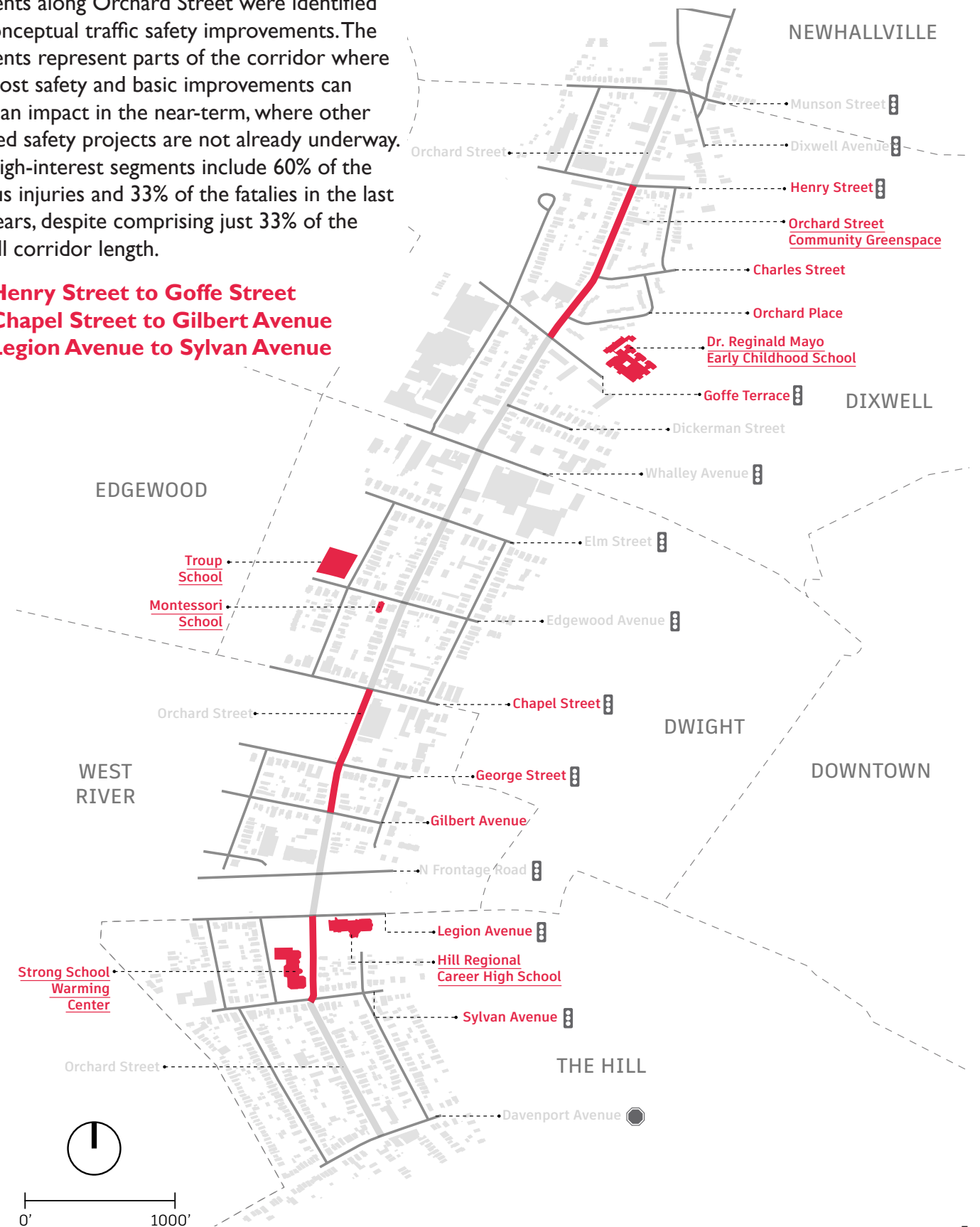
Multiple respondents of the online survey mentioned consideration of independent walk signals at all intersections, diverters to reduce vehicle traffic along Orchard Street, and dedicated bicycle facilities. Additional comments included the consideration of replacement of traffic signals with all-way stops or roundabouts.

All public feedback not integrated into the design concepts was documented as consideration for future rounds of design work along the corridor.

Segment Concepts

Through the safety analysis, three high-interest segments along Orchard Street were identified for conceptual traffic safety improvements. The segments represent parts of the corridor where the most safety and basic improvements can make an impact in the near-term, where other planned safety projects are not already underway. The high-interest segments include 60% of the serious injuries and 33% of the fatalities in the last five years, despite comprising just 33% of the overall corridor length.

- **Henry Street to Goffe Street**
- **Chapel Street to Gilbert Avenue**
- **Legion Avenue to Sylvan Avenue**



Segment #1

Henry Street // Goffe Street

Three serious injuries and one pedestrian fatality occurred in the last five years between Henry and Goffe Streets. This concept encourages low vehicle speeds with raised, mid-block interventions that also increase pedestrian visibility and crossing opportunities.

SEGMENT CHARACTERISTICS

- Longest block on the corridor
- Segment with the most serious injuries and fatalities
- High number of pedestrian crashes
- Opportunity for basic improvements at every intersection

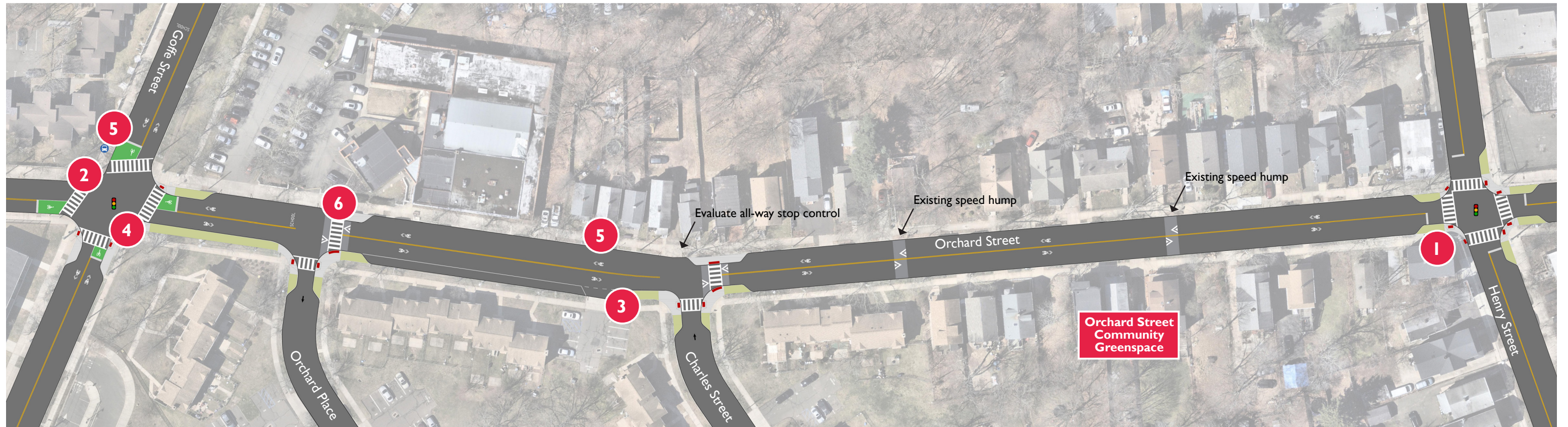


Image: Tekway



Image: WTOP/Kristi King



Image: Richard Drdul



Image: City of Long Beach



Image: Montgomery County DOT



Image: Urban Milwaukee

ADA-COMPLIANT CURB RAMPS

HIGH-VISIBILITY CROSSWALK

CURB EXTENSION/RAIN GARDEN

LEADING PEDESTRIAN INTERVAL (LPI)

BIKE PAVEMENT MARKINGS

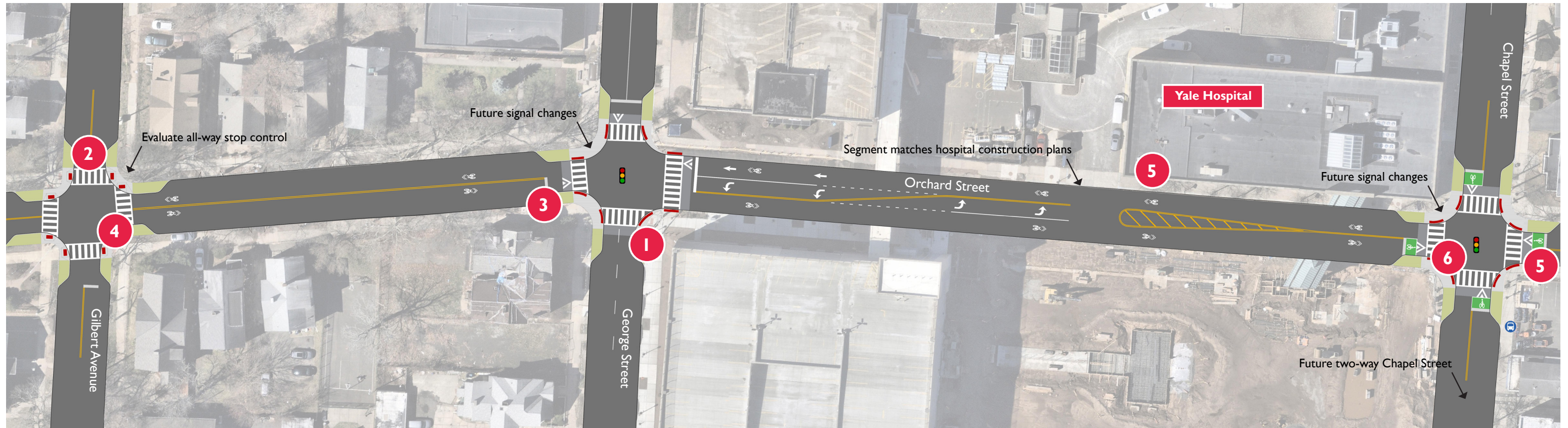
RAISED MID-BLOCK CROSSWALK

Segment #2

Chapel Street // Gilbert Avenue

This concept illustrates the current restriping of the block between George and Chapel Streets, as well as the future two-way transition of Chapel Street, and proposes two, consecutive raised intersections to encourage safe driving along a heavily-used block.

- SEGMENT CHARACTERISTICS**
- Good opportunity for consecutive intersection improvements
 - Highest crash rate and total number of crashes
 - Serious injuries at intersections of Chapel and George Streets



ADA-COMPLIANT CURB RAMPS



HIGH-VISIBILITY CROSSWALK



CURB EXTENSION



LEADING PEDESTRIAN INTERVAL (LPI)



BIKE PAVEMENT MARKINGS



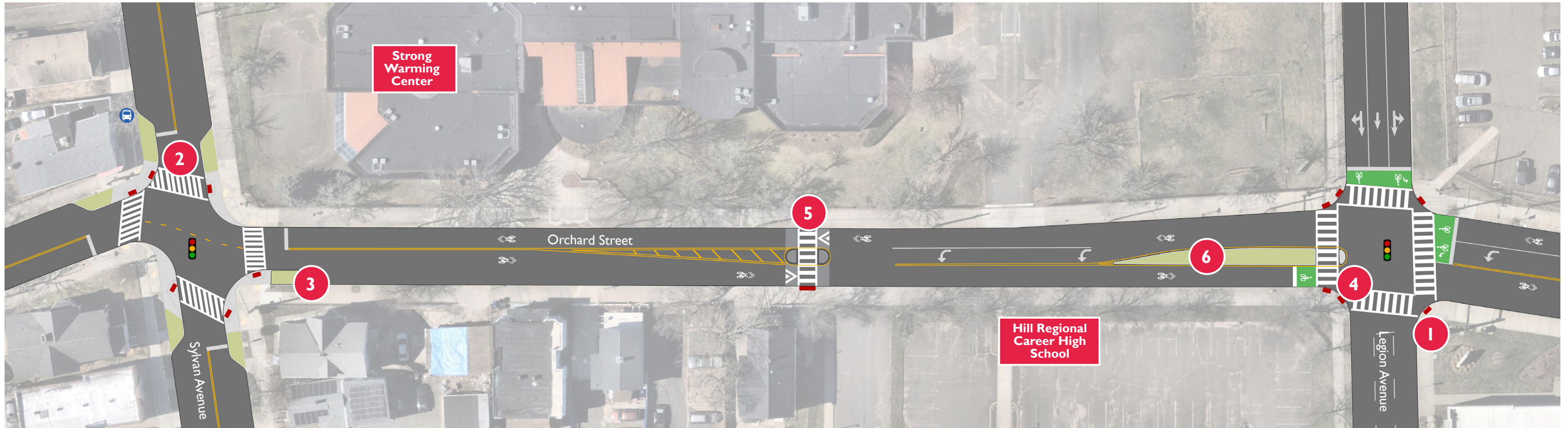
RAISED INTERSECTION

Segment #3

Legion Avenue // Sylvan Avenue

This concept increases pedestrian access to Career High School and the Warming Center, and visually narrows the roadway on the approach to Legion Avenue, where a pedestrian serious injury occurred, to ensure low travel speeds. A realignment of Orchard Street through Sylvan Avenue is proposed to clarify vehicle movements.

- SEGMENT CHARACTERISTICS**
- Adjacent to High School parking lot entry and bus exit
 - Basic upgrades needed at both intersections
 - Opportunity to manage travel speeds so as to not be a cut-through thoroughfare



ADA-COMPLIANT CURB RAMPS



HIGH-VISIBILITY CROSSWALK



CURB EXTENSION



LEADING PEDESTRIAN INTERVAL (LPI)



RAISED MID-BLOCK CROSSWALK



PEDESTRIAN REFUGE

Appendix

13	Additional Recommendations
15	Neighborhood Greenway Toolkit
18	Map: Orchard Street All Crashes
19	Map: Segment #1 KSIs
20	Map: Segment #2 KSIs
21	Map: Segment #3 KSIs

Additional Recommendations

The Traffic-Calming Toolkit and other near-term improvements can be applied elsewhere along Orchard Street for corridor-wide improvements.

NEAR-TERM

The high-interest segment concepts present crash data-driven ideas for augmenting the visibility of bicyclists and pedestrians, and managing vehicle travel speeds through intersections and at mid-block locations. As application of the traffic-calming toolkit is evaluated elsewhere along the corridor, the City can do the following in the near-term in response to public feedback and the Study's existing conditions analysis:

■ Crosswalks

Upgrade transverse crosswalks with high-visibility markings at:

- Munson Street
- Henry Street
- Charles Street
- Orchard Place
- Goffe Street
- Dickerman Street
- Whalley Avenue
- Chapel Street
- George Street
- Gilbert Avenue
- Legion Avenue
- Davenport Avenue

■ ADA Accessibility

Ensure all ADA ramps have detectable warning pads, and that sidewalk segments at each intersection are passable, at:

- Henry Street
- Charles Street
- Orchard Place
- Goffe Street
- Dickerman Street

- Chapel Street
- George Street
- Gilbert Avenue
- Davenport Avenue

■ Signalization

Alter existing signals to increase pedestrian crossing time, especially where, especially where pedestrian refuges are lacking, at the following intersections based on public feedback:

- Chapel Street
- Elm Street
- Edgewood Avenue

■ Signage

Frequent speed limit signage to reinforce safe travel speeds. Once more robust volume management measures are installed, Neighborhood Greenway signage help brand the corridor as a traffic-calmed alternative, and help drivers anticipate the presence of pedestrians and bicyclists.

NEXT STEPS

The design concepts in the report include one option per high-interest segment, with interventions specifically to eventually advance Orchard Street as a Neighborhood Greenway. As such, dedicated bicycle facilities were not considered, as bicyclists are encouraged to use parallel routes, like Sherman Avenue.

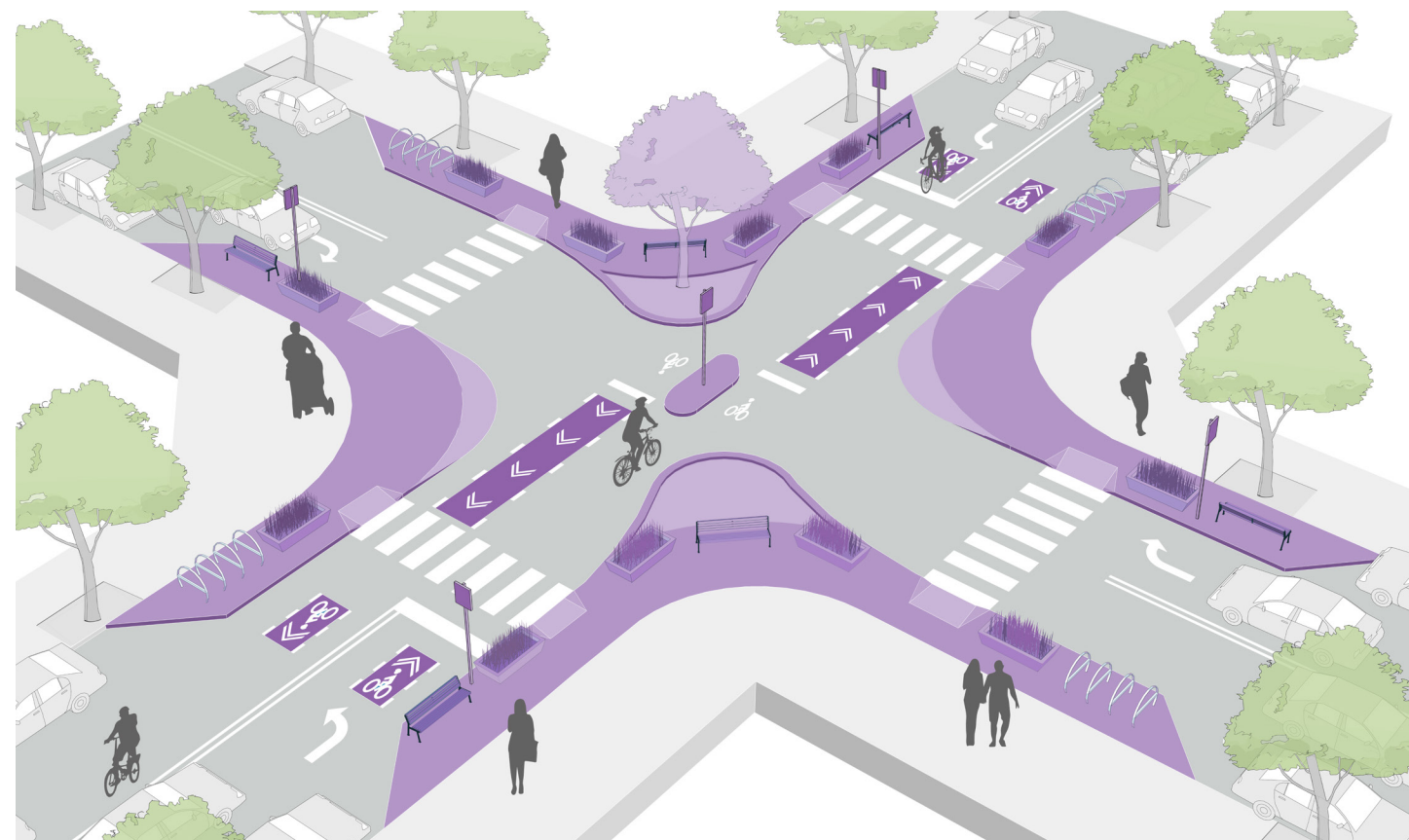
Alternatives to these design concepts may be explored in the future. For example, following a cost-benefit and further engineering analysis, it may be as effective to explore center line hardening at

certain intersections rather than curb extensions. Design interventions for the intersections at Edgewood Avenue and Elm Street should be explored based on public feedback. For example, given the narrow intersection at Chapel Street, perhaps center line hardening is explored for this intersection, and the raised intersection moved to the Edgewood Avenue intersection, where the community cites speeding and difficulty crossing.

Additional recommendations are as follows:

- More traffic data is needed to evaluate the all-way stop recommendations illustrated in the high-interest design concepts, as well as in response to public feedback.
- For between Charles Street and Orchard Place, consider extending the west sidewalk to push out the parking, thus reducing the width of travel lane with more than a line stripe, and causing perceived friction to encourage vehicles to proceed cautiously.
- Explore comments received from the public regarding traffic circles and diverters as two volume management Neighborhood Greenway

toolkit components not represented in the high-interest concept designs. For example, adding a median diverter (in the graphic below) forcing a right turn onto Sylvan Avenue with thru-space carved out for pedestrians and bicyclists would help reduce volumes and mitigate the challenges inherent to this offset intersection. Set a goal of reducing vehicle volumes to approximately 2,000 AADT.



The Toolkit

The following design components form the foundation of a Neighborhood Greenway to apply to the high-interest segments and beyond.

BIKE PAVEMENT MARKINGS

Pavement markings provide predictability of bicycle movements to vehicles, and emphasize the presence of bicycles along a Neighborhood Greenway or Bicycle Boulevard. **Shared lane markings** approximate a bicyclist's position in a travel lane when sharing the lane with vehicles. **Intersection markings and bike boxes** (shown at right) guide bicyclists through intersections, and provides a space for bicyclists to get ahead of vehicles once a light turns green.



Image: Montgomery County DOT

CHICANE

Chicanes are offset curb extensions installed on low volume streets. Their staggered placement slows down vehicle speeds by forcing drivers to weave slowly between the curb extensions and in some cases, yield to oncoming traffic. Chicanes may also include amenities such as benches, bicycle parking, or plantings.



Image: Dan Burden

CURB EXTENSION/RAIN GARDEN

Curb extensions, often called "bump outs," increase the amount of pedestrian space available at intersections or mid-block crossings. The shortened crossing distance reduces pedestrian exposure to moving vehicular traffic, and smaller curb radii can encourage slower vehicle turning speeds for increased safety. They are also good opportunities to add green infrastructure and landscaping for both stormwater retention and beautification.



Image: Richard Drdul

DIVERTER

Diverters are traffic-calming measures that create physical barriers to control movement of traffic in a particular direction, and can be used to prevent people driving from entering or exiting certain legs of an intersection. There are multiple types of diverters that can break up traffic grids while maintaining permeability for cyclists and pedestrians. They are a common treatment used to reduce cut-through traffic along Neighborhood Greenways, or streets where residents desire to minimize through traffic.



Image: Gary Kavanaugh

HIGH-VISIBILITY CROSSWALK

High-visibility crosswalks use contrasting pavement treatments to significantly increase the visibility of a crosswalk to oncoming vehicular traffic. These should be applied to controlled and uncontrolled intersections with vehicular and pedestrian conflicts, areas with high volumes of foot traffic, mid-block locations, and across high-volume roads.



Image: WTOP/Kristi King

MEDIAN

Center medians are used to visually or physically narrow travel lane widths to manage vehicle speeds. Capital construction medians can be painted with bollards or delineator posts to deter vehicles from crossing over them, or be made of concrete with a planting strip for additional greenery and beautification.



Image: City of Minneapolis

MID-BLOCK CROSSWALK

Mid-block crosswalks offer an additional opportunity for pedestrians to cross the street, and are particularly appropriate on long blocks (greater than 500' long) where unsafe pedestrian crossing may be encouraged, or already taking place. Mid-block crosswalks can be paired with pinch points to create an additional sense of friction for vehicles, to maintain slow speeds through the crosswalk.



Image: Univ. of Louisville

NEIGHBORHOOD TRAFFIC CIRCLE

Neighborhood Traffic circles are circular islands placed within the middle of an intersection, interrupting a driver's continuous travel path. When designed well they allow for a safer interaction between pedestrians, bicyclists, and motorists. They also reduce vehicular and cycling delay because they allow for slow but continuous travel.



Image: NYC DOT

PEDESTRIAN REFUGE ISLAND

Pedestrian refuge islands create a protected moment for pedestrians to pause while crossing multi-lane streets. The island reduces exposure to moving vehicles and provides a place to wait if a pedestrian cannot cross in a single signal phase. They may include additional amenities like seating, bicycle parking, and landscaping.



Image: NYC DOT

PINCH POINT

Pinch points are mid-block curb extensions that may also be paired with median islands to reduce travel lane widths at strategic locations. Where warranted, pinch points may include high-visibility crosswalks.

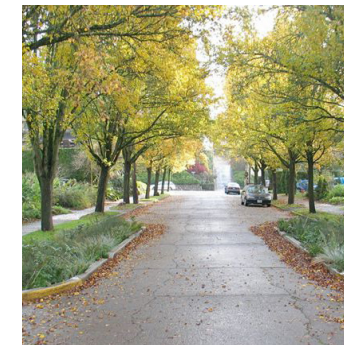


Image: Kevin Robert Perry

RAISED CROSSWALK/INTERSECTION

When crosswalks are integrated with speed tables (see below), these are called “**raised crosswalks**”. A “**raised intersection**” is when the speed table is applied to the entire center of an intersection, so that the entire intersection is flush with the sidewalk, inclusive of all crosswalks.



Image: Urban Milwaukee

SIGNAGE

As Neighborhood Greenways are typically a set of design components that are combined block-by-block to achieve volume and speed management, and prioritize bicycle and pedestrian travel, signage branding a corridor a Neighborhood Greenway can be a helpful tool to ensure compliance with all design interventions and other strategies.



Image: BikePortland

SIGNALS

Leading Pedestrian Intervals (LPIs), for example (pictured at right) allow pedestrians a 3-7 second “head start” before the traffic signal turns green in the same direction. Signal progression times can also be set to the average speed of a bicyclist so that cyclists continuously get a greenlight, a so-called “**greenwave**.” Other signal additions include **Rectangular Rapid Flashing Beacons (RRFBs)**, and ensuring adequate signal cycle time for pedestrians to cross.

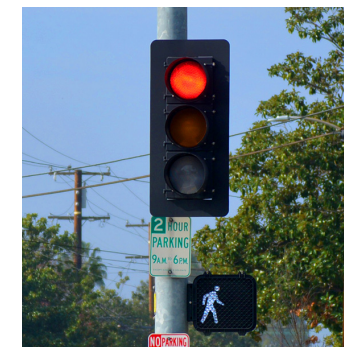


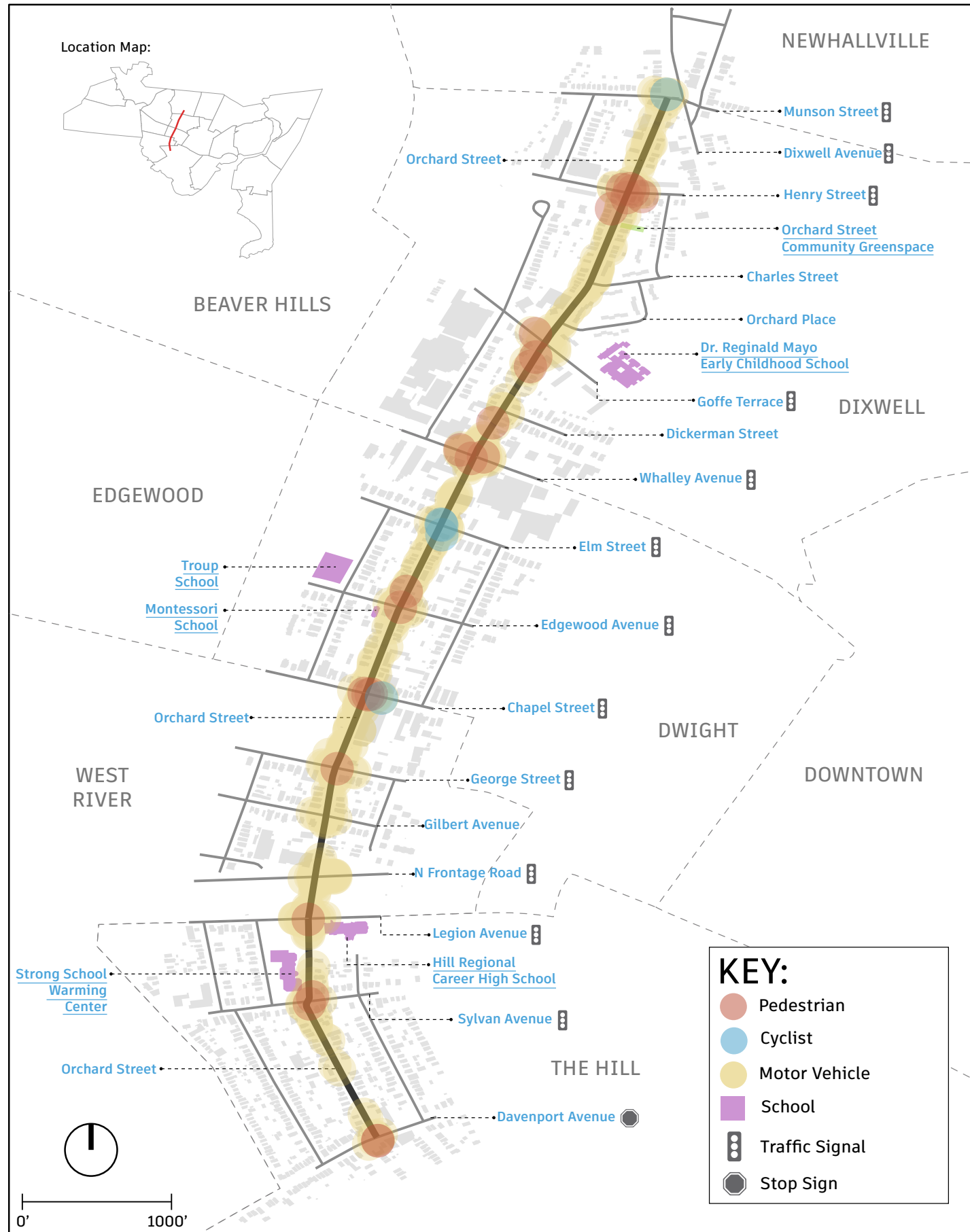
Image: City of Long Beach

SPEED HUMP/SPEED TABLE

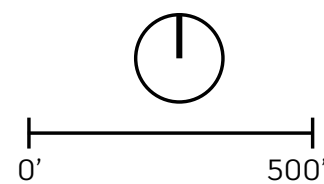
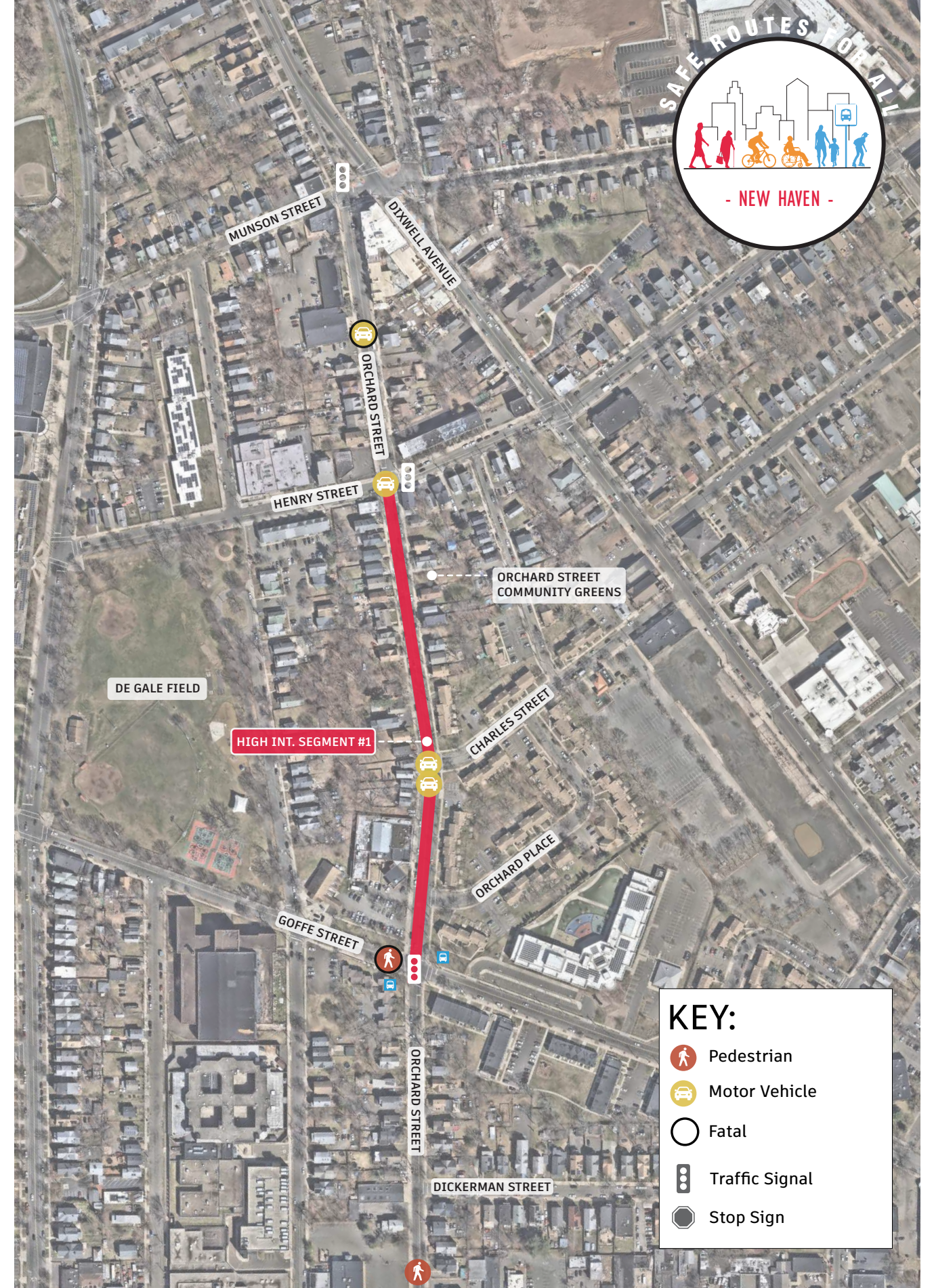
Speed humps and speed tables are mid-block, vertical traffic calming devices intended to slow vehicular traffic speeds on low volume, low speed streets. Speed tables feature a flat rather than rounded surface, and therefore can integrate crosswalks or be applied to an entire intersection.



Image: City of Louisville

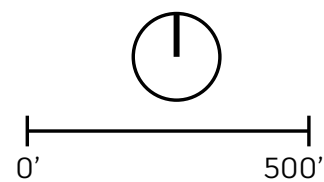
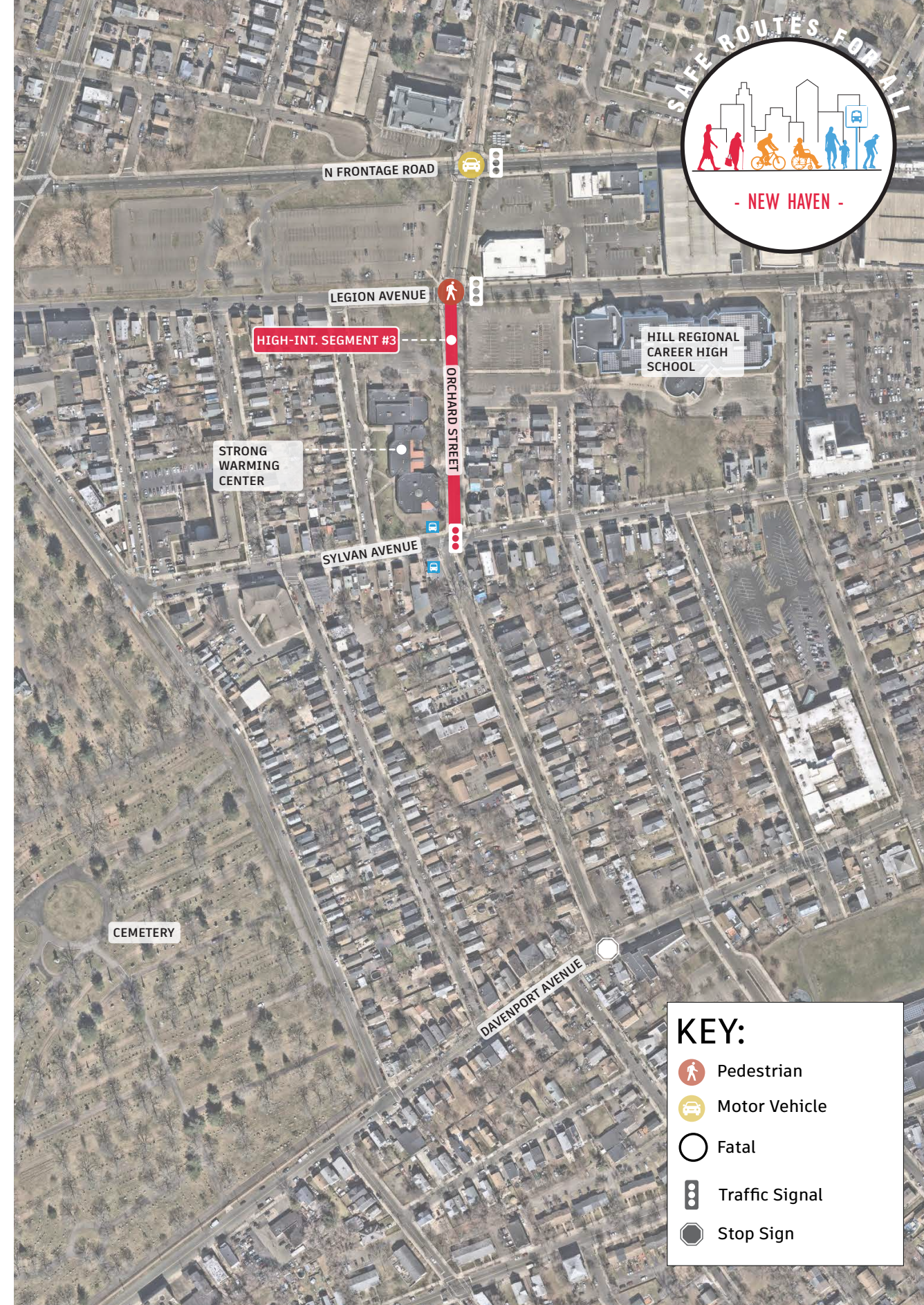
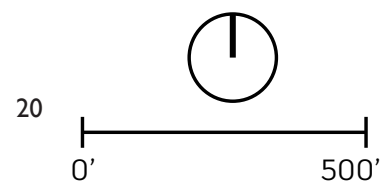


ORCHARD STREET CORRIDOR STUDY | ALL CRASHES
2019-2023



Orchard STREET

FATALITIES + SERIOUS INJURIES
MUNSON ST. - DICKERMAN ST.
JANUARY 2019 - DECEMBER 2023



Orchard STREET