



Street Design Guide

June 2026

Version 1.2



DISCLAIMER

The material presented in this Street Design Guide has been carefully researched and presented, and is based on latest available standards, guidelines and best practices. However, street design is highly context sensitive. Practitioners should confirm that design treatments are appropriate to a given location, with consideration of all relevant contextual factors and application of sound professional judgment. Street design is also an evolving practice. Practitioners should confirm that designs are consistent with current legislation, regulations, and by-laws before implementation.

PHOTO CREDITS

Unless otherwise specified, all figures were provided by the Region of Waterloo or by members of the WSP project team.

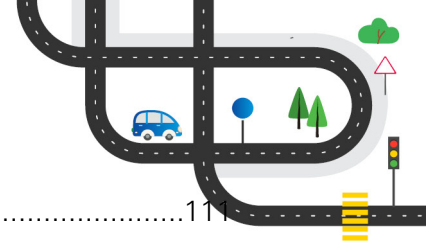




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Chapter 1

Introduction





Introduction

The Region of Waterloo Street Design Guide aims to develop a safe, inclusive, and sustainable Regional road network. Based on a “complete streets” approach, it focuses on designing Regional roads to support the safe and efficient movement of people and goods while serving as welcoming public spaces. It carefully integrates Regional roads with their respective land use contexts and roles in the transportation system by appropriately balancing various needs—including walking, cycling, transit, goods movement, personal vehicle use, green infrastructure, and utilities. This complete streets approach aligns well with the Safe Systems and Vision Zero approaches by promoting road designs that aim to eliminate all traffic fatalities and serious injuries.





This guide is intended to be a resource for everyone involved in the planning, design, construction, operation, and maintenance of the Region of Waterloo's road network, including engaged members of the public. Informed by guiding principles and the Regional policy context, it outlines context-specific design guidance for cross-sections and intersections. This guide also helps decision makers navigate and document design selections and trade-offs for allocating space within a given right-of-way, especially when multiple priority users are identified. This guide should be used alongside existing standards, requirements, and guidelines that apply to the Regional road network, supported by engineering judgement and stakeholder input.

Guiding Principles

1 Establish a well-defined hierarchy for the Regional road network

The Regional road network should consist of a well-defined hierarchy of roads that relate to primary function and surrounding environment, providing a framework around which the Region and its stakeholders can maximize the potential of the overall transportation network. Careful consideration should be given to right-sizing the road for target operating speeds and volumes, level of separation between motor vehicles and vulnerable road users (including people walking, cycling, and rolling), level of transit priority, and connections to surrounding land use. By aligning street design with the unique characteristics of each area, the Regional road network can effectively support growth while maintaining functionality and reflecting the community's identity.

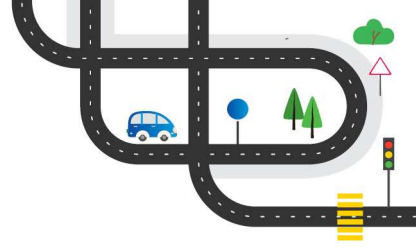


2 Prioritize the safe movement of people with an emphasis on vulnerable road users

Dedicated pedestrian and cycling facilities should be provided, each with elements to improve accessibility for a wide range of ages and abilities, adequate separation from motor vehicles, and frequent crossing opportunities. This is critical for streets where motor vehicle speeds exceed 30 km/h. Additionally, the street design should be self-enforcing by providing consistent cues for people driving to interpret and maintain target operating speeds, which reduce the risk and severity of collisions. What is considered a safe target operating speed for a street depends on a variety of factors, such as anticipated types of users and surrounding land use.

3 Promote the use of active transportation and transit through the built environment

Streets should be designed to encourage the use of transit and active transportation by creating a built environment that feels inviting, regardless of how people are travelling. This would contribute to improving public health and reducing environmental impacts, such as greenhouse gas emissions and noise pollution. Also, this would improve mobility options for people who may not be able to drive, thereby providing more equitable access to community and social services. Some strategies may include implementing wider sidewalks to accommodate high volumes of people walking and improving the public realm with street trees for shade, lighting for visibility, and furniture for places to rest. It is important to develop a well-connected, accessible network that enables people to seamlessly integrate transit with active modes of travel. Overall, street designs should aim beyond minimum standards to prioritize the user experience and foster long-term sustainability.



4 Integrate various forms of green infrastructure to serve critical functions

Green infrastructure within a street network serves ecological and hydrological functions, such as reducing urban island heat effect, supporting biodiversity, improving air quality, enhancing energy efficiency, and managing stormwater. It also helps to create an attractive public realm and provides traffic calming benefits to create inviting spaces for walking, cycling, and transit use. Street designs should thoughtfully allocate space for vegetation to promote environmental and community health. Additionally, street designs should account for managing groundwater infiltration to protect the Region's drinking water supply, balancing ecological sustainability with urban functionality.

5 Reflect the Region's urban, rural, agricultural, and township contexts

The Regional road network serves a diverse range of urban, suburban, settlement-area, rural, agricultural, employment, and natural contexts. Street design should respond to the primary function, surrounding land use, operating conditions, maintenance requirements, drainage needs, goods movement, agricultural operations, emergency access, and local community character of each corridor. While safety, accessibility, active transportation, transit-supportive design, and green infrastructure remain important objectives, the appropriate design solution will vary by context. Distinct parts of the Regional network, including rural roads, agricultural corridors, township main streets, industrial corridors, and commercial main streets, should be designed in keeping with their respective contexts and local needs while supporting the safe and efficient movement of people and goods, as well as appropriate access to adjacent businesses, services, and community destinations.





Application of This Guide

This guide serves as a resource for a variety of practitioners and the public contributing to the planning, design, and maintenance of the Regional road network. Projects where this guide can be applied include (but are not limited to):

1. Standalone Projects



**Development
Applications**



**Active
Transportation
Enhancements**



**Road Safety
Projects**



**Public Realm
Improvements**



**Temporary
Interventions
for Evaluation**

2. Long-Term Planning Studies



**Growth Area
Plans**



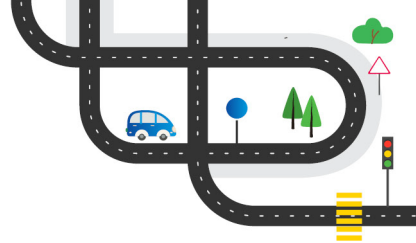
**Transportation
Master Plans**



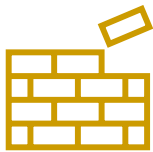
**Road Safety
Plans**



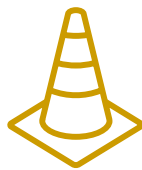
**Transit Corridor
Studies**



3. Capital Road Projects



**New
Construction**



**Reconstruction
and Retrofits**



**Environmental
Assessments**

4. Maintenance and Operations



**Signs, Signal
Installations,
Lighting**



**Utility Cut
Repairs**



**Various Sized
Maintenance,
Operations, and
Emergency Vehicles**



What's New in This Guide?

This guide builds on the Contexts Sensitive Regional Transportation Corridor Design Guidelines (2013) to reflect the Region's latest policy context and leading industry best practices for complete street design.

1. Refreshed Typologies

This guide introduces a refreshed set of typologies for urban and rural contexts to simplify the previous terminology and enhance clarity of the design objectives of each. The new typologies can be distinguished based on three key factors: the target operating speed, the primary transportation function, and the level of emphasis on placemaking. They ensure decisions are context-sensitive and respond to the evolving demands of urban and rural areas within the Region.



2. Updated Design Guidance Based on Industry Best Practices

Drawing from leading research and emerging trends in complete street design, this guide focuses on prioritizing safety, accessibility, and sustainability. This includes techniques to separate people walking, cycling, and rolling; creating self-enforcing streets to achieve target operating speeds through appropriate pavement widths and curb radii; and public realm improvements to encourage sustainable modes of travel and placemaking.

3. Structured Decision-Making Process

A significant addition to this guide is a structured decision-making process to develop context-specific designs. It encourages a clear understanding of the scope and priorities for a design context at the start, which sets the foundation for exploring suitable design criteria and investigating applicable trade-offs based on a modal priority framework. This would result in consistent decision-making on the allocation of right-of-way space while respecting project limitations and fulfilling community priorities.



Supporting Standards and Guidelines

This guide was developed based on a thorough review of relevant policies and guidelines at the national, provincial, regional, and municipal levels to reinforce support for adopting a complete streets approach. This guide is meant to be used in conjunction with other design guidelines as well as standards and policies that contribute to developing and maintaining a safe, connected, equitable, and sustainable transportation system within the Region. This includes (but is not limited to):

- The Ontario Traffic Manuals;
- Transportation Association of Canada design guidelines;
- Region of Waterloo and its local municipality policies and guidelines, including the Region of Waterloo's Transportation Master Plan; the Region of Waterloo's Active Transportation Master Plan; Grand River Transit Bus Stop Design Guidelines; and urban design manuals from City of Kitchener, City of Waterloo, and City of Cambridge.

This guide can assist a user in navigating conflicting policies or guidelines to determine the most suitable resolution based on local context, engineering experience, and/or Council direction.





What's Included in This Guide?

The remainder of this guide is divided into the following four chapters:

- **CHAPTER 2 TYPOLOGIES** defines the five typologies for the Regional road network, with an outline of priorities and example cross-section illustrations for each.
- **CHAPTER 3 CROSS-SECTION ELEMENTS** describes the major elements of complete streets and provides design guidance on each to suit the context of each typology from Chapter 2.
- **CHAPTER 4 DECISION-MAKING PROCESS** provides guidance on how to develop context-specific designs, considering project scope and priorities, a modal priority framework, and necessary space reallocation.
- **CHAPTER 5 INTERSECTIONS** provides guidance on intersection treatment suitable for various contexts, including example illustrations of five intersection types.



Chapter 2

Typologies





Typologies

Typologies are a classification system that organizes streets based on key factors, including primary function, surrounding land use context, and design needs. They allow the Region and its stakeholders to make consistent, well-informed decisions on how to manage the Regional road network and balance competing modal needs. Based on a thorough review of the Region's policy context, best practices for complete street design guides, and stakeholder input, the Regional road network has been organized into five typologies. A map of the Regional road network with typologies is provided in the **Maps**.

This chapter presents a profile for each of the five typologies that apply to the Regional road network meant to serve as a starting point for a design. It outlines a general description, key operational parameters, design considerations for user groups, general width allocation priorities for street elements (in line with the modal priority framework presented in **Chapter 4**), and sample cross-sections (in line with **Chapter 3**).

Refer to **Chapter 3** for guidance specific to each street element that make up the typologies. Note that the example cross-section elements provided in this chapter demonstrate the general features that make up a typology, which may differ when adapted to the specific context of a street.

Refer to **Chapter 4** for a decision-making process that develops context-specific designs to reflect the priorities of the appropriate typology.

Defining Typologies

The primary function of a street can be categorized as either “mobility focus” or “access focus” based on the following characteristics:

Characteristics of Streets with a Mobility Focus



Figure 2.1: Example of a Street with a Mobility Focus

- Safe and efficient movement of people and goods
- Greater separation between different road user groups
- Limited access to surrounding land uses
- Higher motor vehicle operating speeds

Characteristics of Streets with an Access Focus



Figure 2.2: Example of a Street with an Access Focus

- Safe access to destinations
- Less separation between different road user groups
- Frequent accesses to surrounding land uses
- Frequent curbside activity
- Lower motor vehicle operating speeds

Although Regional roads generally have a mobility focus, those that pass through built-up urban and rural communities also need to provide a higher degree of placemaking given their active street frontages and higher walking and cycling activity. This can be achieved through street designs that promote slower motor vehicle speeds to prioritize the safety of vulnerable road users and the use of various streetscaping elements that create vibrant, human-scale spaces.

The typologies are divided into rural and urban types to reflect adjacent context and land uses, not to reflect a City/Township division. Sections of Regional roads within communities such as Ayr, Baden, Elmira, New Hamburg, and St. Jacobs are considered urban context and classified accordingly, as shown in Map 1.



The five typologies for the Regional road network are outlined below:

1. **Rural Connectors** move people and goods at relatively higher speeds, linking communities through low-density agricultural or natural areas of the Region. They are typically characterized by a moderate degree of access control, lower walking and cycling activity and may also serve slow-moving agricultural vehicles and horse and buggies.

Rural Connector Street Characteristics



Figure 2.3: Example of a Rural Connector Street

2. **Rural Main Streets** move people and goods at low to moderate speeds through rural communities of the Region. They are typically characterized by higher walking and cycling activity and a mixture of small-scale, low-to-mid-density, street-oriented built form.

Rural Main Street Characteristics



Figure 2.4: Example of a Rural Main Street



3. **Urban Connectors** move people and goods at relatively higher speeds, linking communities within urban areas of the Region. They are typically characterized by a high degree of access control, lower walking and cycling activity, and lower-density built form that is not street-oriented.

Urban Connector Street Characteristics



Figure 2.5: Example of an Urban Connector Street

4. **Urban Avenues** move people and goods at low to moderate speeds through mixed-use urban areas of the Region. They are typically characterized by a moderate degree of access control, some walking and cycling activity, and a built form that may become street-oriented through redevelopment.

Urban Avenue Street Characteristics



Figure 2.6: Example of an Urban Avenue Street



5. **Urban Main Streets** move people and goods at low speeds through compact urban core areas of the Region. They are typically characterized by higher walking and cycling activity and a mixture of street-oriented built form of varying size.

Urban Main Street Characteristics



Figure 2.7: Example of an Urban Main Street



Figure 2.8 presents the five typologies developed for the Region in relation to their function and target operating speed.

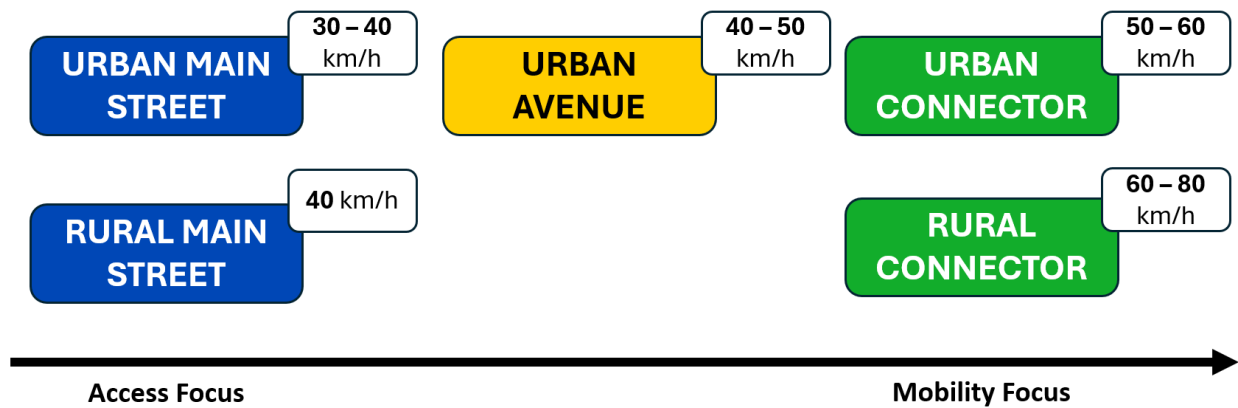


Figure 2.8: Region of Waterloo Typologies in Relation to Function and Target Operating Speed

Figure 2.9 provides a high-level flowchart to indicate a suitable typology based on the land use, design, and function of a street. Each segment of the Regional road network was classified based on the defined typologies and input from Regional staff.

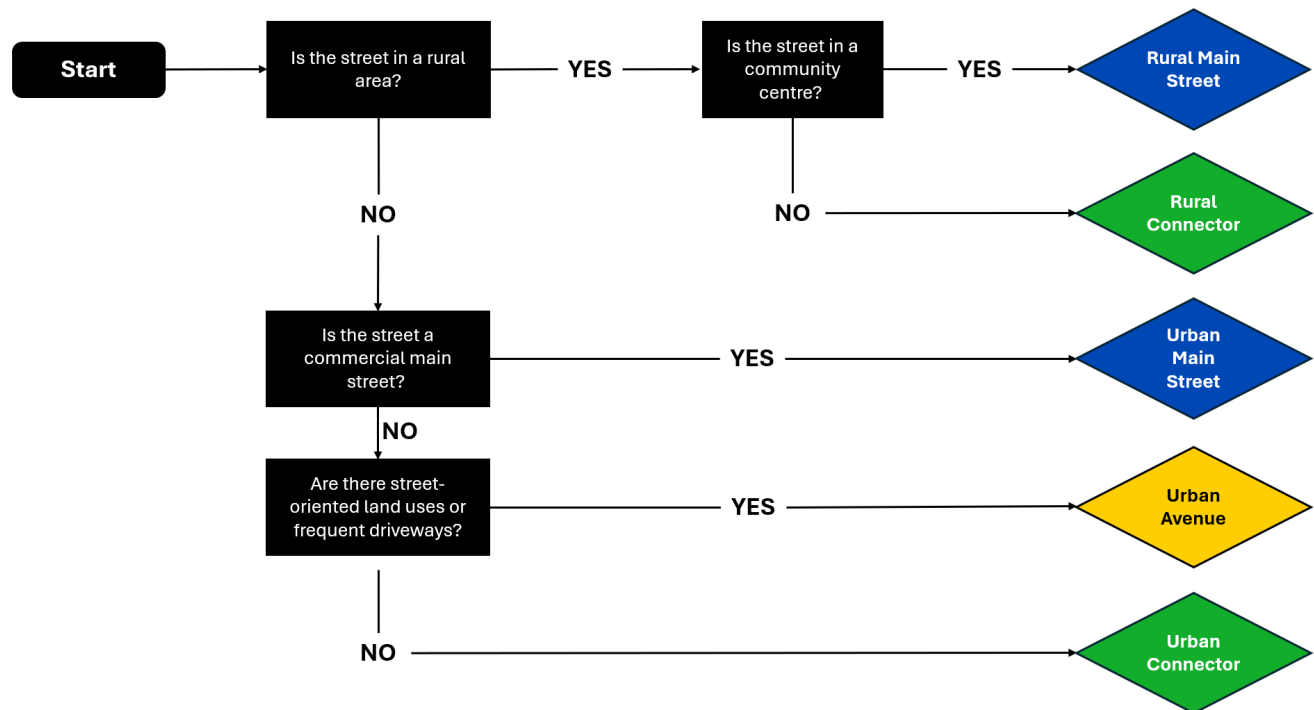


Figure 2.9: Region of Waterloo Typology Selection Flowchart



These tools should be used in conjunction with the details provided on each typology in the following sections. Please note the following for the cross-section examples shown for each typology in the following sections:

- All utilities and underground service locations are conceptual only and provide high-level detail (e.g. do not show storm connections to opposite curb).
- Where minimum separation between running lines cannot be achieved therefore limiting space for municipal services, Joint Use Trenches may be considered on a case-by-case basis following additional review by the Region.
- Utility pedestals, grade boxes, vaults, etc. are preferred to be installed 0.15m from property line or along the hydro pole alignment. These are not shown for the purposes of the cross-section renderings presented in this guide.
- Street furniture (e.g. benches, bikes racks, etc.) are to be located in agreement with local municipalities. Consider snow storage and if assets can be removed in winter (e.g. planters).





Rural Connector

Rural Connectors move people and goods at relatively higher speeds, linking communities through low-density agricultural or natural areas of the Region. They are typically characterized by a moderate degree of access control, lower walking and cycling activity and may also serve slow-moving agricultural vehicles and horse and buggies.

Table 2.1: Key Operational Parameters

Primary Road Function:	Mobility
Walking and Cycling Activity:	Low
Right-of-Way Width:	30 m
Target Operating Speed:	60 – 80 km/h
Travel Lanes (Per Direction):	1
Intersection Spacing:	800 m minimum
Access:	Preferred spacing of 800 m with moderate degree of access control

Design Considerations for Road User Groups



Provide multi-use paths (**Figure 2.10**) to improve the safety and comfort of people walking and cycling. Maximize level of separation from adjacent motor vehicles using drainage swales and landscaped buffers. Consider the suitability of a mixed-use pedestrian and cyclist facility types based on anticipated user volumes.

Provide paved shoulders (**Figure 2.11**) for cycling and horse and buggy routes. Unpaved shoulders may also be considered for applicable horse and buggy routes.

Higher posted speeds require consideration of fully separated facilities, consistent with Section 4.5.4 guidance on paved shoulders in OTM Book 18, including Figures 4.71 and 4.72 and Table 4.11. If full separation is impractical, consider reducing design and posted speeds to 60 km/h to reduce



separation requirements, and design road accordingly to ensure target speeds are met.



Provide transit service as buses operating in mixed traffic. Refer to the Grand River Transit Bus Stop Design Guidelines for further information.



Prioritize the movement of people and goods, with a mix of transit, heavy vehicles, personal vehicles, and the occasional slow-moving agricultural vehicles on the paved shoulders. Ensure the physical design self-enforces target operating speed, such as ensuring appropriate travel lane widths and paved shoulder treatment, given the potential use of the shoulders by slower moving vehicles, horse and buggy, and people cycling. Provide a single centreline that allows for passing.

Table 2.2: General Width Allocation Priorities

Street Element	MUST	SHOULD	CONSIDER	NOT APPLICABLE
<i>Frontage Zone</i>				●
<i>Pedestrian Facilities</i>	●			
<i>Cycling Facilities</i>	●			
<i>Planting</i>	●			
<i>Lay-bys</i>				●
<i>Dedicated Transit</i>				●
<i>Through Lanes</i>	●			





Example Cross-Sections

Designer notes:

- Project scope is important in right-sizing an achievable outcome. For example, if the project is scoped as a pavement rehabilitation, then the trade-offs process should focus on cost-effective upgrades that could be implemented without full reconstruction.
- Rumble strips shown as optional in Example 2 should not be used on horse and buggy routes.



Figure 2.10: Rural Connector — Example 1 (Multi-use Path)— 30 m ROW





UTILITY LEGEND

G - GAS

WM-WATERMAIN

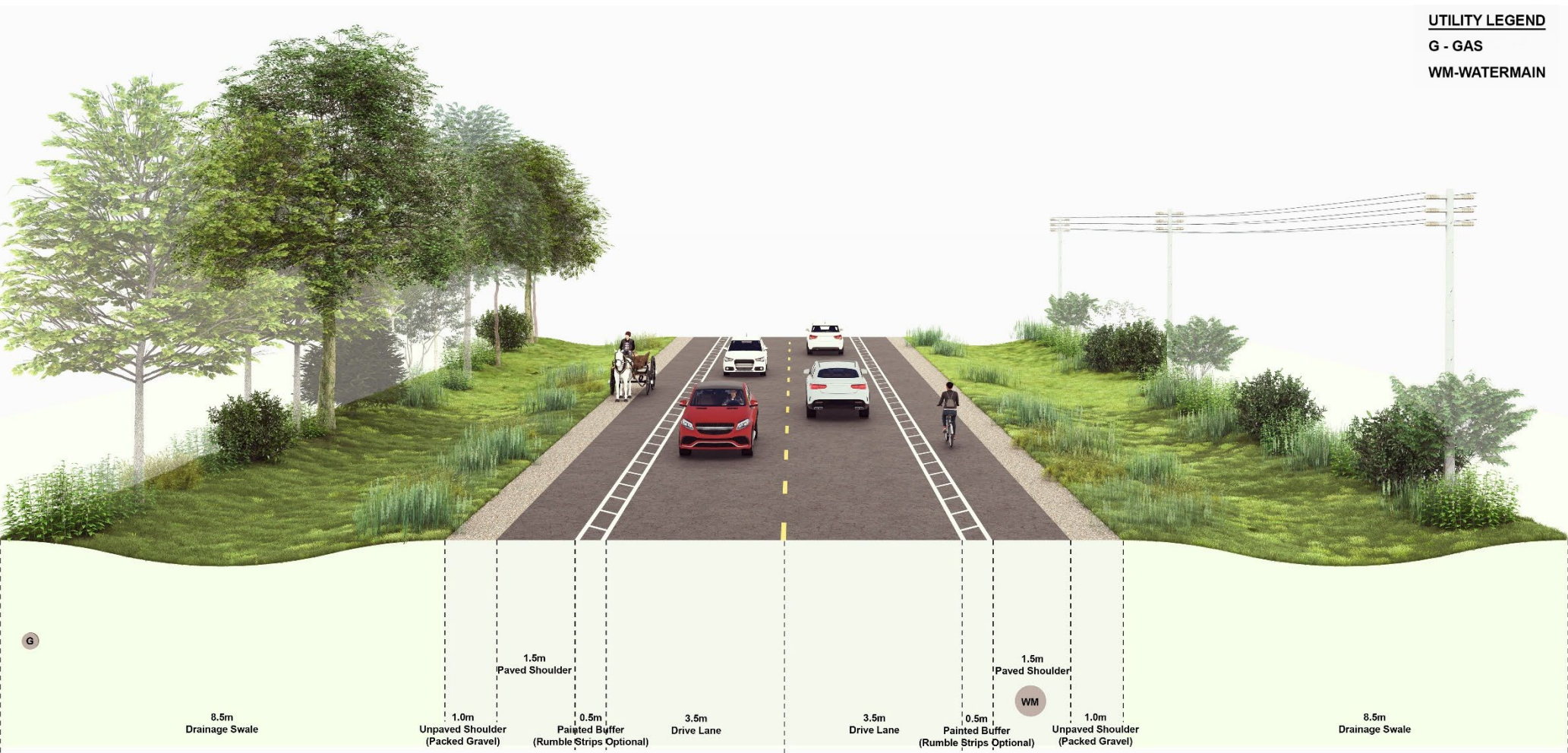
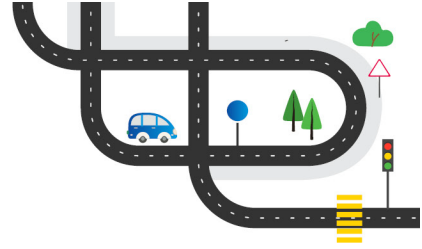


Figure 2.11: Rural Connector — Example 2 (Paved Shoulders) — 30 m ROW

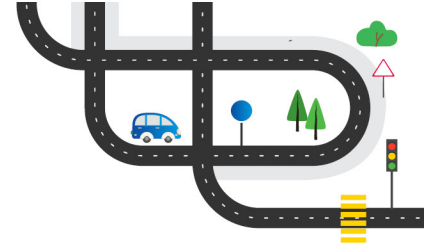




Example Street



Figure 2.12: Erb's Road East of Nafziger Road (Source: Google Maps, 2025)



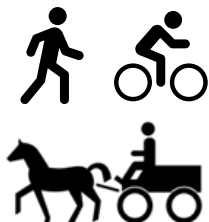
Rural Main Street

Rural Main Streets move people and goods at low to moderate speeds through rural communities of the Region. They are typically characterized by higher walking and cycling activity and a mixture of small-scale, low-to-mid-density, street-oriented built form with small or no setbacks and direct accesses or rear accesses. They may occasionally serve slow-moving agricultural and maintenance vehicles and horse and buggy.

Table 2.3: Key Operational Parameters

Primary Road Function:	Access
Walking and Cycling Activity:	High
Right-of-Way Width:	20 m
Target Operating Speed:	40 km/h
Travel Lanes (Per Direction):	1
Intersection Spacing:	60 – 150 m
Access:	Direct driveway access or rear access, depending on site-specific characteristics

Design Considerations for Road User Groups



Prioritize people walking and cycling using a combination of a sidewalk with a multi-use path (**Figure 2.13**) or with buffered bike lanes (**Figure 2.14**). Buffered bike lanes may be appropriate for routes that occasionally serve slow-moving agricultural or maintenance vehicles and horse and buggy use.

The suitability of each facility type will vary based on factors such as adjacent motor vehicle volumes and speeds, network connectivity needs, and user volumes. Prioritize placemaking features to create inviting spaces for active travel, such as through active frontages, landscaped buffers with street trees, and adequate streetlighting. Provide controlled crossings that are 60 to 180 m (on average) apart to align with desire lines of people walking and cycling.



Provide transit service as buses operating in mixed traffic. Refer to the Grand River Transit Bus Stop Design Guidelines for further information.



Accommodate through movement with a mix of transit, heavy vehicles, personal vehicles, and the occasional slow-moving agricultural or maintenance vehicles. Ensure the physical design self-enforces target operating speed given high volumes of vulnerable road users expected, slower moving vehicles, and curbside activity. Gateway features should be introduced to create lateral friction and provide cues to people driving to adjust to a lower speed context. Provide a single centreline.

Table 2.4: General Width Allocation Priorities

Street Element	MUST	SHOULD	CONSIDER	NOT APPLICABLE
Frontage Zone		●		
Pedestrian Facilities	●			
Cycling Facilities	●			
Planting	●			
Lay-bys		●		
Dedicated Transit				●
Through Lanes	●			





Example Cross-Sections

Designer notes:

- Project scope is important in right-sizing an achievable outcome. For example, if the project is scoped as a pavement rehabilitation, then the trade-offs process should focus on cost-effective upgrades that could be implemented without full reconstruction.
- For Rural Main Street, at driveways, the multi-use path or sidewalk are provided at a continuous height, and the vehicle access ramps up to that height.

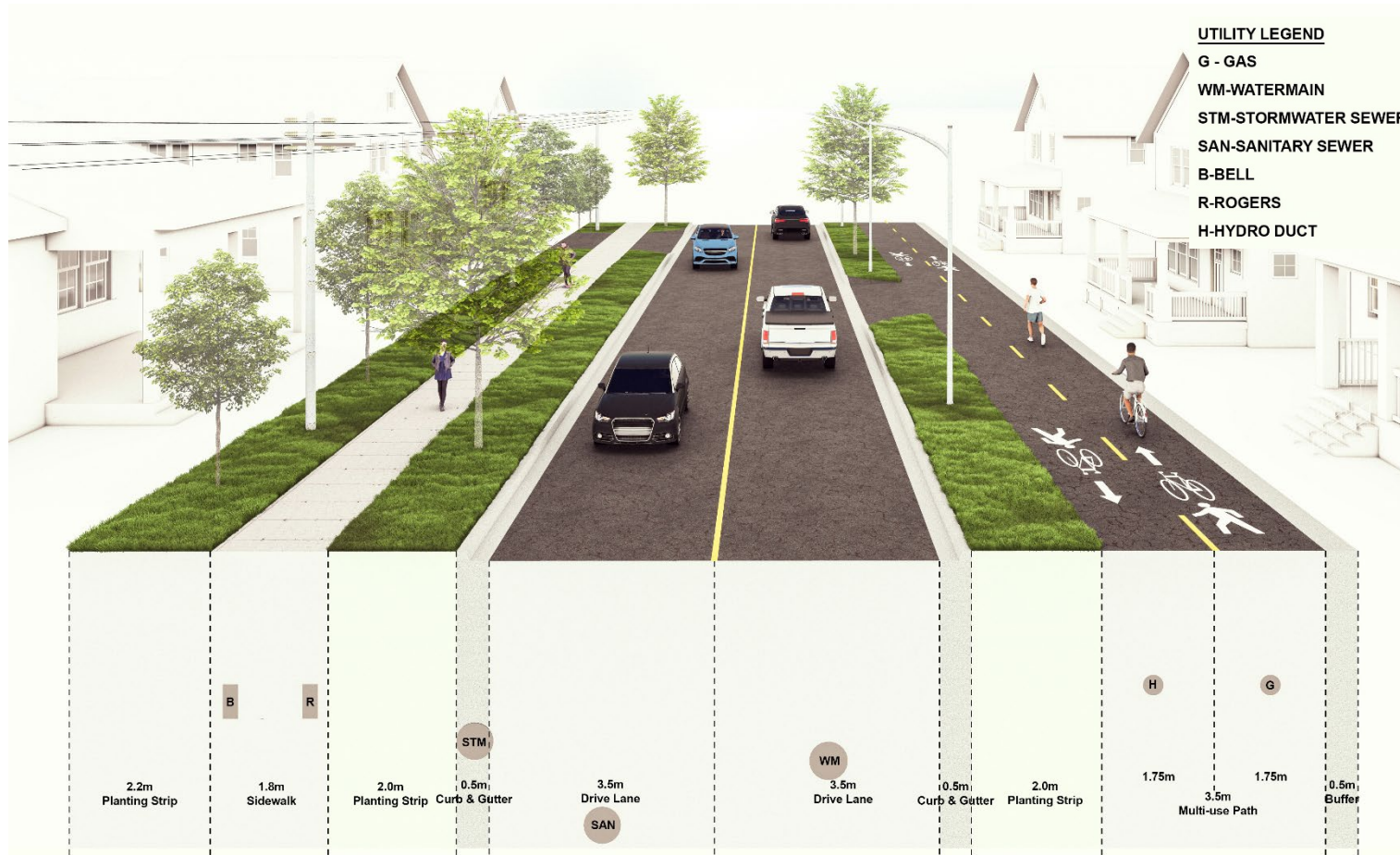


Figure 2.13: Rural Main Street — Example 1 — 20 m ROW



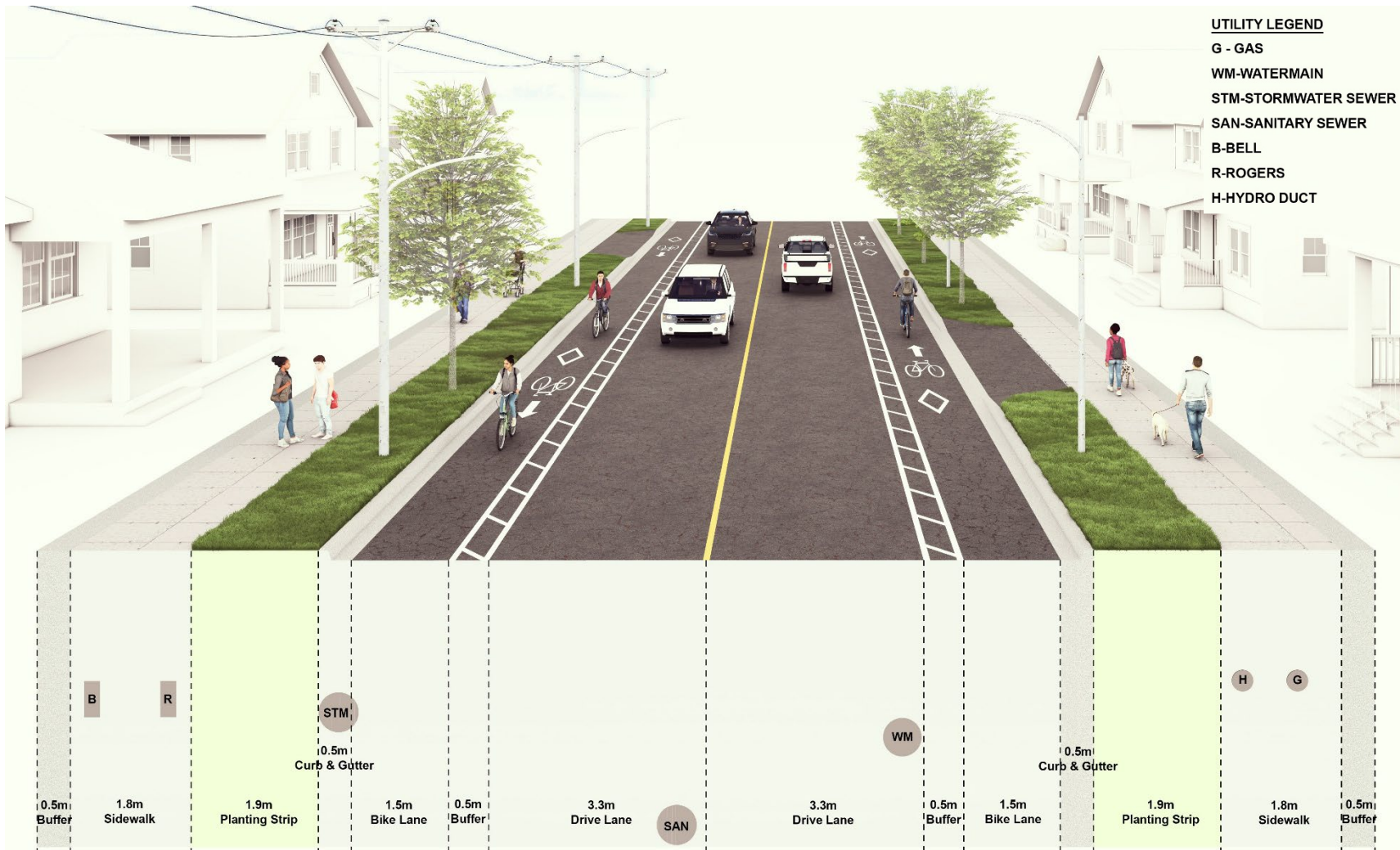


Figure 2.14: Rural Main Street — Example 2 (Buffered Bike Lanes) — 20 m ROW



Example Street

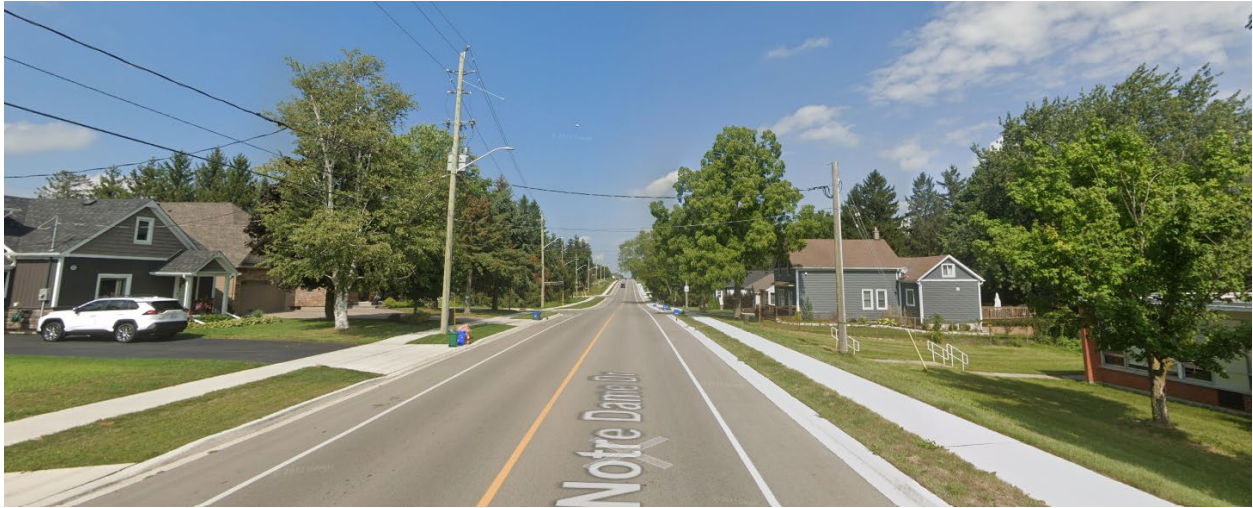


Figure 2.15: Notre Dame Drive North of Erb's Road (Source: Google Maps, 2025)



Urban Connector

Urban Connectors move people and goods at relatively higher speeds, linking communities within urban areas of the Region. They are typically characterized by a high degree of access control, lower walking and cycling activity, and lower-density built form that is not street-oriented with large setbacks.

Table 2.5: Key Operational Parameters

Primary Road Function:	Mobility
Walking and Cycling Activity:	Low
Right-of-Way Width:	35 – 45 m
Target Operating Speed:	50 – 60 km/h
Travel Lanes (Per Direction):	2
Intersection Spacing:	800 m or more preferred, 400 m minimum
Access:	Preferred spacing of 800 m (minimum of 400 m) with a high degree of access control

Design Considerations for Road User Groups

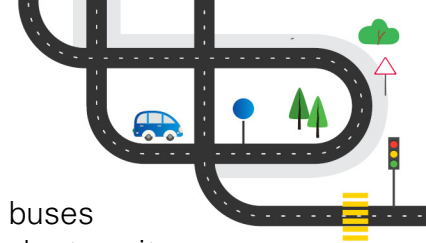


Provide sidewalks with adequate width and pedestrian-scale lighting as well as landscaped buffers from adjacent motor vehicles. Consider the addition of passive irrigation features as appropriate. Provide midblock controlled crossings aligned with desire lines or network connectivity considerations for people walking.



Provide cycle tracks with adequate width and lighting as well as landscaped buffers from adjacent motor vehicles.

Higher posted speeds require consideration of buffer widths and clear zone requirements, consistent with OTM Book 18 guidance in Table 4.6, and TAC Geometric Design Guide Table 7.3.1. If providing buffer widths is impractical, consider reducing design and posted speeds to reduce separation requirements, and design road accordingly to ensure target speeds are met.



On applicable corridors, provide transit service as buses operating in mixed traffic. Along planned higher-order transit corridors, provide light rail transit in dedicated lanes to maximize transit capacity. Refer to the Grand River Transit Bus Stop Design Guidelines for further information.

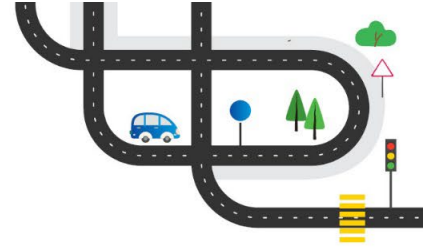


Prioritize the movement of people and goods, with a mix of transit, heavy vehicles, and personal vehicles. Ensure the physical design self-enforces target operating speed, such as ensuring appropriate travel lane widths and a landscaped centre median. Consider the need for local widening approaching intersections to accommodate additional turning lanes.

Table 2.6: General Width Allocation Priorities

Street Element	MUST	SHOULD	CONSIDER	NOT APPLICABLE
Frontage Zone				●
Pedestrian Facilities	●			
Cycling Facilities	●			
Planting	●			
Lay-bys				●
Dedicated Transit		●		
Through Lanes	●			





Example Cross-Sections

Designer notes:

- Project scope is important in right-sizing an achievable outcome. For example, if the project is scoped as a pavement rehabilitation, then the trade-offs process should focus on cost-effective upgrades that could be implemented without full reconstruction.
- The use of dual services on each side of the LRT tracks is to be considered on a case-by-case basis based on site conditions and review by the Region.

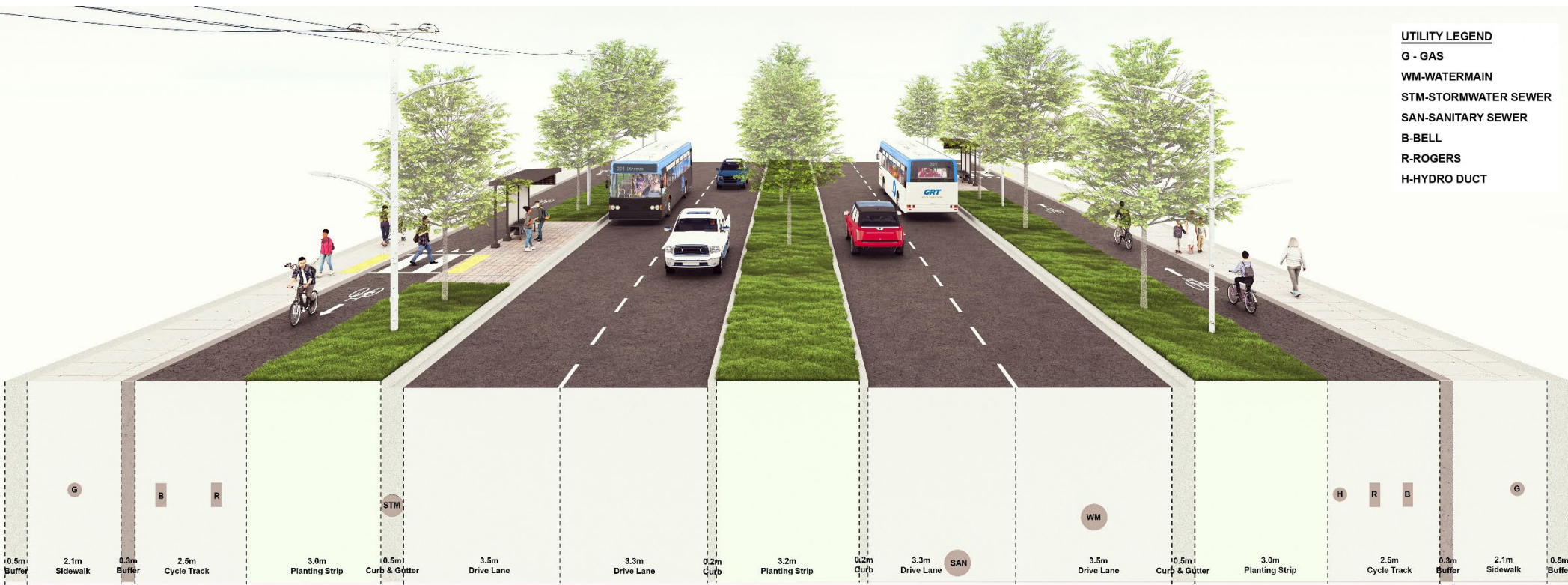


Figure 2.16: Urban Connector — Example 1 — 35 m ROW





UTILITY LEGEND

- G - GAS
- WM-WATERMAIN
- STM-STORMWATER SEWER
- SAN-SANITARY SEWER
- B-BELL
- R-ROGERS

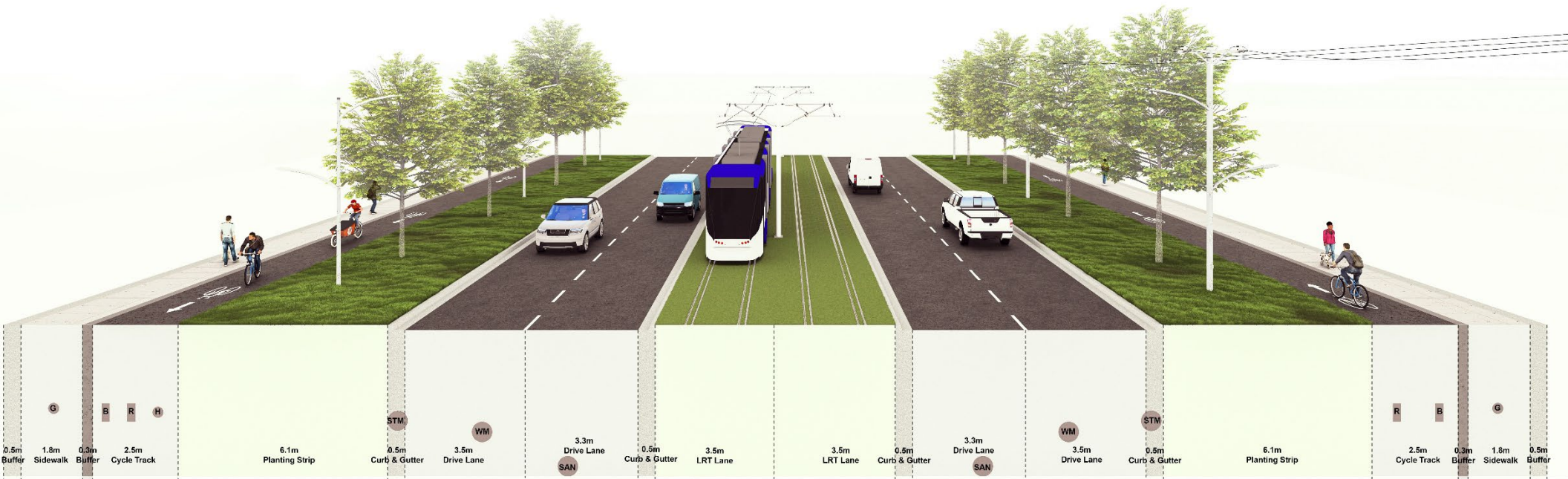


Figure 2.17: Urban Connector — Example 2 (Light Rail Transit) — 45 m ROW





Example Street



Figure 2.18: Maple Grove Road West of Fountain Street North (Source: Google Maps, 2025)



Urban Avenue

Urban Avenues move people and goods at low to moderate speeds through mixed-use urban areas of the Region. They are typically characterized by a moderate degree of access control, some walking and cycling activity, and a built form with varying setbacks that may become street-oriented through redevelopment. Higher-density built form can be found around transit nodes and hubs.

Table 2.7: Key Operational Parameters

Primary Road Function:	Mobility
Walking and Cycling Activity:	Medium
Right-of-Way Width:	30 – 35 m
Target Operating Speed:	40 – 50 km/h
Travel Lanes (Per Direction):	1 general purpose lane + optional bus lane
Intersection Spacing:	200 – 400 m preferred, 120 m minimum
Access:	Preferred spacing of 200 m or more with a moderate degree of access control

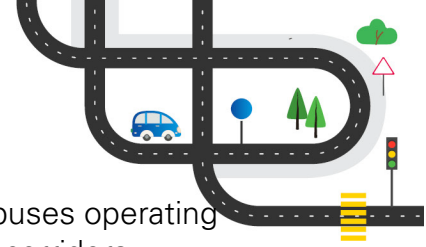
Design Considerations for Road User Groups



Provide sidewalks with adequate width and pedestrian-scale lighting, active frontages, and planting and furnishing zone buffers from adjacent motor vehicles. Consider the addition of passive irrigation features as appropriate. In high-density areas with high volumes of people walking, provide appropriate placemaking features. Provide controlled crossings that are 100 to 200 m (on average) apart to align with desire lines of people walking.



Provide cycle tracks with adequate width and lighting as well as planting and furnishing zone buffers from adjacent motor vehicles.



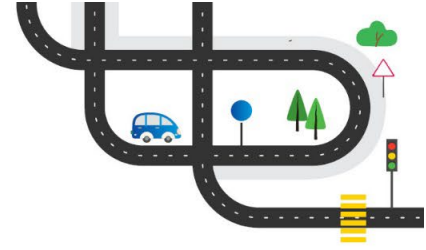
On applicable corridors, provide transit service as buses operating in mixed traffic. Along planned higher-order transit corridors, provide bus service or light rail transit in dedicated lanes to maximize transit capacity. Refer to the Grand River Transit Bus Stop Design Guidelines for further information.



Prioritize the movement of people and goods, with a mix of transit, heavy vehicles, and personal vehicles. Ensure the physical design self-enforces target operating speed, such as ensuring appropriate travel lane widths and planting and furnishing zones to provide visual cues to people driving to adjust operating speeds. Provide wide travel lanes adjacent to centre-running light rail transit to accommodate wide operating space of maintenance vehicles without interfering with transit operating space. Typically provide a single centreline unless a double centreline may be appropriate (such as for a four-lane road with dedicated bus lanes). Consider the need for local widening approaching intersections to accommodate additional turning lanes.

Table 2.8: General Width Allocation Priorities

Street Element	MUST	SHOULD	CONSIDER	NOT APPLICABLE
<i>Frontage Zone</i>		●		
<i>Pedestrian Facilities</i>	●			
<i>Cycling Facilities</i>	●			
<i>Planting</i>	●			
<i>Lay-bys</i>			●	
<i>Dedicated Transit</i>		●		
<i>Through Lanes</i>	●			



Example Cross-Sections

Designer notes:

- Project scope is important in right-sizing an achievable outcome. For example, if the project is scoped as a pavement rehabilitation, then the trade-offs process should focus on cost-effective upgrades that could be implemented without full reconstruction.
- The use of dual services on each side of the LRT tracks is to be considered on a case-by-case basis based on site conditions and review by the Region.



Figure 2.19: Urban Avenue — Example 1 — 30 m ROW



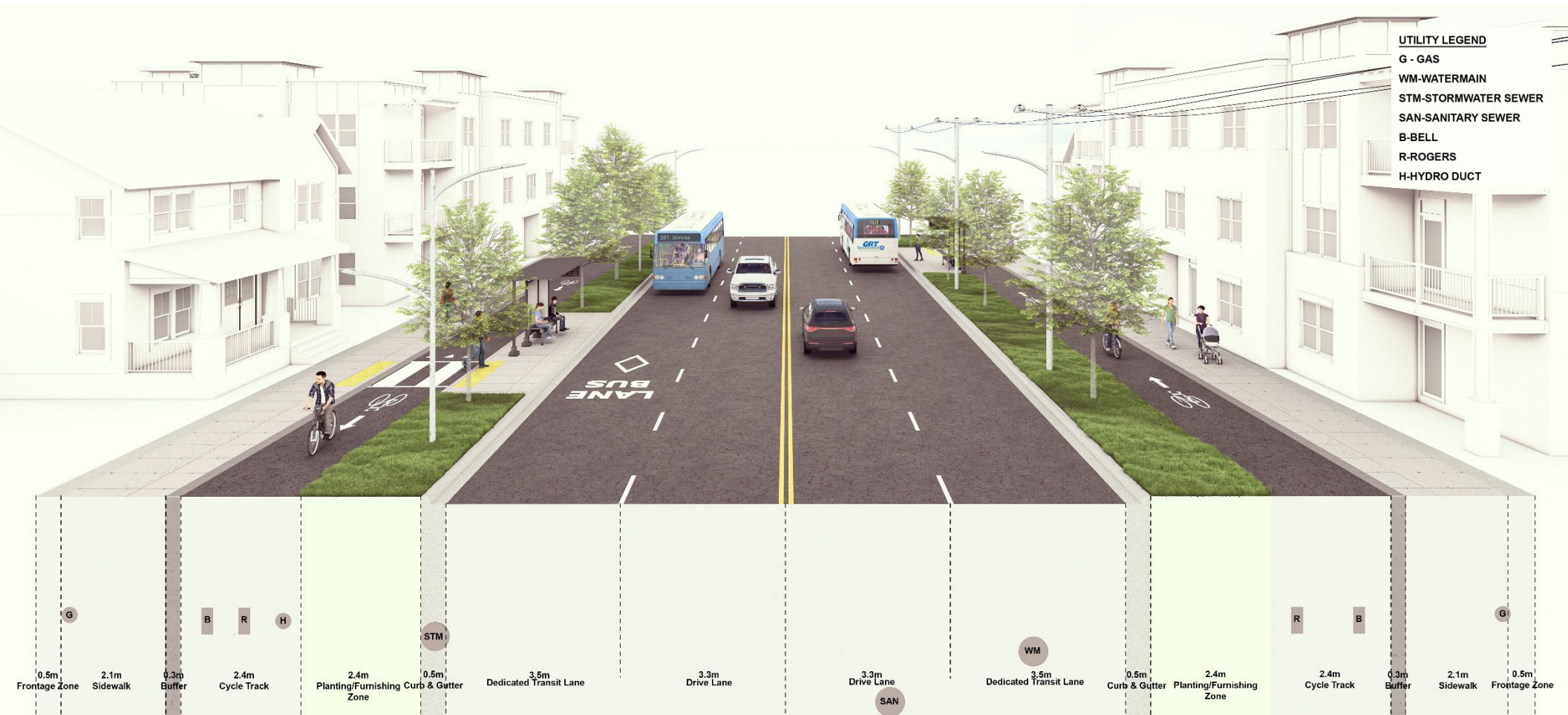
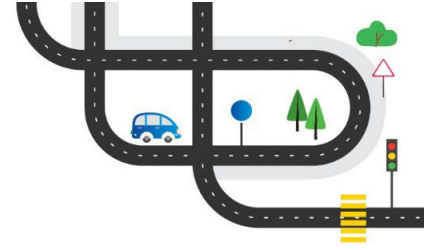


Figure 2.20: Urban Avenue — Example 2 (Dedicated Bus Lanes) — 30 m ROW



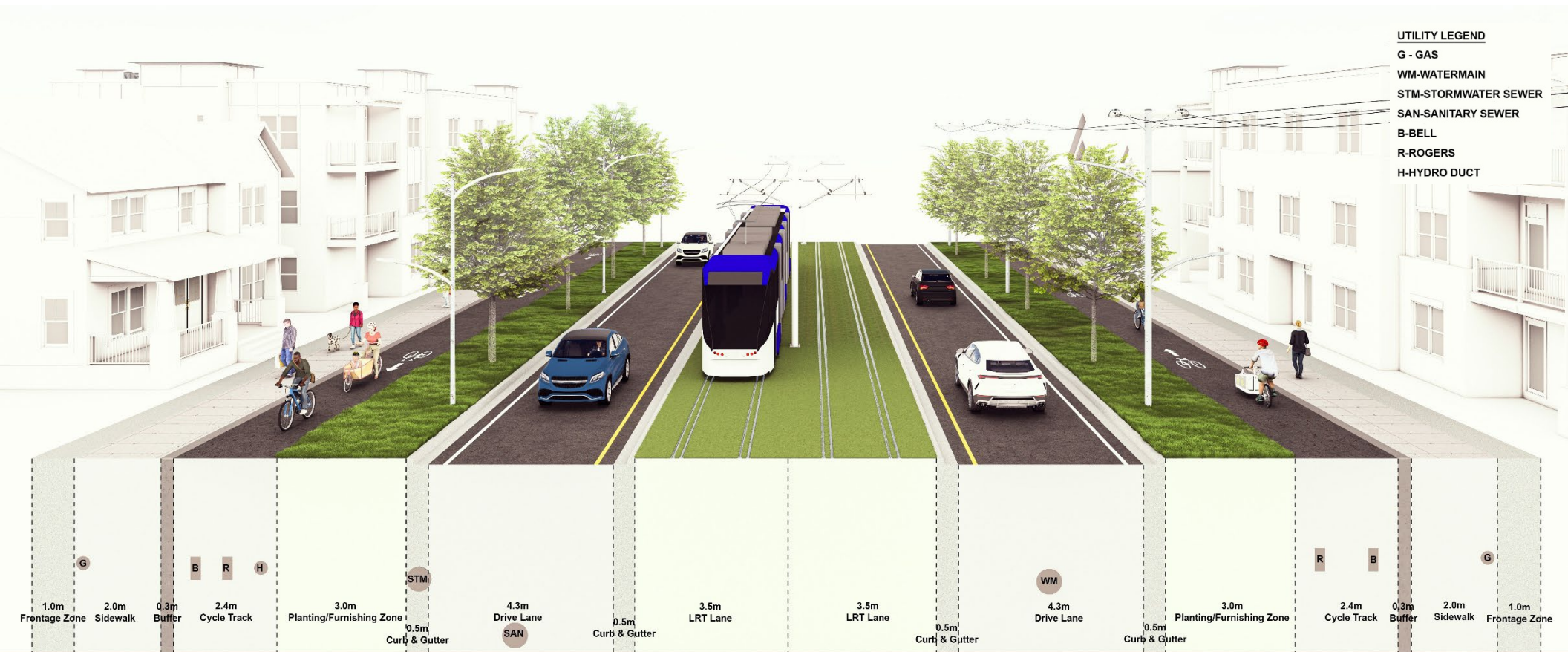
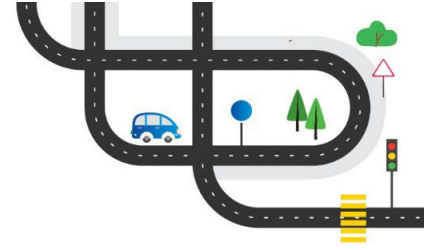


Figure 2.21: Urban Avenue — Example 3 (Light Rail Transit) — 35 m ROW

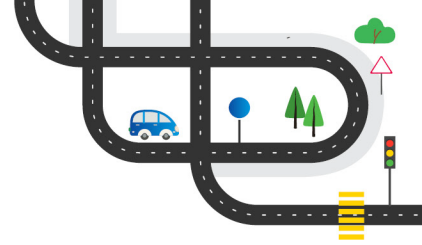




Example Street



Figure 2.22: Bishop Street North in Cambridge (Source: Google Maps, 2025)



Urban Main Street

Urban Main Streets move people and goods at low speeds through compact urban communities of the Region. They are typically characterized by higher walking and cycling activity and a mixture of street-oriented built form of varying size with small or no setbacks and accesses provided via rear laneways. High-density built form can be found around transit nodes and hubs.

Table 2.9: Key Operational Parameters

Primary Road Function:	Access
Walking and Cycling Activity:	High
Right-of-Way Width:	30 m
Target Operating Speed:	30 – 40 km/h
Travel Lanes (Per Direction):	1
Intersection Spacing:	60 – 90 m preferred, 150 m maximum
Access:	Limited driveway access, properties are street facing and typically serviced by rear laneways

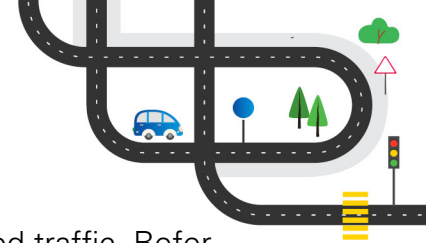
Design Considerations for Road User Groups



To accommodate high walking activity, prioritize wide sidewalks and planting and furnishing zone buffers from adjacent motor vehicles. Prioritize placemaking features to create inviting spaces for active travel, such as active frontages with patios, street trees, street furniture, public art, and decorative pedestrian-scale streetlighting. This may be done in collaboration with local businesses. Provide controlled crossings that are 60 to 180 m (on average) apart to align with desire lines of people walking.



Provide one-directional cycle tracks with adequate width, lighting, planting and furnishing zone buffers from adjacent motor vehicles, and amenities (such as convenient and frequent bicycle parking).



Provide transit service as buses operating in mixed traffic. Refer to the Grand River Transit Bus Stop Design Guidelines for further information.



Accommodate through movement with a mix of transit, heavy vehicles, and personal vehicles. Ensure the physical design self-enforces target operating speed given high volumes of vulnerable road users expected and curbside activity. Gateway features should be introduced to create lateral friction and provide cues to people driving to adjust to a lower speed context. This may include narrowing travel lane widths, integrating textured pavement, and providing planting and furnishing zones. Provide a single centreline. Lay-by spaces alternating with the planting and furnishing zone may be considered to accommodate temporary curbside activity, such as for nearby local business deliveries

Table 2.10: General Width Allocation Priorities

Street Element	MUST	SHOULD	CONSIDER	NOT APPLICABLE
Frontage Zone		●		
Pedestrian Facilities	●			
Cycling Facilities	●			
Planting	●			
Lay-bys			●	
Dedicated Transit				●
Through Lanes	●			





Example Cross-Section

Designer note: Project scope is important in right-sizing an achievable outcome. For example, if the project is scoped as a pavement rehabilitation, then the trade-offs process should focus on cost-effective upgrades that could be implemented without full reconstruction.

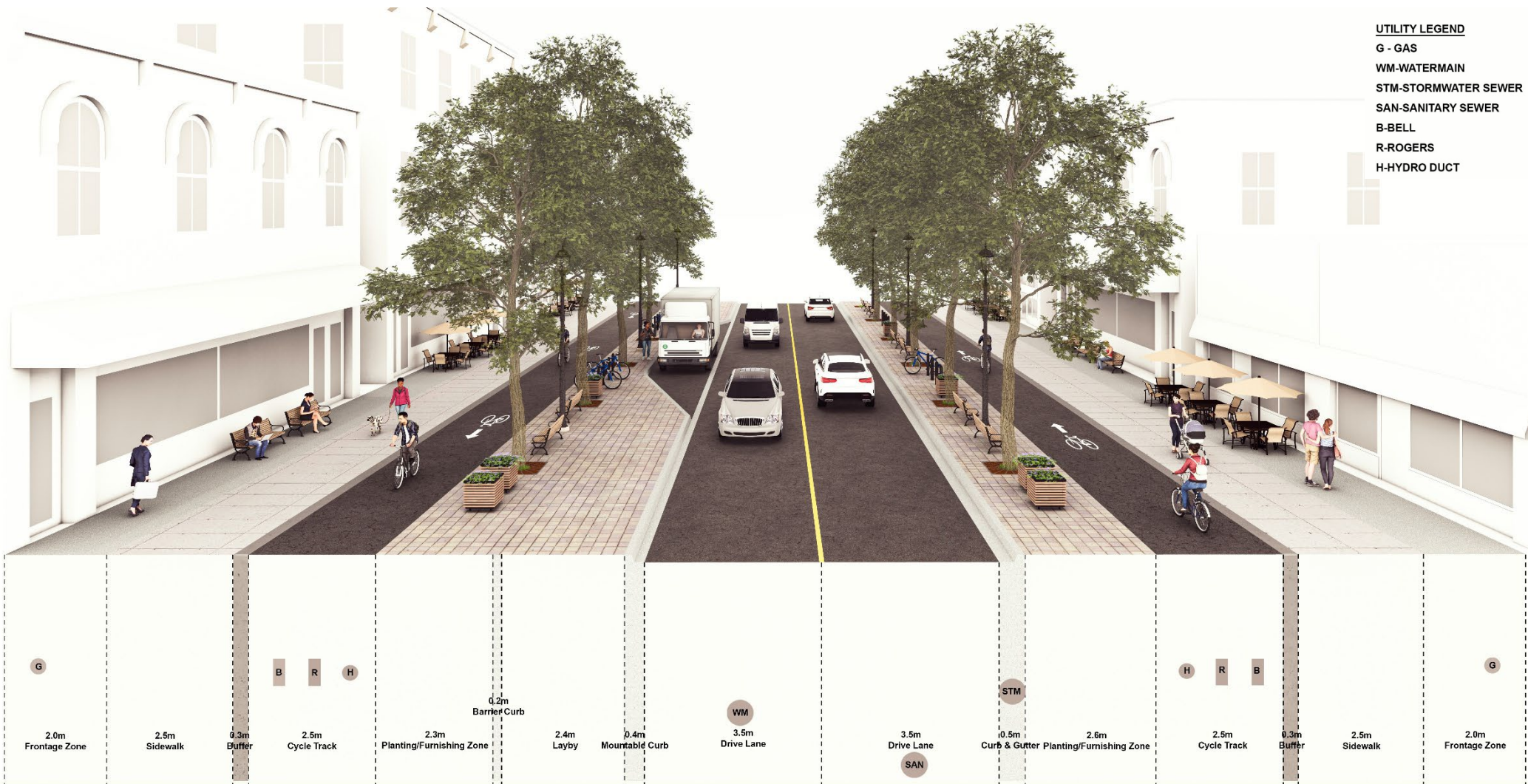


Figure 2.23: Urban Main Street — Example 1 (On-Street Loading) — 30 m ROW





Example Street



Figure 2.24: King Street North, South of Princess Street (Source: Google Maps, 2025)

Chapter 3

Cross-section Elements





Cross-section Elements

Pedestrian Realm

The pedestrian realm is the portion of the street environment dedicated to people walking and using mobility devices. It is also designed to support placemaking, accessibility, and the overall function of streets. It typically consists of four zones, illustrated in **Figure 3.1**:

- Frontage Zone;
- Pedestrian Clearway;
- Furnishing and Planting Zone; and
- Buffer Zone.

On some streets, these zones may be combined or their boundaries may be less distinct due to limited right-of-way width or flexible, shared street design. Effective pedestrian realm design considers the unique function of each zone while ensuring they work together cohesively.



Figure 3.1: Illustration of Pedestrian Realm Zones



Frontage Zone

The **frontage zone** is the area between the pedestrian clearway and building fronts or property boundaries.

It serves as an extension of the public realm, and may be used for patios, storefront displays, or to provide space for a door to swing open. In an urban context, a wider frontage zone provides greater flexibility of uses and supports an **activated frontage**.

In contexts where active land uses are not fronting the street, the frontage zone may be omitted. In these cases, the available space can be reallocated to provide a wider pedestrian clearway or wider furnishing and planting zone.

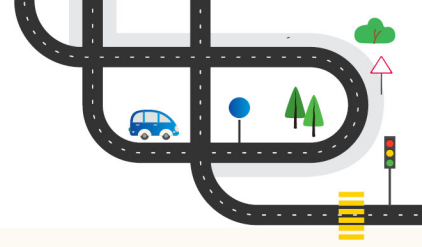
Pedestrian Clearway

The **pedestrian clearway** is a designated zone used for pedestrian mobility.

Its primary purpose is to provide a **continuous, unobstructed path** for people walking or using mobility devices. The clearway area is free of obstructions, both horizontally and vertically. Requirements for width and slope are prescribed by *Accessibility for Ontarians with Disabilities Act* (AODA) standards.

The preferred pedestrian clearway is a sidewalk, reserved exclusively for people walking and using mobility devices. A multi-use path, shared by people walking and cycling, is an alternative form of pedestrian clearway.

In rural contexts, people walking may use the paved shoulder which would serve as the pedestrian clearway. In urban contexts, it is recommended that every Regional Road (existing and future) provide a dedicated pedestrian clearway on both sides of the street.



Furnishing and Planting Zone

The **furnishing and planting zone** provides a dedicated space for amenities such as grass, planters, trees, and street furniture. Streetlighting poles, road signage, and snow storage can also be accommodated within this zone.

When placed between the buffer zone and the pedestrian clearway, this zone increases the lateral clearance to motor vehicles, which can improve the level of comfort for people walking, including those using mobility devices.

Certain minimum widths are necessary to accommodate planting within these zones:

- **Trees** require a width of **1.5 m or more**.
- **Grasses, perennials, or shrubs** may be considered with a minimum width of **0.6m**.
- Zones **less than 0.6m** wide should be **hardscaped**.

Buffer Zone

The **buffer zone** represents the lateral clearance between the pedestrian clearway and roadway. It acts as a buffer between motor vehicles and people within the pedestrian realm.

This zone also provides lateral clearance between motor vehicles and roadside obstacles, such as trees or poles, and provides space for snow storage. Signage may also be placed within this zone.

For **Rural Connectors**, shoulders (including with rumble strips) and swales function as a buffer. No additional buffer is required.

For **Rural Main Streets** and in **urban contexts**, the furnishing and planting zone will sometimes extend to the curb, leaving no dedicated buffer zone (other than the curb itself). In other cases, a buffer zone may be provided in the form of a “splash strip” – a narrow band of hardscaped surface adjacent to the curb.



Pedestrian Realm Design Criteria

The design criteria for the Pedestrian Realm zones are outlined in **Table 3.1**.

Table 3.1: Target (minimum constrained) dimensions for the Pedestrian Realm (metres)

Typology	Frontage Zone	Pedestrian Clearway	Furnishing and Planting Zone	Buffer Zone
Urban Main Street	1.0	2.5 (1.8)	≥ 1.5 (0.6)	See note 4
Urban Avenue	1.0	2.1 (1.8)	≥ 1.5 (0.6)	
Urban Connector	N/A	2.1 (1.8)	≥ 1.5 (0.6)	
Rural Main Street	1.0	2.1 (1.8)	≥ 1.5 (0.6)	
Rural Connector	N/A	See note 3	≥ 3.5	N/A

1. Frontage zone may be accommodated on private property, dependent on land-use setbacks.
2. Absolute minimum 1.5 m pedestrian clearway is required for AODA compliance.
3. A multi-use path is provided as a cycling facility, which will accommodate people walking.
4. As a minimum, a 0.5 m curb and gutter should function as the buffer zone. See the Buffer Zone section above for further details on other street elements that can also serve this purpose.



Cycling Facilities

The thoughtful design of cycling infrastructure is critical to provide low-stress environments that are inviting for people of all ages and abilities. It also contributes to the overall safety, efficiency and accessibility of the transportation network throughout the Region.

This section outlines the design criteria for cycling facilities on Regional Roads. Detailed guidance on cycling facility design can be found in *Ontario Traffic Manual (OTM) Book 18*.

Facility Types

Cycling facilities are treatments that delineate or physically separate a dedicated space for people cycling. *OTM Book 18* categorizes cycling facilities into three groups:

1. **Physically Separated facilities**, such as in-boulevard cycle tracks; multi-use paths; and protected bike lanes
2. **Designated facilities**, such as buffered or conventional painted bike lanes
3. **Shared facilities**, such as a shared street mixed with motor vehicles

The types of cycling facilities presented in the street typologies (**Chapter 2**) are described below. Considering the higher motor vehicle traffic volumes and posted speeds typically present on the Regional Road network, **Physically Separated Facilities** are the preferred facility type on all Regional Road typologies.



CYCLE TRACKS

For **reconstruction and new construction projects** in urban areas, in-boulevard cycle tracks are the preferred design approach. This provides a high-quality facility with a strong degree of physical separation between people cycling and motor vehicles.



Figure 3.2: In-boulevard Cycle Track on King Street North Near Central Street (Source: Google Maps, 2025)

For **retrofit projects**, fully separated on-road cycle tracks can be implemented between the curbs, by reallocating roadway space from other uses.

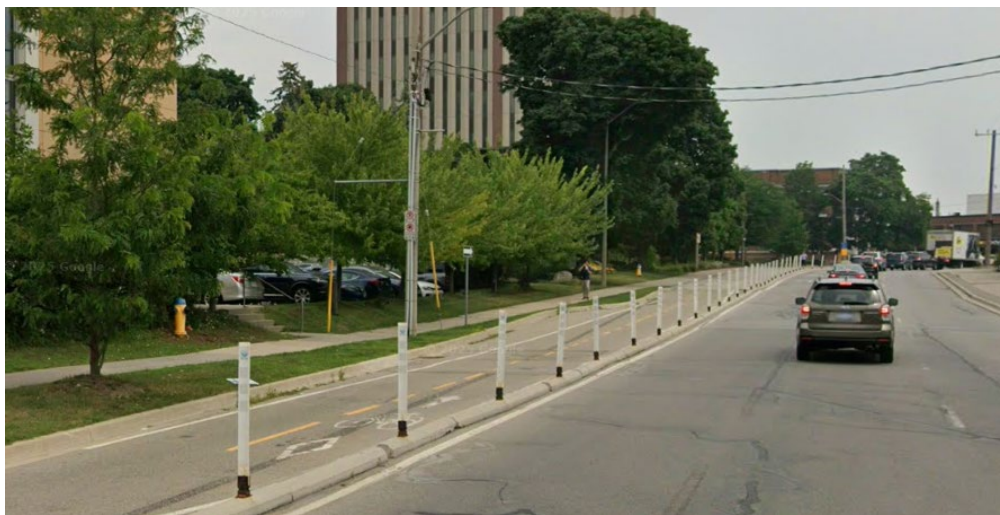


Figure 3.3: Fully Separated On-road Cycle Track on Erb Street West Near Albert Street (Source: Google Maps, 2025)



In **urban areas**, cycle tracks can provide one-way or two-way flow, however **one-way facilities are the Region's preferred cycling design approach**, particularly where there are frequent driveway and intersection crossings. One-way facilities can provide access to both sides of the street, minimize potential conflict points with intersecting features (e.g. driveways and roads), and are less complex at intersections.

PROTECTED BIKE LANES

Protected bike lanes are on-road cycling facilities delineated by line markings and physical barriers.

Physical barriers can include quick-build modular materials such as flex posts and concrete barriers, or more permanent materials such as poured-in-place concrete curbs. On-street parking may also be used to protect bike lanes in appropriate typologies.

The key difference between a protected bike lane and a cycle track is that a protected bike lane is built at roadway elevation, typically within the existing curb-to-curb width of a roadway, while a cycle track is elevated and in the boulevard area adjacent to the roadway. Protected bike lanes are a suitable design choice for **retrofit or resurfacing projects**. Constrained Case Study 1 for an Urban Avenue (**Chapter 4**) provides an example of a protected bike lane.



Figure 3.4: Protected Bike Lane on King Street North Near Hickory Street (Source: Google Maps, 2025)



MULTI-USE PATHS

Multi-use paths are a shared facility for people walking, cycling, and using mobility devices. They are considered most suitable in the Region's **rural areas and Urban Connectors**, where there are generally lower walking and cycling demands, and longer distances between conflict points (e.g. intersecting driveways and roads).

Multi-use paths should be constructed with asphalt surface and marked with a centreline to provide visual distinction from sidewalks and encourage all users to keep to the right except when passing. OTM Book 18 Table 4.5 provides guidance on multi-use path desired widths for different design conditions based on expected number of users per hour.

If high pedestrian and cycling volumes are expected, the Region's preferred approach is a **separated cycling facility** to minimize conflicts and improve comfort for people walking and cycling.

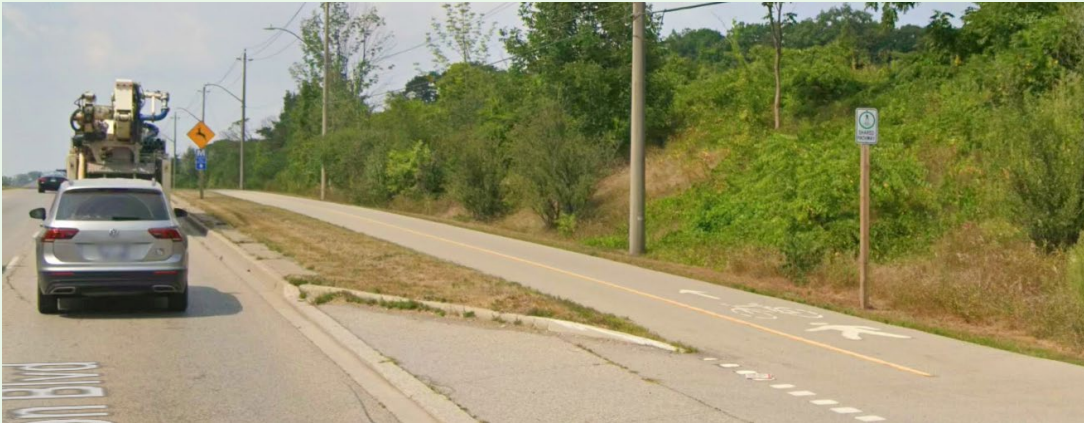


Figure 3.5: Multi-use Path on Homer Watson Boulevard Near Bleams Road (Source: Google Maps, 2025)



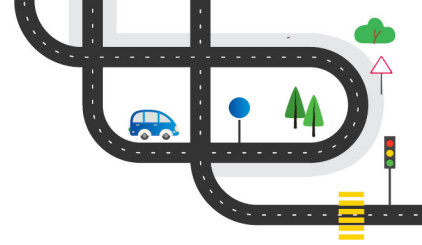
BUFFERED BIKE LANE

Buffered bike lanes are on-road cycling facilities delineated by line markings only. They do not provide physical separation between vehicles and people cycling.

Buffered bike lanes are not preferred on Regional roads. However, they may be considered in constrained corridors with low operating speeds. For example, in the **Rural Main Street** typology, buffered bike lanes may be a viable option, particularly where they provide continuity to a paved shoulder on adjacent road segments.



Figure 3.6: Buffered Bike Lanes on Snyders Road East (Source: Google Maps, 2025)



Facility Type Design Criteria

The design criteria for cycling facilities on the Regional Road network is outlined in **Table 3.2**. For each typology, a preferred facility type is indicated.

The suggested minimums should only be considered under constrained situations, where the target widths cannot be accommodated. Refer to **Chapter 4** for guidance on how to navigate a constrained situation.

Table 3.2: Cycling Facility Design Criteria (metres)

Typology	Facility type	Facility Width	Buffer Width
Urban Main Street	Cycle track	2.0 – 2.5 (one-way)	1.5+ (0.5) See note 1.
Urban Avenue	Cycle track	2.0 – 2.5 (one-way)	1.5+ (1.0)
Urban Connector	Cycle track or MUP	2.0 – 2.5 (one-way) 3.5 – 4.0 (two-way)	2.0+ (1.0)
Rural Main Street	Cycle track or MUP	2.0 – 2.5 (one-way) 3.5 – 4.0 (two-way)	1.5+ (1.0)
	Buffered bike lane	1.5 – 1.8 (one-way)	0.5 – 1.0 (0.3)
Rural Connector	Paved shoulder	1.5 – 2.0	0.5 – 1.0
	MUP	3.5 – 4.0 (two-way)	6.0+ (4.0)
Min Constrained (Absolute Min)	Cycle track or MUP	1.8 (1.5) (one-way) 3.5 (2.4) (two-way)	Varies – see above
	Protected bike lane	1.5 – 2.0 (1.2) (one-way)	0.5 – 1.0 (0.3)

1. Where a cycle track is adjacent to a parking lane (most applicable to Urban Main Street), refer to OTM Book 18 for guidance (recommended 1m buffer, minimum 0.6m).
2. MUPs should always be two-way facilities.
3. Shared operating space may be considered on Urban or Rural Main Streets with 30 km/h target speed.
4. One-way facilities are strongly preferred on Urban Main Street and Urban Avenue typologies; however two-way facilities may be considered where there is a compelling network connectivity reason to do so or where conflicts with driveways and intersections can be avoided by placing a two-way cycling facility on one side of the street.
5. The width of the bike lane should be considered in conjunction with the width of the adjacent travel lane, and if there is no gutter present, a wider bike lane should be considered.



Delineation with the Pedestrian Clearway

A clear delineation between the cycling facility and pedestrian clearway should be provided to minimize conflicts and improve accessibility. Delineation can be achieved through various design techniques:

Material Delineation: Using different surface materials and/or colors for pedestrian clearways and cycling facilities helps visually distinguish the two areas, reducing the likelihood of encroachment by users. A buffer strip comprised of texturally and colour-contrasting materials – for example, a band of paver stones with a rough texture and contrasting colour – provides increased delineation and improved accessibility.

Horizontal Separation: Implementing a buffer zone, such as a furnishing and planting zone, between the cycling facility and pedestrian clearway creates separation, visually distinguishing the two areas. The presence of street furniture or a softscape surface within the furnishing and planting zone provides accessible delineation.

Vertical Separation: Elevating a cycling facility above the roadway but below the pedestrian clearway creates a vertical separation that can distinguish the two areas. Common techniques include the use of a low (50-70 mm height) curb, which provides an accessible form of delineation (e.g. for people with visual impairment) while minimizing the risk of striking a pedal against the curb for people cycling.



Travel Lanes

The primary function of **travel lanes** is to move motor vehicles through the road network.

Historically, motor vehicles have been the primary consideration in roadway design with other modes being of secondary importance. A complete streets approach refocuses the design to accommodate all modes of travel. While the importance of efficiently moving goods, people and emergency services through travel lanes does not go unrecognized, designing for people and the environment takes an approach that prioritizes the safety and mobility of all users. Travel and turning lanes function differently, therefore require different widths based on the typology.

The **Region's preferred design approach is to implement narrower lane widths** as a traffic calming measure to promote lower motor vehicle speeds, where appropriate. Some benefits may include increased reaction time for people driving and lower crash severity, in the event of potential conflicts, and reduced crossing distances for people walking and cycling.

The inclusion of **turning lanes** can improve the intersection capacity by separating turning and through movements, and it presents the opportunity to include a protected turning phase to minimize conflicts with other users.

The Region has identified a minimum **7m pavement width for all Regional Roads**, excluding curb and gutter. Exceptions may be considered for constrained corridors on a case-by-case basis.

Medians

Medians provide horizontal and vertical separation between travel lanes of opposing direction that can serve a variety of purposes.

They can be installed along the centre of major roads to restrict left-turn access to/from side streets, they can be used to increase landscaping along a corridor, and they provide a space to incorporate planting, signal poles and streetlighting. Medians can also reduce the potential for head-on collisions, which are more likely to result in serious or fatal injuries at speeds over 70km/h.

On the **Urban Connector** typology, a median is recommended to separate opposing streams of traffic and to support a higher degree of access control. At intersections, the median can be narrowed to allow a left-turn lane to be introduced.



On-Street Parking and Lay-bys

On-street parking is **not considered a priority** on the Regional Road network. Wherever possible, parking and loading opportunities should be considered on private property or on intersecting lower-tier streets before accommodating these uses on Regional Roads.

On-street parking may be considered for Regional Roads where it does not impact on the ability to accommodate the multi-modal movement of people and goods.

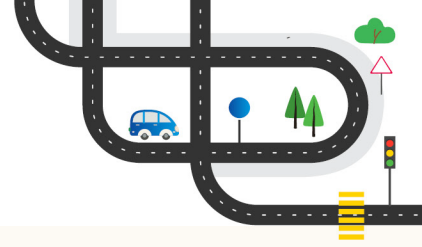
Where accessible parking is required, lay-bys can fulfill this function when designed to minimum standards outlined in AODA. **Lay-bys** are designated zones accessed from the travel curb lane that function as temporary stopping points along a corridor.

For **Main Streets (urban or rural)**, lay-bys allow for commercial operations (e.g. delivery) and short-term on-street parking. For example, the Urban Main Street cross section includes a 2.4m lay-by which can accommodate short-term parking for vehicles up to the size of a delivery vehicle that may require access to commercial businesses.

Lay-bys may be considered for transit stops in select locations such as:

- Stops with schedule layovers and operator relief points;
- End-of-route locations;
- Roadways with posted speeds of 70km/h or greater;
- Bus stops served by multiple bus routes;
- On the exiting end of a roundabout; and
- Where stops and lay-bys can be integrated with transit signal priority and queue jump lanes.

Refer to the Grand River Transit Bus Stop Design Guidelines for further information.



Roadside Features

Beyond the travel lanes, there are roadside elements that should be considered in design, including clear zones, curbs, and shoulders.

Clear zones are obstacle-free areas adjacent to the travelled roadway, which provide an opportunity for an errant vehicle to recover or come to a rest before colliding with a fixed object. Consistent with the TAC *Geometric Design Guide for Canadian Roads* (2017) guidance, in lower-speed urban contexts, the emphasis is on providing a limited obstacle-free area, which balances safety considerations with right-of-way constraints. On higher-speed roads, such as the Rural Connector, TAC or MTO guidance should be reviewed to confirm a clear zone width.

Curbs provide vertical separation between the roadway and pedestrian realm. They are typically used in urban settings and rural main streets.

Shoulders provide horizontal clearance between the travel lanes and drainage swales (in rural settings). Shoulders also form part of the clear zone. Refer to the next section for further information on shoulders.



Roadway Design Criteria

The design criteria for roadway elements on the Regional Road network is outlined in **Table 3.3**.

Table 3.3: Roadway design Targets (metres)

Typology	# Lanes	Curb Lanes	Inner Lanes	Turn Lanes	Minimum Pavement Width	Clear Zone	Curb / Shoulder
Urban Main Street	2	3.5		3.0	7.0	0.5	Barrier curb
Urban Avenue	2	3.3 – 3.5	3.0 – 3.3	3.0 – 3.3	7.0	0.5	Barrier curb
Urban Connector	4	3.5	3.3	3.0 – 3.3	7.0	2.0 (1.2)	Barrier curb
Rural Main Street	2	3.5		3.0	7.0	0.5	Barrier curb
Rural Connector	2	3.5		3.3	7.0	See note 6.	Paved or granular shoulder
Minimum Constrained (Absolute Min)		3.3 (3.0)	3.0	3.0 (2.7)	6.6 (6.0) – two-way 4.6 (3.5) – one-way		

1. Lane and pavement widths are measured to edge of pavement (exclusive of gutter).
2. Lane widening may be required on horizontal curvature.
3. The pavement width minimums should only be considered under constrained situations, where the target widths cannot be accommodated. Refer to Chapter 4 for guidance on how-to navigate a constrained situation.
4. One-way streets: Consult with emergency services for pavement widths less than 6.0 m
5. When wider lanes are necessary for operational reasons, consider applying pavement markings to visually delineate a narrower travel lane. See Urban Avenue - Example 3 (LRT) for an example of this technique.
6. Refer to TAC Geometric Design Guide for Canadian Roads (2017) or MTO Roadside Design Manual (2023) for guidance.
7. Increased lateral clearance is recommended at intersections and on horizontal curvature. Refer to TAC Geometric Design Guide for Canadian Roads (2017) for guidance.



Shoulders

Shoulders provide horizontal clearance adjacent to the travel lanes and can be implemented with paved or granular material. They are more common on rural connectors to act as a buffer between the travel lanes, drainage swales and pedestrian realm.

In **urban settings and rural main streets**, shoulders are not considered a priority, and the curb generally functions as a buffer beside the travel lanes.

Paved Shoulders

Paved shoulders provide additional pavement width for vehicle recovery, emergency vehicles, and may be used by people cycling where separated cycling facilities are not provided.

Paved shoulders are the preferred design approach for a buffer between the travel lanes, drainage swales and pedestrian realm on Rural Connectors. **A width of 1.0m should be targeted for the Regional Road network.**

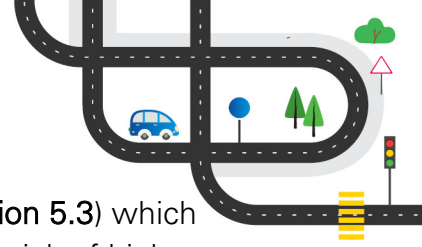
For roads that do not accommodate horse and buggy, include **0.5m shoulder rounding** on each side of the paved shoulder.

Horse and Buggy

Horse and buggy routes require key considerations for their interactions with other modes of transportation throughout the Region. Rural contexts such as Rural Connector and Rural Main Street typologies (**Section 2**) should consider the safety, geometric, and operational need of these users.

The Region's **preferred design approach**, which has been informed by community feedback, is shown in the Rural Connector Example 2 typology. It consists of:

- 2.5m-wide shoulder consisting of a 1.5m paved (asphalt) segment beyond the painted buffer line to accommodate people cycling and a 1.0m unpaved (packed gravel) portion. Although the typical buggy width is 1.65m, it was noted by the Region that horses are able to straddle between the paved (asphalt) and unpaved (packed gravel) segments.
- Exposed aggregate concrete finish is preferred for roll over curbs, as it provides grip for horses, rather than smooth finish concrete curbs.



At intersections, consider the use of rural single lane roundabouts (**Section 5.3**) which provide simpler turning movements for horse and buggies, reducing the risk of high-speed collisions.

Treatments to avoid in rural contexts with horse and buggies are:

- Narrow roadway widths that are not comfortable for horse and buggy.
- Beveled or raised curbs which can negatively impact the horses' hooves and legs. Additionally, they are not passable for a horse and buggy.
- Rumble strips, which create potential for a horse to be startled by the noise.
- Concrete, asphalt or stone materials where horse use is expected as they are hard and slippery which wear on their hooves and cause potential for injury.
- While OTM Book 18 suggests that rumble strips may be appropriate within the painted buffer area, on buggy routes (e.g. most Regional roads within Woolwich and Wellesley), avoid the use of rumble strips due to hazard potential for horses.

As horse and buggies transition from rural connector to rural main street, they merge into a shared travel lane.

In addition to design strategies, educational strategies should be considered to raise awareness for people driving. Loud sounds, bright lighting and sudden acceleration or stopping are particularly aggravating to horses and can lead to horses being spooked and throwing off the buggy and its occupants, injuring the occupants and the horse as well. It is therefore important to leave space for horses and buggies by account for transitions from higher speed to lower speed contexts.

Transit Infrastructure

Transit infrastructure and services are a critical part of an effective transportation network. Grand River Transit (GRT) currently operates the Region's transit services, including local bus routes for region-wide coverage, iXpress rapid bus routes for high-demand corridors, and the ION Light Rail Transit (LRT) serving as a north-south spine. On-demand transit services are also present in some rural communities.

Designing streets to prioritize transit within the cross-section requires a nuanced approach that considers the specific context and functional classification of the roadway. Rather than prescribing a one-size-fits-all solution, planners should consider various design elements to enhance transit efficiency and reliability, which may include dedicated transit lanes, targeted measures at intersections, signal operations strategies, and passenger amenities at transit stops.

Recognizing that transit users begin and end their journey by walking, cycling or rolling to a transit stop, a well-designed pedestrian realm is supportive of encouraging the use



of transit. The road design should consider the full end-to-end journey including arrival at the stop, waiting, boarding, riding, and disembarking at the destination.

This section outlines the design criteria for transit infrastructure in the Region. Refer to the Grand River Transit Bus Stop Design Guidelines for further information.

Transit Stop Design

Transit stops should be well designed, safe and accessible from the pedestrian realm.

Where cycle tracks are present, the Region's preferred design approach is **island boarding stops**. Island boarding stops are located on a dedicated platform situated between the travel lanes and cycle track, which provides separation between transit vehicles and people cycling and walking. They can be accommodated mid-block or incorporated into the intersection design. The target dimensions are a length of 12.0m or more and width of 3.0m or more.

Passengers board and alight from the island, crossing the cycling facility at marked crosswalks. This configuration allows transit vehicles to stop in the travel lane, avoiding conflicts between buses and people cycling, and improves transit performance by avoiding a need for the bus to merge into traffic after serving the stop.

An example of a mid-block island boarding transit stop has been shown on the Urban Connector Example 1 (**Figure 3.7**) and Urban Avenue Example 1 and 2 typologies.



Figure 3.7: Example of Island Boarding Transit Stop for Urban Connector Typology

For LRT, the Region's preferred design approach is **center median platform stops**. Design of LRT platforms would be done on a project by project basis. LRT platforms are typically incorporated into the intersection design, therefore refer to **Chapter 5** for further design guidance.



Transit Lanes

Allocating exclusive lanes for buses or LRT vehicles ensures that transit services are not impeded by general traffic congestion. These lanes can be situated curbside or within a central median, depending on the characteristics of each corridor. Dedicated lanes are commonly considered on higher-frequency transit corridors (defined by NACTO as greater than 4 vehicles per hour).

Transit lanes on Regional Roads have a preferred width of 3.5m. In constrained corridors, narrower lanes can be considered on a case-by-case basis.

For buses, curbside versus median bus lanes may be considered on a case-by-case basis. Curbside bus lanes can be a cost-effective method to significantly improve service reliability and service existing curbside stops with minimal reconstruction. They are commonly combined with transit signal priority. They should be marked with clear "BUS ONLY" pavement markings, and optionally with red surface treatments, to deter unauthorized use.

Challenges can be faced at intersections, where buses must contend with right-turning vehicles. This can be mitigated with queue jumps or restricted turning movements, described further in **Chapter 5**. Also, curbside lanes may be susceptible to encroachment from parked vehicles or delivery trucks, necessitating strict enforcement and potential physical separation measures.

Curbside bus lanes have been illustrated on the Urban Avenue Example 2 typology. A built precedent of curbside bus lanes is shown in **Figure 3.8**.



Figure 3.8: Curbside Bus Lanes on Hespler Road Approaching Coronation Boulevard (Source: Google Maps, 2025)



For LRT, the Region's preferred design approach is a **central median guideway**. Challenges can be faced at intersections, where LRT vehicles must contend with left-turning vehicles. This can be mitigated with stronger transit signal priority or restricted turning movements, described further in **Chapter 5**.

For example, central-median LRT lanes have been illustrated on the Urban Connector Example 2 and Urban Avenue Example 3 typologies. A built precedent of a centre running LRT is shown in **Figure 3.9**.



Figure 3.9: Centre Running LRT at King Street S / John St.W, Waterloo (Source: Google Maps, 2025)

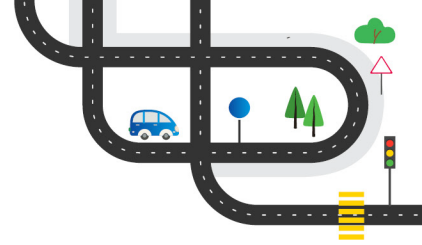
Transit Infrastructure Design Criteria

The design criteria for curbside bus stops on the Regional Road network are outlined in **Table 3.4**.

Table 3.4: Curbside Bus Stop Design Criteria

Design Parameter	Minimum Value	Target Value
Platform Length	12.0m	16.0m
Platform Width	2.5m	3.0m
Clearance Width to Curb	0.5m	1.8m
Clearance to Cycle Track	0.2m	0.5m

Note that the design of LRT platforms would be done on a project by project basis.



Green Infrastructure

Green infrastructure serves a variety of important functions in complete street design through hydrological and ecological support. Beyond the aesthetic benefits that create a more inviting and comfortable space for the users, the Region relies on green infrastructure to reduce pollutants entering the water system, maintain good quality water sources, and provide a source of erosion control and flood management. It plays a pivotal role in the Region's stormwater management, air quality, biodiversity, and mitigates the urban heat island effect.

For example, rainwater infiltration into the ground minimizes the overburden on stormwater systems and mitigates heavier pollutants from reaching the sewer systems.

Low impact development (LID) is encouraged to capture or slow the movement of stormwater runoff. This prevents heavier pollutants from reaching local watersheds that eventually reach major sources of water throughout the Region, degrading the water sources.

In a rural setting, **drainage swales**, open channels with filtered media and planting, reduce and absorb runoff and pollutants before they reach the main stormwater system.

The suggested treatment for planting and furnishing zones varies dependent on typology, as shown in **Table 3.5**. These suggested treatments have been informed by LID, maintenance, and source water protection considerations, but should be reviewed on a project-by-project basis. Refer to the *Region of Waterloo and Area Municipalities Design Guidelines and Supplemental Specifications for Municipal Services (January 2025)* for further information.

Table 3.5: Suggested form of green infrastructure within planting/furnishing zones

Typology	Suggested treatment
Urban Main Street	Hardscape with planting
Urban Avenue	Softscape planting strips
Urban Connector	Softscape planting strips
Rural Main Street	Softscape planting strips
Rural Connector	Drainage swale

Maintenance for green infrastructure should be coordinated between the relevant area municipalities and the Region to determine the appropriate assignment of responsibilities and requirements.



For all green infrastructure design, consideration should be made to the site-specific environmental conditions, road function, space availability, and maintenance operations. Refer to Regional and area municipality guidelines, including:

- City of Waterloo Engineering and Landscape Manual Volume 7: Landscape Architecture
- City of Kitchener Urban Design Manual: Landscape and Natural Features
- City of Kitchener Urban Design Manual: Landscape Design



Utility Infrastructure

Utility infrastructure can be located above and below ground, which supplies watermains, sanitation and storm water systems, internet services and cabling, and hydro throughout the Region.

The preferred design approach for utilities has been illustrated on the typology examples, which demonstrate the placement of streetlighting, overhead hydro, and underground utilities.

Special consideration must be made to the utility location to avoid issues during construction, and to provide adequate clearance for maintenance and repairs.

Linear infrastructure cannot be placed under LRT guideways. Crossings are possible, but must be approved by Corridor Management.

Where possible, streetlighting should be combined with hydro poles to lower the cost of construction and maintenance as well as lower street clutter.

Refer to the following for further guidance on utility infrastructure design:

- The Regional Municipality of Waterloo Standard Drawings
- City of Waterloo Engineering and Landscape Manual: Underground Servicing, Grading, and Utilities
- City of Kitchener Urban Design Manual
- Province of Ontario's F-6-1 Procedures to Govern Separation of Sewers and Watermains

Wet Utilities

- All wet utilities (watermain, storm and sanitary) are to be included under the roadway, provided sufficient minimum separation requirements can be met.
- Vertical separation for wet utilities follows 1.5m to top of storm sewer, 1.8m depth to top of watermain, and 2.8m depth to top of sanitary sewer pipe
- Watermain and sanitary pipes should have a minimum horizontal separation of 2.5m edge-to-edge.
- Stormwater mains should be located under the road allowance so that access is possible for future maintenance and repair.
- If the roadway is too narrow to meet minimum separation requirements, place watermain under loading lay-by/furnishing zone as close to curb as possible.



Hydro

- Hydro is shown as overhead along one side of the corridor, for all typologies except for Urban Main Street, where it is shown underground.
- There must be a minimum of 3.0m of separation between overhead hydro and any obstructions.
- Hydro poles and streetlighting should be a minimum of 0.45m offset from the cycling facilities and pedestrian clearway, with an exception in constrained conditions when this may not be achievable.

Gas Line

- The gas lines are typically placed closest to private property, with a minimum offset of 0.5m to the property line.
- Where applicable, there must be a minimum 1.0m separation from various telecommunication utilities.
- Where there are retaining walls and other obstructions, special considerations should be made on a case-by-case basis.

Telecommunication Utilities

- Where feasible, telecommunication utilities should be located a minimum of 1.0m under multi-use paths or cycle paths for easier access in the boulevard
- For rural connectors, overhead telecommunications utilities are accommodated along one side of the corridor.



Chapter 4

Decision-making Process





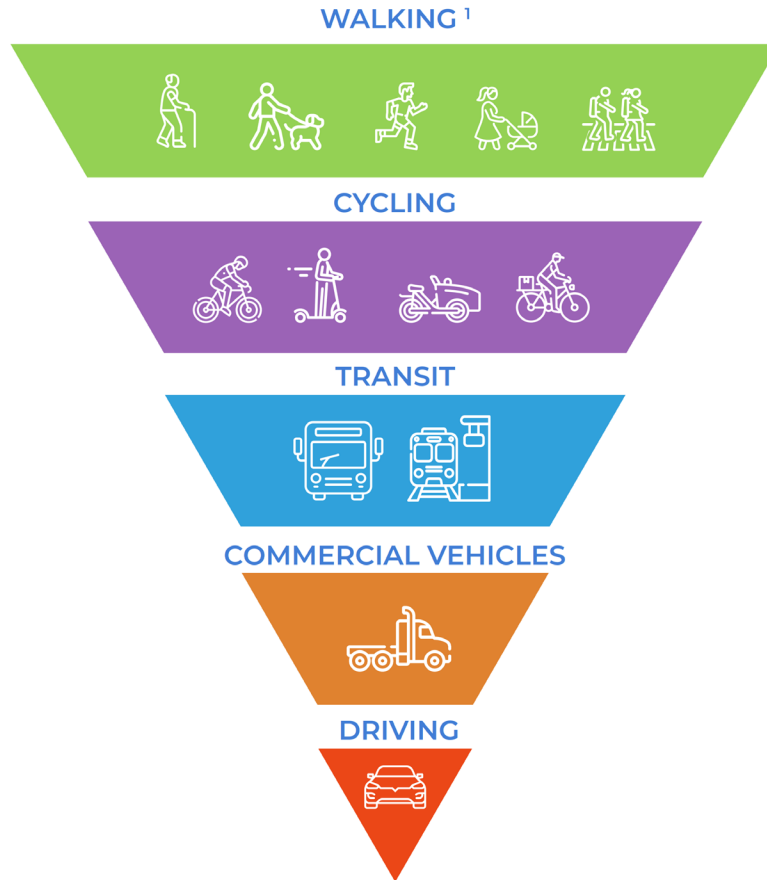
Decision-making Process

A road is considered to be constrained when its cross-section elements (at the target widths identified in Chapter 2 and 3) cannot fit within its existing or designated right-of-way. Constrained Regional roads (refer to the **Maps**) were identified based on a comparison between designated right-of-way and proposed typology right-of-way.

To achieve a cross-section that satisfies the key principles of The Guide within the available width, it may be necessary to reduce the width of or make trade-offs between particular cross-section elements. In these cases, it is important to thoughtfully decide how to allocate space while respecting project limitations and fulfilling community priorities.

This decision-making should be guided by the Region's Strategic Plan at the time in addition to the current Transportation Master Plan and local Official Plans. It is recognized that any future iteration of the Region's Strategic Plan may introduce new prioritizations, at which time Transportation Services will review and update this Guide to maintain alignment, if applicable.

The 2023-2027 Strategic Plan states that everyone should have the opportunity to live a good life, and one aspect of achieving this is to provide ease of accessibility for all users. With that said, while each street holds a different function, a default modal priority framework should be followed as shown in **Figure 4.1**. There may be projects that identify multiple modes at the same priority level (such as establishing that walking and cycling must both be accommodated).



¹ Walking includes green infrastructure, which helps to create a more comfortable space for walking and placemaking.

Figure 4.1: Default Modal Priority Framework

The remainder of this chapter presents a decision-making process (**Figure 4.2**) meant to guide practitioners through the required steps to design a cross-section suitable for their context. This takes into consideration project limits and priorities, the default modal priority framework (**Figure 4.1**), available width, and necessary space reallocation.

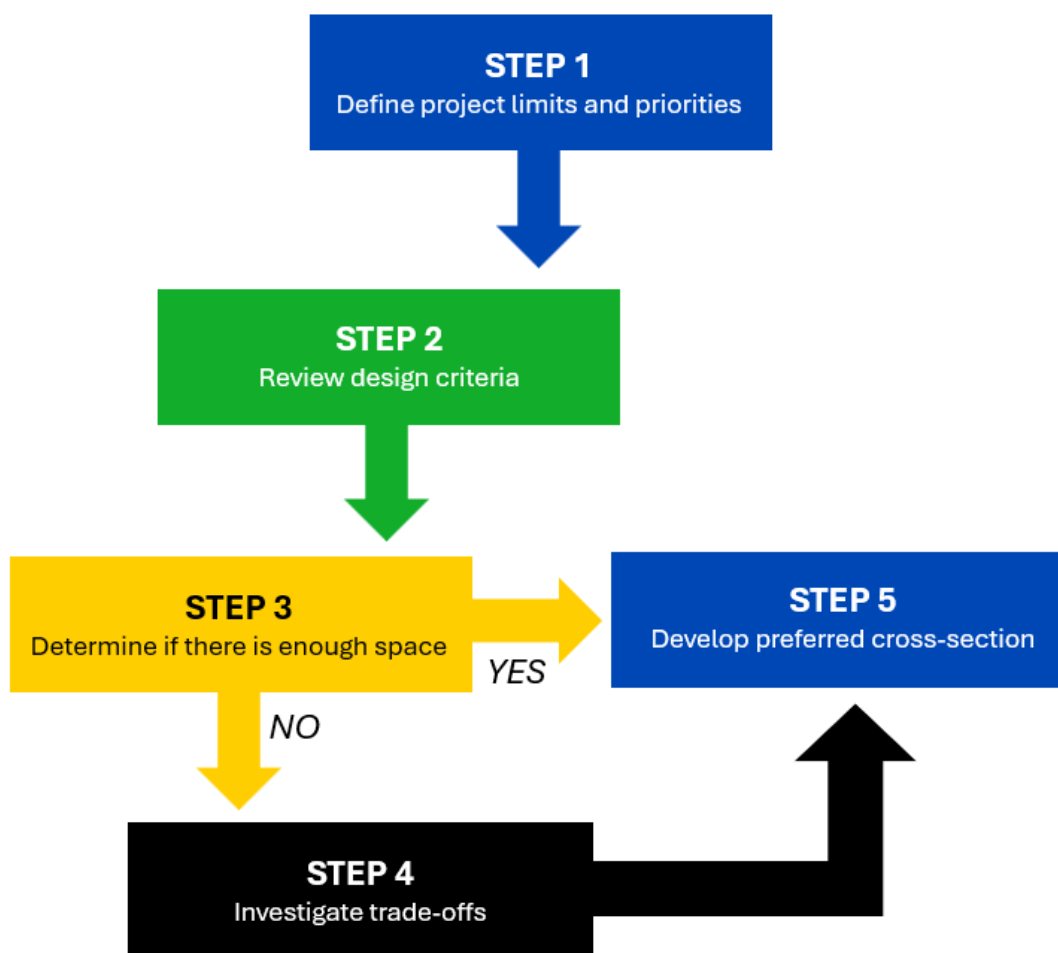
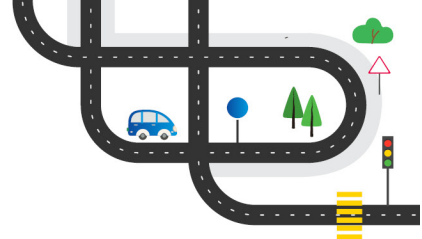


Figure 4.2: Decision-making process for constrained contexts

STEP 1: DEFINE PROJECT SCOPE AND PRIORITIES

Step 1 is to define the project scope and set the project priorities. Understanding the project scope is important to right-size an achievable outcome. For example, if the project is scoped as a pavement rehabilitation, then the trade-offs process should focus on cost-effective upgrades that could be implemented without full reconstruction. Furthermore, clearly setting out the project priorities up front will shape the framework for the subsequent steps. Note that the project scope and priorities should be cross referenced against the priorities of the proposed typology (**Chapter 2**) to identify any opportunities or challenges.



A list of appropriate questions may include, but is not limited to, the following:

Purpose & Context

What purpose does this road serve?

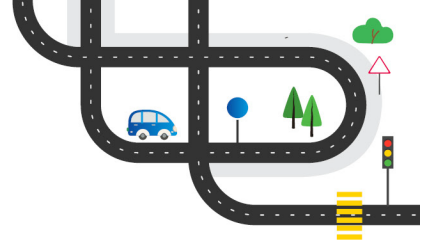
- How does this road fit into the broader network? This may include a review of the active transportation network, rapid transit network, and horse & buggy routes, in order to understand network continuity.
- What type of project is being contemplated? This may be full reconstruction, pavement rehabilitation, or an operational change (such as two-way to one-way conversion).
- What is this road's current and planned context? This may include adjacent land uses, building setbacks, and driveway frequency.
- Is future growth expected to significantly change the existing purpose of this road? This could include private developments or public investments, such as new transit hubs or civic/educational institutions.
- What is the priority level (Must, Should, Consider) associated with each street element for this design context? Does this align with the typology proposed for the study area in Chapter 2? If not, review other typologies provided in Chapter 2 to determine a typology that is more suitable for the design context.

Physical Parameters

- What is the existing right-of-way width, and is this different to the width designated by the Region?
- Are there any fixed elements (for example, utility infrastructure) that pose design constraints?

Operational Parameters

- What are the anticipated user volumes (people driving, walking, cycling, using transit)?
- What is the appropriate target speed for this road? Do existing operating speeds align with this target speed?



STEP 2: REVIEW DESIGN CRITERIA

Step 2 involves reviewing the design criteria (Chapter 3) for each cross-section element, based on the street typology and the level of priority established in **Step 1**. This process may lead to adaptation of the cross-section elements in the existing condition and the cross-section examples from Chapter 2 to represent a project-specific scenario, while maintaining acceptable dimensions for each element.

Where the design criteria provides a range, the priority level associated with each street element and network role (i.e. anticipated usage) of the street should help inform the most acceptable design criteria. For example, when choosing the cycling facility width, the upper-ended dimension should be considered if the street has a high user volume, given it is a “Must” mode.

There may be instances where adherence to the design criteria alone may not be enough to achieve certain desired outcomes. For example, if a project intends to foster a low-speed environment (30 – 40 km/h), additional considerations are suggested, such as:

- Create a sense of enclosure by narrowing the visual field of view using plantings, minimal building setbacks, and on-street parking
- Remove excess sight distance
- Remove excess pavement width
- Vary surface treatment, such as stamped concrete at intersections
- Introduce horizontal deflection, such as sharp tapers at the start of a turn lane



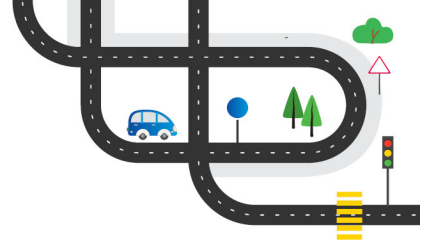
STEP 3: DETERMINE IF THERE IS ENOUGH SPACE

Step 3 compares the cross-section developed in **Step 2** against the available right-of-way width. This will determine if the preferred widths of the cross-section elements can be accommodated within the existing and/or designated right-of-way.

- **If yes:** Consider if there are additional priorities that can be achieved within the available right-of-way. Then go to **Step 5**.
- **If no:** Determine if it is feasible to acquire property to achieve adequate space. Considerations may include construction and utility impacts, costs, and land acquisition. If this is not possible, go to **Step 4**.

After ensuring that each element satisfies the preferred width, allocate any additional space to planting to promote environmental and community health.





STEP 4: INVESTIGATE TRADE-OFFS

Step 4 provides guidance for trade-offs when there is insufficient space to accommodate the cross-section elements at the design widths reviewed in **Step 2**, in accordance with the key principles of The Guide. The intention is to achieve a reduced, but still acceptable, width for the cross-section elements. Where possible, consideration should be given to the combination or reconfiguration of elements, before adopting the absolute minimum widths or entirely removing the element.

If an element cannot be provided, the practitioner should demonstrate countermeasures that could accommodate the element or set up the design for its future implementation. This is likely to relate to rehabilitation / resurfacing projects, where there are constraints such as budget or physical constraints. For example, if separated or shared walking and cycling facilities cannot be accommodated within the boulevard area, an alternative to explore may be to accommodate on-road cycling. This could be supported with countermeasures, such as a lower speed limit, narrower lanes, and speed management measures. As another example, if turn lanes are occupying limited space, a solution may be to remove the turn lane and combine the turning and through movements into a shared lane or prohibit the turning movement.

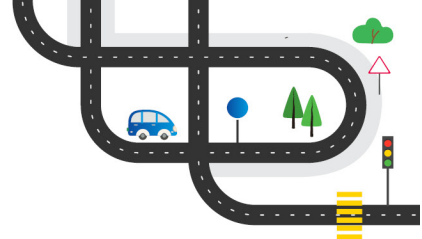
Step 4 can be divided into the three phases illustrated below:

STEP 4 PHASE 1: Reduce Dimensions of Cross-Section Element(s)

Step 4 Phase 1 involves reducing the width of the cross-section element(s), based on the acceptable ranges outlined in Chapter 3. The intent is to maintain the element widths within acceptable ranges, or the minimum constrained dimension if necessary. The absolute minimum dimensions should not be adopted at this phase.

If each element has been reviewed and the cross-section remains constrained, continue to **Step 4 Phase 2**.



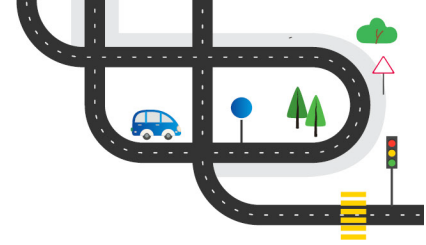


The “Consider” element(s) identified in **Step 1** should be reviewed first, based on the street typology. For example, for a constrained Urban Avenue, it may be identified that cycling and walking must be accommodated, but the frontage zone only be considered (due to minimal store fronts). Based on this, the trade-offs process should start reviewing the frontage zone width.

Considerations for each cross-section element to help guide the trade-off process include:

Table 4.1: Cross-Section Element Considerations

Cross-Section Element		Considerations
Pedestrian Realm	Walkway zone (clearway)	• Prioritize a wider walkway in high-activity areas (e.g. urban main street) for a comfortable user experience • Prioritize people walking within Major Transit Station Areas
	Frontage zone	• Can this be provided on private property?
	Planting zone	• May play an important role in narrowing the lateral field of view and managing speed • Recognize that narrower widths require greater attention to soil volume • Recognize that narrower widths may limit ability to provide bus shelters or other passenger amenities, along transit routes
Cycling Facilities	Facility width	• Prioritize people cycling within Major Transit Station Areas • Recognize that narrower widths may limit opportunities to pass or negotiate obstacles • Where a cycle track is adjacent to a parking lane, recognize that a narrower buffer could result in dooring risk
Roadway Design	Travel lanes	• Consider impacts of lane widths on emergency services, transit, and winter operations
On-street Parking / Loading		• Consider whether parking can be provided on adjacent streets or off-street • Laybys for loading/delivery purposes can alternate with planting



STEP 4 PHASE 2: Modify Cross-Section Elements

Step 4 Phase 2 investigates if elements can be reconfigured or combined to reduce the overall width. The intent is to accommodate all users within the cross-section before adopting the absolute minimum dimensions for elements or fully removing elements.

Examples may include:

- Reconfiguring separate walking and cycling facilities (see image below)
- Combining multiple elements into the furnishing zone by alternating planting, seating, lay-bys, and transit stops.
- Combining turning and through movements into a shared lane.

The feasibility of modifying a cross-section element should take into account the context and function of the road, and refrain from introducing new conflicts between users.

For example, in an urban context, bi-directional facilities (such as cycle tracks and multi-use paths) are not the preferred option, in order to minimize conflicts with front-lotted residential properties (i.e. driveways), and busy frontages on Main Streets and Avenues.

This example demonstrates options on how walking and cycling facilities can be reconfigured given limited space availability:

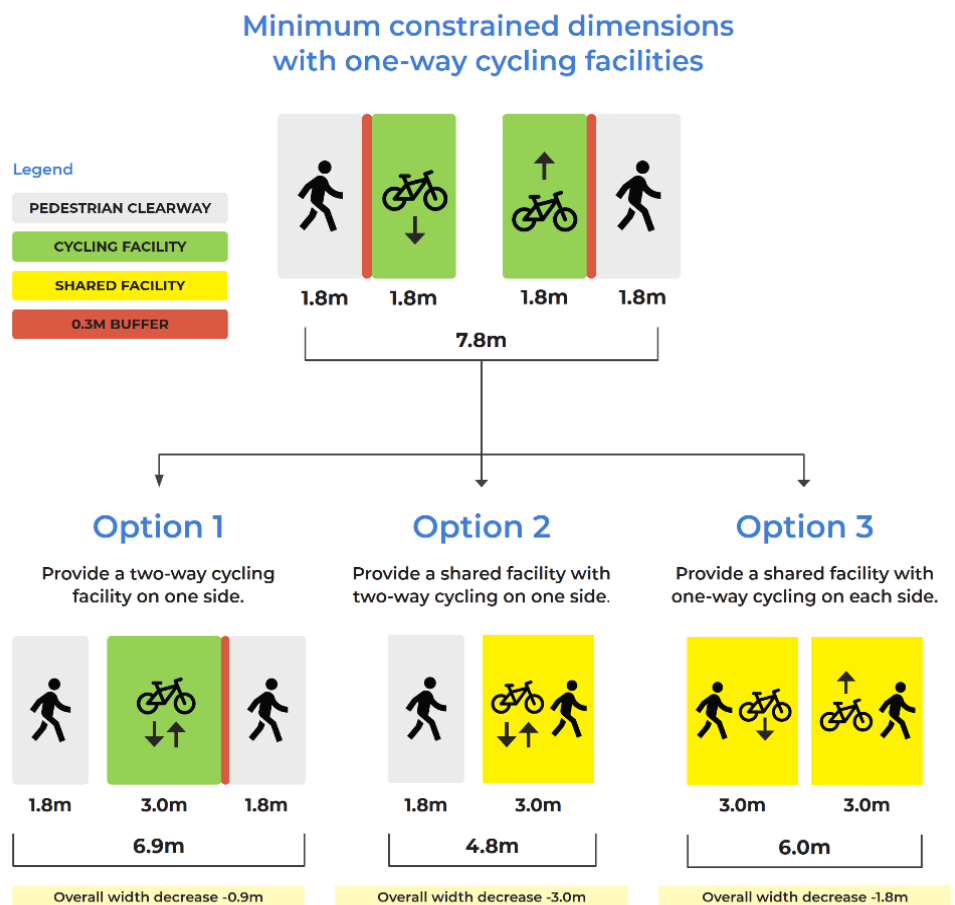
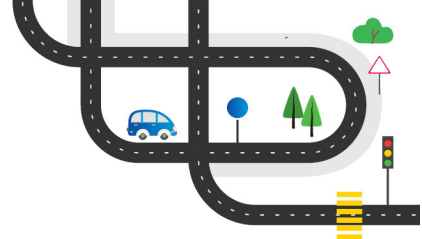


Figure 4.3: Constrained Dimension Options for One-Way Cycling Facilities



If the cross-section remains constrained:

- First, review the suitability of adopting the absolute minimum dimensions, starting with the “Consider” elements (identified in [Step 1](#)). *Does the absolute minimum dimension still achieve the project priorities?* If no, the absolute minimum dimensions may not be the best solution.
- Next, consider if any elements could be removed and accommodated elsewhere. An example of this could be a street located beside a park, where walking and cycling facilities are available within the park. *If any element is removed, would the project scope and priorities still be achieved?* If no, continue to [Step 4 Phase 3](#).

STEP 4 PHASE 3: Special Measures

[Step 4 Phase 3](#) investigates special measures that could further reduce the constrained cross-section design. This may include the removal of travel lane(s), conversion from two-way to one-way vehicular operations, restricting transit and/or heavy vehicles, and a shared low-speed street. If a project reaches this phase, the decision-making process may require discussion and coordination with relevant stakeholders.





Example: Removal of a travel lane

The removal of a travel lane should focus on the potential increase of people-carrying capacity that can be accommodated, such as for walking, cycling, and transit. In traditional evaluations, road performance is gauged by the flow and speed of motor vehicles. These traditional metrics focusing solely on motor vehicle volumes fail to encompass the full spectrum of activities occurring on urban streets, including the diverse social, cultural, and economic functions served by transit, walking, and cycling.

A more comprehensive assessment can be achieved by considering the number of people utilizing the road — referred to as its person throughput or person-carrying capacity. This approach offers a holistic understanding of how residents and visitors navigate a community. Whether for daily commutes or recreational outings, people are more likely to opt for transportation modes that offer reliability, convenience, and comfort.

Figure 4.4 illustrates the person-carrying capacity of a single lane by different modes during a peak period under normal operating conditions. It highlights the ability of transit to efficiently move large numbers of people within limited space. While a single lane on an urban street might accommodate between 600 to 1,600 people per hour by personal vehicle, a dedicated bus lane has the capacity to transport up to 8,000 people per hour.

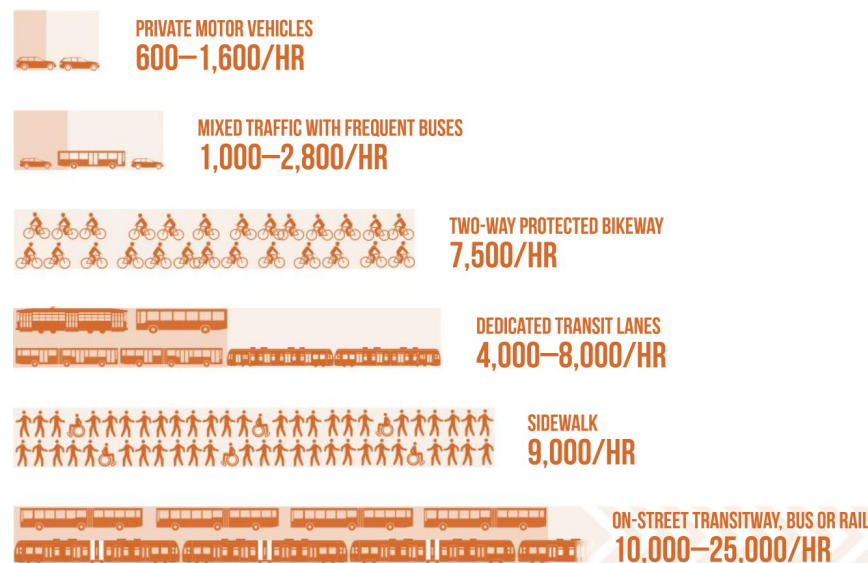


Figure 4.4: Person-Carrying Capacity of a Single Lane During Peak Conditions with Normal Operations (Source: NACTO Transit Street Design Guide)

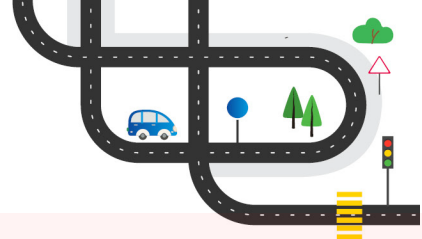
Prioritizing person-carrying capacity as a key metric helps to effectively design streets to prioritize transit and active transportation use and deprioritize personal vehicle use, thus contributing to broader objectives of encouraging shifts towards more efficient transportation modes that enhance the utilization of street space.



STEP 5: DEVELOP PREFERRED CROSS-SECTION

Step 5 summarizes the outcome of the preceding steps, which may lead to one or more design alternatives. The alternatives are evaluated against the project limits and priorities to establish the most suitable design.





Case Study #1: Urban Avenue with 26 m Right-of-Way

Case Study #1 is presented for a generic street classified as an Urban Avenue to demonstrate how the decision-making process can be applied to a scenario with competing uses for the road that must provide adequate space for people walking and cycling.

CASE STUDY #1 STEP 1: DEFINE PROJECT SCOPE AND PRIORITIES

For the purpose of Case Study #1, it has been assumed that this project will be a pavement rehabilitation to represent a scenario where the curbs are not reconstructed. To help understand the project limitations, the following guiding questions have been answered:

Table 4.2: Project Guiding Questions and Answers for Case Study #1

Guiding Question	Answers
<i>What type of project is being contemplated?</i>	The project will be a pavement rehabilitation.
<i>What is the road's current context?</i>	The road currently has: two lanes in each direction sidewalks on both sides with hydro poles on the south side and light poles on the north side on-street bike lanes some planting alternating with lighting adjacent mixed use (residential, retail, commercial) along the road
<i>What is the road's planned context?</i>	Upgrade cycling facility to protected bike lanes.
<i>How does the road fit into the broader network?</i>	There are bus routes along this street, with curbside bus stops at the intersections. It is assumed that these bus stops are excluded from the cross-section design and will be addressed at the intersections.



Guiding Question	Answers
<i>Will future growth significantly change the usage of the street?</i>	There is a future transit hub proposed further south of the street. This will attract a high number of people walking and using transit.
<i>What is the most appropriate street typology?</i>	It is assumed to be an Urban Avenue.
<i>What is the existing right-of-way? Is there additional width designated by the Region?</i>	The existing and designated right-of-way is 26 m, with a curb-to-curb width of 17.6m.
<i>Are there any fixed elements that pose design constraints?</i>	There are hydro poles and light poles on either side of the street. The project does not plan to relocate the hydro poles.

Figure 4.5 provides an illustration of the existing cross-section context provided.

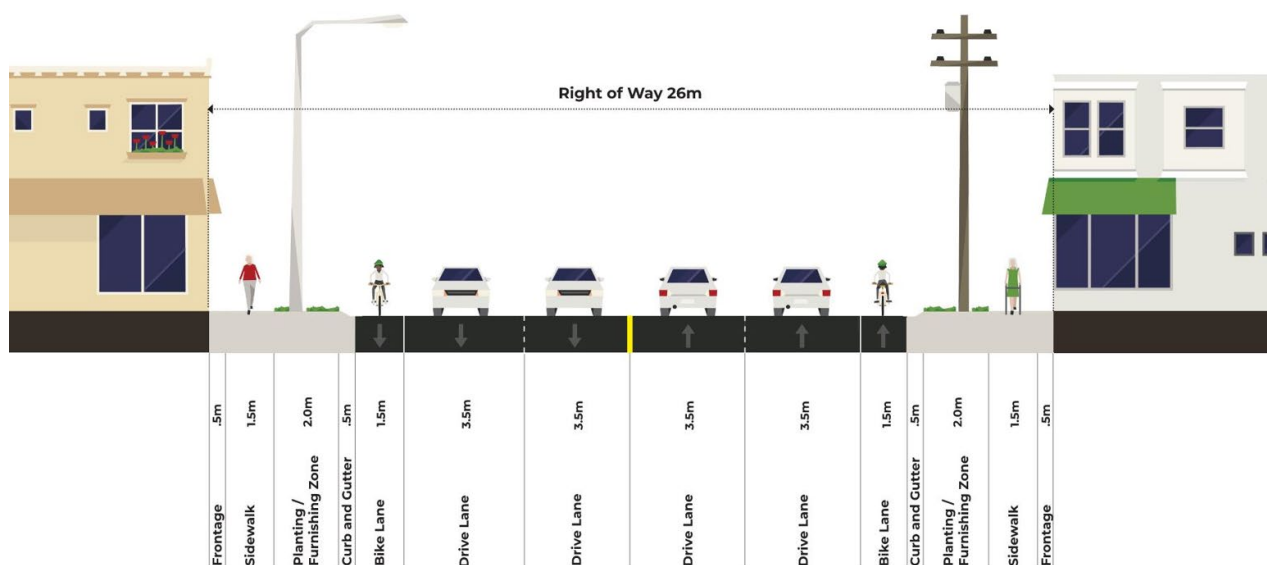


Figure 4.5: Existing Cross-Section for Case Study #1 - Urban Avenue - 26 m ROW

Based on the answers above, the following priorities have been established to maximize potential for active transportation and transit users, while still accommodating for other users:

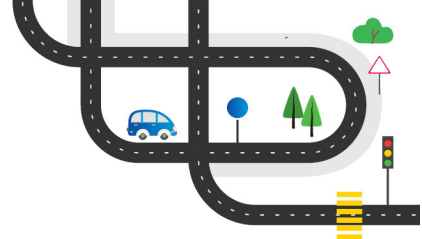


Table 4.3: Priority Level for Users for Case Study #1

Priority Level	Users	Infrastructure
Must	People walking, cycling and using transit	Sidewalks, cycling facilities, bus stops
Should	Business owners /customers, plants	Frontage, furnishing
Consider	People driving private vehicles	General travel lanes, lay-by

CASE STUDY #1 STEP 2: REVIEW DESIGN CRITERIA

The design criteria have been assessed for the cross-section elements within the curbs, excluding any changes to the pedestrian realm elements (sidewalk, frontage and furnishing). Given the pavement width constraints, where there is a range for suggested dimensions, the value has been chosen based on the minimum constrained values.

Table 4.4: Design Criteria Considerations for Case Study #1

Priority Level	Users	Infrastructure	Design Criteria
Must	People walking	Sidewalks	No changes to the pedestrian realm.
	People cycling	Cycling facilities	Assume constrained protected bike lanes. Range 1.5 – 2.0m one-way physically separated bike lane with 0.3 - 0.5m separation from people driving. Assume 1.5m bike lane with 0.5m separation buffer for jersey barrier. <i>Aligns with cycling facility targets for The Guide and with OTM Book 18 guidance.</i>
	People using transit	Bus stops	Bus stops can be excluded from midblock cross-sections , as they are located at the intersections.
Should	Business owners and customers	Frontage	No changes to the pedestrian realm.
	Plants	Furnishing	No changes to the pedestrian realm.
Consider	People driving private vehicles	General travel lanes	Maintain 3.5 m curb travel lanes in each direction and reduce 3m inner travel lane in each direction.
		Lay-by	Lay-by zones are not needed for Urban Avenues.



CASE STUDY #1 STEP 3: DETERMINE IF THERE IS ENOUGH SPACE

With a curb-to-curb width of 17.6m, there is enough space to satisfy the design criteria summarized above with no additional width available. As a pavement rehabilitation project, the pedestrian realm was excluded from design enhancements.



CASE STUDY #1 STEP 5: DEVELOP PREFERRED CROSS-SECTION

Overall, one alternative cross-section has been developed for Case Study #1, as shown in Figure 4.6.

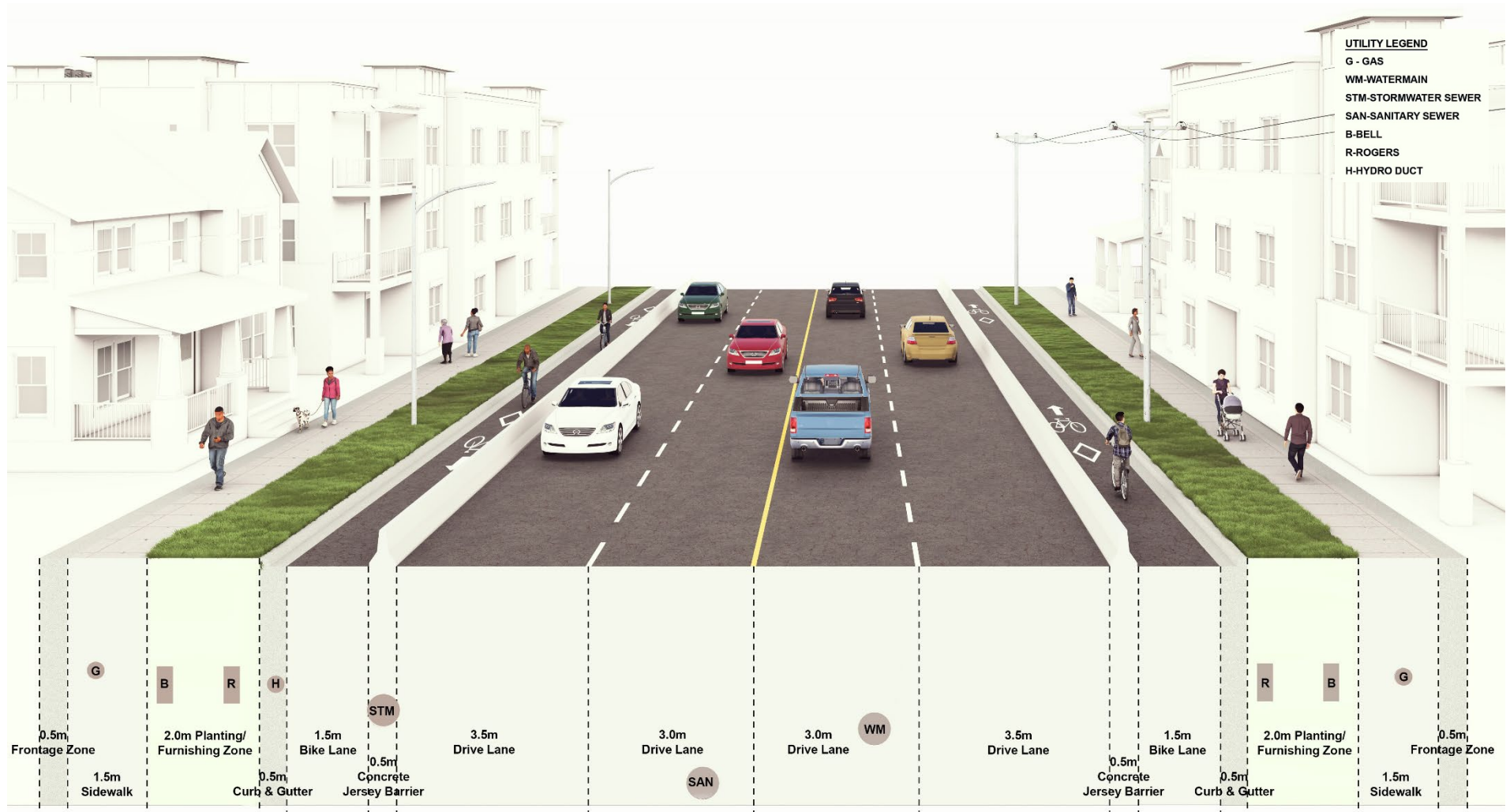
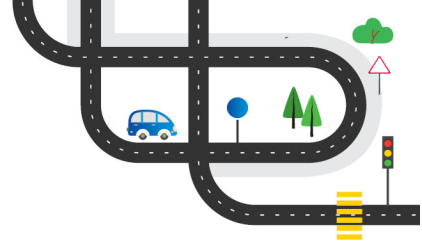


Figure 4.6: Proposed Cross-Section for Case Study #1 - Urban Avenue - 26 m ROW





Case Study #2: Urban Main Street with 20 m Right-of-Way

Case Study #2 is presented for a generic street classified as an Urban Main Street to demonstrate how the decision-making process can be applied to a scenario where the designated and/or existing right-of-way is much smaller than the respective typology right-of-way width per Chapter 2.

CASE STUDY #2 STEP 1: DEFINE PROJECT SCOPE AND PRIORITIES

For the purpose of Case Study #2, it has been assumed that this project will be a full reconstruction to narrow the curb-to-curb width for a lower speed environment. To help understand the project limitations, the following guiding questions have been answered:

Table 4.5: Project Guiding Questions and Answers for Case Study #2

Guiding Question	Answers
<i>What type of project is being contemplated?</i>	The project will be a full reconstruction.
<i>What is the road's current context?</i>	The street has an approximate 20m right-of-way, with: two lanes, painted bike lanes, and indented on-street parking in each direction sidewalks on both sides some planting alternating with lighting adjacent retail, food and drink uses along the road with parking lots
<i>How does the road fit into the broader network?</i>	There are bus routes along this road, with curbside bus stops at the intersections. It is assumed that these bus stops are excluded from the cross-section design and will be addressed at the intersections.
<i>Will future growth significantly change the usage of the street?</i>	No known future growth plans.



Guiding Question	Answers
<i>What is the most appropriate street typology?</i>	It is assumed to be an Urban Main Street.
<i>What is the existing right-of-way? Is there additional width designated by the Region?</i>	The Region has designated 20 m for the right-of-way, which aligns with the existing available space.
Are there any fixed elements that pose design constraints?	There are no hydro poles along the road (it is accommodated underground). There are streetlight poles on each side of the road alternating with planting, which could be relocated if necessary.

Figure 4.7 provides an illustration of the existing cross-section context explained provided.

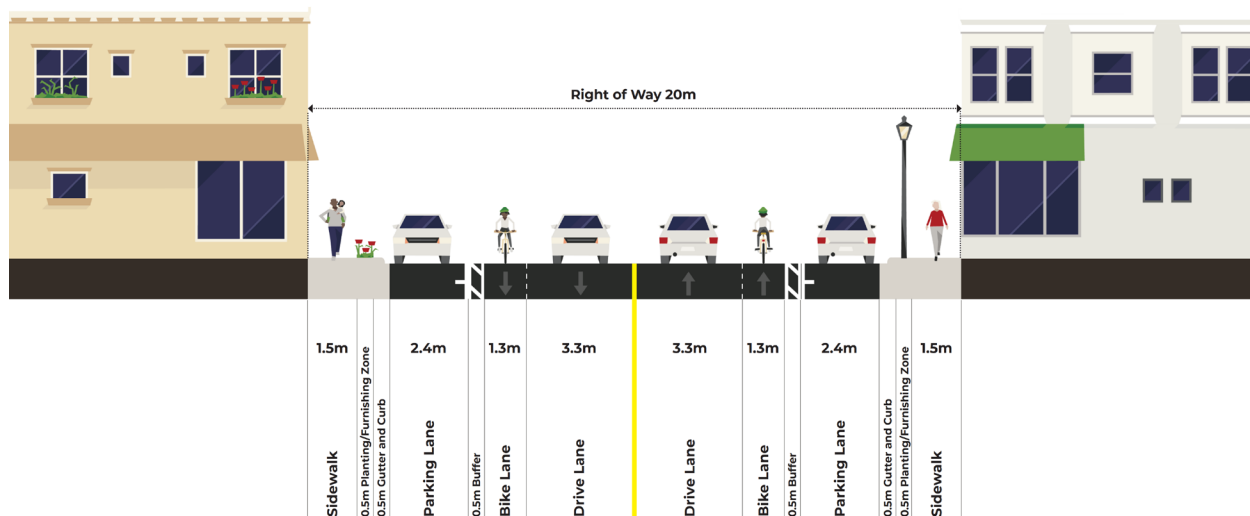


Figure 4.7: Existing Cross-Section for Case Study #2 - Urban Main Street - 20 m ROW

Based on the answers above, the following priorities have been established to maximize potential for active transportation and transit users, while still accommodating for other users.

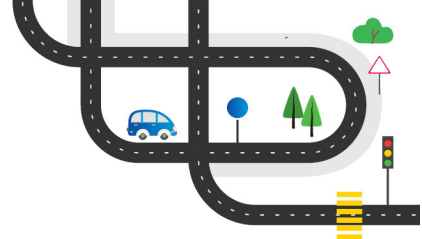


Table 4.6: Priority Level for Users for Case Study #2

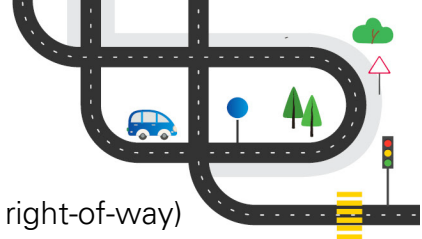
Priority Level	Users	Infrastructure
Must	People walking and cycling, business owners and customers, plant	Sidewalks, cycling facilities, Frontage zone, and furnishing
Should	People using transit	Bus Stops
Consider	People driving private vehicles	General travel lanes, lay-by

CASE STUDY #2 STEP 2: REVIEW DESIGN CRITERIA

The design criteria have been assessed for each cross-section element, and where there is a range for suggested dimensions, the value has been chosen based on the cross-section element priority.

Table 4.7: Design Criteria Considerations for Case Study #2 Step 2

Priority Level	Users	Infrastructure	Design Criteria
Must	People walking	Sidewalks	Provide 2.5m sidewalks , which aligns with pedestrian clearway targets for The Guide.
	People cycling	Cycling facilities	Range 2 – 2.5m one-way cycle track with 1.5+m physical separation from people driving. Assume 2.5m upper range for “Must” priority with 1.5m separation buffer. <i>Aligns with cycling facility targets for The Guide and with OTM Book 18 guidance.</i>
	Business owners and customers	Frontage zone	Preferred 1m for a main street frontage.
	Plant	Furnishing	Provide tree planting alternating with the existing streetlighting. Preferred +2m for trees Assume 3m for “Must” priority.
Should	People using transit	Bus stops	Bus stops can be excluded from midblock cross-sections, as they are located at the intersections.
Consider	People driving private vehicles	General travel lanes	Reduce roadway width to accommodate one 3.5m travel lane in each direction.
		Lay-by	Lay-by zones could be provided for Urban Main Street.



The “existing condition” and Urban Main Street (Example 1 with a 30m right-of-way) cross-section can be referenced to adapt the cross-section elements in accordance with the design criteria.

Figure 4.8 provides an illustration of the cross-section changes explained above in Step 2.

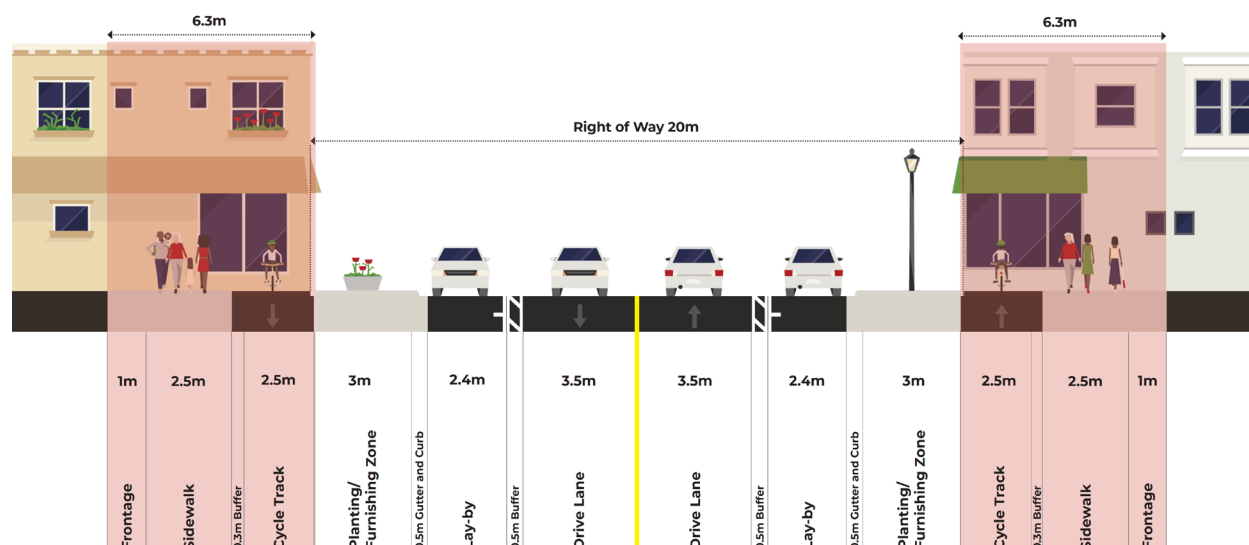


Figure 4.8: Intermediate Cross-Section for Case Study #2 - Urban Main Street - 20 m ROW

CASE STUDY #2 STEP 3: DETERMINE IF THERE IS ENOUGH SPACE

With an existing and designated right-of-way of 20m, there is not enough space to achieve the design criteria summarized above. Therefore, **Step 4** is required to investigate the trade-offs.

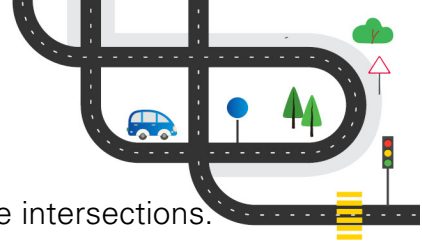
CASE STUDY #2 STEP 4: INVESTIGATE TRADE-OFFS

STEP 4 PHASE 1: REDUCE DIMENSIONS OF CROSS-SECTION ELEMENT(S)

First, the widths of the “Consider” elements have been reviewed as follows:

Promoting a lower speed environment is important for an Urban Main Street. Therefore, the travel lanes have been reduced to 3.3m (exclusive of gutter width) to provide traffic calming benefits.

Lay-by zones have been considered unnecessary in a constrained environment, so they have been removed.



Note that bus stops have been excluded because they are located at the intersections.

Figure 4.9 provides an illustration of the cross-section changes explained above in Step 4 Phase 1.1.

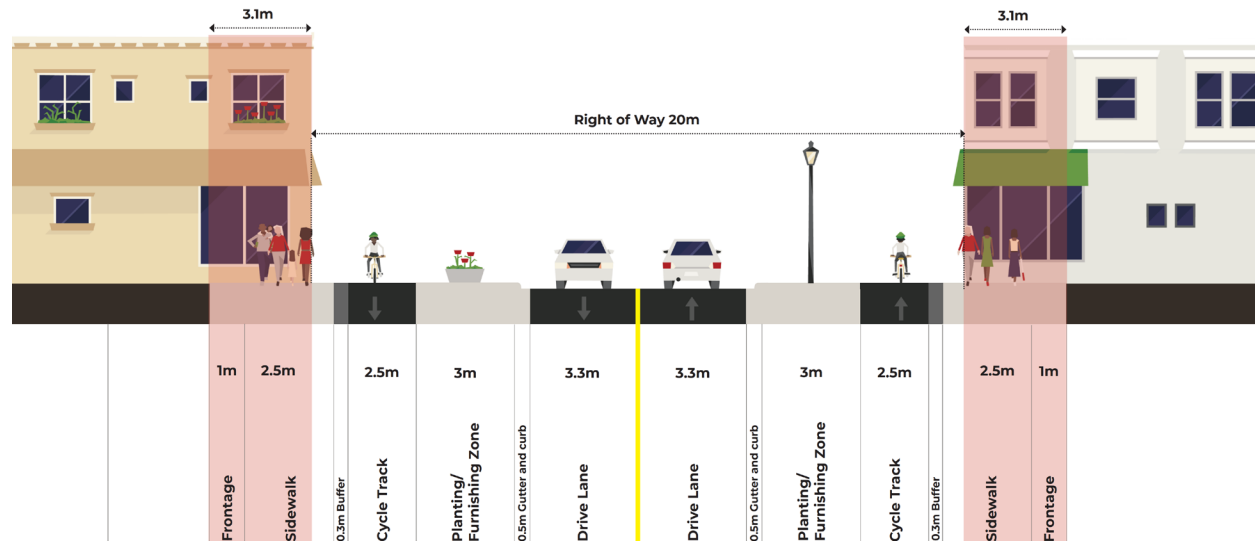


Figure 4.9: Intermediate Cross-Section with Step 4 Phase 1.1 Trade-offs for Case Study #2 - Urban Main Street - 20 m ROW

The reductions made to "Should" and "Consider" elements has not been adequate to achieve all elements within the 20m right-of-way; therefore, the "Must" elements have been investigated as follows:

The walking facilities (1.8m) and cycling facilities (1.8m) have been reduced but maintained within the lower end of their respective ranges, which has been considered acceptable.

The furnishing zone has been significantly reduced to 1.8m; however, trees can still be accommodated to provide shade and places to rest, which help to create inviting and comfortable public urban space.



Figure 4.10 provides an illustration of the cross-section changes explained above in Step 4 Phase 1.2.

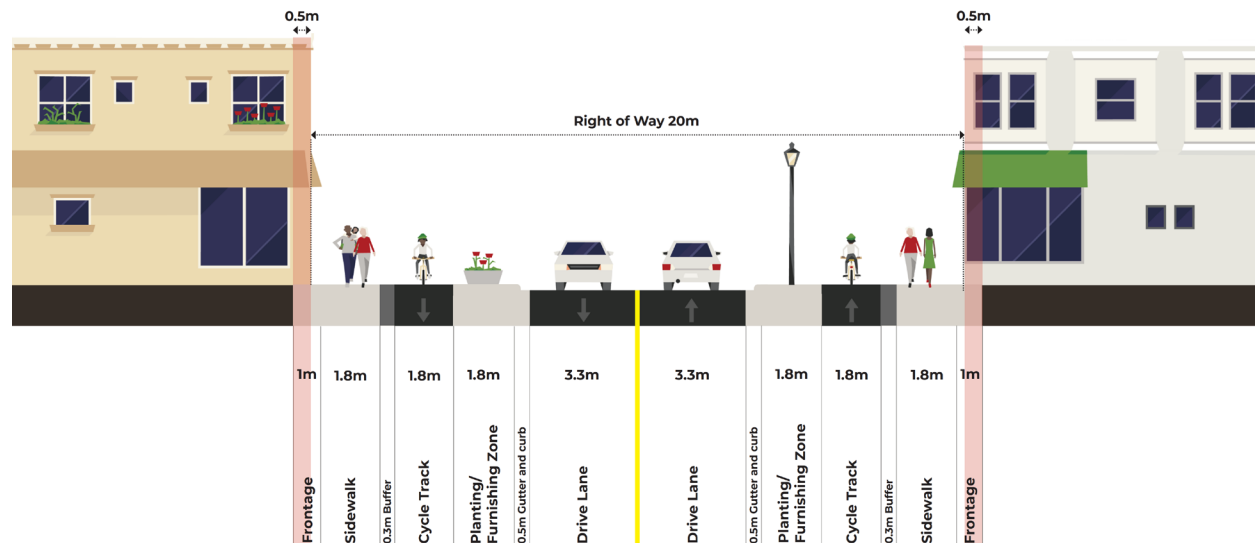


Figure 4.10: Intermediate Cross-Section with Step 4 Phase 1.2 Trade-offs for Case Study #2 - Urban Main Street - 20 m ROW

At this point, the cross-section still needs to be reduced by 1.0m, for which two options have been considered:

The frontage zone could be reduced to a minimum 0.5m on each side, instead of further reducing (or eliminating) the pedestrian, cycling or planting elements, to achieve a 20m right-of-way.

Proceed to **Step 4 Phase 2** to investigate if any elements can be reconfigured or combined to reduce the overall width.

For the purpose of Case Study #2, the first of the two options described above has been chosen based on the assumption that reducing the cross-section by an additional 1.0m is insignificant, and the frontage zone could still achieve its purpose at 0.5m. Therefore, summarizing the trade-offs established in **Step 4 Phase 1**, the design elements would be as follows:

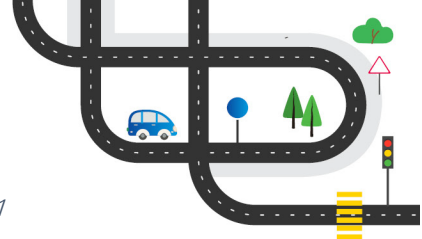


Table 4.8: Design Criteria Considerations for Case Study #2 Step 4 Phase 1

Priority Level	Users	Infrastructure	Design Criteria
Must	People walking	Sidewalks	Provide 2.5m sidewalks. Reduce to minimum 1.8m which aligns with pedestrian clearway minimum targets for The Guide.
	People cycling	Cycling facilities	Range 2 – 2.5m one-way cycle track with 1.5+m physical separation from people driving. Assume 2.5m upper range for “Must” priority with 1.5m separation buffer. Reduce to 1.8m plus 300mm buffer to sidewalk. <i>Aligns with cycling facility targets for The Guide and with OTM Book 18 guidance.</i>
	Business owners and customers	Frontage	Preferred 1m. Reduce to 0.5m , which can still achieve its purpose.
	Planting	Furnishing	Provide tree planting alternating with the existing streetlighting. Preferred +2m for trees Assume 3m for “Must” priority. Reduce to 1.8m, which can still accommodate trees , alternating with streetlighting
Should	People using transit	Bus stops	Bus stops can be excluded from midblock cross-sections, as they are located at the intersections.
Consider	People driving private vehicles	General travel lanes	Reduce curb to curb width to 7.2m, which accommodates a 3.3 m travel lane and a 0.3 m gutter in each direction.
		Lay-by	Do not provide lay-by zones.



CASE STUDY #2 STEP 5: DEVELOP PREFERRED CROSS-SECTION

Overall, one alternative cross-section has been developed for Case Study #2, as shown in Figure 4.11.



Figure 4.11: Proposed Cross-Section for Case Study #2 - Urban Main Street - 20 m ROW



Chapter 5

Intersections





Intersections

Street Design for Intersections

Intersections are places where all road users, including people driving, walking and cycling, interact while travelling in different directions at varying speeds. A high proportion of collisions happen at intersections, and in the Waterloo Region specifically, 70% of collisions occurred at intersections (based on 2018 data).

Designing a safe and complete transportation network necessitates a focus on intersections to ensure the safety of users is not compromised while maintaining traffic operation and network connectedness—particularly for cycling and pedestrian facilities.

This chapter begins by presenting high-level design principles for intersections. It then provides sample design treatments for five common intersection types, categorized based on intersecting street typologies and context. These sample intersections are not intended to cover every possible scenario. However, the design principles are intended to be broadly applicable, and serve as a starting point when considering situations that are not explicitly covered in this chapter.

The following documents are useful resources for further guidance on intersection design:

- Ontario Traffic Council (OTC) Protected Intersection Guide
- Ontario Traffic Manual (OTM) Book 12: Traffic Signals
- OTM Book 15: Pedestrian Crossing Treatments
- OTM Book 18: Cycling Facilities
- National Association of City Transportation Officials' (NACTO) Don't Give Up at the Intersection
- Transportation Association of Canada (TAC) Canadian Roundabout Design Guide
- National Cooperative Highway Research Program (NCHRP) Report 672 Roundabouts: An Information Guide
- NCHRP Report 737: Design Guidance for High Speed to Low-Speed Transition Zones for Rural Highways
- Roundabouts: An Informational Guide
- TAC Geometric Design Guide for Canadian Roads, and Accessibility for Ontarians with Disabilities Act (AODA) Regulation 191/11:
- Integrated Accessibility Standards for Exterior Paths of Travel
- Grand River Transit (GRT) Bus Stop Design Guidelines





Intersection Design Principles

Overarching themes were extracted from the relevant resources to inform the design principles, which have been deconstructed below to address the main considerations for intersection design.

Spatial Separation: Spatial separation between vulnerable road users and motor vehicles is usually considered mid-block and should be maintained through the intersection to minimize conflicts with turning motor vehicles. Spatial techniques for maintaining separation between people driving walking, and cycling include vertical separation, setback stop bars and crosswalks/rides for improved visibility, designated separated facilities, and smaller curb radii to allow for improved sight lines.

Temporal Separation: Temporal separation can take various forms of dedicated traffic movements like leading pedestrian intervals, pedestrian scrambles, elimination of permissive left-turn, and right-turn-on-red prohibition. This design principle can be an effective tool for minimizing dangerous conflicts between motor vehicles and vulnerable road users.

In areas where there are frequent conflicts between vulnerable road users and turning motor vehicles, or when it is not possible to reduce motor vehicle speeds through geometric design, using protected signal phasing can effectively mitigate these conflicts.

Reduced Motor Vehicle Speed: “Safe speeds” is a core pillar of the safe system approach. Lower motor vehicle speeds result in increased reaction time for road users interacting with one another at the intersection. Research has shown that slower turning speeds result in increased yielding rates of people driving. Where people driving turn permissively across the path of people walking or cycling, a turning speed of 15 km/h or less is recommended.

Maximize Visibility: All road users need to have clear sight lines to one another approaching and entering intersections, allowing them to identify potential conflicts and necessary reactions on time. Positioning people walking and cycling ahead of the motor vehicle traffic by advanced stop bars for people cycling or set back distance for motor vehicles could be used to improve visibility at intersections. Leading pedestrian and bicycle signal intervals are an additional step which protect people walking and cycling at the intersection.

Minimize Delay: The more delay users experience at intersections, the higher the frequency of risky behaviour by road users at intersections. Safety design elements at intersections that pose unnecessary delay will not be effective. Therefore, minimizing



unnecessary stop signs on low-speed routes, providing refuge islands for two-stage crossing, reducing cycle lengths of traffic signals, and effective signal coordination are helpful strategies for minimizing delays at intersections.

Use Clear and Consistent Design Language: Clear pavement markings and signage should be consistently used throughout intersections to highlight conflict zones and communicate the right-of-way and expected yielding behaviour. Consistent signage across all intersections throughout the region will eliminate confusion among road users.

Accessibility: Intersections should be accessible to all road users with different ranges of abilities. Curb cuts, attention and directional tactile walking surface indicators (TWSI), audible signals, and other accessibility features should be used to ensure people experiencing disability can safely navigate the intersection.

Effective Transition of Active Transportation Facilities: It is important to determine a safe transition of active transportation facilities for vulnerable road users, before reaching the intersection to ensure the path of travel is predictable for these users as well as people driving. Highlighting cross rides or crosswalks with appropriate surface treatment and determining safe space requirements and geometric design for crossings helps ensure the travel path is connected throughout the network.



Geometric Considerations

The following factors influence geometric design and considerations at intersections.

Design Vehicle: the largest typical motor vehicle that is expected to regularly use the intersection and intersecting streets. The right-turning paths of a design vehicle inform the intersection corner curb radii to ensure the motor vehicle body remains within its travel lane.

Control Vehicle: the largest infrequent motor vehicle that is expected to use the intersection and intersecting streets. Control vehicles are typically larger than the design vehicle, with larger turning paths. Therefore, control vehicles may encroach into the opposing travel lane or take up to three receiving travel lanes where available to complete their turn, to avoid designing larger corner radii for infrequent motor vehicles.

Managed Vehicle: the most common motor vehicle to use the street. These motor vehicles are typically smaller than the design and control vehicles, and are more capable of higher and more dangerous speeds. Managed vehicles are typically personal motor vehicles.

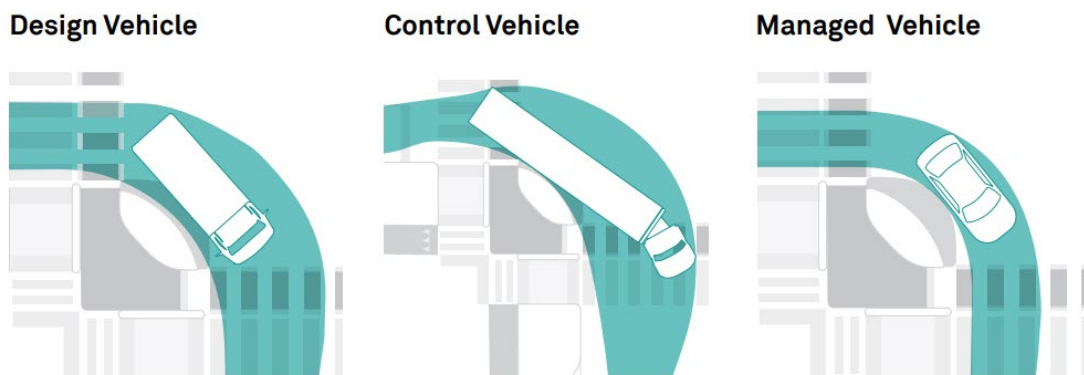
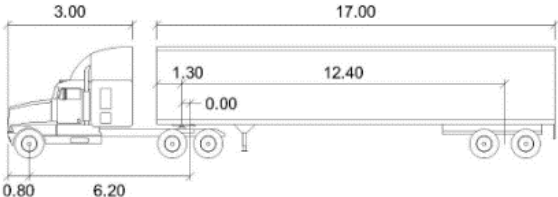
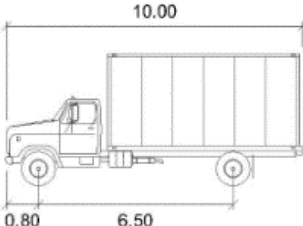
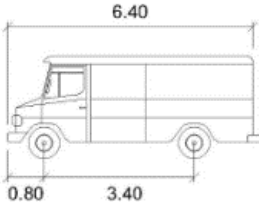
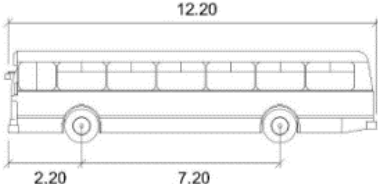


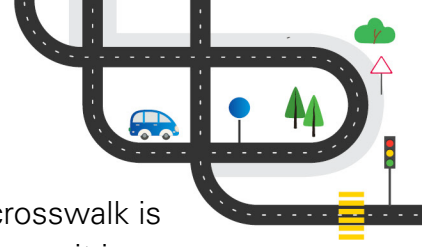
Figure 5.1: Design, Control, Managed Vehicles at Intersections (Source: NACTO).

The following motor vehicles are defined by TAC Geometric Design Guideline for Canadian Roads, which includes the typical dimension for each motor vehicle:



Table 5.1: Dimensions of Design and Control Vehicles based on TAC Geometric Design Guideline for Canadian Roads

Vehicle	Typical Dimensions																
WB-20 tractor semi-trailer	 WB-20 meters <table><tr><td>Tractor Width</td><td>: 2.60</td><td>Lock to Lock Time</td><td>: 6.0</td></tr><tr><td>Trailer Width</td><td>: 2.60</td><td>Steering Angle</td><td>: 28.3</td></tr><tr><td>Tractor Track</td><td>: 2.60</td><td>Articulating Angle</td><td>: 70.0</td></tr><tr><td>Trailer Track</td><td>: 2.60</td><td></td><td></td></tr></table>	Tractor Width	: 2.60	Lock to Lock Time	: 6.0	Trailer Width	: 2.60	Steering Angle	: 28.3	Tractor Track	: 2.60	Articulating Angle	: 70.0	Trailer Track	: 2.60		
Tractor Width	: 2.60	Lock to Lock Time	: 6.0														
Trailer Width	: 2.60	Steering Angle	: 28.3														
Tractor Track	: 2.60	Articulating Angle	: 70.0														
Trailer Track	: 2.60																
Medium Single Unit (MSU) truck	 MSU meters <table><tr><td>Width</td><td>: 2.60</td></tr><tr><td>Track</td><td>: 2.60</td></tr><tr><td>Lock to Lock Time</td><td>: 6.0</td></tr><tr><td>Steering Angle</td><td>: 40.1</td></tr></table>	Width	: 2.60	Track	: 2.60	Lock to Lock Time	: 6.0	Steering Angle	: 40.1								
Width	: 2.60																
Track	: 2.60																
Lock to Lock Time	: 6.0																
Steering Angle	: 40.1																
Light Single Unit (LSU) truck	 LSU meters <table><tr><td>Width</td><td>: 2.60</td></tr><tr><td>Track</td><td>: 2.60</td></tr><tr><td>Lock to Lock Time</td><td>: 6.0</td></tr><tr><td>Steering Angle</td><td>: 40.8</td></tr></table>	Width	: 2.60	Track	: 2.60	Lock to Lock Time	: 6.0	Steering Angle	: 40.8								
Width	: 2.60																
Track	: 2.60																
Lock to Lock Time	: 6.0																
Steering Angle	: 40.8																
B-12 single unit bus	 B-12 meters <table><tr><td>Width</td><td>: 2.40</td></tr><tr><td>Track</td><td>: 2.40</td></tr><tr><td>Lock to Lock Time</td><td>: 6.0</td></tr><tr><td>Steering Angle</td><td>: 37.1</td></tr></table>	Width	: 2.40	Track	: 2.40	Lock to Lock Time	: 6.0	Steering Angle	: 37.1								
Width	: 2.40																
Track	: 2.40																
Lock to Lock Time	: 6.0																
Steering Angle	: 37.1																



Setback: the setback refers to the distance which the crossside and/or crosswalk is offset back from the adjacent travel lane. People walking and cycling can wait in an area that improves visibility for people driving and turning left and right. The OTC Protected Intersection Guide should be referenced for further geometric considerations.

Corner Radii: the corner radii corresponds to the size of the intersection corner, and can influence the speed of motor vehicles turning the corner. The corner radius is typically determined by analyzing the effective turning radius, which is based on the turning path of the design and control vehicles. A smaller corner radii may be adopted, if other elements are present (such as on-street parking, bike lanes, limited sightlines, or multiple receiving travel lanes) to force people driving to take a larger turning path.

Turning speed has a direct correlation with increased collisions and severe or fatal injuries of people walking and cycling at intersections. Based on research, every 1 km/h increase in speed is associated with a 6.3% increase in likelihood of injury. Smaller corner radii help lower turning speeds and improve driver reaction times, reducing the likelihood and severity of collisions with vulnerable road users at intersections. Where smaller corner radii are present in existing built intersections, they should be maintained unless there are operational concerns.

Each motor vehicle's turning radius provides the most restrictive condition to be applied when determining corner radii. The design and control vehicle identified for each intersection type ensures all motor vehicle types at the intersection can successfully make the turning movements.



Table 5.2 summarizes the influencing factors to be adopted in the development of intersection design.

Table 5.2: Geometric Considerations for Intersection Types (adapted from Table 2 of the Ontario Protected Intersection Guide)

Intersecting Typologies	Intersection Corner Type	Design Vehicle	Control Vehicle	Target Effective Turning Radius
Urban Main/Avenue – Lower-tier street	Lower-tier street	LSU	MSU/B-12	6.0 – 9.0 m
Urban Avenue – Urban Main	Urban Main	MSU	B-12	6.0 – 9.0 m
Urban Avenue – Urban Avenue	Urban Avenue	B-12	WB-20	6.0 – 10.0 m
Urban Connector – Urban Avenue	Urban Avenue	B-12	WB-20	6.0 – 10.0 m
Urban Connector – Urban Connector	Urban Connector	WB-20	WB-20	8.0 – 15.0 m
Rural Connector – Rural Connector	Rural Connector	MSU	WB-20	8.0 – 15.0 m

- *Select B-12 as a design vehicle if regularly scheduled transit vehicles are expected to make the turn; otherwise, the B-12 should be considered a control vehicle for street type.*
- *If a specific type of large vehicle makes more than 10 turns in the peak hour, consider making it the design vehicle.*
- *For industrial areas where Long Combination Vehicles (LCVs) are expected to turn at the corner, LCVs should be considered an additional control vehicle for the corner.*
- *Where the control vehicle cannot be accommodated with a 15 m radius, consider using a two-centred compound curve at the corner with the smaller radius starting at the approach lane.*
- *In all cases, roads should be sized to enable the passage of emergency vehicles. It is common to allow these vehicles use of the entire roadway to complete turns. Fire trucks should be assessed at all intersection corners with a motor vehicle speed of 10-15 km/h.*



Transit Integration

Transit Stops

When a transit stop is incorporated into the intersection design, there are two preferred stop types, based on the transit mode.

Buses: Island Boarding Stop

A dedicated platform situated between the travel lanes and separated cycling facility. This allows buses to stop without leaving the travel lane. Passengers board and alight from the island, crossing the cycling facility at designated crosswalks. This setup minimizes conflicts between transit vehicles and people cycling by maintaining continuous bike lanes and reduces transit vehicle delays caused by re-entering traffic.

Island boarding stops have been illustrated on the following intersection examples:

- Unsignalized Urban Intersection
- Signalized Urban Intersection
- Signalized Urban Intersection with Light Rail Transit

Other key features include:

- Tactile walking surface indicators (TWSI) should be incorporated to comply with AODA standards.
- Shelters should be placed on the far side of the island, opposite the travel lanes, and open towards the transit vehicle.
- Manage conflicts with people cycling where cycling facilities are adjacent to the transit stop. Refer to OTM Book 18 for the relevant design guidelines. For example, the Urban Connector Example 1 demonstrates a crosswalk between the pedestrian realm and transit stop, as shown in **Figure 5.2**.

For more guidance on bus stop design, dimensioning and preferred location of bus stops at intersections refer to the GRT Bus Stop Design Guidelines for Region specific recommendations.



Figure 5.2: Island Boarding Stop on Urban Connector

LRT: Centre Median Platform Stop

A centre median platform is located in the middle of the roadway, with the dedicated LRT lanes and travel lanes on each side. Passengers board and alight on the platform, which is accessed via signalized crosswalks from the pedestrian realm, reducing the conflicts with people cycling and driving.

For LRT stations, the design criteria have been developed as part of the ION projects.

Centre median platform stops have been illustrated on the **Signalized Urban Intersection for Light Rail Transit** example.

Other key features include:

- Tactile walking surface indicators (TWSI) should be incorporated to comply with AODA standards.



Figure 5.3: LRT Centre Median Platform Stop at the Grand River Hospital Station, Kitchener (Source: Google Maps, 2024)



Transit Priority Measures

Effective integration of transit priority measures during the street design process is essential for increasing the speed, reliability, and efficiency of the Region's transit operations. Implementing these measures within the right-of-way can significantly reduce operating costs, increase service & fleet availability, and make transit service more attractive – encouraging higher ridership.

Transit Signal Priority involves adjusting signal timings to favor transit vehicles, in order to minimize delays at intersections. TSP is effective when paired with other interventions such as far-side transit stops and dedicated transit lanes. The Region has activated TSP for the LRT routes and key intersections. Further implementation of TSP could enhance the reliability of the Region's transit network.

Queue Jump Lanes are short travel lanes at intersection approaches that allow transit vehicles to bypass general traffic. Queue jump lanes are most effective when paired with a leading transit signal. They are suitable for intersections with significant congestion, providing transit vehicles with a dedicated lane to jump ahead of general traffic. They can also be implemented for turning movements.



Recommended Intersection Design Approaches

Based on geometric constraints, intersection design examples have been developed to provide a fundamental understanding of the Region's preferred approach when designing intersections, based on the typologies.

Unsignalized Urban Intersection

The unsignalized urban intersection example is comprised of an Urban Avenue intersecting with a lower-tier road. In the context of the Region of Waterloo, three-leg intersections can minimize potential conflicts between road users when compared to the traditional four-leg intersections, and they may be appropriate when transitioning from residential neighbourhoods to higher-tier roads.

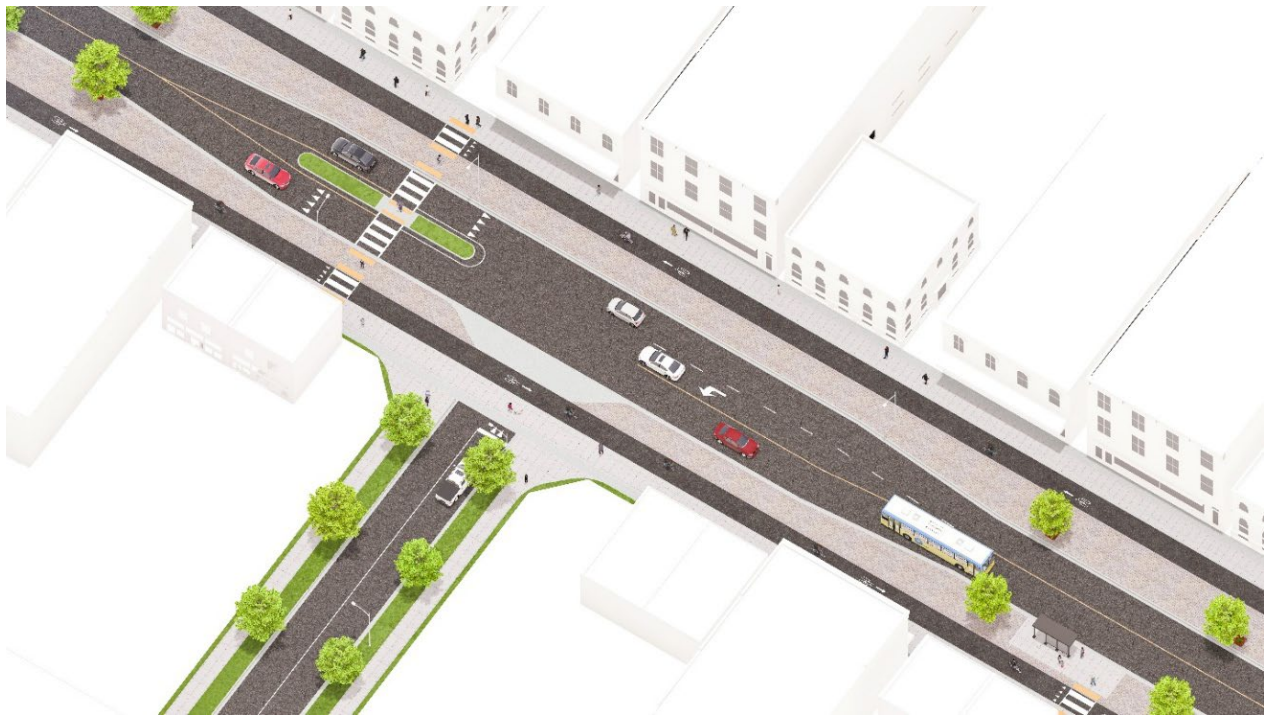
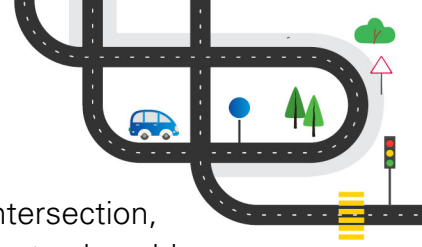


Figure 5.4: Unsignalized Urban Intersection Example

The design illustrates a stop-controlled minor road, with dedicated separate walking and cycling facilities, island boarding bus stops, and pedestrian crossings. Other key features incorporated into the intersection design include:



- The raised cycle track and sidewalk are continuous through the intersection, which maintains priority for people walking and cycling, as the most vulnerable users on the road.
- Smaller curb radii helps slow down motor vehicles turning, which can improve visibility between people driving and people on the boulevard.
- There is a staged crossing point at the pedestrian refuge island to cross the cycle tracks and travel lanes, including tactile warning surface indicators (TWSIs) to identify safe waiting areas for people with mobility and visual impairments. A staged crossing design shortens the crossing distance into incremental stages, which allows people to take rests and eliminates the need to navigate two-way traffic in one crossing.
- A dedicated left-turn lane on the major road, to improve operational capacity and minimize queues by removing the left-turning motor vehicles from through traffic.
- Island boarding bus stops on the far-side of the intersecting road, with a crosswalk on the cycle track to manage conflicts between people using transit and cycling.



Signalized Urban Intersection

The signalized urban intersection example is comprised of two-lane Urban Avenues and incorporates protected intersection elements to create a safe environment for people walking and cycling and minimize potential conflicts with motor vehicles.



Figure 5.5: Signalized Urban Intersection Example

The design illustrates protected corners for people cycling, dedicated separate walking and cycling facilities, island boarding bus stops, separate signalized crosswalks and crossrides on each leg. Other key features incorporated into the intersection design include:

- Smaller curb radii helps slow down motor vehicles turning, which can improve visibility between people driving and people on the boulevard.
- Layby with a buffer to the cycle track, in order to minimize conflicts between motor vehicle doors and people cycling.
- Dedicated left-turn lanes to improve operational capacity by removing the left-turning motor vehicles from through traffic.
- Island boarding bus stops located on the far-side of the intersection, with a crosswalk on the cycle track to manage conflicts between people using transit and cycling.



Signalized Urban Intersection For Light Rail Transit

The signalized urban intersection example is comprised of a two-lane Urban Avenue with light rail transit, and a four-lane Urban Connector. The design incorporates protected intersection elements to create a safe environment for people walking and cycling, and minimize potential conflicts with motor vehicles.



Figure 5.6: Signalized Urban Intersection for Light Rail Transit Example

The design illustrates protected corners for people cycling, dedicated separate walking and cycling facilities, island boarding bus stops, centre-median LRT platform stops, separate signalized crosswalks and crossrides on each leg. Other key features incorporated into the intersection design include:

- Dedicated left-turn lanes to improve operational capacity by removing the left-turning motor vehicles from through traffic.
- Island boarding bus stops located on the far side of the intersection, with a crosswalk to manage conflicts between people using transit and cycling.
- Centre-median LRT platform stops located on the far-side of the intersection, with staged crossing points at the cycle tracks and platforms. TWSIs are used to identify safe waiting areas for people with mobility and visual impairments. A staged crossing design shortens the crossing distance into incremental stages, which allows people to take rests and eliminates the need to navigate two-way traffic in one crossing.



Rural Single Lane Roundabout

The rural single lane roundabout example is comprised of two-lane Rural Connectors. The Region's preferred rural design approach is single lane roundabouts to minimize potential conflicts between motor vehicles and horse and buggies.



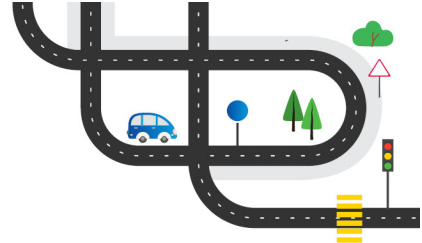
Figure 5.7: Rural Single Lane Roundabout Example, Line 86 & Floradale Rd

The example above illustrates a buffer between the roadway and paved shoulder or multi-use path for people walking and cycling, with un-controlled crosswalks. Other key features incorporated into the roundabout design example include:

- Uncontrolled crossings are setback from the roundabout yield line to improve visibility between people driving and non-motorised users, given people driving have priority over people crossing.
- There are staged crossing points at the median islands to cross the travel lanes, which shortens the crossing distance to allow people to take rests and eliminates the need to navigate two-way traffic in one crossing.
- The gravel shoulders on the Rural Connectors taper down, therefore horse and buggies are expected to merge into the travel lanes when travelling through the roundabouts.

Glossary





Glossary

All Ages and Abilities: A principle for planning and designing cycling facilities to ensure they are safe, comfortable, and accessible for people with a wide range of abilities and experience levels, including families with children, women, seniors, and new riders.

Complete Street: A principle for planning, designing, and operating a road right-of-way to safely accommodate various needs, including walking, cycling, transit, goods movement, personal vehicle use, green infrastructure, and utilities. They integrate mobility, safety, and placemaking functions in a context-sensitive way.

Driver Reaction Time: The time a person driving needs to perceive and respond to a hazard, used in designs for stopping sight distance.

Horizontal Deflection: A lateral shift in the path of a motor vehicle, such as curb extensions, used in traffic calming to reduce motor vehicle speeds and improve overall road safety.

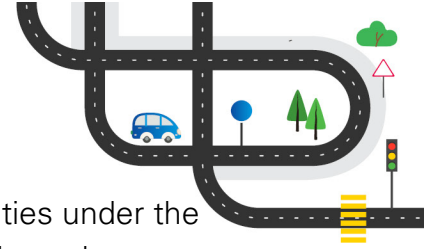
Lay-Bys: Lay-bys allow for commercial operations (e.g. deliveries) and short-term on-street parking in both rural and urban main streets. Lay-bys can also accommodate accessible on-street parking when designed to AODA standards. Lay-bys are generally not intended for the long-term storage of vehicles

Person-carrying Capacity or Person Throughput: The number of people a road corridor can move per unit time, considering all travel modes (such as transit, cycling, walking, and motor vehicles).

Placemaking: Designing streets and public spaces to be vibrant, attractive, and functional to support community identity and economic vitality alongside mobility.

Public Realm: The shared outdoor spaces between buildings that are publicly accessible (including streets, sidewalks, plazas, and parks) designed for social interaction, mobility, and placemaking.

Rapid Transit Network: A high-capacity, frequent transit system, such as light rail transit, operating on dedicated or priority corridors to move large volumes of people efficiently.



Right-of-way: The legal width of land reserved for transportation and utilities under the jurisdiction of a municipality, including travel lanes, sidewalks, boulevards, and sometimes green infrastructure.

Sight Distance: The length of roadway visible to a person driving, allowing time to perceive hazards, react, and stop safely. This includes stopping sight distance and passing sight distance.

Spatial Separation: Physical separation between different travel modes (such as using curbs, buffers, and physical barriers) to reduce user conflicts and improve overall road safety. This is commonly applied in the design of pedestrian and cycling facilities.

Target Operating Speed: The intended speed that people driving should travel at based on street context, not just posted speed limits. It influences lane widths, curb radii, and traffic calming to achieve safety goals. Unless otherwise indicated, target operating speed should equal "design speed" used in the TAC Geometric Design Guide for Canadian Roads and other similar guidelines.

Temporal Separation: Using time-based controls, such as traffic signal phasing or protected traffic signal phasing for people walking, to separate conflicting movements of the same travel mode or of different travel modes at intersections.

Vulnerable Road Users: People who are at greater risk of injury in the event of a collision, including people who walk, people who use mobility devices, seniors, children, and people who cycle / roll. They lack the physical protection of a motor vehicle.

Maps



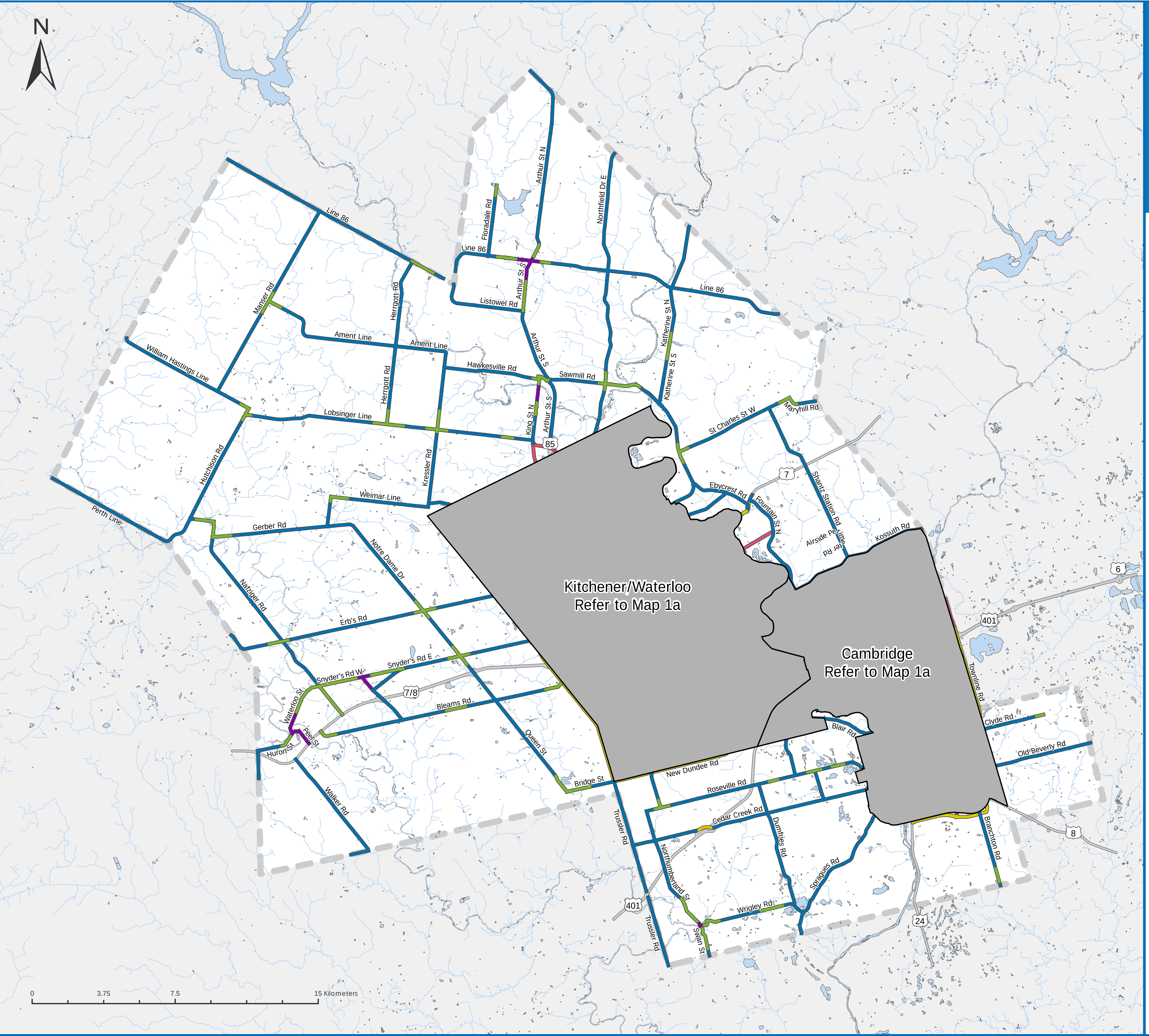


MAP 1

Corridor Classifications

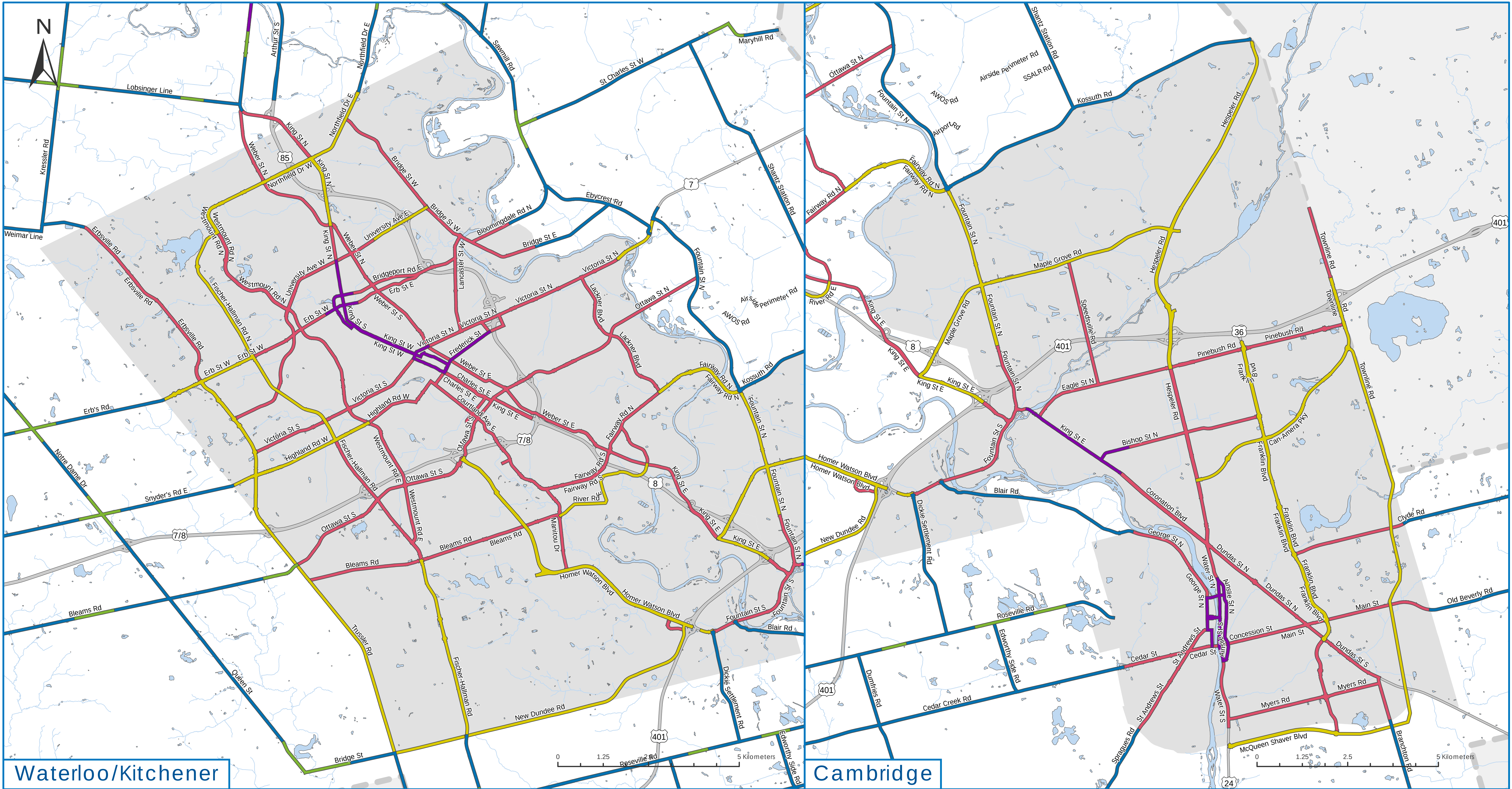
Legend

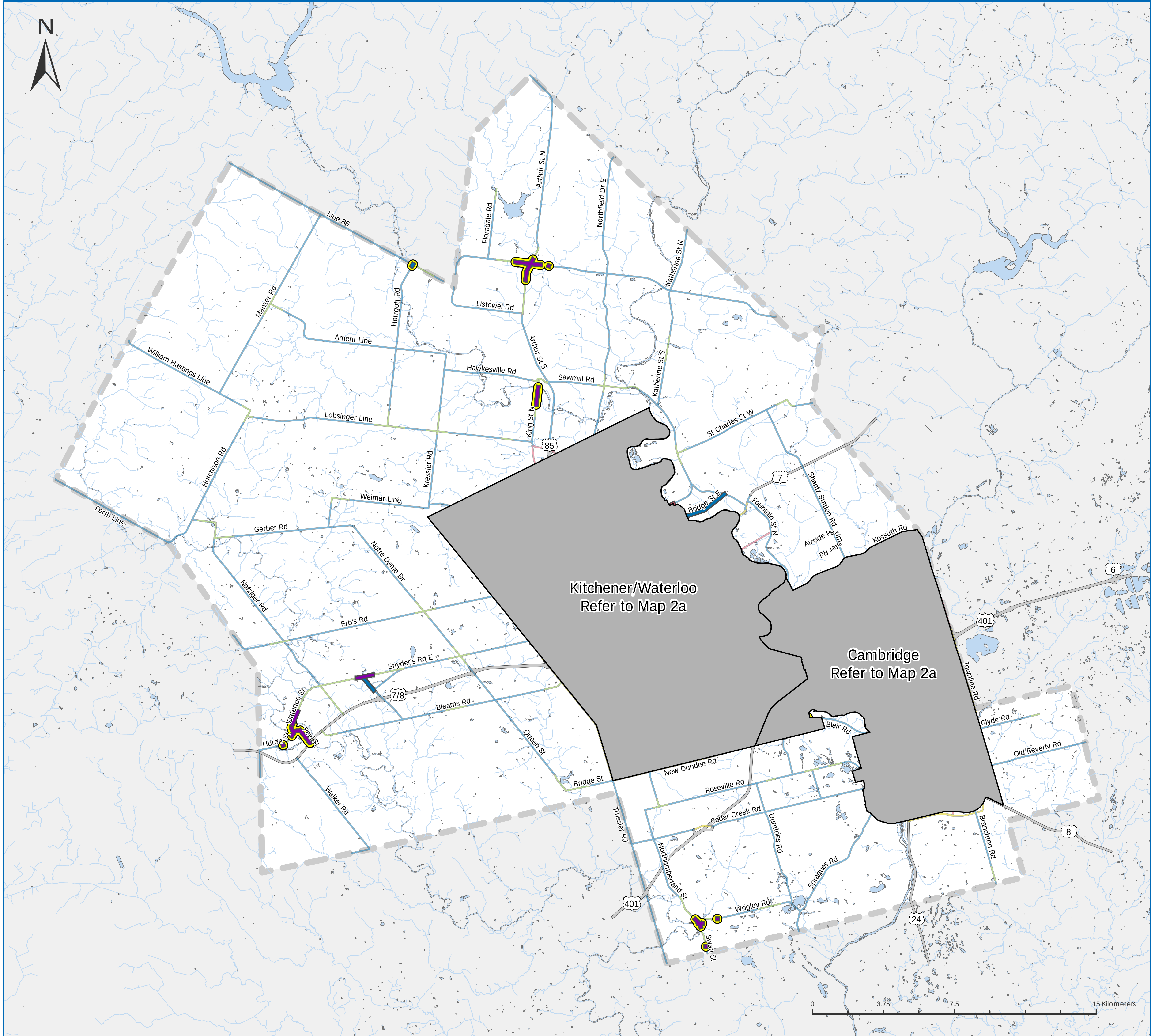
	Rural Main Street		Provincial Highway
	Rural Connector		
	Urban Connector		
	Urban Main Street		
	Urban Avenue		



Data retrieved from the Region of Waterloo and Ontario Geohub.







DECEMBER 2025

Legend

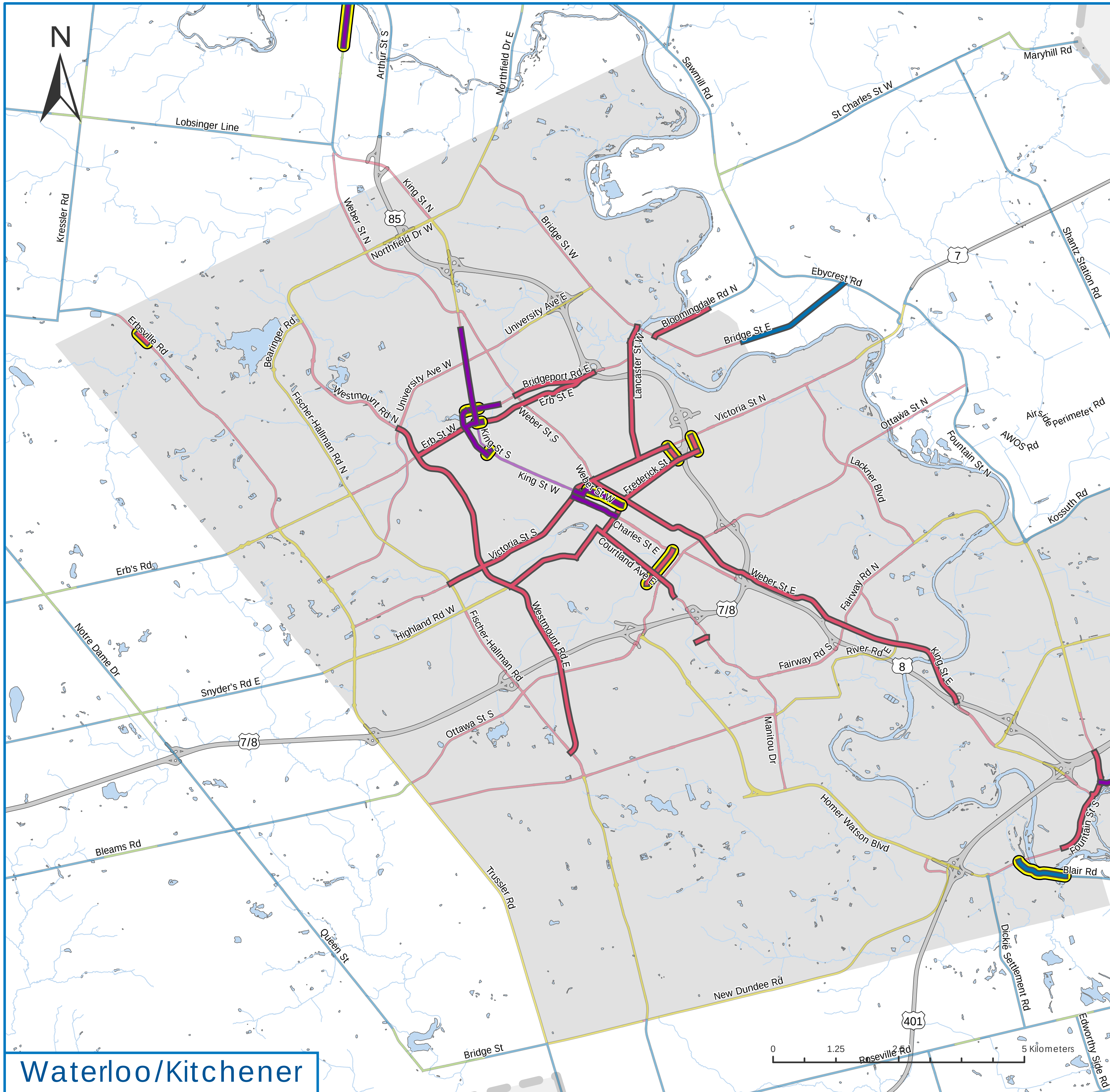
Urban Main Street

Urban Avenue

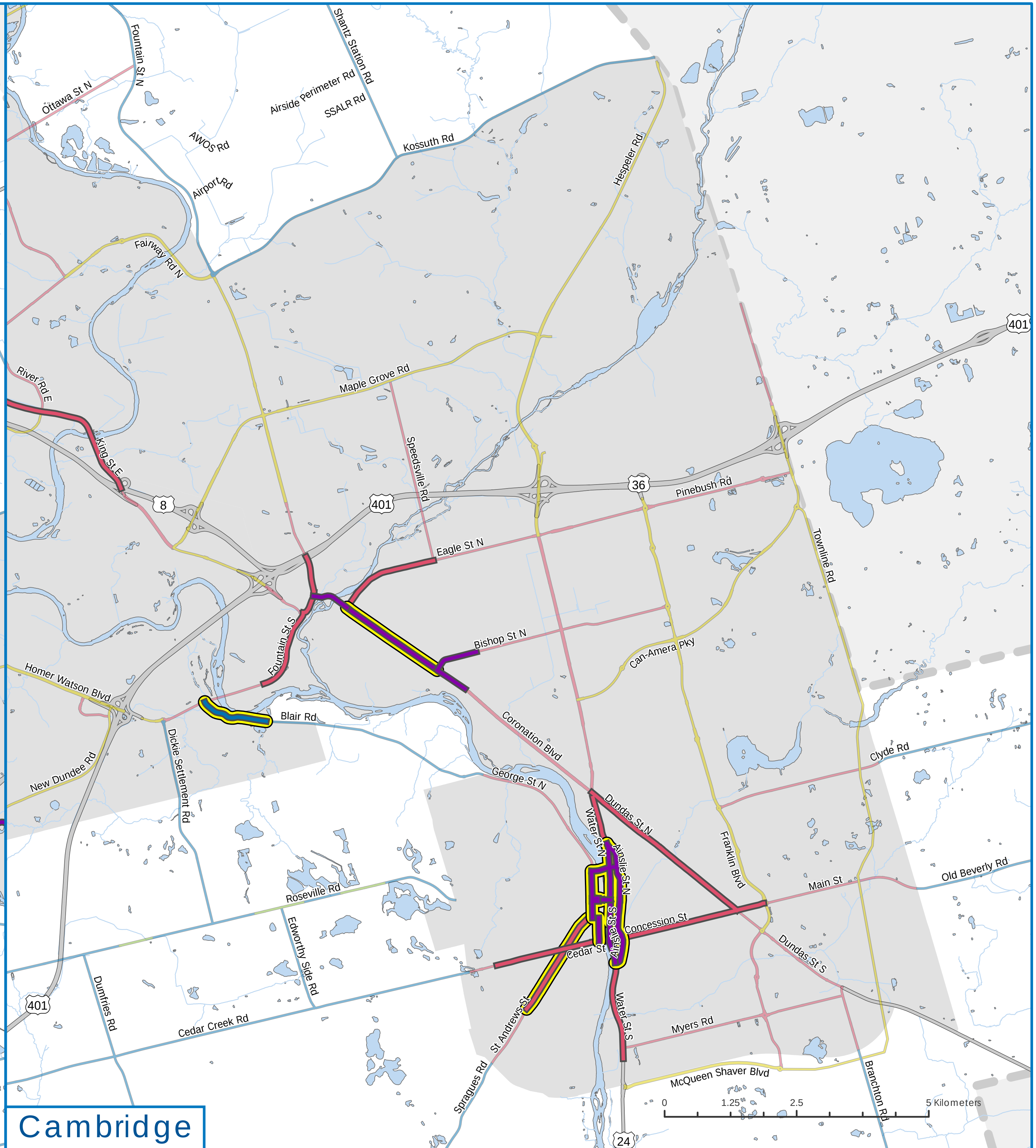
Rural Connector

 Significant (20 m)

— Urban Avenue



Waterloo/Kitchener



Cambridge

REGION OF WATERLOO

STREET DESIGN GUIDE

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MAP 2a

Constrained Corridors Waterloo/Kitchener & Cambridge

Legend

Level of Corridor Constraint

Urban Main Street

- Minor (26 m)
- Significant (20-24 m)

Urban Avenue

- Minor (26 m)
- Significant (20 m)

Rural Connector

- Minor (26 m)
- Significant (20 m)

Unconstrained Regional Roads

- Rural Main Street
- Rural Connector
- Urban Connector
- Urban Main Street
- Urban Avenue

Provincial Highway