TOOLE DESIGN

LAWRENCE ACTIVE TRANSPORTATION PLAN

CANAL STREET DESIGN ALTERNATIVES

Developed for the Merrimack Valley Planning Commission

January 23, 2025 | DRAFT

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Information contained in this document is for planning purposes and should not be used for final design of any project. All results, recommendations, concept drawings, cost opinions, and commentary contained herein are based on limited data and information and on existing conditions that are subject to change. Further analysis and engineering design are necessary prior to implementing any of the recommendations contained herein.

PROJECT OVERVIEW AND EXISTING CONDITIONS

PROJECT OVERVIEW

The City of Lawrence, MA and Merrick Valley Planning Commission (MVPC) envision future Canal Street as an active transportation corridor and gateway into downtown for people walking, biking, and traveling via similar modes. The project was identified in the MVPC's 2024 Active Transportation Plan as a top three priority project to promote regional connectivity and increase safe active transportation options. In pursuit of this vision, this report documents design alternatives explored for Canal Street.

NEARBY PROJECTS AND PLANS

- Spicket River Greenway at eastern end of Canal Street
- Proposed Lawrence-Manchester Rail Trail at western end of Canal Street (a MassDOT project)
- Proposed shared use path (SUP) running along the south side of the canal, pending agreements with the Essex Company. Canal Street could tie in with this SUP as part of an active loop.
- Bike lanes to be installed on nearby streets in downtown Lawrence

EXISTING CONDITIONS

The project area encompasses both sides of Canal Street for approximately .9 miles from its intersection with Broadway on the west and east to a proposed connection with the Spicket River Greenway just passed the bridge at Island Street. Originally a hub of industrial activity in Lawrence, many of the historic mills along the North Canal have been converted to apartments. The surrounding area features restaurants, historic sites, and civic buildings.

CROSS SECTION SEGMENTS

Generally, there are four distinct cross section segments along North Canal: Segment 1 extending from Broadway to Amesbury Street, Segment 2 from Amesbury Street to Mill Street, Segment 3 from Mill Street to Union Street, and Segment 4 from Union Street east (Figure 1). The width of the public right-of-way (ROW) varies from approximately 50 feet to 70 feet; exact widths must be confirmed as a next step. An additional 10 to 12 feet of buffer space exists south of Canal Street between the ROW and abutting the North Canal wall. Dimensions in the diagrams below are not ROW dimensions but rather account for the approximate total space between ROW or street width and buffer area. See the Property Ownership section for more information.

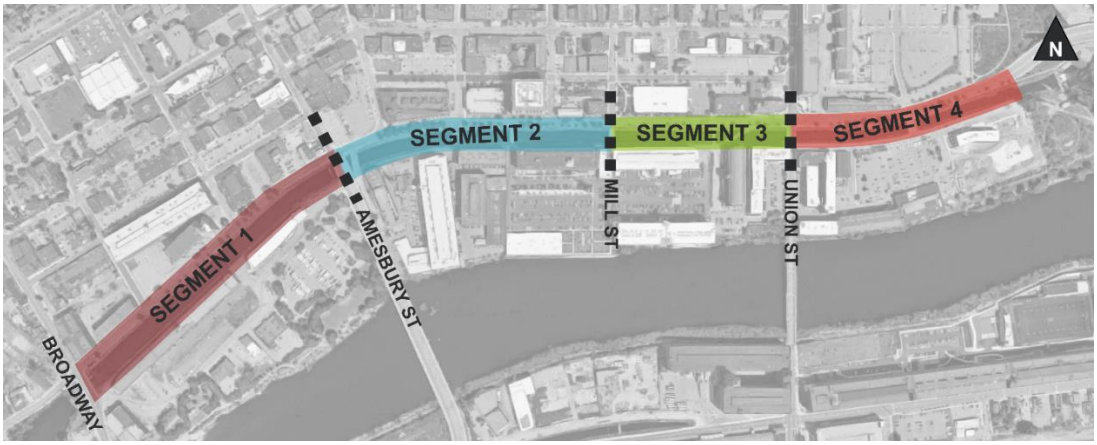


Figure 1 - Cross section segments along Canal Street

SEGMENT 1: BROADWAY TO AMESBURY STREET

Segment 1, extending from Broadway to Amesbury Street, has an approximately 60-foot wide cross section consisting of an 8-foot sidewalk on the north side of Canal Street, 16-foot eastbound and westbound travel lanes, a 5-foot grass strip, a 5-foot sidewalk, and a 10- to 12-foot grass strip (Figure 2). A fence separates the southern sidewalk from the grass strip adjacent to the canal. The trees species for segment 1 appear to be in mixed health, with several dead and unhealthy trees, and sidewalk heave from tree roots.

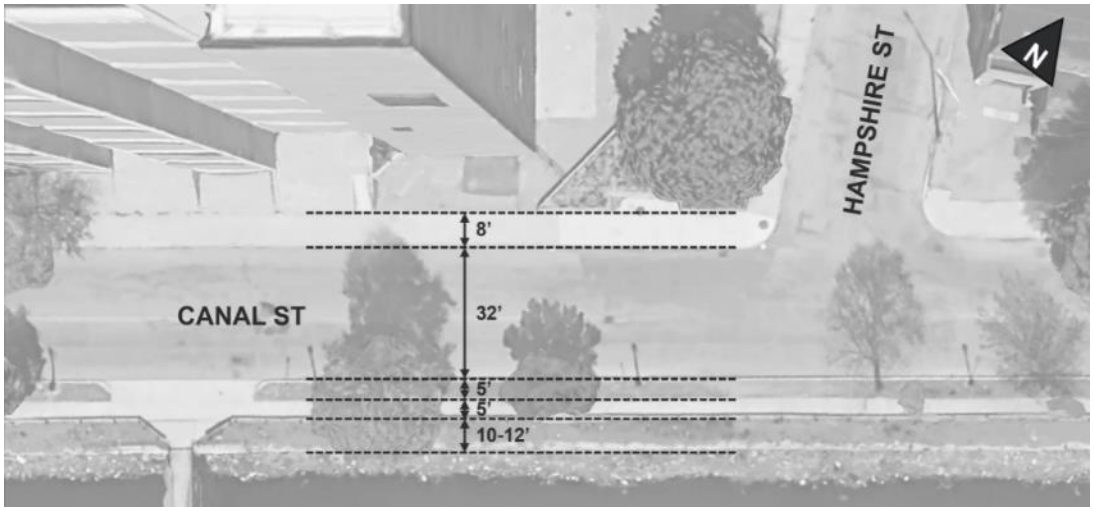


Figure 2 - Approximate Segment 1 cross section on Canal Street near Hampshire Street

SEGMENT 2: AMESBURY STREET TO MILL STREET

Segment 2 also has sidewalks on both sides and a 10-foot grass strip south of the street. Here, however, the roadway transitions to a 16-foot one-way travel lane (Figure 3). Canal Street is one-way eastbound from Amesbury to Lawrence Street and one-way westbound between Lawrence and Mill Streets. A paved or vegetated area is present on the north side between Lawrence and Mill Streets. Between Jackson Street and Mill Street, the cross section includes an approximately 17-foot-wide brick-paved seating area (Figure 4). In this segment, existing oaks appear to be in relatively good condition, but the Callery pears appear less healthy.

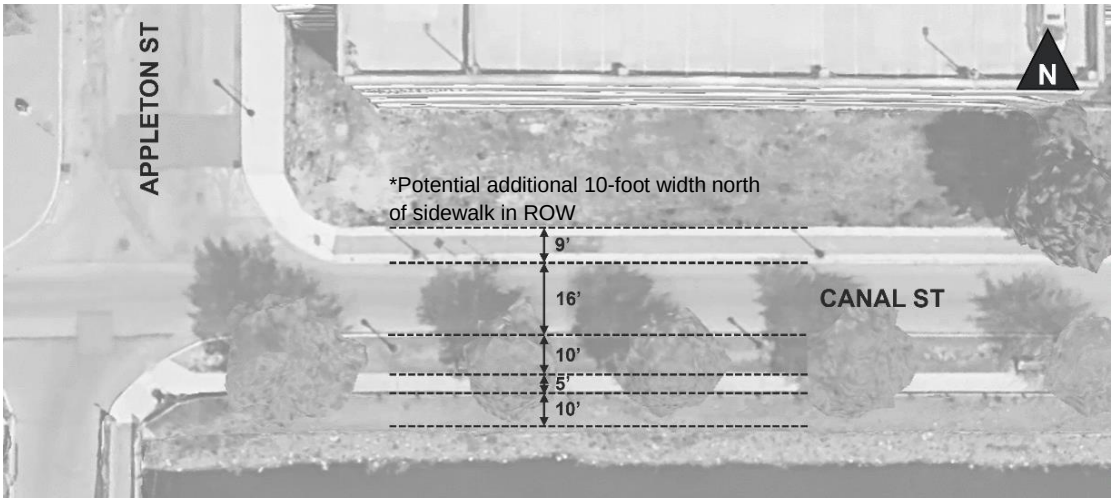


Figure 3 - Approximate Segment 2 cross section of Canal Street near Appleton Street

Figure 4 - Seating area between Jackson Street and Mill Street

SEGMENT 3: MILL STREET TO UNION STREET

Canal Street widens west of Mill Street to a roughly 60-foot cross section with an 8-foot grass strip, 17-foot travel lanes in both directions, a 5-foot grass strip, a 5-foot sidewalk, and a 10-foot grass strip abutting the southern canal wall. There appear to be at least three dead trees near the diagonal trestle bridge and several other trees in poor condition.

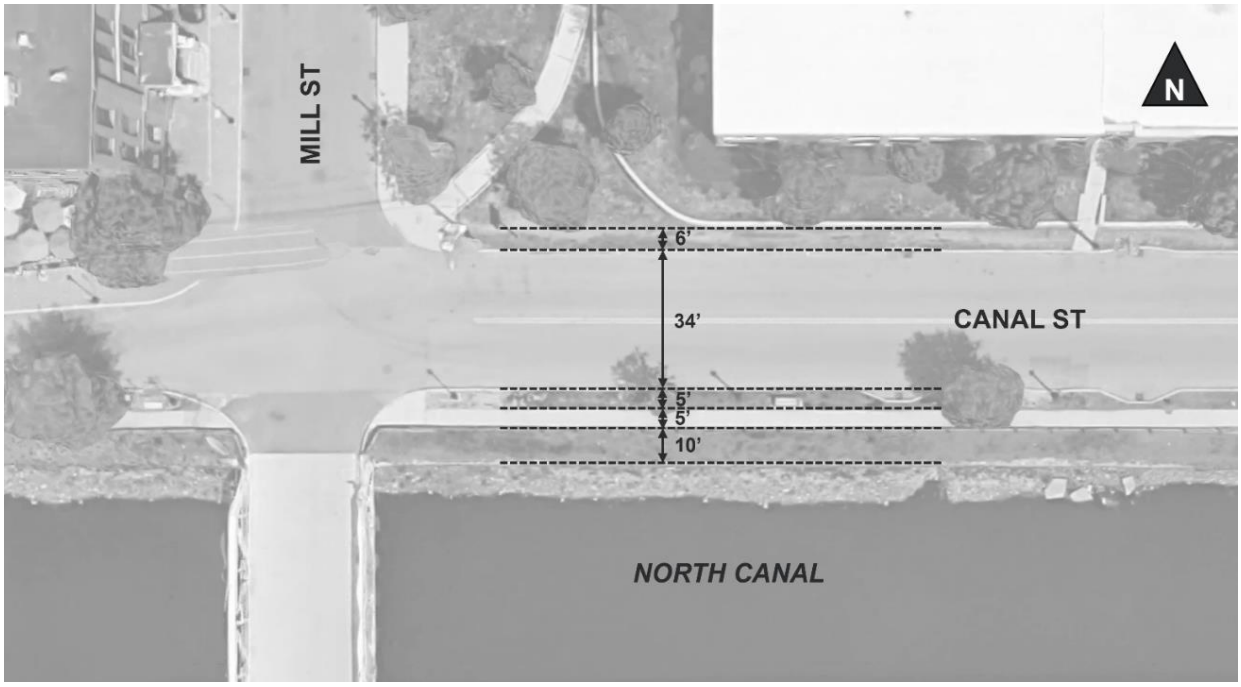


Figure 5 - Approximate Segment 3 cross section of Canal Street near Mill Street

SEGMENT 4: UNION STREET WEST

East of Union Street, the Canal Street cross section continues to widen to approximately 80 feet, consisting of a 6-foot sidewalk on the north side, a 54-foot curb-to-curb width with three eastbound travel lanes and one westbound travel lane, a 5-foot grass strip, a 5-foot sidewalk, and a 10-foot grass strip between the sidewalk and canal wall (Figure 6). A fence separates the sidewalk and the canal wall. The curb-to-curb width narrows heading to the east of Union Street, but the grass strips and sidewalks generally remain consistent, with some trees lining the sidewalk. While some trees appear healthy, others seem to be showing signs of die off on the top.

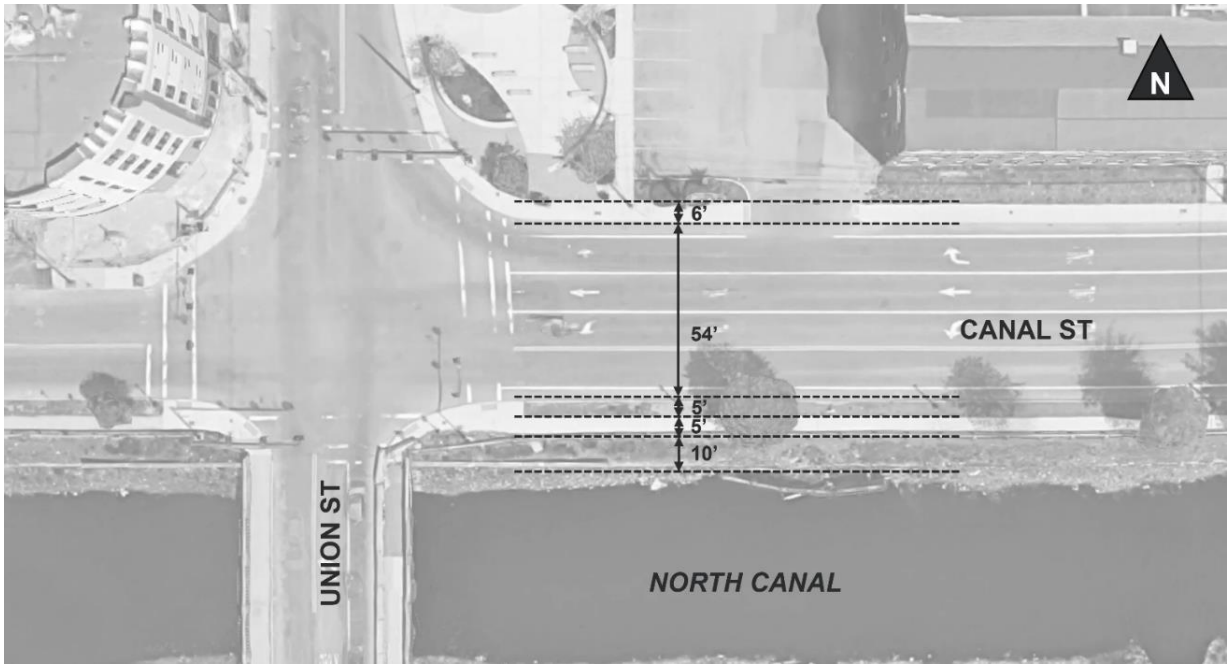


Figure 6 - Approximate Segment 3 cross section near Union Street

SAFETY AND ACCESSIBILITY

SAFETY REVIEW

The Merrimack Valley Planning Commission created a High Injury Network (HIN) map to identify where crashes have occurred to better understand where they are likely to happen in the future.[1] Based on crash data available through the MassDOT IMPACT Portal for crashes occurring between 2017 and 2022, the network assigns severity to roads and intersections. This categorization is based on severity of crashes, crashes involving non-motorists, and crashes occurring in Regional Environmental Justice Communities (REJ+). Intersections and roadway segments appear on the HIN when they score above-average severity. Canal Street from west of Prospect Street to west of Union Street and along Broadway shows red on the trends-based and risk-based HIN, suggesting that crashes have occurred on these segments, and that more crashes are likely to occur should no changes be made to the roadway (Figure 7).

[1] Merrimack Valley Vision Zero, High Injury Network (https://mvpc.org/data-2/)

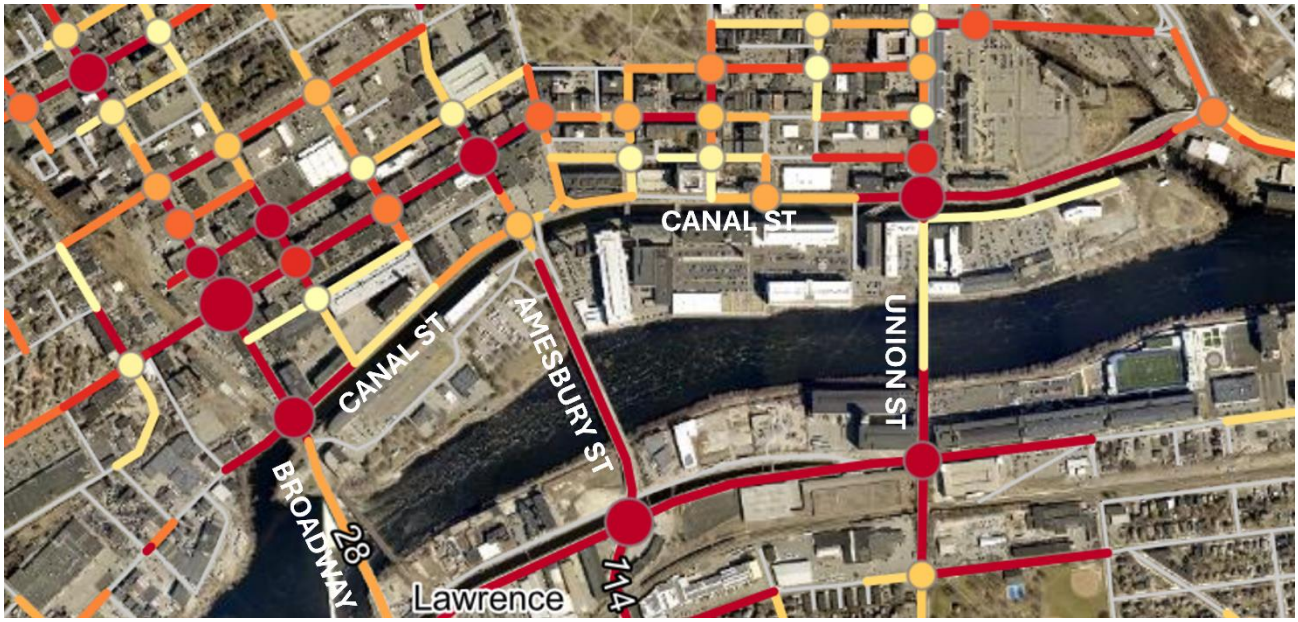


Figure 7 - High Injury Network map showing hot spots for collisions along study area roadways and intersections occurring between 2017 and 2022

Four intersections within the study area appear on the HIN: Canal Street's intersections with Broadway, Amesbury, Mill and Union Street. Table 1 accounts only for injury crashes and crashes involving motorists. The prevalence of such crashes highlights the need for better, safer facilities for all users.

Table 1 - High Injury Network crashes at intersections within the study area occurring between 2017 and 2022

Canal Street at…	Total Injury Crashes	Total Non-Motorist Crashes
Broadway	52	4
Amesbury Street	20	3
Mill Street	5	0
Union Street	49	3

Note: The crashes listed do not account for all crashes that may have occurred at the intersections.

ACCESSIBILITY

Many of the sidewalks along Canal Street are in poor condition with cracked and upheaved surfaces that result in a discontinuous walkway. Often, curb ramps at intersections lack detectable warning panels, and it was observed that poor drainage left debris within the ramps. Many crossings lack high visibility crosswalk markings and at Broadway at Canal Street the pushbuttons to activate the WALK signal did not work. At Canal Street's intersections with Broadway and Amesbury Street, the signalized intersections lack audible pushbuttons, and the pedestrian indications are outdated and lack a countdown timer during the DON'T WALK phase.

PUBLIC TRANSPORTATION

The Massachusetts Bay Transportation Agency (MBTA) operates the Haverill Line of the commuter rail through Lawrence with Lawrence Station/McGovern Transportation Center located just south of the project area along Union Street between Merrimack Street and Market Street. A parking garage is available for commuter rail riders at the station.

Merrimack Valley Transit (MeVa) operates free bus routes in several communities and has one of its core transit hubs, Buckley Transportation Center, just north of the study area on Amesbury Street at Common Street. Six bus routes pass through the project site:

- **Broadway:** Route 26 (Buckley Transportation Center to Internal Revenue Service)
- **Amesbury Street:** Route 1 (McGovern Transportation Center to Washington Square Transit Center) and Route 24 (Robert B. Kennedy Transfer Center to McGovern Transportation Center)
- **Union Street:** Route 5 (McGovern Transportation Center to Dana-Farber Cancer Institute), Route 6 (McGovern Transportation Center to Holy Family Hospital), and Route 10 (McGovern Transportation Center to Village Plaza Dollar Tree).

Routes 1 and 24 run along Canal Street between Hampshire Street and Amesbury Street with a bus stop located on the northwest corner of Canal Street's intersection with Amesbury Street for Route 24. Additionally, a bus stop for 26 is located on the northeast corner of Canal Street at Broadway.

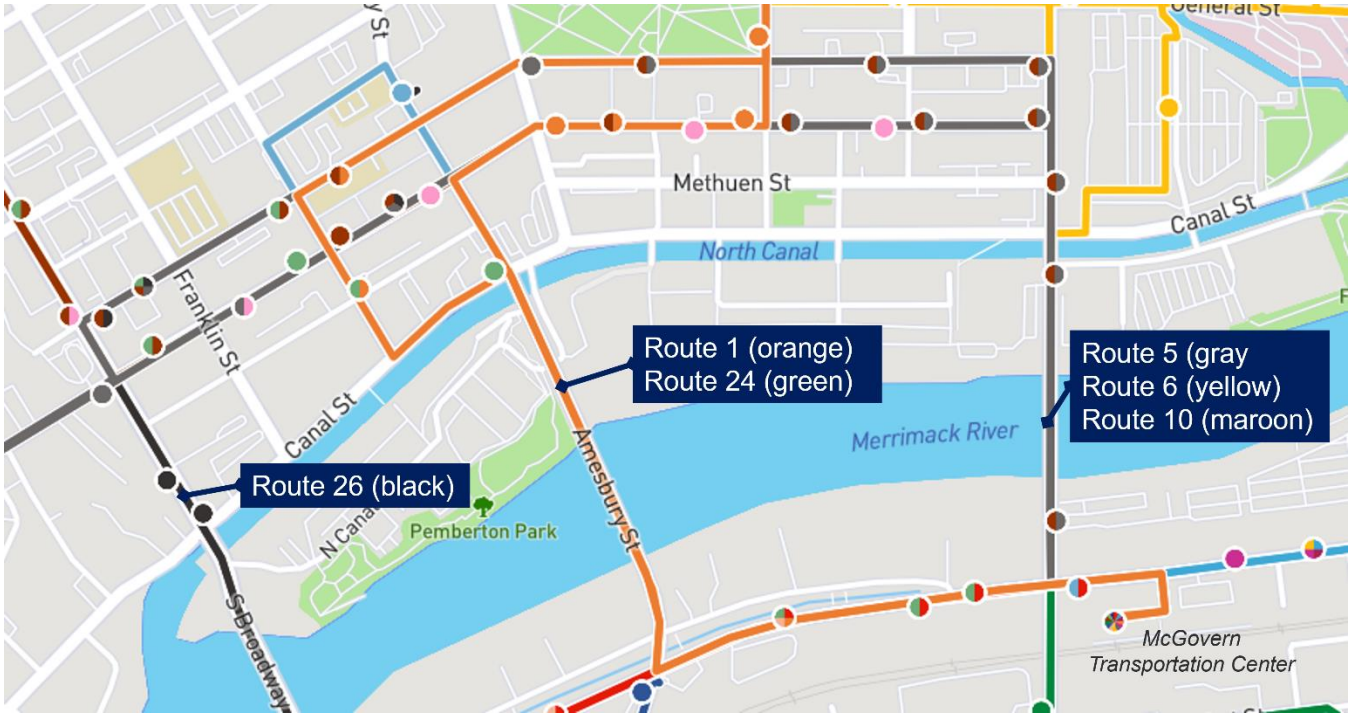


Figure 8 - MeVa bus routes within the project area

PROPERTY OWNERSHIP

The survey and title exam will establish true bounds of ownership. The following are considerations for further analysis and coordination on property ownership as the design of Canal Street moves forward. The nature of the maintenance agreement between Lawrence Redevelopment Authority (LRA) and Department of Conservation and Recreation (DCR) will also need to be explored as a next step.

CANAL PROPERTY / ESSEX CO. / LRA

It would be beneficial to allow people to move closer to the canal for more connection with the water and opportunities for seating and other amenities. Therefore, how the land can be used closer to the canal is an important question.

Based off a takings map provided by MVPC from Essex Co and dated 10/2/1986, the public ROW appears to generally be 50' wide. However, Essex Co sold an additional 10' along the length of the canal to the LRA in June 1990, from roughly the back of the sidewalk south of Canal Street to the face of the north side canal wall. According to the project kickoff meeting, some sort of maintenance agreement exists between the LRA and DCR north of the canal. So, Toole Design suggests that all three entities – Essex, LRA, and DCR – are eventually brought to a meeting together to discuss opportunities for the public realm.

Additional considerations that come from the terms of property transfer between Essex and LRA:

- Hazardous waste can be expected to impact future analyses and costs given previous industrial use
- The Essex Company is responsible for maintenance of the North Canal and its walls but is not responsible for maintaining fences along the canal.
- Do fences (i.e. the guardrail) fall to DCR? The City will want to construct a higher rail if moving people closer to water, and ideally should change the rail to something more pedestrian oriented.
- Does Essex have inspection reports on the structural integrity of the stone canal walls? This is needed to establish how closely the path or sidewalk can be built near the walls, how much retaining height or grade transition is needed (the existing sidewalk is higher than the walls), and impacts railing design.
- The Essex Company maintains easement over the transferred parcels for canal / utility maintenance access. Discussions should establish what they would consider a restriction to access.

FRONTAGE, SETBACK, AND DRIVEWAYS ON CANAL STREET

- At some buildings with 0' setbacks, there are entryways with steps into the sidewalk, and the survey and title process will clarify ROW bounds and permissions for encroachments. Wider sidewalks and/or a north side treeway may be needed to accommodate regrading that eliminates steps, where possible, to create more barrier free entries.
- Several parcels have building setbacks of 10'-15'. Consider what can be done with those setbacks to support public space along the street and for the residents and employees in the adjacent buildings. This will require coordination with owners.
- Per the *Lawrence Canal Parcel Ownership Map*, the restaurant building east of the Broadway bridge along the canal appears to be part of public ROW, but this land doesn't appear to have been transferred by Essex in the 1986 maps. The City should confirm ownership. If the building is for sale, the City may purchase and demolish the building. The building appears to require removal or relocation to support either concept alternative.
- Driveway entries should be narrowed, and grading should be designed to continue the sidewalk through for pedestrians. This implies discussions with property owners regarding driveway easements.

BRIDGES

- Bridge ownership and extents must be established. What can be done (added) on each bridge based on existing deck/structure and load capacity? Where does each structure begin at Canal Street?
- MassDOT does not appear to own all bridges in the project area per the MassDOT Open Data Portal. The Amesbury Street bridge (Joseph W Casey Bridge) and Union Street bridge solely where it passes over the canal is listed as owned by the municipality. This may open flexibility in intersection design.

CANAL CHARACTER

The canal still features industrial remnants that speak to the heritage of the area and would provide visual interest for pedestrians and cyclists. Situated on both the north and south sides of the canal are remnants of sluice gates and other mechanical elements and east of the Island Street Bridge on are a series of vertical wooden pilings. The canal wall is composed of square blocks of granite.

To the east end of the island, heading towards Nunzio Dimarca Park, is a dam with a walkway that is currently closed but could provide a good focal point for pedestrians and cyclists.

There is also an existing wayfinding and historic interpretation with “The Path/El Sendero” a series of hexagonal signs in light green and white featuring historic photos and information of the area. This series results from a partnership between the City of Lawrence, the Department of Conservation and Recreation, Lawrence History Center and Groundwork Lawrence, among others. On Canal Street, this signage is located at plaza by Mill Street and the Union Street Bridge.

Figure 9 - Historic remnants and existing wayfinding along Canal Street

VEGETATION, MATERIALS, AND LIGHTING

TREES AND VEGETATION

The vegetation on site consists predominantly of street trees and mowed lawn. Tree species on Canal Street between Broadway and Amesbury include Zelkova (with noticeable/inaccessible sidewalk heave), Cherry and Tulip Trees, many of which appear older. At Amesbury through Union species include oaks and Callery Pears located in the seating area/brick plaza. The Callery Pears do not appear to be in good condition and may be suffering from fire blight. The trees next to the diagonal trestle bridge are either dead or do not appear healthy. Continuing east from Union are more oaks, also in not great condition.

FURNISHING/PAVING

Canal Street currently features periodically placed benches, which are cast iron with wooden slats and are bolted to concrete pads. Throughout the site, the southern sidewalk is predominantly concrete with granite curbs. However, the north side east of Lawrence Street is predominantly red brick with granite curbs. Between Jackson Street and Mill Street, there is a built-out plaza with a slight overlook on the southern side, which is also red brick with granite curbs. Moving east from Mill Street to Union Street, the north side of Canal Street loses its sidewalk, and the southern side reverts to cast concrete. The fencing which separates the sidewalk from the canal is comprised of wooden beams secured to metal posts.

LIGHTING

Current lighting fixtures are acorn lights with cast iron poles. When replacing or installing new lighting, consider installing light fixtures that adhere to Dark Sky principles.

Figure 10 - Photographs from along Canal Street

CONCEPT ALTERNATIVES

CONCEPT ALTERNATIVES

This project contrasts two alternate designs, a shared use path and two-way bike lane, which provide safer transportation options for non-motorists by narrowing travel lanes and generating key connections between existing and proposed trails. Canal Street will serve as a primary link for non-motorists traveling in Lawrence to/from the downtown area and regional trail networks. Narrowing travel lanes reduces pedestrian crossing time while providing sufficient space for cars and opens amenity space for tree plantings and public use. Both the shared use path and two-way bike lane provide space outside the roadway for cyclists and allow cyclists, including families, to ride in groups.

ALTERNATIVE 1: SHARED USE PATH

- Alternative 1 provides a shared use path adjacent to the canal for use by all pedestrians, cyclists, and similar users.
- Utilities will move to accommodate the shared use path and narrowing travel lanes.
- The addition of the shared use path close to the canal wall will require additional retaining. If this is not possible, then the buffer/viewing zone or possibly the shared use path width may need to be reduced.
- Adequate lighting coverage will need to be provided via photometric analysis.
- The shared use path width is highly recommended between 13 to 15 feet to accommodate future higher traffic, with 11 feet as the minimum.
- The shared use path allows for additional placement of trees/tree lawn on both sides of Canal Street when compared to the two-way bike lane, which generally adds trees on the south side only.

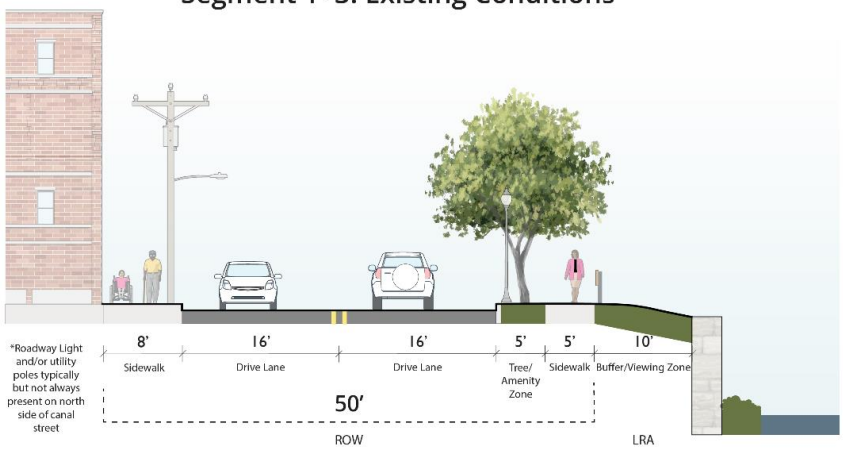
ALTERNATIVE 2: TWO-WAY BIKE LANE

- Alternative 2 provides a two-way bike lane on the south side of Canal Street plus a new sidewalk between the bike lane and canal.
- Utilities will move to accommodate the two-way bike lane and narrowing travel lanes.
- Addition of the bike lanes close to the canal wall will require additional retaining. If this is not possible, then the buffer/viewing zone or possibly the two-way separated bike lanes, sidewalks, or buffers may need to be reduced.
- Adequate lighting coverage will need to be provided via photometric analysis.
- The two-way bike lane width is recommended to be a minimum of 11 feet for passing with a minimum 3-foot buffer to prevent dooring by vehicle users who may drop off people on the passenger side of the vehicle.

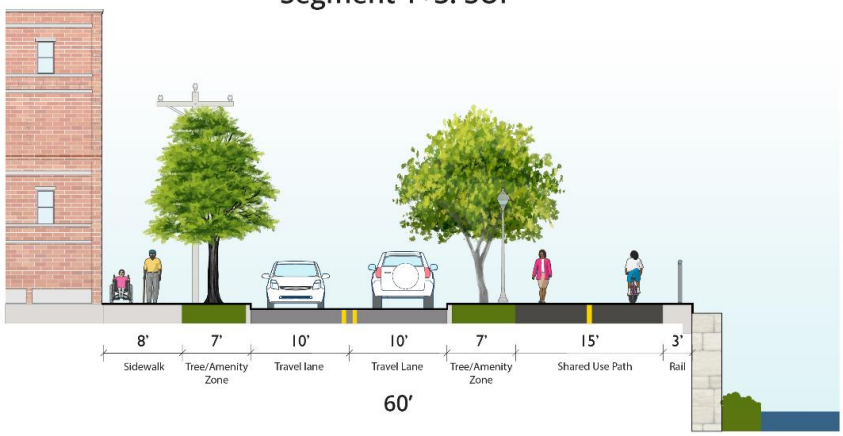
PROPOSED SECTIONS

SEGMENT 1 AND SEGMENT 3

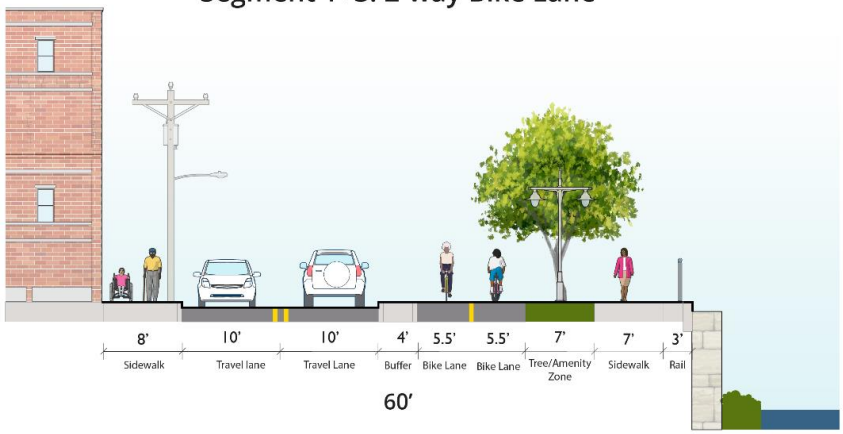
Segment 1+3: Existing Conditions



Segment 1+3: SUP

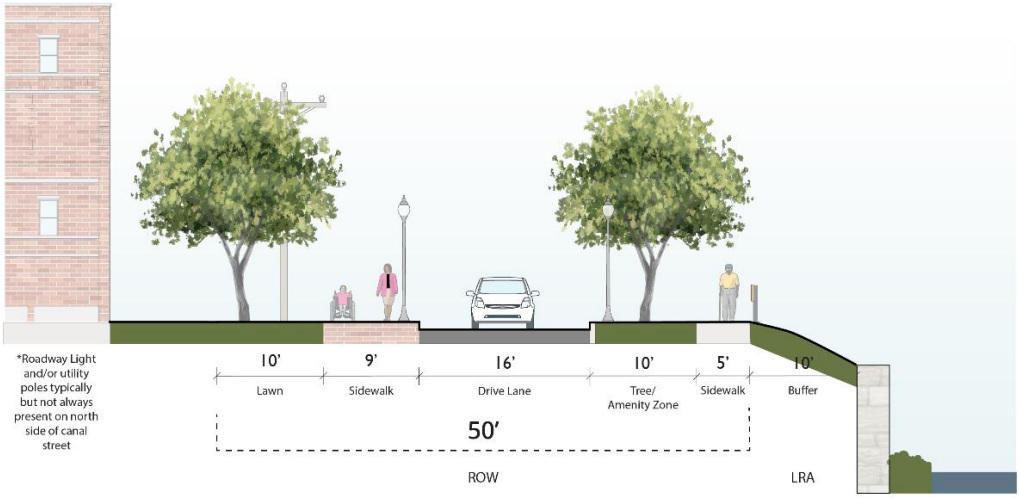


Segment 1+3: 2-way Bike Lane

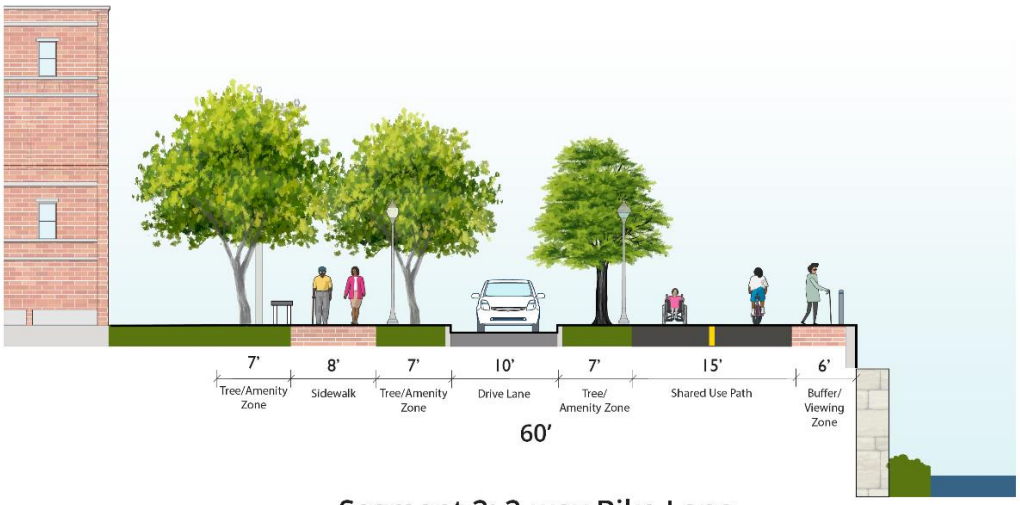


SEGMENT 2

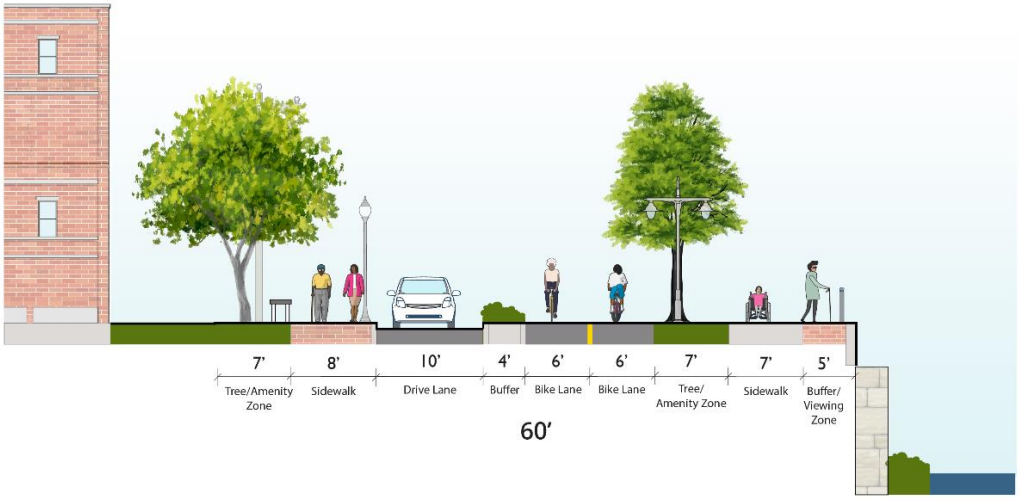
Segment 2: Existing Conditions



Segment 2: SUP

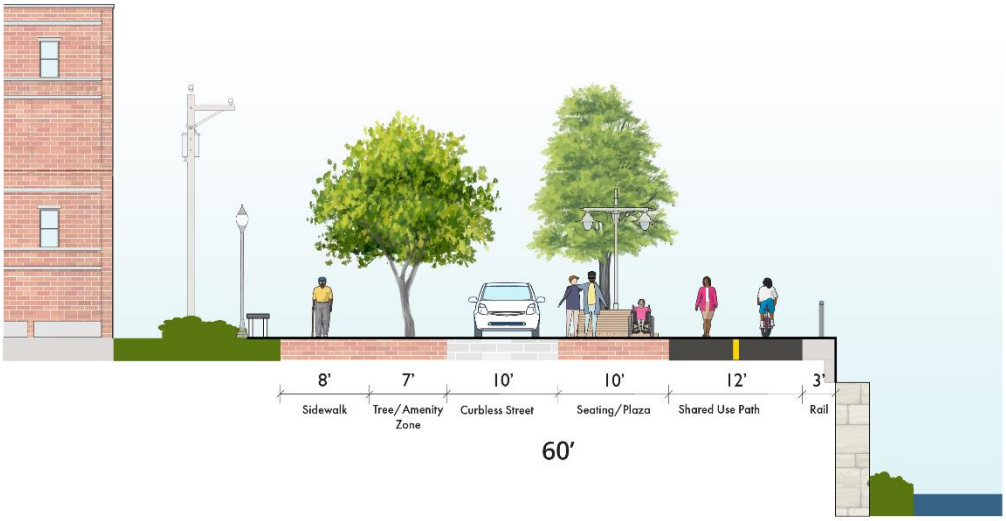


Segment 2: 2-way Bike Lane



For the plaza area, two options are shown below in cross section and plan. Both options might be used with the Alternative 1 shared use path, but Plaza Option 2 is more likely to apply for Alternative 2 two-way bike lanes. Both plaza options feature a curbless street with a 10’ lane for vehicles and dedicated seating/plaza space. In Plaza Option 1, the SUP continuously runs along the south side of the canal, providing a consistent travel path with all users close to the canal. In Plaza Option 2, the SUP transitions to a sharrow and contra flow bike lane for cyclists, while pedestrians can continue along the canal. This option provides more seating and vegetative space closer to the canal and deemphasizes the “through” path. The sharrow and contra flow lane in option 2 would revert to a SUP on either side of the plaza, with transitions to be designed in future phases.

Segment 2: Plaza Option 1



Segment 2: Plaza Option 2

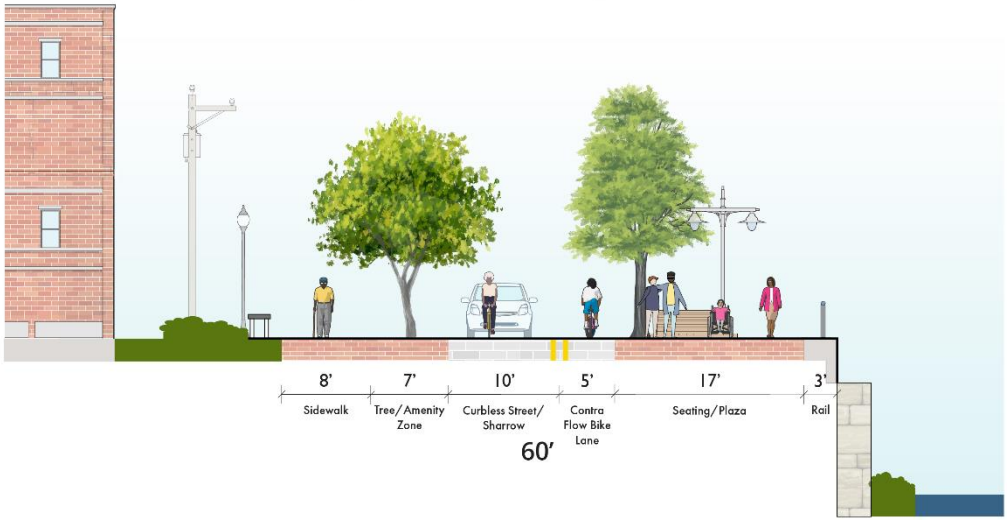


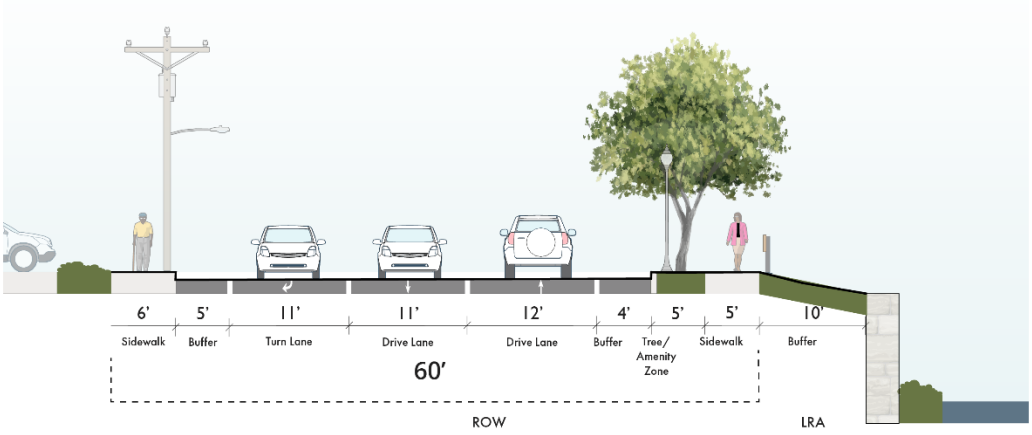
Figure 11 - Segment 2, Plaza Option 1

NOTE: Like the cross sections above, the plans on this page express basic concepts. All aspects, and particularly transitions to and from the shared use path for cyclists at cross streets, require further analysis and design for safe use.

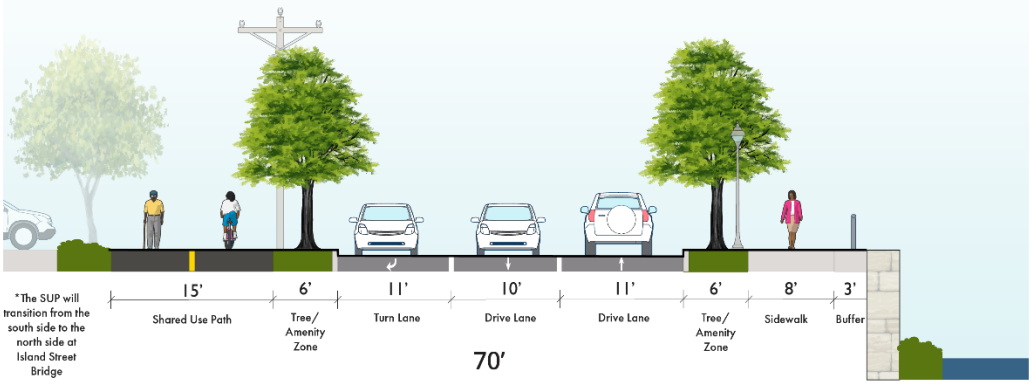
Figure 12 - Segment 2, Plaza Option 2

SEGMENT 4

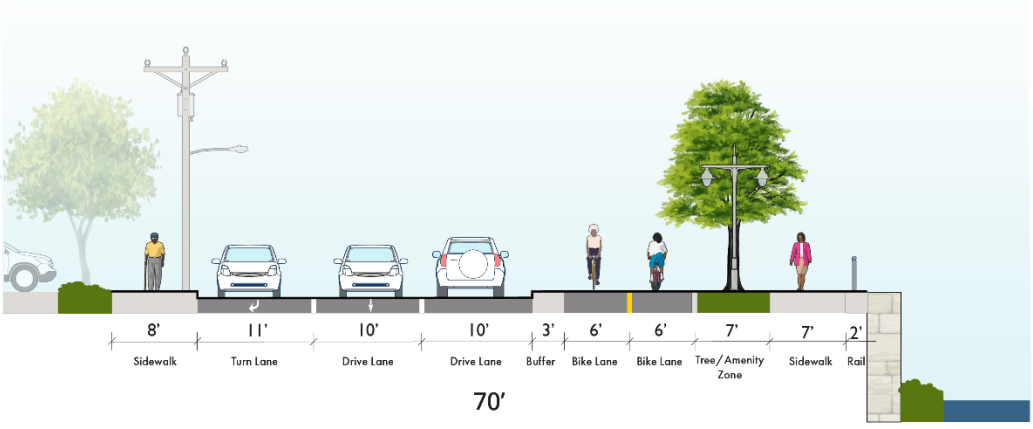
Segment 4: Existing Conditions



Segment 4: SUP



Segment 4: 2-way Bike Lane



CONCEPTUAL DESIGN PLANS

Conceptual design plans were developed to provide examples of how the proposed cross sections may traverse signalized intersections, in this case, through Canal Street at Broadway and Canal Street at Union Street. While shown with Alternative 1 alone, similar designs can be provided with Alternative 2.

CANAL STREET AT BROADWAY

At Canal Street at Broadway, the proposed amenities along Canal Street can connect to the Lawrence-Manchester Rail Trail currently being designed and set to terminate at the northwest corner of the intersection. Alternative 1 or Alternative 2 can connect to the shared use path to provide regional connectivity.

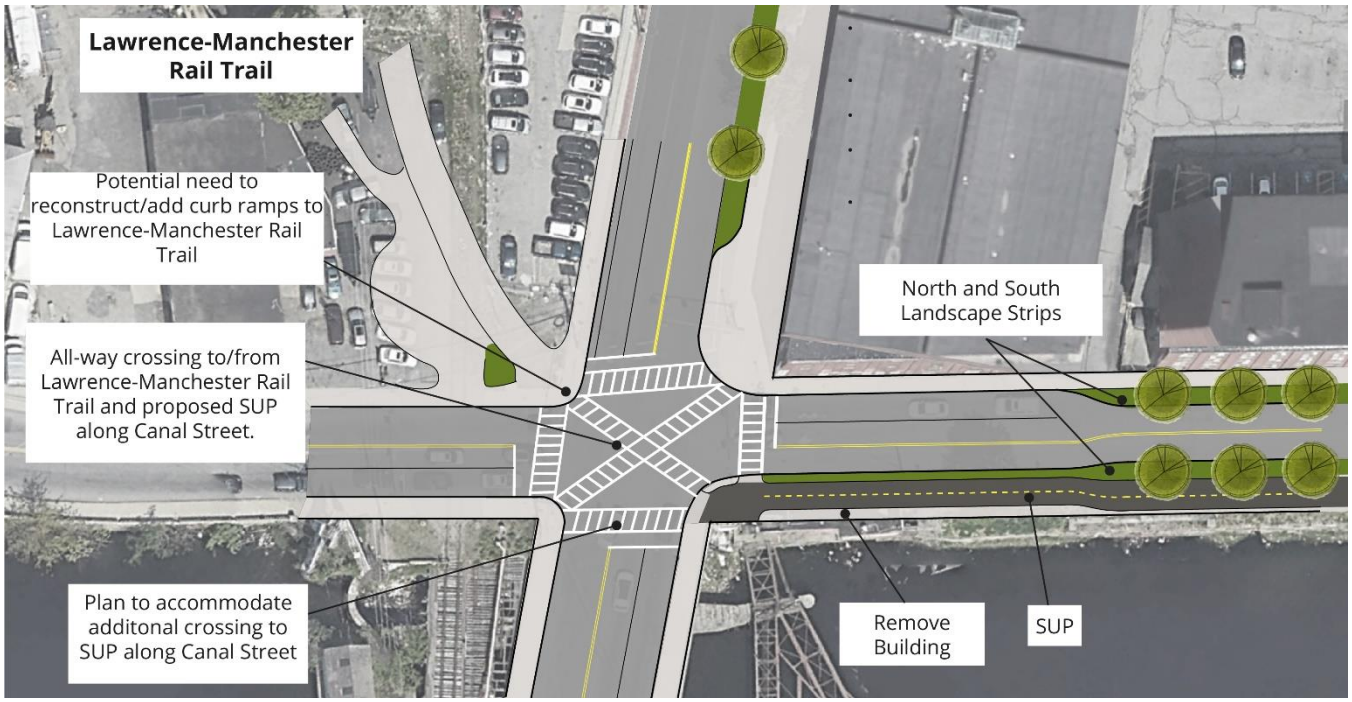


Figure 13 - Concept plant at Canal Street at Broadway

Some aspects of the traffic signal should be considered as follows:

- Determine feasibility of removing some or all turn lanes and reallocating width to greenspace.
- Consider concurrent/exclusive pedestrian signal phasing with the concurrent pedestrian phases on recall (WALK phase comes up every cycle) and the exclusive pedestrian phase for the diagonal crossings to be activated by push button.
- During a concurrent phase, the audible signal can say, for example, “Broadway, WALK signal is on to cross Broadway.”
- When the push button is activated, the exclusive pedestrian phase audible signal can say, for example, “WALK signal is on for all crossings.”
- With concurrent/exclusive pedestrian phasing, when someone activates the push button, they will not have any concurrent traffic turning across them during their crossing, regardless of the crossing they are using.
- Install “BIKES USE PED SIGNALS” (Manual on Uniform Traffic Control Devices (MUTCD) sign R9-5) such that people biking use pedestrian signals at the intersection.
- Further traffic analysis should be conducted to determine feasibility.

CANAL STREET AT UNION STREET

At Canal Street at Union Street, the Canal Street westbound left turn lane is proposed to be removed to provide space for the amenities of Alternative 1 or Alternative 2. Curb radii are drastically reduced to shorten crossings and limit exposure for vulnerable users within the travel lanes.

Should a shared use path be constructed along Island Street, further exploration of cross section options along the bridge between Union Street and Island Street should be explored to provide protected, safe connections in all directions. An option for the bridge to facilitate connections would be to have a sidewalk on the west side, a bike lane, two travel lanes, a two-way separated bike lane, and a sidewalk on the east side. This would provide safe and separated connections for all modes from the Canal Street amenities to and Island Street shared use path to Union Street bike lanes.

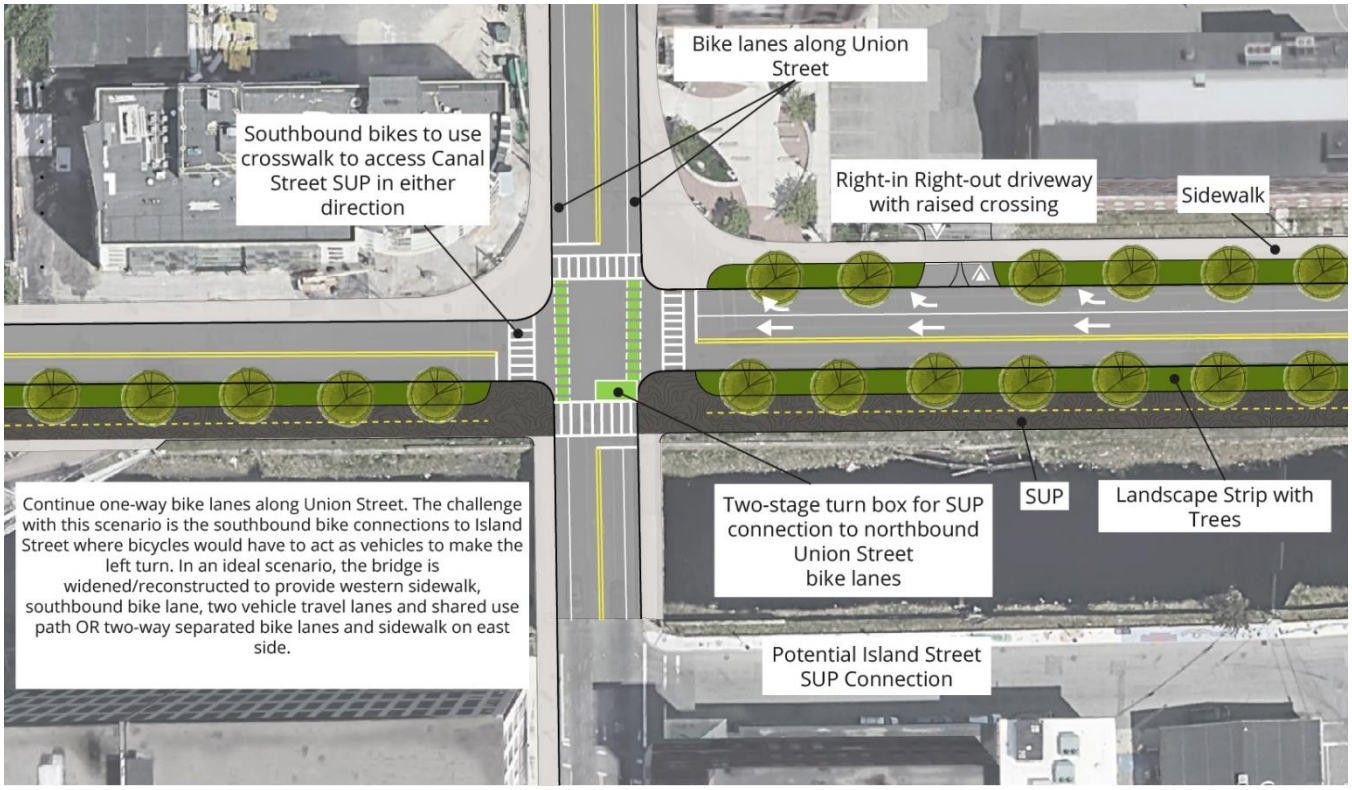


Figure 14 - Concept plan at Canal Street at Union Street

Protected intersection treatments on the south side of Canal Street to facilitate connections to/from the Union Street conventional bike lanes and Canal Street shared use path or two-way bike lanes may be challenging due to space constraints. In the concept plan shown in Figure 14, southbound bicyclists attempting to access the Canal Street facilities should utilize the western crosswalk. From there, they may continue west on the shared use path, or continue east via the southern crosswalk. Northbound cyclists attempting to go to westbound on the shared use path should similarly use the southern crosswalk. Westbound cyclists attempting to go northbound should use the two-stage turn box.

The same considerations for traffic signal phasing as at Canal Street at Broadway, concurrent/exclusive pedestrian phasing with bikes following pedestrian signals, should be evaluated at Union Street.

COMPARISON OF ALTERNATIVES AND PROBABLE COSTS

ALTERNATIVES COMPARISON

A comparison of Alternatives 1 and 2 is provided below in Table 2. Both alternatives help address safety for active users by narrowing roadways, which helps slow cars and shortens crossings, and by providing space for cyclists outside the roadway. Accessibility can also be similarly increased in both alternatives. Table 2 provides a comparison of alternatives that expands on safety and comfort, describes environmental / climate resilience impacts, ROW impacts, and evaluates constructability and maintenance.

Table 2 - Comparison of Alternatives

Criteria	Alternative 1: Shared Use Path	Alternative 2: Two-Way Bike Lane
Safety & Comfort	The path near the canal brings more active users closer to the water, though step-off space near the rail is needed for pedestrian comfort. On both sides of the street, more amenity space can be added between trees for increased comfort. A path requires less space overall and provides more cross section flexibility for non-travel spaces.	Added separation between pedestrians and faster users can help reduce safety issues and increase overall comfort versus Alternative 1. This can be a large benefit where pedestrian volumes are high, particularly for seniors, children, and families.
Environmental Impacts / Climate Resilience	Drainage must be adjusted to new curbs. This is an opportunity to update all drainage to improve capacity. Added green space at the roadway may support green infrastructure (GI). Tree planting on both sides will help store carbon. However, most existing trees must be replanted. Trees on the north side will shade the sidewalk, while trees to the south must grow large to shade the path.	Offers similar drainage benefits as Alternative 1. Green space between the bike lane and sidewalk is less likely to incorporate GI. As with Alternative 1, trees must be replanted. Trees will benefit from placement away from the road, but fewer trees will be added overall. Trees on the south side will shade cyclists and provide more benefit to pedestrians sooner as well.
ROW Impacts	Alternatives 1 and 2 both require the same ROW as drawn in this report. If cross section adjustments must be made, however, a path takes up less space than bike lanes and sidewalk. The path would more easily fit into the more limited existing ROW of 50 feet.	Two-way bike lanes and a sidewalk take up more space than a path so could be harder to incorporate into existing ROW, if necessary. Separated uses also either require more space at intersections (versus a path) or must mix in one crossing zone.
Construction Feasibility	The SUP requires less space on the south side of Canal Street than Alternative 2 and allows the centerline to stay nearer to the existing location. This may help reduce the need to reconstruct the roadway to meet grades, and tree planting near the roadway on both sides provides more grading flexibility.	This option may have a higher chance of needing roadway reconstruction given the greater movement of the centerline. However, the roadway appeared quite flat during in-field observation, which provides more flexibility for altering the centerline and crown via mill and overlay than would higher existing cross slopes.
Maintenance	Alternative 1 may be slightly easier to maintain given the single path can be plowed by a standard pickup.	Alternative 2 will have a narrow sidewalk that requires smaller maintenance vehicles to clear it of snow.

PROBABLE COST COMPARISON

To assist with budgeting and grant/funding applications, planning-level opinions of probable construction cost (OPCC) have been developed based on the design concepts presented across the four character segments:

- Segment 1: Broadway to Amesbury Street, not including Amesbury Street
- Segment 2: Amesbury Street to Mill Street, not including Mill Street
- Segment 3: Mill Street to Union Street, not including Union Street
- Segment 4: Union Street east to the connection with the Spicket River Greenway

The OPCCs include demolition/clearing costs, curb and pavement work, landscaping, pavement markings and signage, raised intersections, traffic signal reconstruction, drainage assumptions, lighting installation, and wayfinding and furnishing components, among other items. The OPCCs were developed with a “per foot” methodology, extrapolating the proposed cross sections along the length of each segment, with assumptions for additional costs at intersections. With this planning-level methodology, the OPCCs do not account for potential variations from the cross sections described in this report. Some other limitations of the OPCCs include:

- Lack of utility information to better understand above and underground utility conditions and costs.
- The traffic signal equipment was not inventoried to understand the capabilities of existing signals.
- Lack of a full tree inventory study to determine where existing trees may be able to be maintained and where they should be replaced. Both alternatives assume, however, that most trees must be removed and replanted if following the proposed cross sections.
- Lack of knowledge of the condition of the North Canal wall. Structural evaluation of the wall is necessary and would either increase cost under the alternatives as drawn or force changes to cross section widths.

OPCCs were developed for both Alternative 1: Shared Use Path and Alternative 2: Two-Way Bike Lanes under “higher cost” and “lower cost” scenarios. All OPCCs assume that the green space near the canal will be incorporated into the project width. The differences between the higher-cost and lower-cost OPCCs are:

- The higher cost opinions assume full reconstruction of Canal Street where the lower cost options only clear and reconstruct portions of the cross sections that do not match existing conditions. The travel lanes are proposed to be milled and overlaid in the lower cost opinions where existing travel lane dimensions align with proposed travel lane extents.
- Where the proposed cross section maintains existing sidewalk widths, the lower cost estimates do not reconstruct sidewalks along the side streets on the same side of Canal Street.
- The allowances for wayfinding and tree planting/landscaping are increased for the higher-cost option to account for fuller treatments.
- A 35% construction contingency was provided for higher cost OPCCs versus 30% for lower cost opinions. These contingencies were provided given the many unknowns about existing conditions and the planning-level nature of this cost opinion work.

In addition to construction contingencies, all OPCCs include “soft costs” for permitting, right-of-way acquisition, and construction engineering, plus an estimate for inflation at 5.4% per year for 5 years assuming lapsed time until construction bidding. Costs for survey, environmental assessment, design, preliminary permitting work, geotechnical analysis, and public engagement are not reflected in the OPCCs and depend on many factors.

PLEASE NOTE: The information below shows that the alternatives are very similar in cost. The slightly higher cost for Alternative 1 reflects solely minor differences for utility adjustments and pavement areas given the methodology for developing each OPCC, and overall cost differences between alternatives are so negligible that costs are not recommended to be used to establish a preferred alternative.

ALTERNATIVE 1: SHARED USE PATH OPCC

The higher cost option for Alternative 1 is estimated to be approximately $32 million dollars, while the lower cost option is estimated to be approximately $25 million dollars.

Table 3 – Higher Cost OPCC for Alternative 1: Shared Use Path

	Segment 1	Segment 2	Segment 3	Segment 4	Total
Construction Costs					
Subtotal	**$5,202,038**	**$5,027,291**	**$2,664,137**	**$3,842,900**	**$16,736,366**
Construction Contingency (35%)	*$1,820,713*	*$1,759,552*	*$932,448*	*$1,345,015*	*$5,857,728*
Soft Costs					
Permitting (5%)	*$260,102*	*$251,365*	*$133,207*	*$192,145*	*$836,818*
Right of Way (5%)	*$260,162*	*$251,365*	*$133,207*	*$192,145*	*$836,818*
Construction Engineering (5%)	*$260,102*	*$251,365*	*$133,207*	*$192,145*	*$836,818*
Subtotal	**$780,306**	**$754,094**	**$399,621**	**$576,435**	**$2,510,455**
Escalation*					
Subtotal	**$2,106,825**	**$2,036,053**	**$1,078,976**	**$1,556,374**	**$6,778,228**
Total	**$9,909,882**	**$9,576,989**	**$5,075,181**	**$7,320,724**	**$31,882,777**

***5.4% escalation per year for 5 years applied to sum of Construction Cost, Construction Contingency, and Soft Costs**

Table 4 – Lower Cost OPCC for Alternative 1: Shared Use Path

	Segment 1	Segment 2	Segment 3	Segment 4	Total
Construction Costs					
Subtotal	**$3,865,953**	**$4,657,542**	**$1,969,670**	**$3,124,715**	**$13,627,881**
Construction Contingency (30%)	$1,159,786	$1,397,263	$590,901	$937,415	$4,085,364
Soft Costs					
Permitting (5%)	$193,298	$232,877	$98,484	$156,236	$680,894
Right of Way (5%)	$193,298	$232,877	$98,484	$156,236	$680,894
Construction Engineering (5%)	$193,298	$232,877	$98,484	$156,236	$680,894
Subtotal	**$579,893**	**$698,631**	**$295,451**	**$468,707**	**$2,042,682**
Escalation*					
Subtotal	**$1,513,521**	**$1,823,428**	**$771,126**	**$1,223,326**	**$5,331,401**
Total	**$7,119,153**	**$8,576,864**	**$3,627,148**	**$5,754,163**	**$25,077,328**

***5.4% escalation per year for 5 years applied to sum of Construction Cost, Construction Contingency, and Soft Costs**

ALTERNATIVE 2: TWO-WAY BIKE LANES

The higher cost option for Alternative 2 is estimated to be approximately $31.5 million dollars, while the lower cost option is estimated to be approximately $25 million dollars.

Table 5 - Higher Cost OPCC for Alternative 2: Two-Way Bike Lanes

	Segment 1	Segment 2	Segment 3	Segment 4	Total
Construction Costs					
Subtotal	**$4,578,029**	**$5,345,748**	**$2,675,477**	**$3,909,260**	**$16,508,514**
Construction Contingency (35%)	*$1,602,310*	*$1,871,012*	*$936,417*	*$1,368,241*	*$5,777,980*
Soft Costs					
Permitting (5%)	*$228,901*	*$267,287*	*$133,774*	*$195,463*	*$825,426*
Right of Way (5%)	*$228,901*	*$267,287*	*$133,774*	*$195,463*	*$825,426*
Construction Engineering (5%)	*$228,901*	*$267,287*	*$133,774*	*$195,463*	*$825,426*
Subtotal	**$686,704**	**$801,862**	**$401,322**	**$586,389**	**$2,476,277**
Escalation*					
Subtotal	**$1,854,102**	**$2,165,028**	**$1,083,568**	**$1,583,250**	**$6,685,948**
Total	**$8,721,145**	**$10,183,649**	**$5,096,784**	**$7,447,140**	**$31,448,718**

***5.4% escalation per year for 5 years applied to sum of Construction Cost, Construction Contingency, and Soft Costs**

Table 6 – Lower Cost OPCC for Alternative 2: Two-Way Bike Lanes

	Segment 1	Segment 2	Segment 3	Segment 4	Total
Construction Costs					
Subtotal	**$3,574,758**	**$4,878,154**	**$2,043,290**	**$2,909,720**	**$13,405,922**
Construction Contingency (30%)	*$1,072,427*	*$1,463,446*	*$612,987*	*$872,916*	*$4,021,777*
Soft Costs					
Permitting (5%)	*$178,738*	*$243,908*	*$102,165*	*$145,486*	*$670,296*
Right of Way (5%)	*$178,738*	*$243,908*	*$102,165*	*$145,486*	*$670,296*
Construction Engineering (5%)	*$178,738*	*$243,908*	*$102,165*	*$145,486*	*$670,296*
Subtotal	**$536,214**	**$731,723**	**$306,494**	**$436,458**	**$2,010,888**
Escalation*					
Subtotal	**$1,399,518**	**$1,909,797**	**$799,948**	**$1,139,155**	**$5,248,419**
Total	**$6,582,917**	**$8,983,121**	**$3,762,719**	**$5,358,249**	**$24,687,006**

***5.4% escalation per year for 5 years applied to sum of Construction Cost, Construction Contingency, and Soft Costs**

RECOMMENDED NEXT STEPS

RECOMMENDED NEXT STEPS

This feasibility analysis is an initial step toward evaluating design alternatives for Canal Street and will serve as a resource for obtaining design funds. Immediate next steps as/after funds are sought are to:

- Complete a topographical survey to establish the right-of-way and provide an accurate base for schematic design. Right-of-way understanding is necessary to continue conversations about available space, particularly near the canal.
- Complete a structural evaluation of the canal wall to understand how close to it construction of new path or sidewalk can occur and develop a design approach.
- Hold meetings with the public to discern priorities and help establish a preferred alternative.
- Coordinate between stakeholders and landholders to help establish a preferred alternative and advance next stages of design.

Bigger picture, following the completion of survey, the project should move through typical phases of design that include schematic design to confirm concepts against survey, design development, construction documents, and then bidding and construction. Public engagement should continue through each phase.

ESTABLISHING A PREFERRED ALTERNATIVE

Given that the cost differences between alternatives are negligible within this analysis, it is recommended to consider the following as the City and Merrimack Valley Planning Commission develop a preferred alternative, and each of these questions is addressed in the Comparison of Alternatives section:

- Can space outside the ROW be obtained?
- How close to the canal wall can infrastructure be constructed?
- For what purposes other than travel will space be used along Canal Street?
- To what extent is user separation desired or needed?

One thing to note, based on conversations during the course of this project, is that demonstration projects are unlikely to help establish a preferred alternative. A shared use path with adequate separation from vehicles cannot be tested given existing infrastructure. Demonstration projects will largely help test operational and spatial changes at intersections, where paint, flexposts, and/or planters may be used to redesignate space.

ADDITIONAL CONSIDERATIONS

Beyond the aforementioned next steps, consider the following to advance design:

- Conduct evaluations for hazardous waste/materials plus cultural and environmental resources.
- Inventory existing traffic signal equipment. Conduct traffic analysis throughout corridor, particularly at signalized intersections to better understand current signal operations and feasibility of future operations that support safe and separated movements for vulnerable users.
- Consider coordination with MeVa to provide enhanced transit connections to Canal Street path.

This report is the result of collaboration between the Merrimack Valley Planning Commission, City of Lawrence, Department of Conservation and Recreation, Groundworks Lawrence, Toole Design, and others. Continued collaboration will ensure that future Canal Street is safe for active users and a lively cultural resource.