

City of Ottawa **Road Corridor Planning & Design Guidelines**

URBAN & VILLAGE COLLECTORS  
RURAL ARTERIALS & COLLECTORS



December 2007

**DELCAN Corporation**  
The Planning Partnership





**1.0 Introduction ..... 2**

**2.0 Utility & Role of the Guidelines ..... 4**

**3.0 Study Process & Stakeholder Involvement ..... 5**

**4.0 The Basis for Sustainable Road Corridors ..... 6**

**5.0 Planning & Design Guidelines for Corridor Components ..... 10**

**6.0 Rural Conditions ..... 26**

**7.0 A Road Typology ..... 28**

**8.0 Green Streets ..... 33**

**9.0 Implementation ..... 36**

**APPENDIX A: Demonstration Cross-sections &  
Right-of-way Width Requirements ..... 39**

**APPENDIX B: Road Design  
Specification Guidelines ..... 55**

**List of Photos ..... 57**

## Introduction

# 1.0

The City of Ottawa continues to show leadership in the pursuit of sustainable urban transportation. Its award-winning *Regional Road Corridor Design Guidelines* (2000) has been widely referenced in urban transportation research across Canada. Those guidelines were pioneering in their recognition that Arterial Roads play a pivotal role in shaping the public space and landscape character of a City, while providing mobility choices, accessibility, and space for vital City services and utilities. The document had a strong influence on the ensuing City of Ottawa Official Plan (2003). The guidelines remain highly relevant today and continue to guide the construction and retrofit of the City's Arterial Road network.

As a follow-on project, the City has now prepared these guidelines which address the following roads as classified in the Official Plan:

1. Major Collector and Collector Roads in the Urban Area and Villages; and,
2. Arterial Roads and Collector Roads in the Rural Area.

**Major Collector and Collector Roads** in the Urban Area, Rural Area, and Villages are designated in the Official Plan (Annex 1, Section 1.0) to:

1. Connect communities and distribute traffic between the arterial system and the local road system;
2. Act as shorter links (than Arterial Roads);
3. Provide direct access to adjacent properties where

such access will not introduce traffic safety or capacity concerns;

4. Accommodate the safe and efficient operation of transit services;
5. Be the principal streets in urban and Village neighbourhoods;
6. Be used by local residents, delivery and commercial vehicles, transit and school buses, cyclists, and pedestrians;
7. Operate with reduced speed and volume of traffic (than Arterial Roads);
8. Be more accommodating (than Arterial Roads) for cyclists and pedestrians; and,
9. Include tree plantings, bus stops, community mailboxes and other streetscape features to create roadways that are integrated with their neighbourhood.

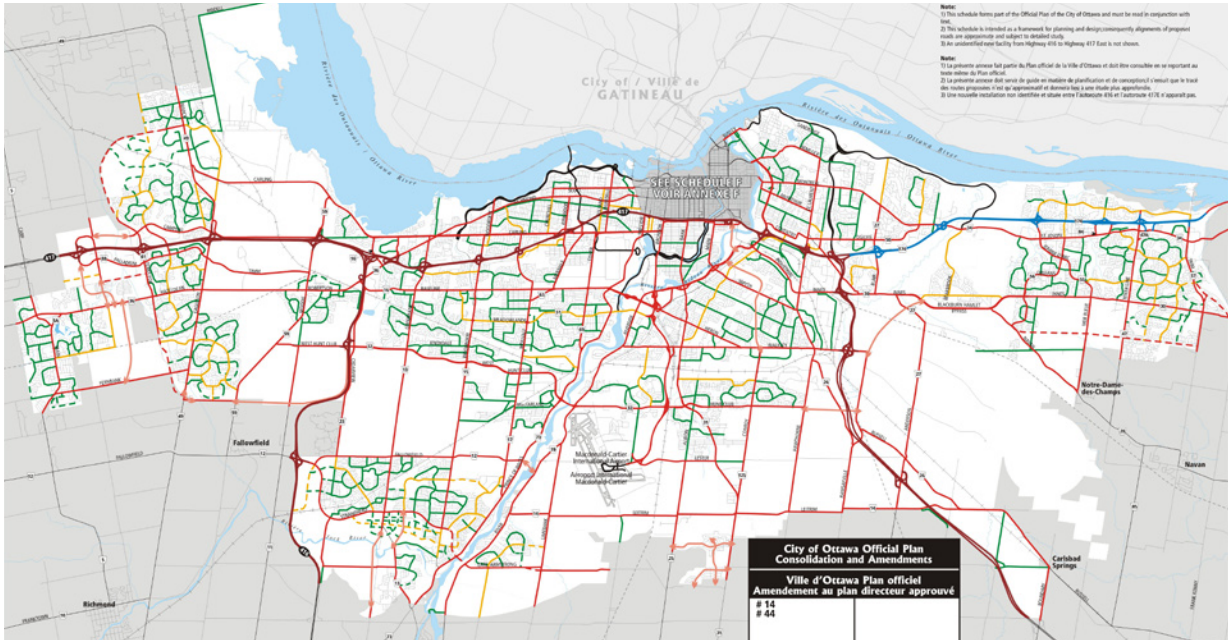
Designated "Major" Collectors act as a connection between Arterial Road and Collector Roads. Higher traffic volumes and a greater mix of vehicle types and sizes are to be accommodated than compared to Collector Roads. There are no Major Collectors designated in the Rural Area or Villages.

**Arterial Roads** are the major roads of the City designated to carry large volumes of traffic over the longest distances. This system provides links to provincial and inter-provincial roads. Vehicular access to adjacent properties should be controlled to reduce turning movements and potential conflicts. Other than these principles, the Official Plan's Road Classification system provides little

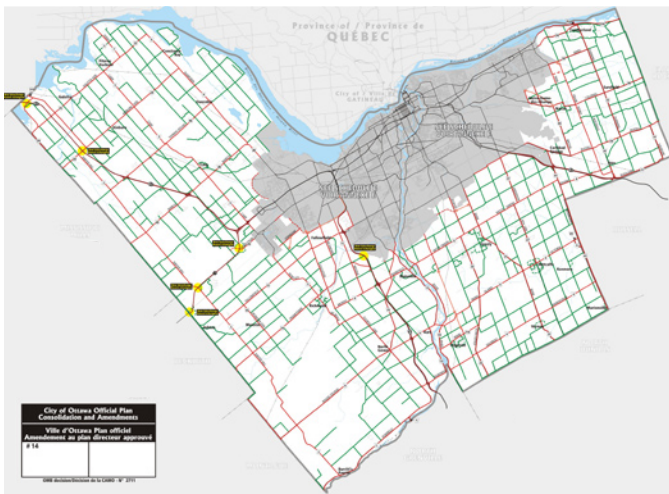
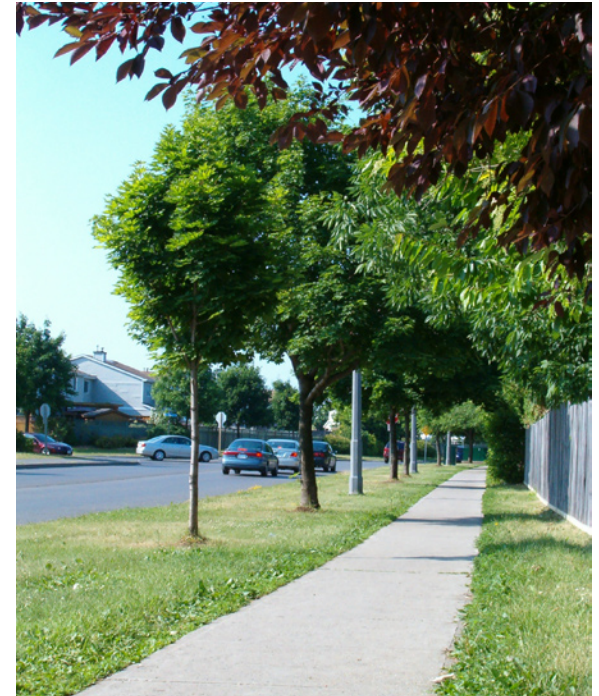
guidance on the planned characteristics of Arterial Roads in the Rural Area.

It is important to note that the *Regional Road Corridor Design Guidelines* addressed Arterial Roads in the Urban Area and those with a "mainstreet" function in the Villages. The City of Ottawa has also completed urban design guidelines for Arterial Mainstreets and Traditional Mainstreets through its Ottawa by Design program. No further design guidance for mainstreets in Villages is provided in this document.

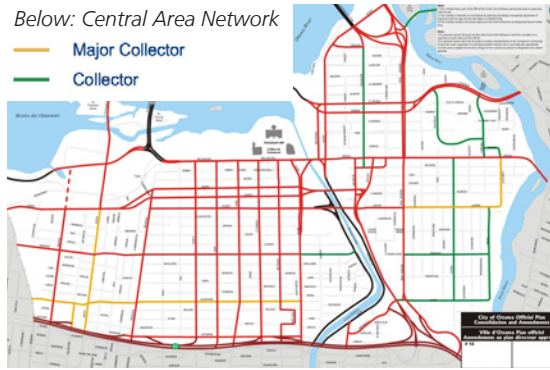
This document will also be highly valued in guiding the design of these important Roads throughout its vast 2,700+ square kilometres of urban, village and rural communities.



1-1



Above: Urban Road Network  
 Below: Central Area Network



Left: Rural Road Network  
 Arterial  
 Collector



1-2

## Utility & Role of the Guidelines

# 2.0

As with the *Regional Road Corridor Design Guidelines*, these guidelines are to be used by anyone involved in the planning and design of new collector and rural Arterial Roads, or their reconstruction. This includes municipal staff and elected officials, citizens, community and interest groups, developers, and design professionals in various disciplines. The guidelines are to be used in the following circumstances:

- > The preparation and review of Community Design Plans;
- > The design and review of Plans of Subdivision;
- > The implementation of Zoning By-Laws and Site Plans;
- > The design of Roads to be constructed new, reconstructed or rehabilitated; and,
- > The selection and harmonization of appropriate right-of-way (ROW) protection policies in the City's next update of its Official Plan.

It is important to note that the guidelines are not intended to be an encyclopedic "how-to" design manual. Their role is simply to provide general design guidance, acknowledging that some of the concepts and demonstrations require detailed design investigations, and may not be achievable in all circumstances. They do not constitute city standards, although they may inform the continual evolution of standards. On this basis, the role of the document is to focus on key design elements and cross-section demonstrations that are specific to the road types in question and that introduce new thoughts and

ideas that are important to the Ottawa context and not referenced in other related documents. These other supporting documents include, but are not limited to (listed alphabetically):

- > *Context Sensitive Solutions in Designing Major Urban Thoroughfares for Walkable Communities: An ITE Proposed Recommended Practice* (ITE, 2006);
- > *Environmental Noise Control Guidelines* (City of Ottawa, 2006);
- > *Geometric Design Guide for Canadian Roads* (Transportation Association of Canada, 1999);
- > *Geometric Design Standards for Ontario Highways* (Ontario Ministry of Transportation);
- > *Greening Guidelines for Regional Roads* (Regional Municipality of Ottawa-Carleton, 1992);
- > *Ottawa Cycling Plan* [Draft] (City of Ottawa, 2005);
- > *Pedestrian Plan* (City of Ottawa, In-Process 2007);
- > *Promoting Sustainable Transportation Through Site Design: An ITE Proposed Recommended Practice* (Institute of Transportation Engineers, 2004);
- > *Postal Delivery Standards Manual* (Canada Post, 2004);
- > *Right-of-Way Cross Sections for New Residential Roads* [Memo] (City of Ottawa, 2007);
- > *Right-of-Way Lighting Policy* (City of Ottawa, 2007);
- > *Rural Pathways Plan* (Stantec Consulting Ltd. & Stonestable Consulting, 2006);
- > *Street Design Policy Special Streets* (City of Ottawa, 2006);

- > *Tree Planting Advice* (Hydro Ottawa);
- > *Urban Design Guidelines for Arterial Mainstreets* (City of Ottawa, 2006);
- > *Urban Design Guidelines for Greenfield Neighbourhoods* [Draft] (City of Ottawa, 2007);
- > *Urban Design Guidelines for Traditional Mainstreets* (City of Ottawa, 2006); and,
- > *Utility Coordination Committee Guidelines and Policies* (City of Ottawa, Ongoing).

It is also important to consider the *Regional Road Corridor Design Guidelines* as a companion document. Although those guidelines address designated Arterial Roads, which are the major roads of the City, much of the design guidance is relevant to urban Major Collector and Collector Roads and there is no need to reinvent or re-package the information. Where new ideas and other innovations have emerged, these are documented. For specific technical design issues, reference should be made to *City of Ottawa Standard Tender Documents, Volumes I and II*.

These guidelines are presented in a format that is simple, succinct, user-friendly, broadly accessible, and focused on select matters of concern for these road corridors both today and in the future.

3-1



These guidelines have benefited from the input of a Working Group that was formed for the project. This group helped to identify matters of concern that are addressed in the document. Their input was highly appreciated. Participants included representation from:

- > Various City of Ottawa departments;
- > Community Associations;
- > Homebuilders and Land Developers;
- > Other consultants; and,
- > Interest Groups.

The group met during the course of the study and provided input in a round-table setting. Minutes were circulated and follow-on discussions were held. Other matters were introduced through individual submissions and small group meetings. Additional comments were received during a Public Open House in June, 2007, and the draft Guidelines were circulated for broad public review. Adjustments were made to reflect this input.



3-2

In addition to the Working Group input, the study consultants and City staff carried out a best practices scan. This included a review of related documents from several agencies and jurisdictions. As is often the case, some of the best practices originated in Ottawa and have been included in the guidelines.

The underlying basis of these road corridor design guidelines is set out in the City's Official Plan (2003). The design objectives vary depending on whether the land use context is urban, Village, or rural in nature. This is consistent with the recent emphasis in transportation planning on "Context Sensitive Solutions", "Smart Growth", and "Sustainable Infrastructure".

### 4.1 Official Plan Direction

The Official Plan's Guiding Principles (Section 1.6) and Strategic Directions (Section 2.0) specifically-related to these guidelines are to:

- > Build a transportation system that emphasizes transit, walking and cycling;
- > Design attractive communities where buildings, open space and transportation work well together;
- > Build communities that are easy to get around and barrier-free for the disabled;
- > Develop a green City with a network of open spaces and to recognize that trees are an important way of maintaining environmental integrity;
- > Provide a range of mobility choices and accessibility options;
- > Pursue land use patterns that reduce the need to travel;
- > Reduce the amount of land used for new transportation facilities;
- > Ensure the provision of facilities for pedestrians and cyclists in the construction or reconstruction of roadways;
- > Minimize capital and operating costs, ensure reliability of level of service, and mitigate environmental impacts of infrastructure;
- > Reduce air pollution and greenhouse gas emissions from private automobile use;
- > Reduce traffic;
- > Reduce Road construction disruption; and,
- > Accommodate the movement of people during peak hours.

The Official Plan's targets (Section 2.3.1) for the modal share distribution of peak-hour trips are 10% walking, 3% cycling, and 30% transit by the year 2021.

Section 4.3 of the Official Plan also establishes the policies used to review development applications that relate to walking, cycling, transit and roads. Key policies related to this study include:

- > On new plans of subdivision, provide the opportunity for direct transit routes through a community and require all buildings to be within 400m walking distance of a transit stop;
- > Provide sidewalks on both sides of Arterial Roads, Major Collector and Collector Roads in the Urban Area and Villages; and,
- > Provide a sidewalk or multi-use pathway on at least one side of all roads in the Urban Area that serve transit.

The design of the City's Major Collector and Collector Roads in the Urban Area and the Arterial and Collector Roads in the Rural Area must be consistent with this Official Plan direction.



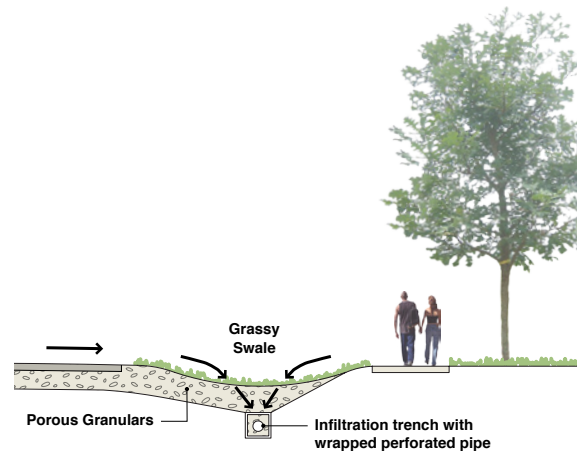
### 4.2 Pursuing Sustainable Infrastructure

Further to the Official Plan's guiding principle of a green and environmentally-sensitive City, the following ten (10) additional criteria should also be considered in the pursuit of smart and sustainable infrastructure solutions for road corridors in Ottawa. These criteria reflect current thinking. Road designs should:

1. Be financially sustainable to construct and maintain;
2. Minimize the use of land;
3. Be efficient to maintain over their life-cycle;
4. Emphasize green living elements for oxygen production, carbon dioxide consumption, and many other benefits;
5. Provide infiltration opportunities for storm water, and retain water for living materials;
6. Reduce waste associated with construction and maintenance activities;
7. Use recycled materials where feasible;
8. Preserve and conserve existing infrastructure where practical;
9. Lead to the remediation of unfavourable environmental conditions; and,
10. Engage stakeholders and respond to their current and future needs.

Ottawa's urban collectors and rural roads should advance environmental quality by showcasing a range of sustainable infrastructure innovations. They are excellent candidates for incentive-based or pilot infrastructure projects such as:

- > Alternative roadside drainage techniques such as grassy swales (bioswales) with pervious pipe filter drains, grassy swales with no curbs, grassy swales with curbs and cutouts, grassy swales with infiltration trenches and pits, vegetated filter strips, pervious catch basins, treatment trains, roadside grey water treatment facilities, and other innovative and emerging "soakaway" and storm water management methods;
- > Pervious paving methods such as porous concrete, porous asphalt, permeable unit pavers, and plastic grid pavers;
- > Enhanced use of organic cover such as wood fibre or mulch (to aid in soil moisture retention and avoid soil compaction), especially in problematic clay soil locations;



*Use innovative road drainage techniques such as grassy swales and perforated pipes as alternatives to conventional designs, and showcase the environmental benefits.*

- > Advanced road material recycling initiatives (asphalt, concrete, and granular materials);
- > Green roof incentive programs and/or construction requirements for existing or proposed adjacent buildings (to aid in meeting storm water management goals along road corridors); and,
- > Bonus incentives or subsidies to developers that achieve enhanced storm water management goals using emerging or innovative techniques.



4-1

## The Basis for Sustainable Road Corridors

### 4.3 Functional Objectives for Collector Roads in Urban Areas & Villages

The following are the functional objectives for road corridors in the Urban Area and in Villages:

**Urban Fabric:** establish the spatial organization and fabric of a community and express its visual character and identity.

**Community Connector:** create identifiable corridors that connect uses within a community as well as connecting the community to the Arterial Road system, and other communities.

**Public Space:** serve as an important public space that can accommodate pedestrian activity and social interaction in a safe and comfortable environment.

**Green Space:** form part of the green and sustainable imprint of a community as well as being tree-lined routes linking open spaces. They should also be capable of accommodating multi-use pathways as part of the City's Greenspace Network, located in green and open space settings, where designated in the Official Plan.

**Access Provider:** provide access to individual properties in accordance with their roadway classification designation, with the frequency of access being dependant on the context as well as traffic safety and capacity considerations.

**Multi-Modal Route:** safely and efficiently provide for movement in all modes, with an emphasis on walking, cycling, transit use, along with private automobiles and service vehicles.

**Goods Movement:** provide for movement of goods and materials carried in a range of vehicle types, particularly those roads designated by the City as Truck Routes.

**Drainage:** manage surface drainage from the ROW, and to serve as a conveyance route for surface water from adjacent lands.

**Service and Utility Route:** accommodate a wide range of services and utilities, often including trunk services, and with adequate horizontal, vertical, above-grade, and below-grade space provided for location and life-cycle maintenance of this infrastructure.



4-2

### 4.4 Functional Objectives for Collector and Arterial Roads in the Rural Area

The following are the design objectives for road corridors in the Rural Area:

**Community Connector:** create linear wayfinding routes that connect uses within the rural community as well as connecting the rural community to the City's Villages, Urban Areas and beyond.

**Green Space:** accommodate multi-use pathways as part of the City's Greenspace Network, located in green and open space settings, where designated in the Official Plan.

**Scenic Entry Route:** form scenic entry routes linking major tourist, recreation, heritage and natural environment destinations in and beyond Ottawa, where designated in the Official Plan.

**Access Provider:** provide access to individual properties, including farm access, and provide for trail and recreation pathway crossings.

**Multi-Modal Route:** safely and efficiently carry varying levels of movement, especially private automobiles, trucks, service vehicles, farm vehicles, cyclists, and occasionally, transit vehicles. They also can accommodate multi-use pathways.

**Goods Movement:** provide for movement of goods and materials carried in heavy vehicles as well as farm vehicles, particularly those Roads designated by the City as Truck Routes.

**Drainage:** manage surface drainage from the ROW, and in some cases, to manage overland drainage from adjacent rural lands.

**Service and Utility Route:** accommodate a limited range of services and utilities, often including above-grade utility poles, anchors and guys, and with adequate horizontal, vertical, above-grade, and below-grade space provided for location and maintenance of this infrastructure.

These objectives also apply to road segments within Villages at the rural-village fringe, with an added emphasis on pedestrian and cycling movements in the Village context.

# Planning & Design Guidelines for Corridor Components

## 5.0

This section provides design guidelines for the key components of Collector Roads when viewed as a “corridor” within the network of a broader community. These components include:

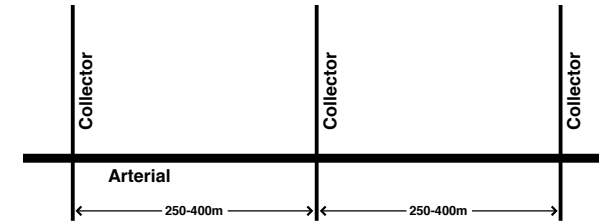
- > Community Layout;
- > Adjacent Uses;
- > Road Edge;
- > Roadway;
- > Intersections & Turning Lanes;
- > Pedestrian Crossings; and,
- > Linear Services & Road Operations.

This section is focused on collector road corridor design in the Urban Area and Villages. Section 6.0 addresses Rural Area Conditions.

### 5.1 Community Network

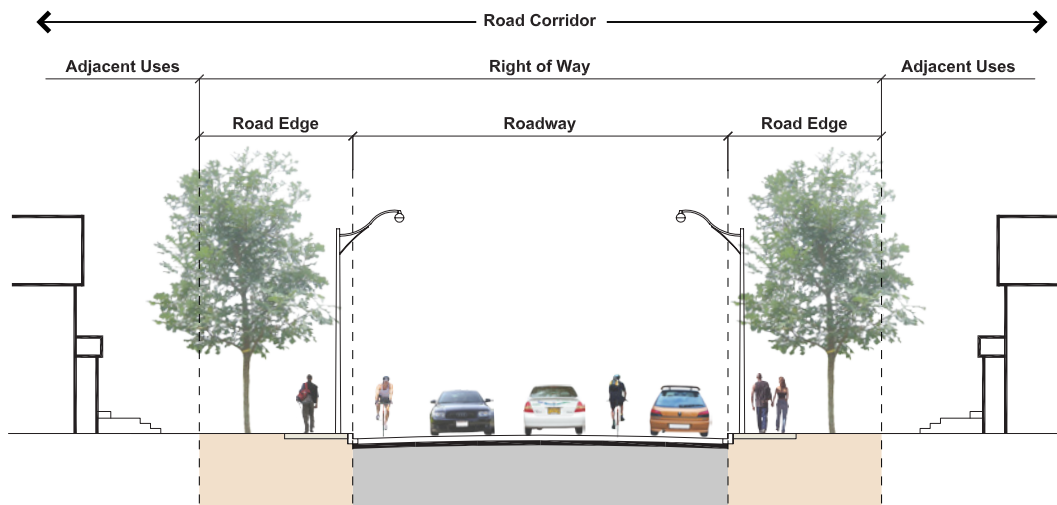
Collector Roads form the basic linear structural framework that communities are fashioned around. Their distribution, frequency, location, segment length, and degree of connection will establish the fundamental design elements that distinguish one community from another. The network of Collector Roads also establishes the primary transit, cycling, and pedestrian routes for a community.

1. Articulate an overall vision for the Collector Road network to direct decisions regarding urban structure in Community Design Plans, Secondary Plans, and other planning exercises. This vision should address the full family of Collector Roads in accordance with their varying planned functions and adjacent land use context.



*Space Collector Road intersections approximately 400m along Arterials (as close as 250m where necessary), to provide spacing for back-to-back left-turn lanes and to facilitate efficient traffic flow along the arterial.*

2. Lay out the community with frequent connections of Collector Roads to Arterial roads in order to increase route choices, to reduce requirements for “back-tracking”, to not “load up” individual collectors, and to create large development blocks well served by collectors. Locate these intersections between 250m to 400m apart to enable efficient traffic flow along the Arterial Road and to allow back-to-back left-turn lanes on the Arterial Road when required. Lesser spacings may be appropriate when Collector Roads form “T” intersections at Arterial Roads.
3. Create a connected network of street and block patterns with relatively frequent Local Road intersections with Collector Roads to promote accessibility, connectivity and continuity along and across the Collector Road corridor.



4. To achieve a highly urban corridor, design blocks with intersecting side streets every 50 to 100m along the Collector Road. In Greenfield areas, blocks between 150 and 250m in length may be appropriate.
5. Design the system of Collector Roads to provide direct and continuous routing options for transit and cycling, and pedestrians, linking major recreation amenities, commercial areas, and employment areas, and connecting multi-use pathways.
6. Design the network so that all buildings will be within 400m walking distance of public transit, to implement Official Plan policy.
7. Use the Collector Road pattern to establish the solar orientation of a neighbourhood such that the number of buildings with south-facing windows is maximized and energy consumption is reduced in Ottawa's winter months.
8. Where multi-use pathways need to cross Collector Roads, locate the crossing points at controlled locations, preferably intersections, to provide safe crossings. Where paths need to cross at mid-block locations, consider stop controls or pedestrian activated signals.
9. Design the intersection of Collector Roads and Arterial Roads as distinctive neighbourhood entry points,

possibly including medians and special landscaping treatments. Also refer to the City's guidelines pertaining to "Gateway Features" in new communities.

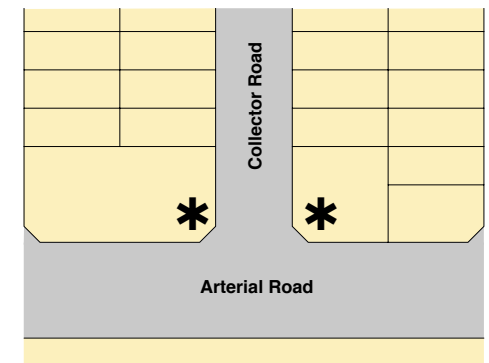
### 5.2 Adjacent Land Use & Buildings

The varying land use context along a street's ROW shapes the way in which roads are used and hence how they are best designed. Given the primary function of Collector Roads as a connector and provider of public amenity, elements such as building height and setbacks, building density and land use mixes all have an important influence on the ability of a Collector Road corridor to meet its intended functions. Good urban form can reinforce the neighbourhood function of Collector Roads and create an environment which encourages pedestrian use and enjoyment of the road corridor as a public space.

1. Ensure that Collector Road corridors act as community "integrators" rather than "dividers" by having buildings relate directly to the road. This includes designing buildings that architecturally and functionally "address" the road rather than turning their backs to it. Accomplish this by orienting facades, windows, signage, and pedestrian entrances towards the street and facilitating pedestrian activity along it.
2. In more urban contexts, locate buildings close to the street lot line with minimal setbacks and in a tight and continuous building fabric oriented to the street. Treat collectors in mixed use environments as main streets and implement relevant aspects of the City's associated design guidelines for those street types.

## Planning & Design Guidelines for Corridor Components

3. Where direct driveway access is undesirable for traffic safety reasons, use side-lotting and single loaded side streets as techniques to achieve the desired building orientation while providing for safe access and adequate space for utilities. Front-lotting with rear lane access may be appropriate in some circumstances such as within or near Mixed Use Centres and Town Centres.
4. Avoid rear-lotting along Collector Roads. Front adjacent uses onto the roads and avoid conditions where sound attenuation fences would be required.
5. Avoid locating street townhomes and narrow-lot detached homes with front driveways along Collector Roads that would lead to an excessive number of driveways and turning movements.
6. Avoid garages that protrude in front of the house and ensure that driveways are not wider than the garage. Use shared driveways where possible. Design front porches and associated detailing to minimize the effect of large garage doors along the street.
7. Provide off-street parking and vehicle access to the rear or side of buildings, using rear lanes where appropriate. Buffer parking lots from the street with dense landscape strips and/or low fences along the street lot line on adjacent lands. Provide breaks in the buffer to enable pedestrian routes from the sidewalk into the parking lot.
8. Locate community serving uses such as schools, community and neighbourhood parks, minor commercial uses and places of worship with frontage and orientation along collector streets and in locations that can become focal points for community interaction. Site these buildings close to the street, and with no parking located between the building and the street.
9. Locate land uses requiring large lots (including medium and high density uses served by private roads or lanes) along Collector Roads to consolidate and minimize driveway connections. Ensure that the buildings address the road.
10. In the cases where a Collector Road separates significantly different land uses (i.e. residential from retail or business park), tie the two street edges together to maximize community integration. Accomplish this through consistency in landscape treatment, lighting, building setbacks, building orientation, and signage.
11. Where a Collector Road corridor runs through or adjacent to a Heritage Conservation District or a federally significant area, and is requiring rehabilitation, design the corridor elements (including street lighting and street furniture) to reflect and reinforce the characteristics of the district, and respect any planning or design guidelines that may apply.
12. Locate prominent “landmark” buildings on corner lots where Collector Roads intersect with other Collectors and Arterial Roads. The prominence may result from a combination of factors such as visual quality, height, size, use, and community function.
13. Provide frequent and direct pedestrian connections from adjacent lands by connecting pedestrian walkways and pathways from building doors or adjacent communities directly to road sidewalks.
14. Minimize ROW widths, reduce building setbacks, and locate higher buildings along Collector Roads to improve the building height to corridor width ratio. This will create a human scale and provide a sense of enclosure along the road which favours pedestrians and calms traffic.



*Creating larger lots where collectors intersect with other collectors and arterials will provide for landmark buildings to locate at community entrances.*

### 5.3 Road Edge

The road edge is the space between the curb and the ROW limit. This is the space dedicated to the non-travel functions of the roadway, and which defines the public space component of the road corridor. Trees and other plants, light/utility poles, road signs, sidewalks or multi-use pathways, driveways, transit stops, and street furniture are located within this space. Available space is often limited. In Urban Area and Village collectors, the road edge provides for pedestrian travel and social interaction and must therefore be designed to provide a welcoming at-grade environment.

#### 5.3.1 Pedestrian and Cyclist Facilities

Accommodating pedestrian movement and providing an attractive walking environment are key objectives in the design of Collector Road corridors. This is required to fulfill the multi-modal function of the roadway and to promote pedestrian activity in accordance with Official Plan policy. See also Section 5.6 regarding pedestrian crossings.

1. Provide sidewalks on both sides of Arterial Roads, Major Collector and Collector Roads in the Urban Area and Villages, in accordance with Official Plan policy.
2. Provide an effective sidewalk width of at least 1.8m on Collector Roads (2m along Major Collector Roads), which allows for pedestrians (including wheelchair users) to pass each other on the sidewalk.

3. Provide a paved pedestrian width of 3m or greater along Collector Roads in areas with high pedestrian volumes and/or outdoor amenities (patios, benches, etc.), or that have a mainstreet type function. Ensure that these wide sidewalks are located along the curb and are not mistaken for multi-use pathways (encouraging cycling), through the use of appropriate surface designs.
4. Ensure that other road edge elements (street furniture, landscaping, and utilities) do not obstruct or interfere with pedestrian movement or road maintenance activities.
4. Locate bicycle racks not closer than 0.3m to curb or building faces, and orient them so that the clear sidewalk width is maintained.



5-1

#### 5.3.2 Road Edge Landscaping

Attractive landscaping features can contribute to the overall visual environment and “feel” of a Collector Road and further encourage walking, leading to a more active streetscape. Plantings also bring many environmental and health benefits (See also Section 8.0 “Green Streets”). Regard for the City’s Tree Planting Guidelines should also be made.

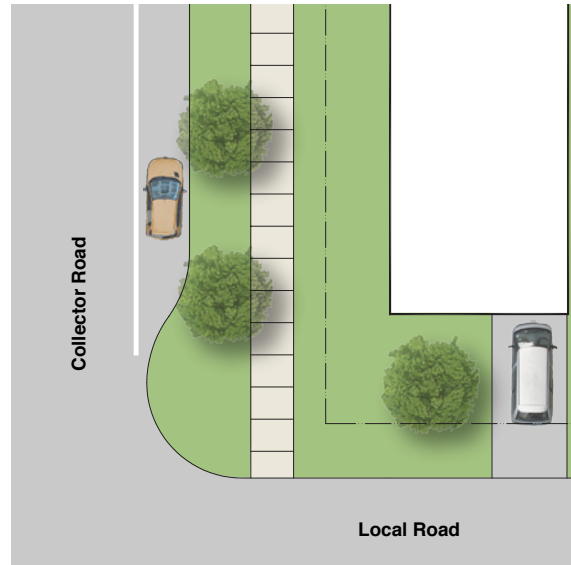
1. Plant deciduous trees between the curb and the sidewalk to provide shade for pedestrians, to protect them from traffic, and to define the sidewalk. Plant a second row of trees on the “back” side of the sidewalk as well, either in the ROW or on private land, wherever possible. Consider this as a major design objective when completing detailed designs and future City standards incorporating services and utilities.



5-2

## Planning & Design Guidelines for Corridor Components

- When selecting landscape materials (trees, shrubs, and other vegetation), consider tolerance to salt spray, sun, shade, wind, and soil conditions, and use native plant species whenever possible.
- Use low water demand species, especially in areas of Ottawa's problematic marine clay soils that are prone to differential settlement issues. Follow the City's planting guidelines for species selection.
- Where space permits, locate trees at least 2m to 2.5m from the curb to allow for snow management and to protect the trees from road salt spray. Offset them 1.0m from street lights to minimize light interference.
- Plant trees no more than 9m apart to provide for a continuous tree canopy.
- Provide a permeable surface area of 10m<sup>2</sup> minimum for trees. In highly urban contexts without green boulevards, provide a continuous planting soil trench of at least 2m wide and 2m deep.
- In districts where the desire for enhanced street-scapes has been identified, choose plantings and special surface treatments that compliment the character of surrounding land uses and buildings.
- Co-ordinate the placement of landscaping features to minimize conflicts with required servicing and utility elements.
- Identify locations along existing roads where trees can be inserted into the right-of-way, as a continuous process of greening existing Collector Roads that have a scarcity of trees.
- Coordinate road edge landscaping with that on adjacent lands as part of a broader street design strategy.



*Locations along Collector Road ROWs beside non-residential uses, or along the “flanking” sides of residences, are often candidate locations to insert trees, as conflicts with below-grade infrastructure are minimized.*

### 5.3.3 Transit Stops and Shelters

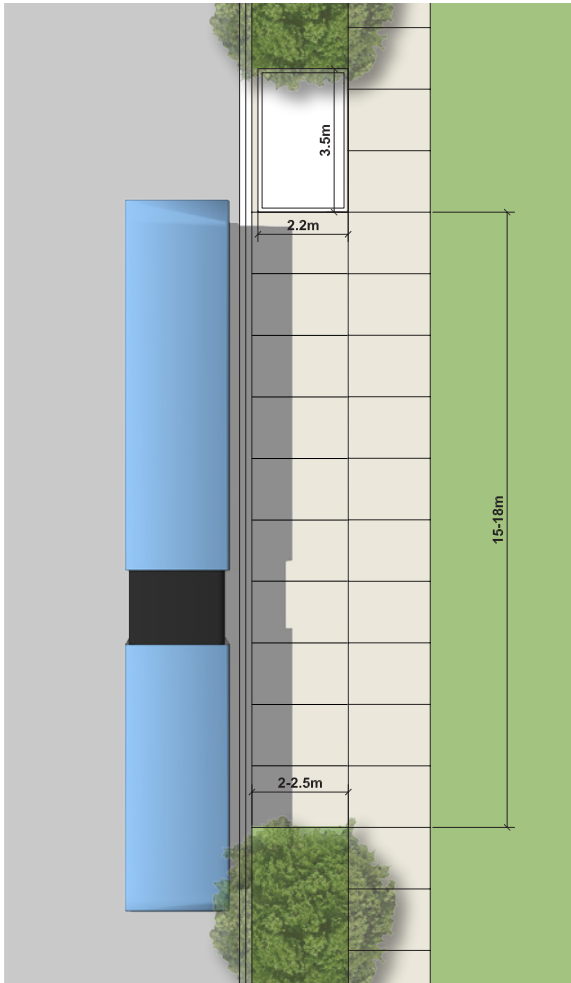
Most Collector Roads in the Urban Area and Villages are served by transit. Accordingly, the design of Collector Road corridors in these areas must be able to accommodate transit. Transit stops should be easily identified, well-defined, and accessible to pedestrians traveling along the corridor. Along higher activity Collector Roads, space will also need to be provided for transit shelters and associated amenities.

- Provide hard surface pads at all transit stops, space permitting. The hard surface landing area should be 2m to 2.5m in width, and 15m to 18m in length (sized to accommodate the location of the rear doors of an articulated bus).
- Use bump-outs or “bus bulges” to provide bus priority at transit stops and to provide more space for transit stop amenities such as shelters, waste/recycling receptacles, bicycle racks, and benches.



5-3





Provide hard surface loading zones at bus stop sufficient to accommodate the City's longer articulated buses as well as concrete pads for shelters.

3. Provide transit shelters and other amenities to provide protected waiting spaces for transit users, appropriate to the context.
4. Locate transit stops where pedestrians will not be forced to wait on the roadway in winter or wet weather conditions, and where there is opportunity for tree shading for cooling and UV protection in warmer months.
5. Locate transit shelters and other amenities 0.5m back from the sidewalk to prevent damage from sidewalk plows and provide sidewalk clearance for pedestrians.
6. Where transit stops are located at the sidewalk (in locations where no boulevard exists), provide a wider sidewalk width and ensure the landing area is clear of obstructions.
7. Locate transit stops as close to intersections as possible, and co-ordinate their location with multi-use pathway connections, mid-block pedestrian crossings, and building entrances.
8. Consolidate the location of street furniture such as waste/recycling receptacles, newspaper boxes, mailboxes, benches, notice boards, and bicycle racks at transit stop locations to maximize their utility and create an active streetscape at those locations. However, do not clutter key pedestrian movement zones,

and locate more active stops away from residential front yards to avoid potential effects on the privacy of residents.

9. Identify potential locations for transit stops and shelters during the Community Design Plan process. Allow for the integration of transit stops with non-residential development and community facilities.



5-4

## Planning & Design Guidelines for Corridor Components

### 5.4 Roadway

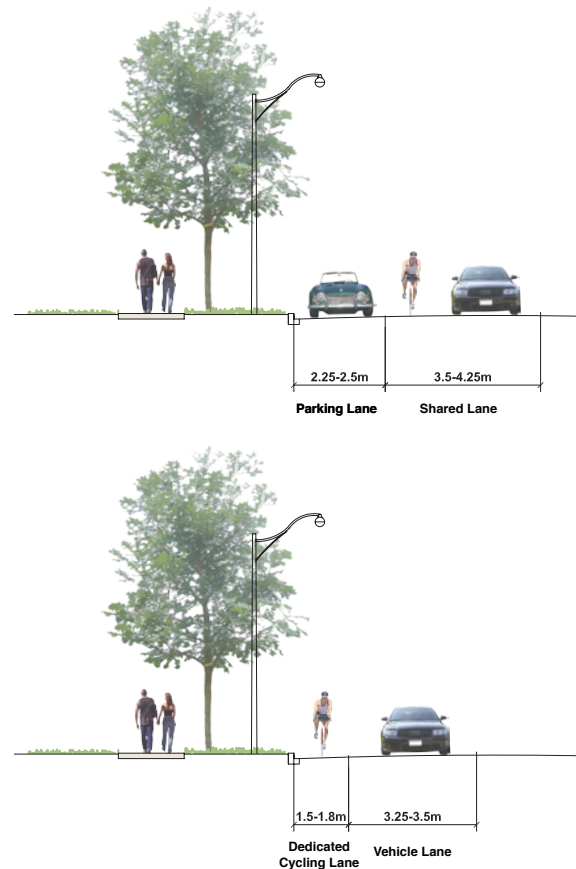
The roadway is the portion of the public ROW dedicated to vehicular travel (bicycles, cars, buses, trucks, and emergency vehicles). It may also include a median, and any space for on-road parking. The roadway design should accommodate travel by all modes while reinforcing the role of the street as a public space, and supporting community activities along the road edge and adjacent lands. Efforts to calm traffic and to narrow the roadway are also an increasing City priority in the Urban Area.

#### 5.4.1 Cycling

Collector Roads serve as an important part of the City's cycling network, allowing cyclists to travel within and between neighbourhoods without the need to use higher-speed and volume Arterial Roads. Accommodation of cyclists on Collector Roads throughout the Urban Area is therefore a key concern.

1. Accommodate cyclists on Collector Roads in the Urban Area and Villages through the use of 4.25m shared lanes where a high level of cycling priority is planned in the Official Plan and/or Cycling Plan.
2. Construct dedicated cycling lanes (1.5m to 1.8m width) only in the few instances where on-road cycling routes are designated along Major Collector Roads in the Official Plan, where on road parking is not required, and where the available ROW permits. Otherwise, use shared lanes along those routes.

3. Consider dedicated cycling lanes where a retrofit "road diet" (road narrowing) is being considered on a road with a wide (10.0m or greater) pavement width or where on-road parking is not required on one or both sides of the roadway.



*Provide facilities for cyclists along designated cycling routes.*

4. In locations where a cycle lane would be next to an on-road parking lane, the total width of both lanes should be 4.5m to provide adequate separation from door openings.
5. Locate catch basins and maintenance-hole covers outside of the wheel path of cyclists. Use the City of Ottawa standard curb-face inlet wherever possible as a cyclist-friendly solution.

#### 5.4.2 Travel Lanes

Collector Roads are intended to accommodate a broad range of vehicle types including buses, passenger vehicles, and trucks of various sizes, as well as cyclists. They are also intended to carry moderate volumes of traffic at relatively low speeds.

1. In most cases two lanes (one per direction), plus turning lanes where warranted, should provide sufficient capacity for vehicular movement at moderate speeds. Where four vehicle lanes are necessary along designated Major Collector Roads due to higher traffic volumes, refer to the City's Regional Road Corridor Design Guidelines as a design reference.
2. Minimize vehicle lane widths, while considering safety and capacity requirements, to reduce the amount of asphalt, pedestrian crossing distances, and to dedicate as much of the ROW as possible to the road edge.

3. Provide wider lanes in the range of 3.5 to 4.25m for roads with higher speeds and volumes and mix of traffic including trucks, buses and larger vehicles as well as cyclists. For Collectors in Villages and more-urban contexts, use narrower lanes ranging from 3.0 to 3.5m, with turning lanes at 3.0m.
4. When reconstructing Collector Roads, reduce existing lane widths to the minimum appropriate widths, in favour of increasing space for pedestrians, cycling lanes (where appropriate) and road edge landscaping, to reduce infrastructure life cycle requirements.

### 5.4.3 On-Road Parking

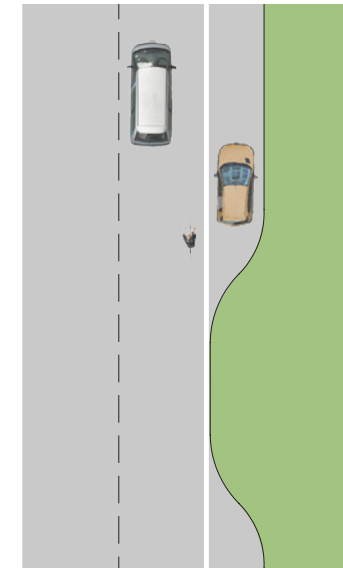
Given the primary objective for Collector Roads to support adjacent neighbourhood functions, on-road parking should generally be provided to meet the needs of residents, visitors or customers of adjacent land uses. On-road parking can also provide for traffic calming of Collector Roads if used appropriately. However, provision of excessive space for on-road parking may result in situations where more parking is provided than is required. This leads to unnecessary pavement width, where space could be better used for road-edge functions such as landscaping, sidewalks, etc., or where the ROW width could be reduced.

1. Provide on-road parking on roads with land uses that are directly accessible from the corridor. This will calm traffic, separate pedestrians from traffic, and promote corridor-oriented community activity.

2. Provide bump-outs to define road segments with full time on-road parking. Bump-outs delineate vehicle lanes, calm traffic speeds, reduce pedestrian crossing distances, and to provide space for tree planting, street furniture, transit stops and bicycle parking between the vehicle lanes and the sidewalk.
3. In road retrofits using bump-outs to create a parking lane, use paint striping along the parking lane to announce and delineate the new use of the road surface.
4. In areas with lower parking demands, such as along natural areas or in lower density single detached housing areas, consider on-road parking on one side of the street only to reduce pavement width. Alternate the single parking lane from one side to the other along the street so that the benefits of additional landscaping can be shared among both sides.
5. Plant trees in bump-out areas.
6. Plant trees in bump-out areas where appropriate. If not, construct the sub-grade to the same standard as under the road pavement to maintain the structural integrity of the roadway and reduce future maintenance or re-construction costs. This also allows the bump-out area to be easily converted to travel lanes or parking if ever appropriate.



5-5



*Use Bump-outs at corners or at the middle of long blocks to define the parking lane and calm traffic.*

## Planning & Design Guidelines for Corridor Components

7. Construct on-road parking lanes 2.5m wide, with 2.25m acceptable in constrained areas or on lower speed/volume roads. Where a parking lane is used as a travel lane or turn lane during peak hours, it should be of a lane width appropriate to the street.
8. Limit on-road parking in corridors with dedicated cycling lanes to reduce conflicts.

### 5.4.4 Medians

For higher activity Collector Roads with wider ROWs, there may be the need or desire for placement of a median between opposing traffic lanes. Medians may also be used to define a unique urban district or gateway area.

1. Limit the use of medians to reduce the road corridor width. Use medians as a traffic control measure only after other measures are considered.
2. Restrict the use of medians to locations at major intersections along the busiest Collector Roads to protect left turn lanes, or to control traffic turning movements at specific locations.
3. Where used at intersections, design the median with a sufficient width (1.5m) for traffic signal infrastructure that may be required.
4. Consider the use of wide landscaped medians for unique streets (such as “Green Streets”, see Section 8) or as entry points into distinctive neighbourhoods.

Medians can accommodate landscaping and street light poles, and can be used to reduce the number of vehicle lanes during road retrofit projects. They can also spatially define wide road corridors and provide refuge areas for pedestrians and cyclists, especially where multi-use pathways or local streets intersect with Collector Roads.

5. Select landscape materials for medians according to the guidelines for road edge landscaping.
6. Construct medians with barrier curbs as opposed to mountable curbs, to prevent vehicle intrusion into the median area.



5-7

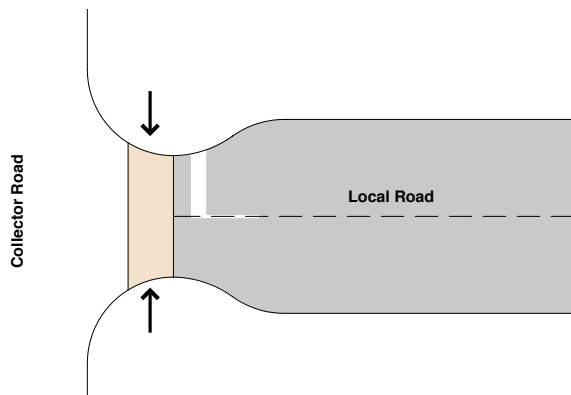


5-6

### 5.5 Intersections, Driveways & Turning Lanes

Collector Roads provide the basic spine of a neighbourhood and connect adjacent land uses via a wide array of intersecting streets, lanes, and driveways. When well-designed as a system, these elements will lead to a high degree of community connectivity and a pedestrian/cyclist/transit focus that is desired in Ottawa's neighbourhoods.

1. Keep corner curb radii at driveways and intersections to the minimum possible, to shorten crosswalk distances and calm turning movements. Use wider curb radii on corners where Collector Roads intersect with other collectors and arterials, to accommodate the needs of the range of transit vehicles and trucks using them.



*"Neckdowns" at intersections of Local Streets with Collectors are used to shorten crosswalk distances and to announce the entry to residential areas.*

2. Provide intersection narrowing or "neckdowns" at intersections with local streets to shorten crosswalk distances, reduce asphalt area, reduce the speed of vehicle turning movements, provide more space for landscaping, and to "announce" the entry to neighbourhoods.
3. Consolidate access points along Collector Roads which serve higher density and mixed land uses, to reduce potential conflicts with turning movements and pedestrian routes.
4. Align driveway accesses on either side of the road to create a more familiar intersection pattern and to coordinate the location of median breaks and potential future intersections.
5. Consider the use of left-turn lanes in advance of only the busiest intersections, and evaluate their need on a case by case basis. Right-turn lanes should seldom be utilized. Where turning lanes are required, consider providing for a wider ROW so that there remains adequate space for road edge landscape features and transit stop amenities.
6. Provide traffic signals in accordance with existing policy. In principle, only intersections of Collector or Major Collector Roads with Arterial Roads should require signalization.

### 5.6 Roundabouts

Roundabouts have emerged as an alternative to traffic signals or all-way stops for traffic control at intersections, particularly in new residential subdivisions or in locations where traffic signals are not warranted. Roundabouts can offer many advantages over traditional forms of traffic control and are well suited to use in Collector Road and Major Collector Road corridors. Roundabouts provide a traffic calming function, and enhance the streetscape by providing additional landscape opportunities and visual focal points along a road corridor. In general, if traffic signal or all-way stop control is warranted, a roundabout will provide acceptable traffic control. While roundabouts can have a positive impact on intersections experiencing a higher than average collision rate, care must be taken to accommodate all road users in their design.

1. Consider the use of roundabouts as an alternative to full signalization or the use of all-way stops for traffic control where two Collector Roads intersect, or where local streets intersect with Collector Roads.
2. Ensure sufficient ROW is protected in road corridors where roundabouts are proposed. Additional ROW may be required at roundabout intersections versus signalized intersections, depending on the number of approach and turn lanes required if the intersection were signalized, and the demonstration plan being used.

## Planning & Design Guidelines for Corridor Components

3. Avoid mixing different traffic control treatments within a road corridor, and avoid placing roundabouts in proximity to a downstream signalized intersection to reduce the possibility of queues blocking the roundabout.
4. Design the roundabout to accommodate a range of vehicles, with particular attention to transit and emergency vehicle requirements.
5. In road corridors with designated on-street cycling lanes, terminate the cycle lane well in advance (25-30m) of the roundabout entry, to allow cyclists to merge into the vehicle stream. Bicycle lanes should not be provided within the roundabout. At locations with higher bicycle volumes, consider provision of an off-street multi-use pathway for cyclists.
6. Provide pedestrian crossings at roundabout intersections at a location 7.5m (one car length) in advance of the roundabout entry. Use a median island to allow for a pedestrian refuge.
7. Locate transit stops to avoid potential vehicle queues extending back into the roundabout.
8. Understand that roundabouts may not be appropriate at locations where transit routes intersect, as the impact of the roundabout on transit stop location may result in longer than desirable walking distances for transit riders transferring between routes.

9. Do not place benches, public art, or other features in the centre island which may attract pedestrians. Locate such amenities in a safer location in the road edge.
10. Give special design consideration when locating roundabouts in areas with high levels of elderly, disabled, or visually impaired pedestrian activity.



5-8

### 5.7 Pedestrian Crossings

Pedestrian crossings include instances where sidewalks cross driveways, and where pedestrian routes cross vehicle lanes at crosswalks. These are among the few locations where pedestrians need to share space with motorized vehicles. The safety and convenience of pedestrians is of paramount importance.

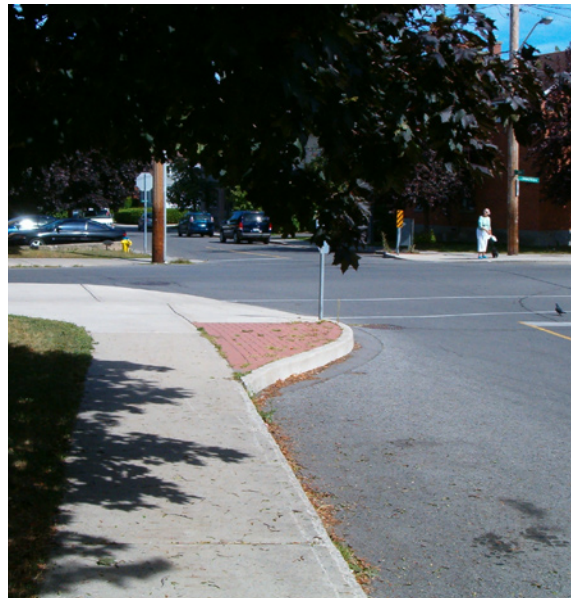
1. Where a sidewalk along a Collector Road crosses an unsignalized private driveway, the Collector Road curb should be continuous but depressed along the crossing. The sidewalk should be depressed as little as possible. Grade transition should occur in the inner and outer boulevards where they exist. The sidewalk surface material should be continuous across the crossing. This design reinforces pedestrian priority and continuity of the road edge.
2. Where a sidewalk along a Collector Road crosses another public street, or signalized private driveway, the Collector Road curb should be returned to meet the curb of the intersecting street or driveway. The returning curb and crossing should be depressed to the elevation of the intersection. To announce the approaching safety risk to the pedestrian, the crossing surface material should be different from the sidewalk. This guideline also applies to other sidewalks that cross Collector Roads.
3. Where extra visual emphasis on pedestrian priority is desirable, or where traffic calming is being pursued, provide pedestrian crossing with distinct surfaces or

markings. In such instances, the pedestrian crossing may retain a surface elevation that is continuous with the sidewalk. The crossing surface may differ from the roadway (or driveway) and the sidewalk surfaces. The use of such designs may be reviewed on a case by case basis, taking into account emergency service vehicle needs, pedestrian and vehicle traffic volumes, and accident history at the crossing.

4. Design sidewalk cross-slopes as well as the slope and surface transition at depressed curbs or crossings to be as gentle and barrier-free as possible.
5. Include safeguards such as detectable warning surfaces, directional textures, warning signs, audible signals, paint markings, and clear sight lines, where sidewalks or multi-use pathways cross intersections or driveways, so that cyclists and pedestrians of all ability are made aware of approaching crosswalks and their routes.
6. Orient the direction of curb ramps and their surface treatments at pedestrian crossings in the same direction as the crossing, so that visually impaired people are directed correctly, as well as providing a tactile warning sidewalk surface (perpendicular grooves) in advance of the ramp.
7. Avoid locating individual formal pedestrian crossings at mid-block locations. Where they are absolutely necessary, provide traffic signals in accordance with

City warrants. Pedestrian routes should be designed so that crossings are consolidated at traffic intersections.

8. Reduce pavement width through the use of bump-outs at pedestrian crossing locations to reduce crossing distances and to provide greater visibility at crossing points.
9. Use textured pavement, coloured pavement, or other treatments to delineate high priority pedestrian crossings such as near schools or crossings of multi-use pathways.

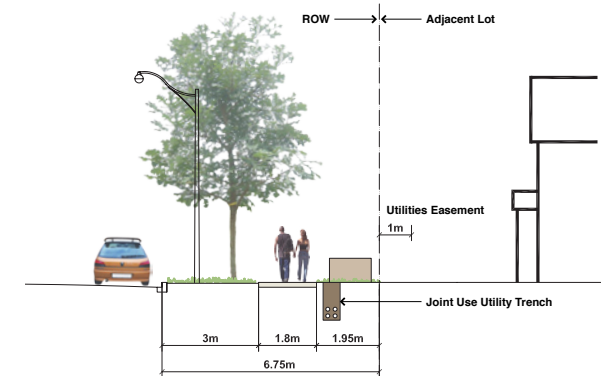


5-9

### 5.8 Linear Services, Utilities & Road Operations

One of the fundamental functions of Collector Roads in the Urban Area is to provide a corridor for many vital City services and utilities. These include water, wastewater, and stormwater services as well as utilities including electric, gas, and telecommunications. Postal service also needs to be accommodated. Collector Road corridors must be well-illuminated, well-drained, and as cost effective as possible to construct and maintain over their life-cycle.

1. Provide sufficient ROW width for Collector Road corridors to enable them to accommodate trunk services and utilities that serve large neighbourhoods or entire communities, and to provide adequate space for all above-ground and below-ground infrastructure and corridor components.



Easements for utilities along the ROW edge, and joint use utility trenches are creative solutions to enable trees to be located within the ROW, while keeping ROWs as narrow as possible for efficient land use (Ottawa's 22m ROW Residential Road cross-section is shown).

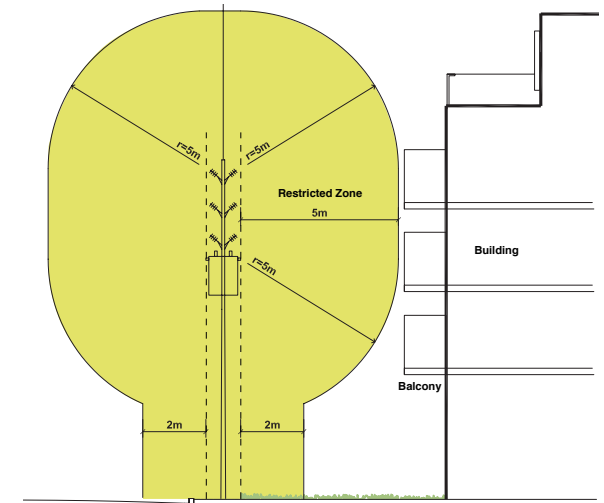
## Planning & Design Guidelines for Corridor Components

2. Provide adequate space and separations for the location, access and maintenance of services and utilities. Use shared use trenches (as per City of Ottawa Utility Coordinating Committee Guidelines), shared use poles, and other creative measures to balance the use of space for all corridor components and to minimize ROW widths.
3. Where there is a municipal objective to minimize the width of ROWs, use easements on adjacent land to provide for the location, operation and maintenance of utilities. Obtain these easements at no cost to the City or the utilities.
4. Bury utilities in new Collector Roads in the Urban Area, with the exception of: industrially-zoned areas, instances where it is appropriate for electrical trunk overhead lines to follow a Collector Road corridor, and locations where consistency with overhead service is required.
5. For new road construction, assign the costs associated with the burying of utilities to the developer. At no cost to the utility or the City, the developer will provide any requested easements to provide for the location of or access to services, ducts, chamber cables or padmounted equipment, as well as providing vaults located within buildings where required.
6. When preparing Community Design Plans for Traditional Mainstreets, Mixed Use Centres, and other

areas where reduced ROW widths are proposed and utilities are to be buried, include provisions that inform developers that utility easements may be required, and that utility equipment may need to be provided outside of the ROW and/or in buildings, at no cost to the City or utilities.

7. Where electrical service is to be buried in narrow road corridors with narrow road edges, including designs with sidewalks located along or near the ROW limit, provide appropriate space in the road edges for ducts (contiguously under the sidewalk) and cable chambers, as well as padmounted equipment and switches as required. Easements for the location of or access to infrastructure on adjacent land may be required. Shared vault space in buildings may also be required.
8. Where electrical service is to be buried in road corridors with wider road edges, including designs that have a grassy boulevard between the sidewalk and ROW limit, provide boulevards that are wide enough (2.0m minimum) to accommodate pad-mounted equipment and switches. Do so to minimize the width of easement that may be required on adjacent land and to minimize the need to protect the transformer or switch with bollards.
9. When electrical distribution is overhead, apply the electric utility's overhead restricted zone clearance requirements. This includes a 5m clear radius from

the nearest electric service, and a 2m clear drop zone from the nearest service, for safety and access reasons. This may result in required building setbacks that are greater than established in the Zoning By-Law and that are greater than building setback patterns along streets in established areas. Consider this when making zoning decisions on minimum front-yard setbacks.



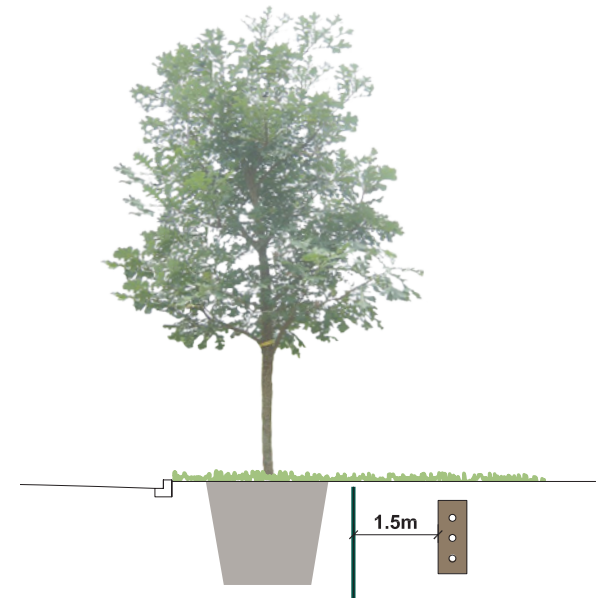
*The electric utility's overhead restricted zone clearance requirements have implications on building setbacks.*

10. When evaluating the costs and benefits of burying existing overhead utilities along corridors planned for rehabilitation, consider the lost development potential and streetscape implications of staggered building setbacks that may result from the applica-



tion of the electric utility's overhead restricted zone clearance requirements.

11. Where utilities are located near the ROW limit or on adjacent lands under easement, require buildings to be set back from the ROW limit an appropriate distance to provide for the operation and maintenance of utilities. For example, additional separation is required when gas service is located on adjacent lands in the area between pad-mount transformers and buildings/structures (such as in four-party shared use trench arrangements), to enable access to the utility.
12. Where reduced building setbacks are proposed, ensure that adequate clearance for utility assets, for protective devices (such as bollards if needed), and for work on the assets is retained. This is to avoid, for example, the need for permanent blast protection walls around surface mounted electrical equipment, the dangerous and costly collapse of utility trenches for building encroachments, or the costly excavation work by hand near utilities.
13. Locate surface-mounted utility equipment (transformer pads, telecommunication pedestals, etc.) away from driveways, intersections, sight triangles, or key view lines, in accordance with the *City's Guidelines for Utility Pedestals Within the Road Right-of-Way* (2003).
14. Where surface-mounted utility equipment needs to be located on adjacent lands (subject to easements), locate it to the side or rear of buildings, at corners of parking lots, and buffer its visual impacts with landscaping that is well-integrated with the site while providing access to the infrastructure.
15. Follow the electric utility's "Tree Planting Advice" when planting near distribution assets, including the requirement that trees under overhead lines need to be species that grow to less than 6m in height at maturity.
16. Consider trees in the road corridor as an important public asset and coordinate service and utility designs to provide space for trees so that their benefits can be maximized and conflicts with services and utilities are minimized.
17. Use "bioshields" to deflect tree root zones from underground utilities, thus keeping the utility corridor clear and protecting the tree roots from utility maintenance activities.
18. Provide space in the ROW for postal service elements including community mail boxes. Locate these amenities conveniently, such as near pathways or transit stops, and in well-illuminated areas. Avoid locations within 9m of intersections, and locations adjacent to "no stopping" or "no parking" zones. Refer to Canada Post's *"Postal Delivery Planning Standards Manual"*.
19. Except on roads in constrained ROWs or in very "urban" locations such as in communities in or near Ottawa's Central Area, provide adequate space (2 to 3m) for snow management along the road edge, thereby reducing the requirement for costly and energy-consuming snow removal operations.
20. Use surface materials and street furnishings that are durable in terms of the road maintenance practices required in Ottawa, particularly snow management activities.



Use "bioshields" to deflect tree roots from underground utilities where road edge space is constrained.

## Planning & Design Guidelines for Corridor Components

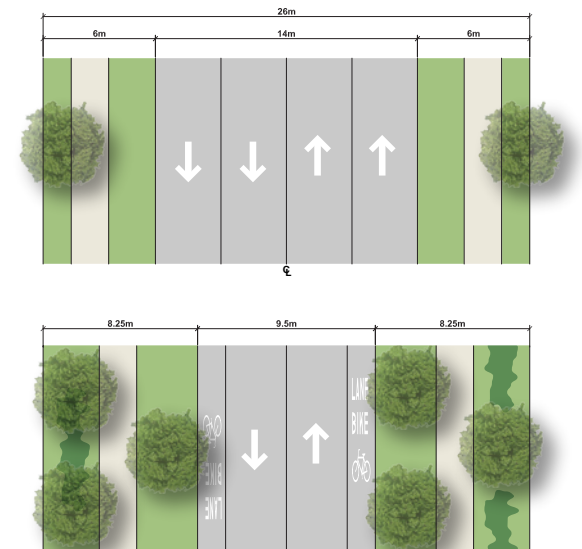
- 21.** Design road sub-grades to carry higher vehicle volumes and heavier vehicles such as buses that may be using the corridors regularly.
- 22.** Design roadway lighting to correspond to the road's land use context. Specific pedestrian-scale lighting should be considered on collectors in priority mixed-use or mainstreet environments. Reference should be made to the *ROW Lighting Policy (2007)* for specific policies and standards when completing designs.
- 23.** Use joint-service (street light and utilities) poles to reduce the number of poles in the corridor when utilities are overhead.
- 24.** Consider the use of innovative or emerging best practices for sustainable and "green" infrastructure, including those presented in Section 4.2.

### 5.9 Retrofitting Measures and Road Diets

Successful new neighbourhoods are designed with the objective of achieving an efficient and balanced transportation system, with traffic management measures built into the design. For the retrofit of existing corridors experiencing traffic concerns, traffic management approaches will differ depending on the nature and function of the road in question. A "road diet" or narrowing is a traffic management technique used to reduce the number of vehicle travel lanes, primarily those with traffic safety issues (speeding, collisions) which may be the result of excessive vehicle capacity.

- 1.** Design new Collector Road corridors to be efficiently and safely used and to prevent the need for retrofitting with traffic management or road diet measures after build-out.
- 2.** Use bump-outs along reconstructed Collector Roads that have on-road parking, to better define the travel lanes, to create road edge friction, and to create protected parking bays.
- 3.** Avoid constructing new Collector Roads in suburban settings that have design elements more reflective of Arterial Road design (such as four traffic lanes) as this may set the stage for future conflicts between the intended function of the roadway and its operational reality (such as high speeds).

- 4.** Assess the potential of any proposed traffic management measures to negatively impact the multi-modal and goods movement function of a Collector Road, before implementation.
- 5.** Identify candidate corridors for application of road diet treatment. These include four-lane Collector Roadways in the Urban Area and Villages which have moderate volumes, safety issues (collisions, speeding, lack of turn lanes), designated on-street bicycle links where facilities are lacking, scenic roads, commercial/mixed use centres, and heritage districts.



*Some of Ottawa's existing four-lane Collectors may be candidates for "road diets" when reconstruction is being planned. Green Streets can result.*

6. Implement road diet projects to improve traffic safety and operations, provide on-road bicycle facilities without the need for a road widening, improve the overall public realm by calming traffic and improving the ease of pedestrian crossing, provide on-road parking to serve adjacent development, or a combination of the above. Also use the extra space made available for road-edge landscaping, possibly pursuing a “Green Street” approach for the road (See Section 8).
7. Implement road diets in various levels of complexity and scale. This could range from a relatively simple re-striping project, to the complete reconstruction of a roadway segment.
8. On a case by case basis, undertake a feasibility study to determine the benefits of a road diet, and address potential traffic diversion issues. Special consideration should be given to potential impacts on transit service.
9. Ensure that any traffic management intervention or road diet initiative is undertaken in conjunction with adequate input from the adjacent community. Refer to the City of Ottawa’s Area Traffic Management Guidelines for guidance.



5-10

The design of the City's Collector and Arterial Roads in the Rural Area should respond to the unique land use context and rural drainage systems (roadside ditches) that differentiate their cross-sections. Whereas the design of urban roads is more influenced by adjacent land uses, buildings, pedestrian activity, and public space functions, the design focus on roads located in the Rural Area is on integration with the landscape and natural processes.

1. Minimize the displacement of rural lands by keeping the required ROW as narrow as possible, working within designated ROW widths wherever feasible. Achieve this efficiency by reducing the number of lanes and reducing lane widths wherever feasible, avoiding wide medians where safe to do so, while maintaining safe road cross-sections and appropriate roadside drainage.
2. For roads that travel along the boundary of the designated Urban Area and the Rural Area, provide an urban cross-section on the designated Urban side of the road and provide a rural cross-section along the Rural side. Protect ROWs accordingly for those segments.
3. Use open grassy swales and ditches (rather than road edge curbs, catch basins and storm water pipes) or other creative options for roadside drainage in the Rural Area, to better reflect the rural setting, accept adjacent farmland drainage, control the rate of discharge, encourage groundwater infiltration, and manage surface water quality. Where the drainage swale may become too deep and/or wide to resolve grades, consider a combination of grassy swale and perforated pipe system under the swale. Use these solutions for Village collectors that are intended to have a rural type (non-curb) cross-section and where sidewalks need to fit within the available ROW.
4. Along roadside ditches, use gentle side slopes, preferably 4:1 and not steeper than 3:1, to accommodate grass, plantings, and maintenance activities and to address road safety (vehicle recovery and roll-over avoidance). Where steeper ditch slopes are required in constrained areas, plant low maintenance vegetation.
5. Consider paving a portion (0.5m up to 1.5m) of road shoulders when rehabilitating, resurfacing, or constructing new rural arterials and collectors. Do this to improve traffic safety by providing additional recovery area, minimizing roll-over risk, and reducing risk of collision with fixed objects, particularly along higher speed roads. Take advantage of the added value for farm vehicle movement and cycling, walking, jogging, running along the road edge. Decisions regarding shoulder paving should be made on a case by case basis while having regard to the road designation in the Official Plan and the Cycling Plan and Pedestrian Plan, the cost to implement, as well as future Road Design Guidelines that may provide further guidance including potential life cycle cost benefits.
6. Where paved shoulders are to be provided, construct rumble strips" on a pilot project basis to test their road safety advantages and operational requirements, and to evaluate their impact on cyclists. Where paved shoulders are used by cyclists, the width of the rumble strip and a 0.3m clear zone should be in addition to the desired shoulder width.
7. Provide safe passenger waiting areas at bus stop locations along rural roads by widening the road shoulder, or ideally, by providing hard surface pads that could accommodate a bus shelter.
8. Provide culverts and lanes to permit farm vehicles to cross the roadway and to access adjacent lands where required, and involve landowners in the choice of location when constructing new roads.
9. To reduce the required ROW and maintain a rural character, avoid the use of raised curb medians unless needed for road safety. As an alternative, consider the use of grooved rumble strips, separated paint lines, turf swales, and other creative designs that have the affect of separating opposing traffic lanes. When evaluating the need for separation, consider traffic speeds, traffic volumes, traffic mix, number of lanes, left-turn lane locations, and adjacent land uses. At the rural/urban interface, and when there is no reasonable solution to providing raised curb medians, consider the need for piped

drainage systems (curb and catch basins) along them.

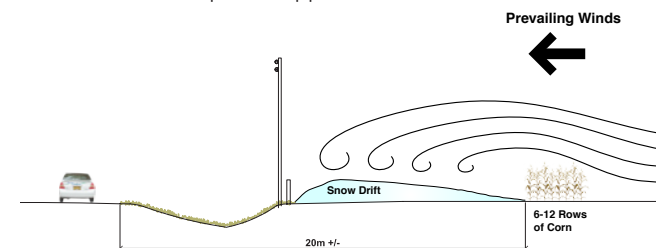
- 10.** Where identified in approved plans or studies, locate multi-use pathways in the ROW. Secure a wider ROW and locate the pathway near the ROW limit, separated from the vehicle lanes. Where the roadway forms a boundary between the Rural Area and an Urban Area, consider substituting a City sidewalk with a multi-use pathway along the urban side of the ROW, to consolidate pedestrian/cycling surfaces and to enhance the user experience.
- 11.** Illuminate roads only where needed for road user safety, to retain the Rural Area's dark night sky. When evaluating the need, consider: the number of vehicle lanes, traffic volumes, intersection locations, cycling route function, location/proximity of pedestrian crossings or routes, road segment length, and road corridor lighting continuity. Where roadside lighting is required, design systems that reduce the overall ambient glow on the rural landscape, including the use of full cut-off luminaires. Refer to the City's Right-of-Way lighting Policy (2007)
- 12.** Where roadside planting is appropriate in the ROW, design it to complement the variable rural character adjacent to the corridor (agricultural fields versus rural residential, etc.). Use species commonly or historically found in the region and plant in rural and naturalized patterns including groupings and uneven spacings. Where roadside planting cannot

be accommodated in the ROW, consider locating it outside of the ROW on adjacent lands to reduce the required ROW, to provide an unencumbered growing area, and to reduce potential conflicts with above-grade or below-grade services.

- 13.** Consolidate utilities and services (buried and overhead) along the ROW limit, on shared-use poles, and along one side of the road whenever possible. This will reduce the visual impact on the Rural Area, provide more unencumbered space for planting, drainage, and will improve road safety.
- 14.** Overhead utility pole lines are typically located at the ROW edge, close to the property line. However, where the pole line would be located in a ditch or where the pole would be shared with street lighting, the pole line may be placed closer to the traveled road edge.
- 15.** Locate trees a minimum of 3m from any overhead lines, to allow canopy growth with minimal pruning. Consider locating light fixtures on utility poles, to minimize poles and provide fewer conflicts with potential tree planting as well as improving road safety.
- 16.** Avoid impacts on valued natural and cultural heritage features (including federally significant resources) when designing and constructing new rural roads. If such features must be displaced or diminished due to construction activities, they should be replaced or

enhanced with features of equal or greater value, either in the ROW or on adjacent lands.

- 17.** For road segments prone to snow drifting such as along open windswept areas, provide opportunities on adjacent rural lands along the windward side of the road for snow drift management. Use measures such as retaining corn crops, planting hedgerows, or using snow fencing in the most problematic areas. Review the City's Alternative Snow Fence Program for further guidance.
- 18.** Coordinate the erection of the City's tourism way-finding signs and visitor attraction signs with other regulatory, tourism, and public service signs, and cycle route signs.
- 19.** Protect wider ROWs in the vicinity of creek and drain crossings, to provide extra space for culvert location and maintenance. Include provisions in the Official Plan to take triangular road widenings as a condition of development approvals.



*Improve winter motorist safety by compensating farmers to leave unharvested corn as snow-breaks along problematic windswept road segments.*

## A Road Typology

# 7.0

One of the hallmarks of the *Regional Road Corridor Design Guidelines* is the way in which the City's designated Arterial Roads are viewed as streets within wider City corridors. Roads are categorized following an analysis of planned function including adjacent land use context and public space objectives, and not solely by traffic carrying capacity or travel speed. This resulted in six (6) Arterial Road types. The needs and designs of each Road type are then reflected in cross-section demonstrations and corresponding ROW widths. The same approach is used in this document.



7-1

### 7.1 Road Types

An analysis of the context and planned function was completed for the Major Collector and Collector Roads located in the Urban Area and Villages, and the Arterial and Collector Roads located in the Rural Area. This led to the identification of the following six (6) main Road types:

#### 1. Neighbourhood Collector

These roads are the most "minor" of the City's Collector Road network. They are typically located in the General Urban Area and are flanked primarily with residential uses of varying sizes and densities together with supporting smaller scale neighbourhood uses such as schools, parks, and places of worship. They are often shorter segments that connect these uses to other Collector Roads and Arterial Roads. Buildings are located close to and oriented towards the street, often with numerous driveways. They are two-lane roads with an urban cross-section and on-street parking.

#### 2. Village Collector

These Village roads serve adjacent residences on larger lots and occasionally parks, schools and other community serving uses. They are often shorter segments that connect these uses to other Collector Roads and Arterial Roads. Buildings are set well back from the street with larger front lawns, sometimes in a forest setting. They are two-lane roads, often with a rural style (shoulder and ditch) cross-section.

#### 3. Community Collector

These relatively long road segments are often designated as Major Collectors. They are typically located in the General Urban Area and Mixed Use Centres. They are flanked by a very wide range of uses, densities, and building sizes. In more densely "urban" areas, these roads sometimes have a "mainstreet" function, with multi-storey mixed-use buildings set close to the street, and sidewalks along the curb. In more "suburban" areas, these roads are lined with larger community components such as schools, major parks, and civic buildings as well as higher density residential uses. In both cases, the number and spacing of driveways is limited in response to the higher volumes of traffic that may use the corridors. They are typically two-lane roads with an urban cross-section and lined with trees, and are transit routes. They often provide on-street parking, although some have been constructed in the past with four traffic lanes without on-street parking.

#### 4. Business Area Collector

These relatively short road segments are located in the City's business parks and industrial areas, typically on lands designated Employment Area and Enterprise Area. They are flanked by typically large office and industrial buildings on spacious lots with surface parking areas and relatively widely-spaced individual driveways. Landscaping along the street is often provided on private land in a campus setting. These streets are most often two-lanes, occasionally providing for on-street parking. The segments connect the employment uses to the adjacent

Arterial Road network, and in some cases form part of the City's Urban Truck Route network. They are often transit routes.

### 5. Rural Collector

These designated Collector Roads are the majority of the "country roads" located along historical concession ROWs in the City's Rural Area. They are flanked by farms and other rural land uses including rural residences on severed lots. The roads often afford long views of the expansive countryside including intermittent buildings, woodlots, natural features, and farmland. The roads have two-lanes with shoulders and open ditches and are not designed for on-street parking.



7-2

### 6. Rural Arterial

These designated Arterial Roads are the longer and more heavily-traveled roads in the Rural Area. They are a combination of main concession roads as well as some former Provincial Highways now under the City's jurisdiction. They are flanked by farms and other rural land uses including rural residences on severed lots as well as some rural businesses. The roads often afford long views of the expansive countryside including intermittent buildings, woodlots, natural features, and farmland. The roads have two lanes with shoulders and open ditches and are not designed for on-street parking.



7-3

### 7.2 Demonstrations and Details

The comparative characteristics of these six (6) road types are summarized on Table 7-1 (next page). Demonstration cross-sections, design emphases, and ROW requirements are provided in Appendix A. These demonstrations are consistent with the design guidelines for corridor components and rural conditions presented in Sections 5 and 6. They are, however, merely demonstrations. Detailed designs will need to be prepared by the City on an as-required basis and in collaboration with utility companies and other key stakeholders.

The demonstration plans will enable a review of current ROW width protection requirements set out in the Official Plan. They will also serve as a starting point for the refinement of the most appropriate detailed designs that adequately provide for services and utilities.

Details for individual road design elements are provided in Tables 1 and 2 in Appendix B. These are provided as a helpful reference, however, original reference documents should be referred to when completing detailed designs. These details are also reflected in the demonstration plans. Some of these details reflect emerging best practices. Follow-on work is suggested to update existing specifications, as appropriate.

# A Road Typology

**Table 7-1: Road Typology & Comparative Characteristics**

ROAD TYPE	Prevalent Land Use Designations	Prevalent Adjacent Land Use Context	Prevalent Adjacent Lot Sizes & Access	Prevalent Adjacent Building Scale & Orientation	Landscape & Visual Environment	Typical Roadside Drainage	Typical Length & Connectivity	Traffic Lanes & Parking	Traffic Volumes & Speed	Typical Roadway Classification
<b>Neighbourhood Collector</b>	Urban Area (General Urban Area)	Residential, Institutional, Open Space, Minor Commercial	Smaller lots with individual driveway access	Smaller buildings oriented close to road	Tightly-knit urban fabric along well-enclosed, tree-lined streets	Curb and catchbasin	Shorter segments that connect a neighbourhood to other collectors and arterials	Typically 2 lanes, with on-street Parking	Lower speed and volume	Collector
<b>Village Collector</b>	Village	Residential, Open Space	Range of lot sizes, with individual driveway access	Smaller buildings with varying setbacks	Buildings in spacious green setting along tree-lined streets	Shoulders and ditches, swales and perforated pipes	Shorter segments that connect a neighbourhood to other collectors and arterials	Typically 2 lanes	Lower speed and volume	Collector
<b>Community Collector</b>	Urban Area (General Urban Area, Mixed Use Centres, Central Area)	Mixed Use, Residential, Institutional, Open Space, Commercial	Range of lot sizes, some limitation and consolidation of lot access	Varying-size buildings oriented close to road	Tightly-knit urban fabric along well-enclosed, tree-lined streets	Curb and catchbasin	Longer segments that connect a neighbourhood between arterials	Typically 2 lanes with on-street parking, occasionally 4 lanes	Moderately higher speed and volume	Major Collector
<b>Business Area Collector</b>	Urban Area (Employment Area, Enterprise Area)	Business Park, Offices, Commercial	Larger lots with individual driveway access	Larger buildings oriented to road but often set back	Variety of buildings on spacious landscaped lots along tree-lined streets	Curb and catchbasin	Shorter segments that connect a business park to arterials	Typically 2 lanes occasionally 4 lanes	Lower speed and volume	Collector, Major Collector
<b>Rural Collector</b>	Rural Area	Farmland, Rural Residential, Vacant Rural Lands, Natural Areas	Large rural lots and severed residential lots with driveway access	Small and large buildings set well back from road	Rural, open setting with long views of farmland, scattered buildings, and natural features	Shoulders and ditches	Long segments that connect rural lands to other collectors and arterials	Typically 2 lanes	Higher speed, lower volume	Collector
<b>Rural Arterial</b>	Rural Area	Farmland, Rural Residential, Vacant Rural Lands, Natural Areas	Large rural lots and severed residential lots with driveway access	Small and large buildings set well back from road	Rural, open setting with long views of farmland, scattered buildings, and natural features	Shoulders and ditches	Very long segments connecting rural lands between arterials and highways	Typically 2 lanes	Higher speed and volume	Arterial



Table 7-2: Applicability of the Demonstrations

DEMONSTRATION	Use When ROW Is	Use for New Development	Use For Reconstruction	Typical Circumstances/Desired Results
<b>Neighbourhood Collector</b>				<b>Where Neighbourhood Collector characteristics on Table 7-1 are desired.</b>
20m	20m	No	Yes	Reconstruction of existing roads with existing 20m ROW.
22m ROW	22m	Yes	No	New roads where parking along one side only is appropriate, and where trees between the curb and sidewalk can be accommodated.
24m ROW Option 1 - Standard	24m	Yes	Yes	New roads where trees between the curb and sidewalk can not be accommodated due to underground service design.
24m ROW Option 2 - Trees Between Sidewalk and Curb	24m	Yes	Yes	New roads where trees between the curb and sidewalk can be accommodated.
26m ROW	26m	Yes	Yes	New roads or reconstruction of existing roads within existing 26m ROW.
<b>Village Collector</b>				<b>Where Village Collector characteristics on Table 7-1 are desired. Note that other Neighbourhood Collector or Rural Collector demonstrations may also be applicable in some Village contexts.</b>
26 m ROW	26m	Yes	Yes	New or reconstructed Collector Roads in Villages.
<b>Community Collector</b>				<b>Where Community Collector characteristics on Table 7-1 are desired.</b>
20 m ROW	20m	No	Yes	Reconstruction of existing roads with existing 20m ROW.
24 m ROW	24m	Yes	Yes	New roads where highly "urban" character is desired, such as in Mixed Use Centres.
26 m ROW Option 1 - Standard	26m	Yes	Yes	New roads or reconstruction of existing roads within existing 26m ROW.
26m ROW Option 2 - Cycling Lanes	26m	Yes	Yes	New roads or reconstruction of existing roads within existing 26m ROW, along segments with on-road cycling routes designated in the Official Plan or Cycling Plan, and where on-road parking not required.
26m ROW Option 3 - Enhanced Areas	26m	Yes	Yes	Roads in unique districts such as in Mixed Use Centres or design controlled neighbourhoods, and where enhanced on-road cycling, parking and road edge drainage facilities are desired.
<b>Business Area Collector</b>				<b>Where Business Area Collector characteristics on Table 7-1 are desired. Note that other Neighbourhood or Community demonstrations of 24m or 26m may be applicable.</b>
26m ROW	26m	Yes	Yes	New or reconstructed roads in designated Employment Areas, Enterprise Areas, or in smaller business parks in the Urban Area.
<b>Rural Collector</b>				<b>Where Rural Collector characteristics on Table 7-1 are desired.</b>
26 m ROW	26m	Yes	Yes	New or reconstructed Collector roads in the Rural Area.
<b>Rural Arterial</b>				<b>Where Rural Arterial characteristics on Table 7-1 are desired.</b>
30 m ROW	30m	Yes	Yes	New or reconstructed roads in the Rural Area.

### 7.3 Application of the Demonstrations

This section provides an overview of how to apply the appropriate demonstration plan from Appendix A when planning/designing a new collector or rural Arterial Roadway, or reconstructing an existing facility. Alternative demonstrations are provided for some of the road types so that a diversity of land use conditions can be addressed. The variability in the alternatives is either in the ROW required or the spatial arrangement of the cross-section elements, or both. Table 7-2 (right) provides direction on when each cross-section is most applicable.

For new road corridors in Greenfield settings, demonstration plans using a ROW of 24m or 26m are applicable for most Collector and Major Collector Roads, respectively. These ROW widths provide sufficient space not only for the on-road requirements but for the many streetscape elements along the road edge as well as choices for the location/design of services and utilities.

In other instances, such as existing road corridors with constrained conditions, or for application in mixed use centres or areas where a highly urban environment is desired, road cross-sections which reflect a narrower ROW should be considered. In constrained or existing locations in older parts of the City, a 20m ROW is typically found, and there is often little or no opportunity for ROW widenings to be provided.

Roads with "Green Street" treatments (See Section 8.0) may require a wider ROW in order to accommodate en-

## A Road Typology

hanced features such as additional landscaping, multi-use pathways, etc.).

When assessing the appropriate demonstration plan for use, considerations include the adjacent land use, applicable roadway typology, projected traffic volumes, and other functional requirements (turn lanes, transit, on-road parking, and cycling facilities). The Official Plan and Community Design Plans will often provide guidance on these matters.



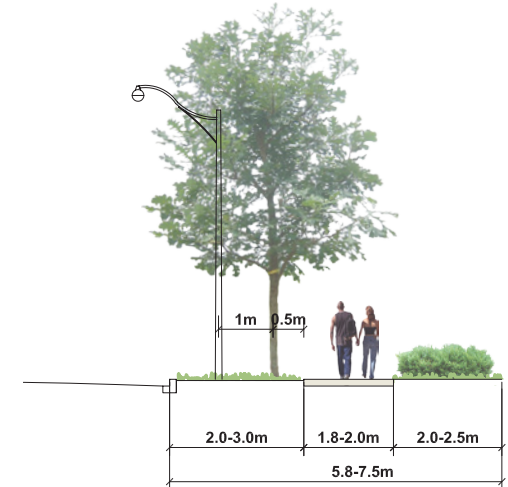
7-4

### 7.4 Completing Detailed Cross-Section Designs

Of the various demonstration plans provided in Appendix A, only the 24m Option 1 - Standard cross-section has been confirmed by the City for immediate use. It is the only collector included in the City's *Right-of-Way Cross-Sections for Residential Roads*. Designs for services and utilities have been approved for this option following a lengthy design process involving key stakeholders, including utility companies. A similar process is recommended for the other collector road and rural arterial road demonstration plans, as needs arise.

As a first priority, detailed designs for the Neighbourhood Collector 24m Option 2 demonstration plan should be investigated. Whereas Option 1 locates trees between the sidewalk and street lot line, Option 2 locates trees between the curb and sidewalk. There are numerous above-grade benefits to the Option 2 demonstration plan, where the trees create a superior enclosure to both the roadway and the sidewalk. It also provides the opportunity for full canopy enclosure over the sidewalk, depending on the location of a second row of trees on adjacent private land. Locating trees closer to the roadway also brings a traffic calming effect, and should not result in traffic safety (collision) concerns due to the relatively low speed of the roads in question. With proper separation of 2 to 2.5m from the roadway, street lighting conflicts, snow maintenance, and salt damage concerns are minimized. Trees located closer to the roadway of lower speed roads is a fundamental principal of contemporary urban road design, and is enshrined as a principle in the RRCDG.

There will often be situations where it will be difficult to accommodate all the required and desired design elements in the cross-section. Trade-offs may need to be made. When completing the final designs, care must be taken to balance competing demands, keeping in mind these design guidelines and broader Official Plan directions. In most instances, priority for space within a road corridor should be given to pedestrians, cyclists, and transit needs, as well as trees and vital infrastructure. The best design solutions will be made with multi-disciplinary input from (listed alphabetically): landscape architects and foresters, municipal engineers, transportation engineers, urban planners and designers, as well as development proponents and community representatives.



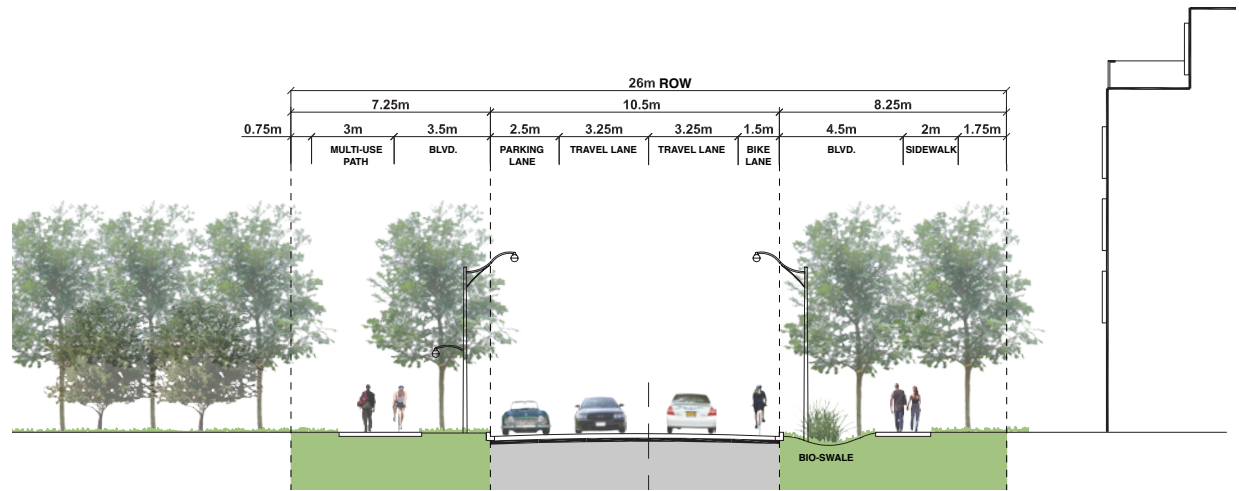
For ROWs of 22 to 26m, road edges of 6.0 to 7.5m approximately provide sufficient space for above-grade elements, and provide choices for services and utilities.

### 8.1 Green Street Designs

The “Green Streets” concept is expressed in the City’s *Greenspace Master Plan (2006)*. Green Streets are defined by their attractive, tree-lined open space character, and by their emphasis on environmental quality. They often connect components of Ottawa’s Greenspace Network such as parks, open spaces, natural areas and stormwater management facilities, as well as schools, civic buildings, workplaces, and other community destinations. They place an emphasis on creating comfortable and convenient facilities for pedestrians and cyclists, and they may also be important transit routes.

As the name implies, Green Streets are inherently very green, with an emphasis on trees, shrubs, sod, and plantings. Green living materials bring a myriad of cumulative benefits such as: temperature amelioration, energy use reduction, shading and UV protection, wind control, soil moisture infiltration, soil compaction avoidance, erosion management, air quality, oxygen production, CO<sub>2</sub> reduction, storm water retention, pollution reduction, noise abatement, glare reduction, habitat creation, visual environment improvement, and property value appreciation.

Green streets are typically located in the Urban Area and Villages and are identified in plans such as the *Greenspace Master Plan*, *Community Design Plans* and *Secondary Plans*. In plans that predated the 2006 *Greenspace Master Plan*, and use of the “green streets” term in the City of Ottawa, there are roads that have been highlighted that



*Green Streets will require location-specific designs. Choices will vary depending on adjacent greenspace features, path and cycling designations, on-road parking requirements, and drainage possibilities. The requirements range from 26m to 30m (see Table 8-1).*

fulfill green street functions noted above. A higher standard of design and construction may be needed to fulfill the green street functions especially in designated areas of higher design standard such as Town Centres and the Central Area where:

- > roads that have intentionally narrow rights-of-way protection;
- > ROWs are constrained by existing development; and,
- > there is competition for space among roadway elements.

While all streets should reflect Green Street characteristics, those that are identified or designated in plans to

fulfill specific Green Street roles should exhibit exemplary design.

1. Identify “priority” Green Streets in Community Design Plans and Secondary Plans that have the greatest potential to connect major elements of the City’s Greenspace Network.
2. Provide additional opportunities for street trees, urban forest, pedestrian amenities and groundwater recharge along designated Green Streets. Use such means as enhancing the amount of area dedicated to the boulevard, placing priority on the creation of landscaped space when coordinating above and below ground utilities, managing surface water to

## Green Streets

enhance natural infiltration (see above), and locating the roadway off-centre in the ROW.

3. Create opportunities for shrub, ground cover and other plants in addition to street trees to emphasize the attractive green nature of the street, enhance environmental quality, and to reinforce its function as a premiere open space component of the City.
4. Design Green Streets using sustainable infrastructure innovations (such as those outlined in Section 4.2), and use these streets as pilot projects where appropriate.
5. Coordinate landscape improvements on lands adjacent to designated Green Street corridors with landscape elements in the corridor to reinforce the green character of the corridor.
6. Give priority to pedestrian, cycling and road edge functions along a designated Green Street corridor through such means as minimizing vehicular lane widths, limiting on-road parking, and coordinating services into shared trenches.
7. Create the opportunity for Green Streets to be highly utilized transit routes, thereby bolstering the street's many environmental benefits. Integrate transit priority measures along the street and enhance the quality of transit stops with shelters and generous landscaping.
8. When multi-use pathways connections are identified in the road corridor to connect key segments of the pathway network, design the pathway for continuity and safety. Locate the pathway to minimize the frequency of driveways, provide sufficient lateral safety clearances, and locate the pathway on the side of the road that would minimize the need to cross the road.
9. Where a Green Street provides a strategic link in the City's Cycling Network, enhance cycling priority within the road corridor. Consider a range of cycling priority measures and dedicated cycling facilities such as: signed shared use lanes, dedicated cycling lanes, off-road pathways, traffic signal priority or other measures.



8-1

### 8.2 Green Street ROW Implications

To fulfill "Green Street" functions, a road may require more space allocated to the road edge or medians. Allocating more space to accommodate green street elements can be accomplished by:

- widening of the road edge or median areas;
- narrowing the road surface through a road diet approach, such as the elimination of on-street parking allocation;
- establishing deeper front yard setbacks and coordinating the design of green street elements on adjacent private lands; and/or,
- making one road edge wider than the other to create sufficient room for green street elements, with roadway surface located off-centre in the ROW.

Green Streets should be identified in plans, and a wider ROW protected to accommodate their additional components. A sufficiently wide ROW can typically be secured by providing a road edge "supplement" in the range of 2.0 to 3.5m along each side of roads in Urban Areas and Villages. This assumes the range of "standard" roadway components such as demonstrated in Appendix A, which typically consume between 11.0 and 13.5m of the ROW. The resulting road edge and ROW widths are presented on Table 8-1.

There are many possible designs for Green Streets. The designs would vary on a case by case basis, and some may even require road edge widths greater than 9.5m.

This may include instances where innovative road edge drainage treatments are desired (such as bioswales), when 3.0m multi-use pathways are planned, or when there are few opportunity for green features on adjacent lands. In some cases, wide (5.0m+) green medians may be desired. In other cases, an enhanced Green Street treatment may be pursued on only one widened road edge. However, in most cases, appropriate Green Street designs for Collector roads in the Urban Area and Villages should be accommodated in ROWs of 30m or less.

**Table 8-1: Supplementing ROW Widths to Create Green Streets**

Standard		→	Green Street		
ROW Widths	Typical Road Edge Width (Each Side)	→	Road Edge Supplement (Each Side)	Resulting Road Edge Width (Each Side)	Resulting ROW Widths
20m	4.0 - 4.5m	→	+3.0 - 3.5m	7.0 - 7.5m	26m
24m	5.25 - 6.5m	→	+3.0m	8.25 - 9.5m	30m
26m	6.5 - 7.5m	→	+2.0m	8.5 - 9.5m	30m



8-2

## Implementation

# 9.0

These guidelines can be immediately implemented in the design of the new road corridors that they address. Various processes and tools exist to assist.

### Confirming a Vision

The design process can follow the guidance set out in Section 9.0 of the *Regional Road Corridor Design Guidelines*. This includes establishing a “vision” for the road that is well-matched to its planned function, with an understanding of how the road segment fits into the road types defined in Section 7.0 of this document. In all cases, this vision is best clarified through a process involving stakeholders.

When existing individual roads or road segments are being reconstructed, the process of confirming a vision could be as simple as a community meeting. In more elaborate projects, the Environmental Assessment (EA) process may provide a more in-depth process.

### Community Design Plans

The vision for a new Collector Road network in developing areas can often be developed through a Community Design Plan (CDP) process. This process provides an excellent planning tool to enable an understanding of the varying functions of the Collector Road network and the community contexts along various segments. Road ROWs can be confirmed at this time. If the network structure is well-planned in the CDP, there should be more certainty in road designs and decisions during the subsequent Plan of Subdivision processes.

### Zoning By-Law

It is also important that Zoning By-Law regulations be harmonized with the design of Collector Road corridors. This is particularly important in developing areas where individual residences along Collector Roads may have direct driveway access. In those instances, the outside portion of the ROW (where driveways cross) may be used for driveway parking, and garage setbacks need to be properly calibrated with sidewalk locations. Setbacks from overhead electric lines and pad-mounted transformers must be considered when building setbacks are reduced.

### Right-of-Way Protection

The Demonstration Plans provided in Appendix A will provide a basis for reviewing the City of Ottawa Official Plan ROW protection policies. Those policies were for the most part carried over from the Official Plans of Ottawa's municipalities prior to amalgamation, and harmonization is required. A classification of the affected roads will be done in accordance with the six road types defined in Section 7. The existing ROW width, the historically designated ROW width, and the road function will be assessed. Adjustments to the ROW width to be protected will be recommended for inclusion as an amendment to the Official Plan. For some existing road segments that have an appropriate ROW width to enable reconstruction to new standards, the City will consider removing ROW protection for those segments altogether.

### Balancing Competing Interests & Objectives

Given the multiplicity of road functions and the variety of road contexts, there is often a need to balance competing interests in the competition for horizontal and vertical space when designing roads and establishing ROWs to be protected. For example, the “ideal” space and separation requirements for services and utilities often conflict with the desired location of above-ground amenities such as trees, street lights and sidewalks, and vice-versa. If treated in isolation, the road design process would run the risk of resulting in ROWs that are excessive (to provide ideal conditions for all elements), or where elements are not properly spatially-organized. Accordingly, the design guidelines must assist in making design choices that result in the most appropriate balance given the context.

The policy basis described in Section 4 and the suggestions provided in Section 7.4 provide a good starting point for making balanced design choices. When evaluating road design choices, regard should also be had for the relevant Official Guiding Principles and Strategic Directions as well as the road classification objectives outlined in Section 1.0. Life-cycle costs and availability of capital funding will always be highly important considerations.

Regard should also be had for the First Principles set out in the *Regional Road Corridor Design Guidelines*. These deal with road corridors as important public spaces, access providers, multi-modal routes, and service and util-

ity routes. How do alternative designs meet all of these criteria? A holistic understanding of these varying road objectives and a constant consideration of trade-offs and innovative solutions is required.

Finally, the City will be informed by these guidelines when preparing and updating its road design manuals, specifications, detailed cross-sections, and in preparing site-specific designs. Those tools will establish municipal standards governing construction, and will be effective in promoting designs for all above-grade and below-grade infrastructure that are compatible with the planning and design guidance provided in this document and other related city documents.





APPENDIX A includes the following demonstration cross-sections and right-of-way width requirements:

## **Neighbourhood Collector**

20m ROW

22m ROW

24m ROW - Option 1 - Standard

24m ROW - Option 2 - Trees Between Sidewalk & Curb

26m ROW

## **Village Collector**

26m ROW

## **Community Collector**

20m ROW

24m ROW

26m ROW - Option 1 - Standard

26m ROW - Option 2 - Cycling Lanes

26m ROW - Option 3 - Enhanced Areas

## **Business Area Collector**

26m ROW

## **Rural Collector**

26m ROW

## **Rural Arterial**

30m ROW

Note that these designs are merely demonstrations and need to be tested and refined by stakeholders following a detailed design process. In the interim, designs need to reference the latest version of the City of Ottawa and utilities' technical design guidelines, standards and specifications.

# Neighbourhood Collector Demonstration

## 20m ROW

### Potential Application

- Reconstruction of existing roads within narrow ROWs, typically in older parts of the City.
- See Tables 7-1 and 7-2.

### Defining Characteristics

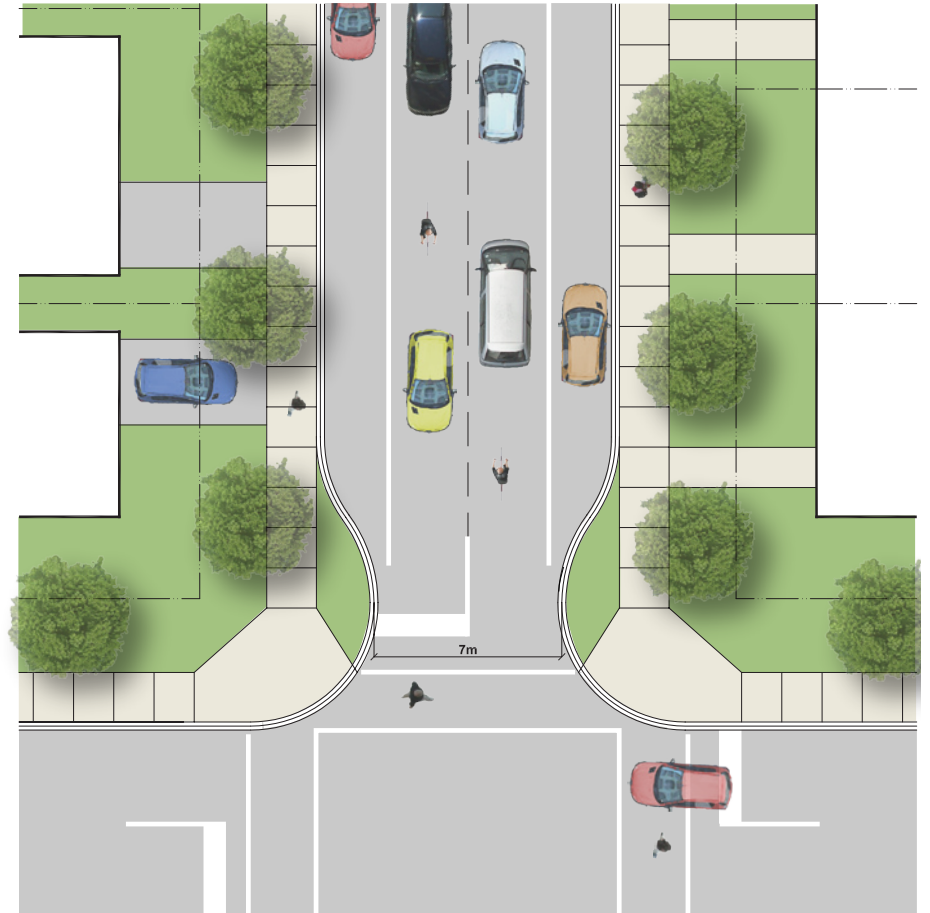
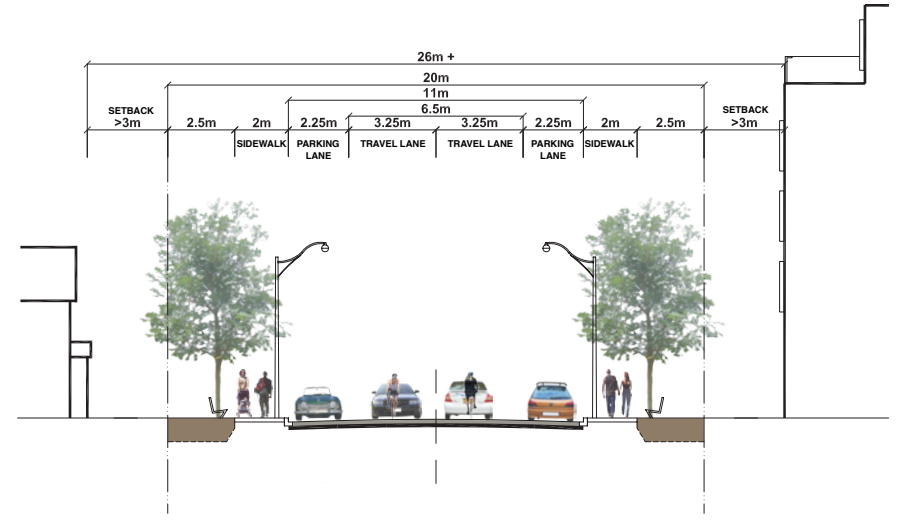
- Narrow (11m) paved surface
- Narrow (3.25m) travel lanes
- Narrow (2.25m) defined parking lanes
- Sidewalks located along curb
- Trees between sidewalk and ROW limit
- Buildings typically set back 0 to 3m from ROW limit
- Typically designated a Collector

### Services & Utilities

- Curb and catch basin drainage
- If electrical distribution is underground, appropriate space in the road edges is required for ducts, cable chambers, and padmounted equipment. Easements and/or vaults in buildings may be required.
- If electrical distribution is overhead, trees under lines need to be less than 6m height at maturity, and overhead restricted zone building setback requirements apply.
- See section 5.8

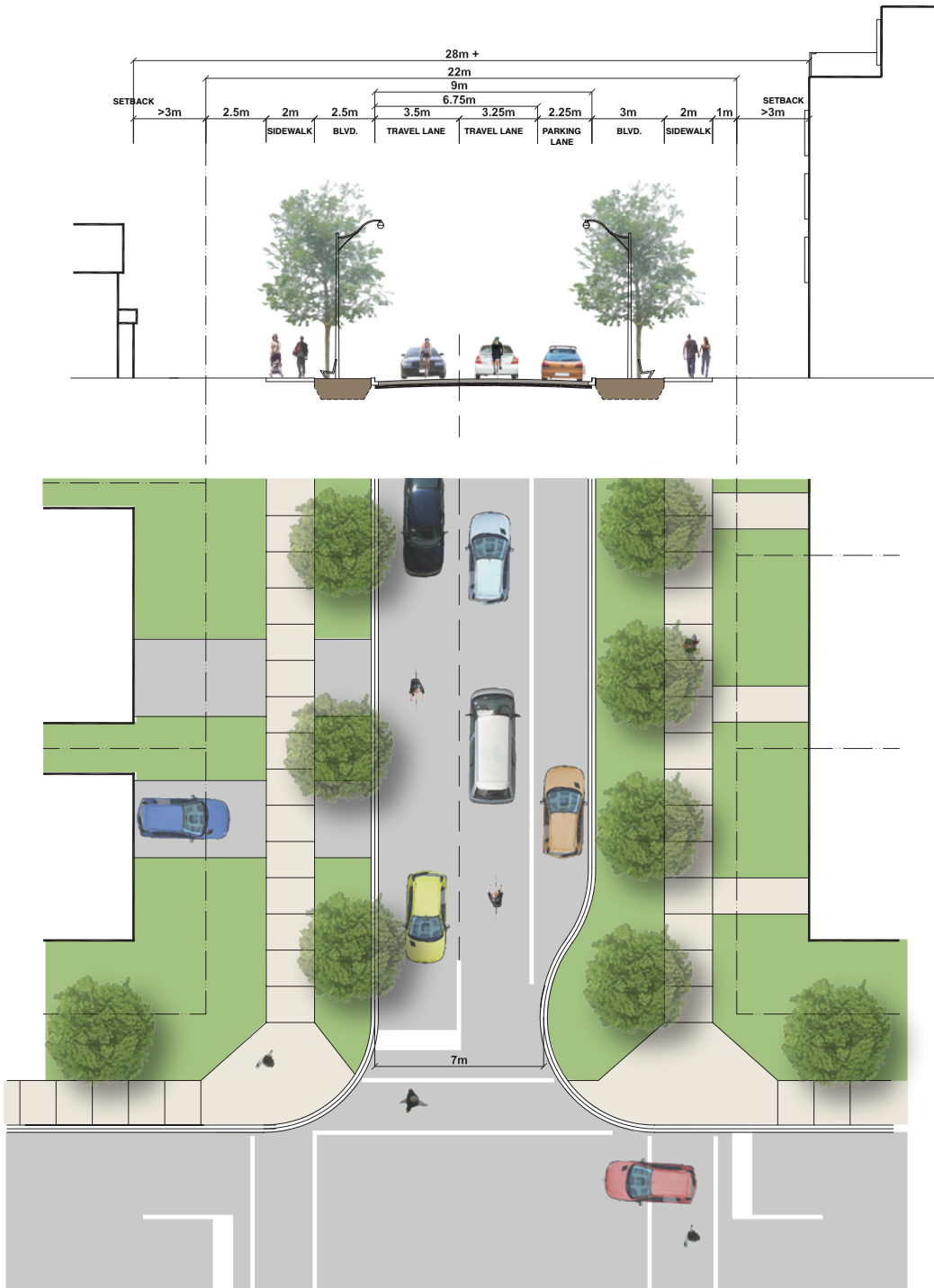


A-1



## Neighbourhood Collector Demonstration

# 22m ROW



### Potential Application

- New roads within narrow ROWs, where parking along one side only is appropriate, and where trees between the curb and sidewalk are desired. Used in unique circumstances. Reconstruction of existing roads within narrow ROWs, typically in older parts of the City.
- See Tables 7-1 and 7-2.

### Defining Characteristics

- Asymmetrical cross-section
- Very narrow (9m) paved surface
- Narrow (3.25 to 3.5m) travel lanes
- Narrow (2.25m) defined parking lane along one side of street only
- Trees between sidewalk and curb in grassy boulevard
- Buildings typically set back 0 to 3m from ROW limit
- Typically designated a Collector

### Services & Utilities

- Curb and catch basin drainage
- If electrical distribution is underground, appropriate space in the road edges is required for ducts, cable chambers, and padmounted equipment. Easements and/or vaults in buildings may be required.
- If electrical distribution is overhead, trees under lines need to be less than 6m height at maturity, and overhead restricted zone building setback requirements apply.
- See section 5.8



A-2

# Neighbourhood Collector Demonstration

## 24m ROW Option 1 - Standard

### Potential Application

- New roads in a reduced ROW where trees between the curb and sidewalk are not accommodated. Used frequently in developing communities for roads with lower speeds and volumes.
- See Tables 7-1 and 7-2.

### Defining Characteristics

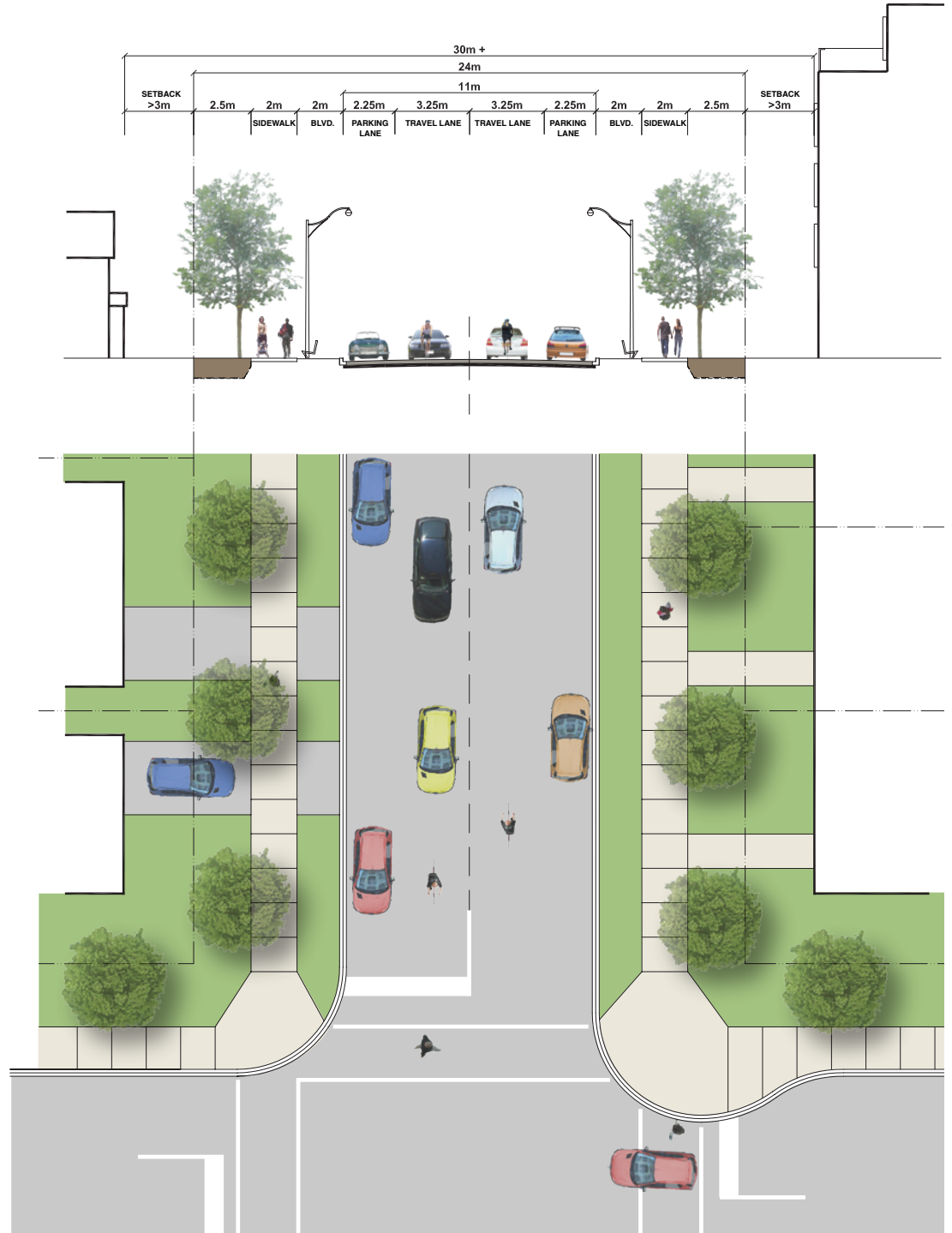
- Narrow (11m) paved surface
- Narrow (3.25m) travel lanes
- Parking lanes not defined
- Trees between sidewalk and ROW limit in grassy boulevard
- Buildings typically set back 3 to 6m from ROW limit
- Typically a Collector

### Services & Utilities

- Curb and catch basin drainage
- If electrical distribution is underground, appropriate space in the road edges is required for ducts, cable chambers, and padmounted equipment. Parallel access easements will be required.
- If electrical distribution is overhead, trees under lines need to be less than 6m height at maturity, and overhead restricted zone building setback requirements apply.
- See section 5.8

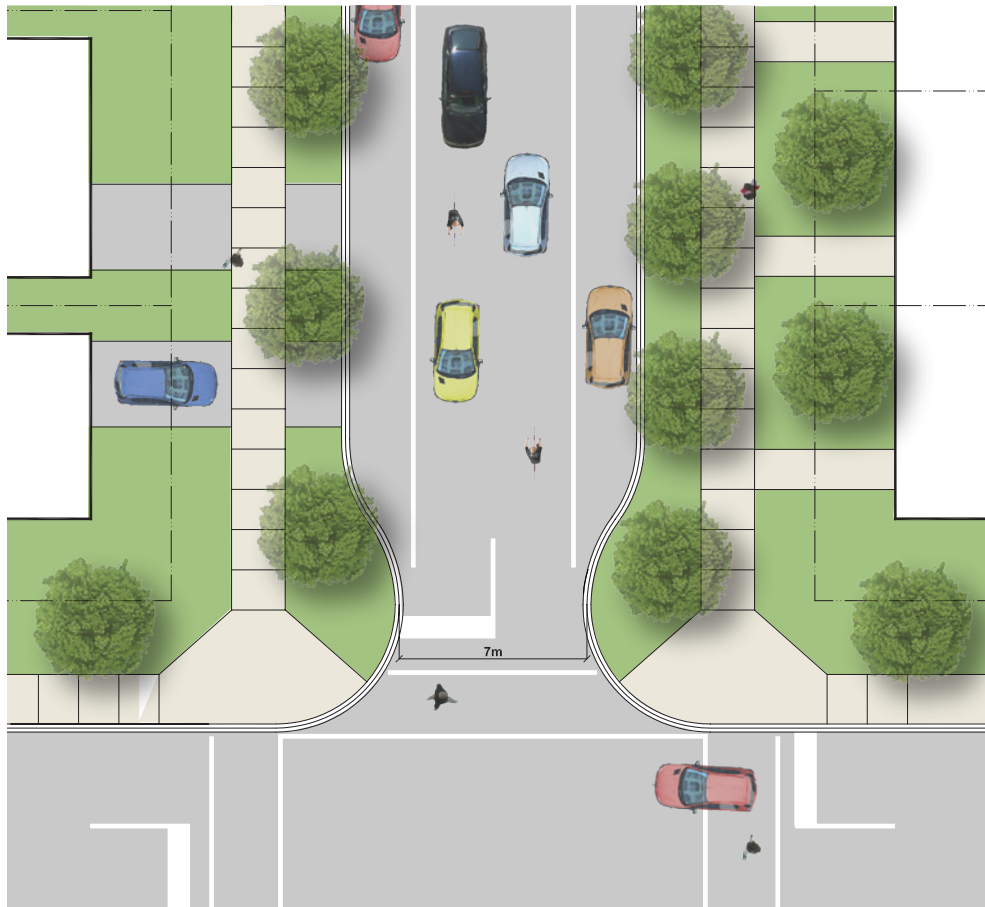
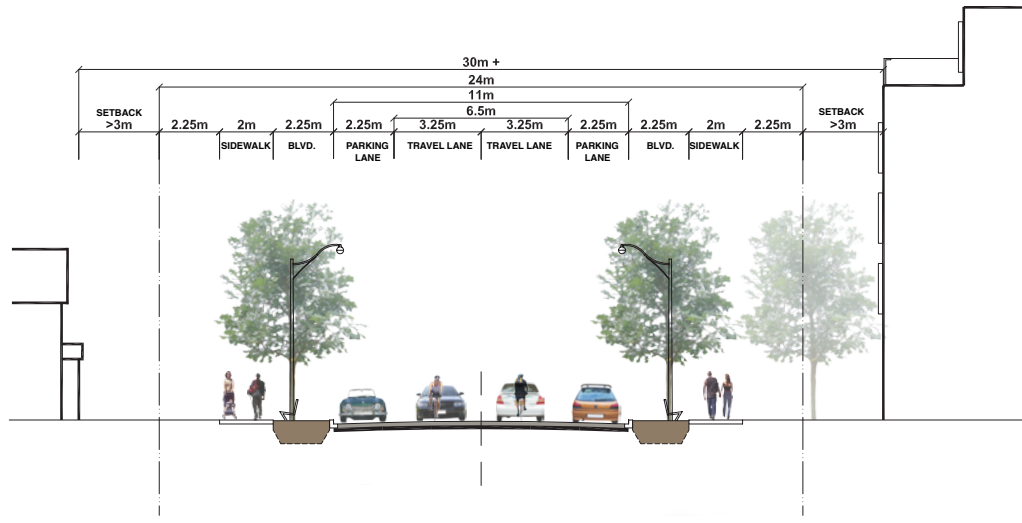


A-3



## Neighbourhood Collector Demonstration

### Option 2 - Trees Between Sidewalk & Curb 24m ROW



#### Potential Application

- New roads in a reduced ROW where trees between the curb and sidewalk can be accommodated. Used frequently in developing communities for roads with lower speeds and volumes.
- See Tables 7-1 and 7-2.

#### Defining Characteristics

- Narrow (11m) paved surface
- Narrow (3.25m) travel lanes
- Narrow (2.25m) defined parking lanes
- Trees between sidewalk and curb in grassy boulevard
- Buildings typically set back 3 to 6m from ROW limit
- Typically designated a Collector

#### Services & Utilities

- Curb and catch basin drainage
- If electrical distribution is underground, appropriate space in the road edges is required for ducts, cable chambers, and padmounted equipment. Parallel access easements will be required.
- If electrical distribution is overhead, trees under lines need to be less than 6m height at maturity, and overhead restricted zone building setback requirements apply.
- See section 5.8



A-4

# Neighbourhood Collector Demonstration

## 26m ROW

### Potential Application

- New roads or reconstruction of existing roads within traditional 26m ROW.
- See Tables 7-1 and 7-2.

### Defining Characteristics

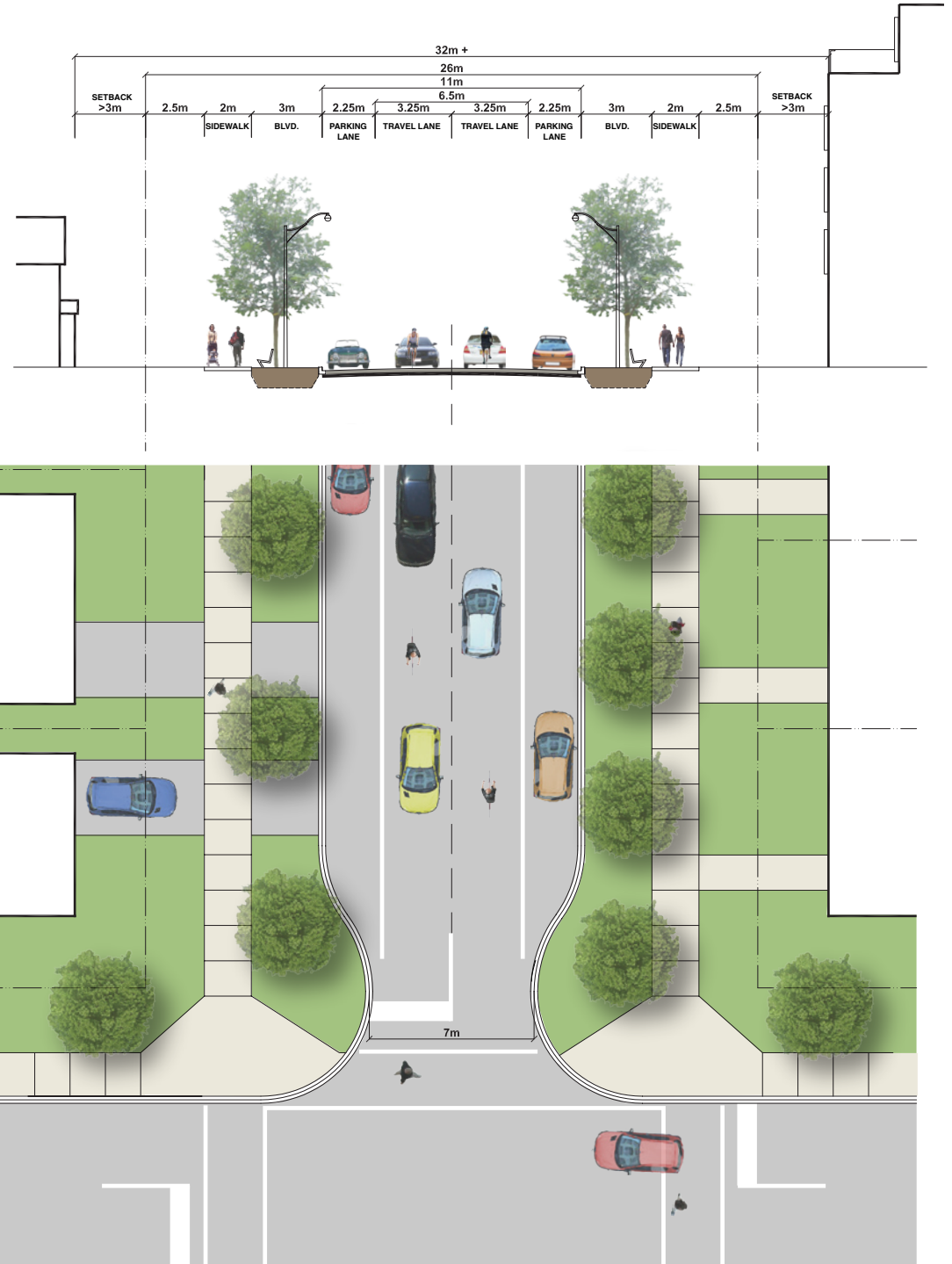
- Narrow (11m) paved surface
- Narrow (3.25m) travel lanes
- Narrow (2.25m) defined parking lanes
- Trees between sidewalk and curb in grassy boulevard
- Buildings typically set back 3 to 6m from ROW limit
- Typically designated a Collector

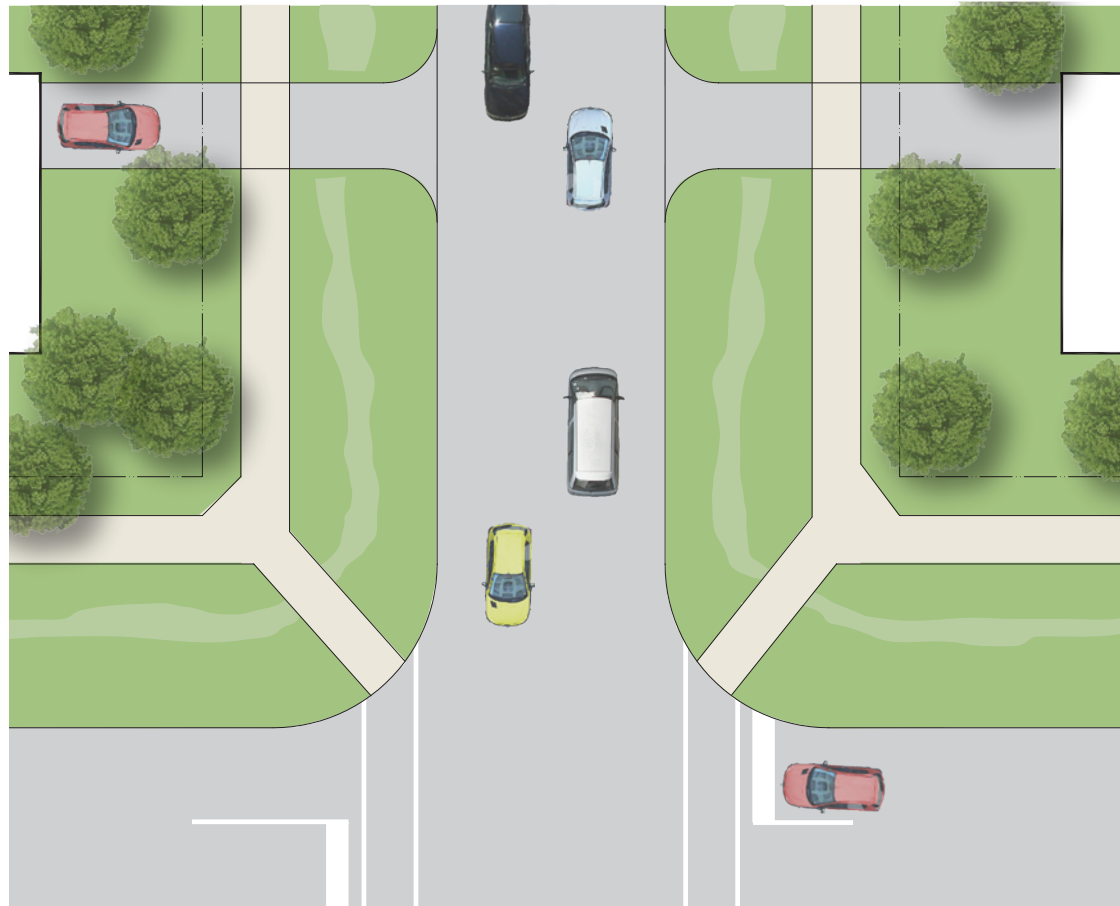
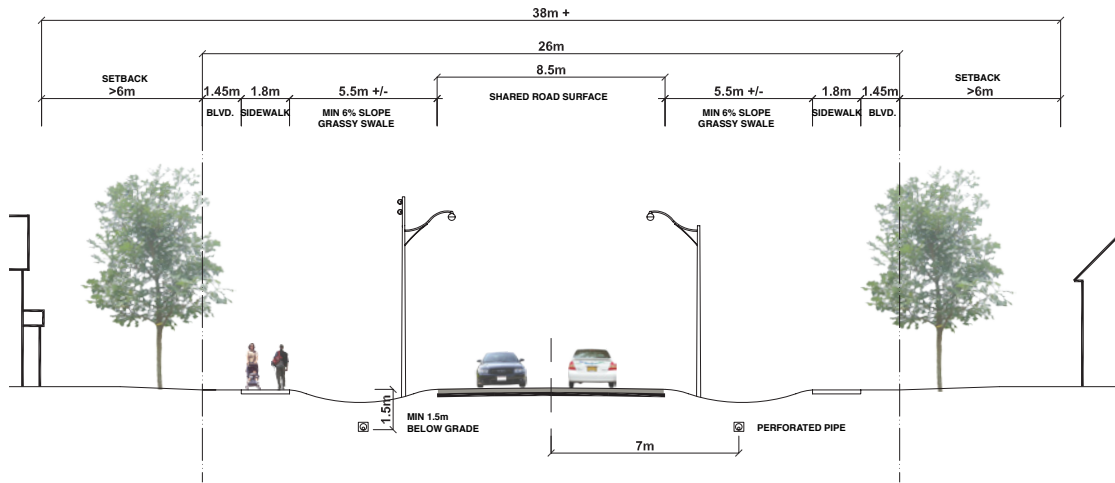
### Services & Utilities

- Curb and catch basin drainage
- If electrical distribution is underground, appropriate space in the road edges is required for ducts, cable chambers, and padmounted equipment. Parallel access easements may be required.
- If electrical distribution is overhead, trees under lines need to be less than 6m height at maturity, and overhead restricted zone building setback requirements apply.
- See section 5.8



A-5





**Potential Application**

- New roads or reconstruction of existing roads in Villages, where sidewalks along both sides of road are required, and where a "rural" type cross-section is appropriate.
- See Tables 7-1 and 7-2.

**Defining Characteristics**

- Narrow 8.5m paved surface
- Road shoulders and swales (no curbs)
- Sidewalks along both sides of street, behind swale
- Trees outside of ROW or possibly between sidewalk and ROW limit in grassy boulevard
- Buildings typically set back 6m plus from ROW limit
- Typically designated a Collector

**Services & Utilities**

- Grassy swale, catch basin, and perforated pipe drainage
- If electrical distribution is underground, appropriate space in the road edges is required for ducts, cable chambers, and padmounted equipment. Parallel access easements may be required.
- If electrical distribution is overhead, trees under lines need to be less than 6m height at maturity, and overhead restricted zone building setback requirements apply.
- See section 5.8



A-6

# Community Collector Demonstration

## 20m ROW

### Potential Application

- Reconstruction of existing roads within existing narrow ROW, typically in older parts of the City.
- See Tables 7-1 and 7-2.

### Defining Characteristics

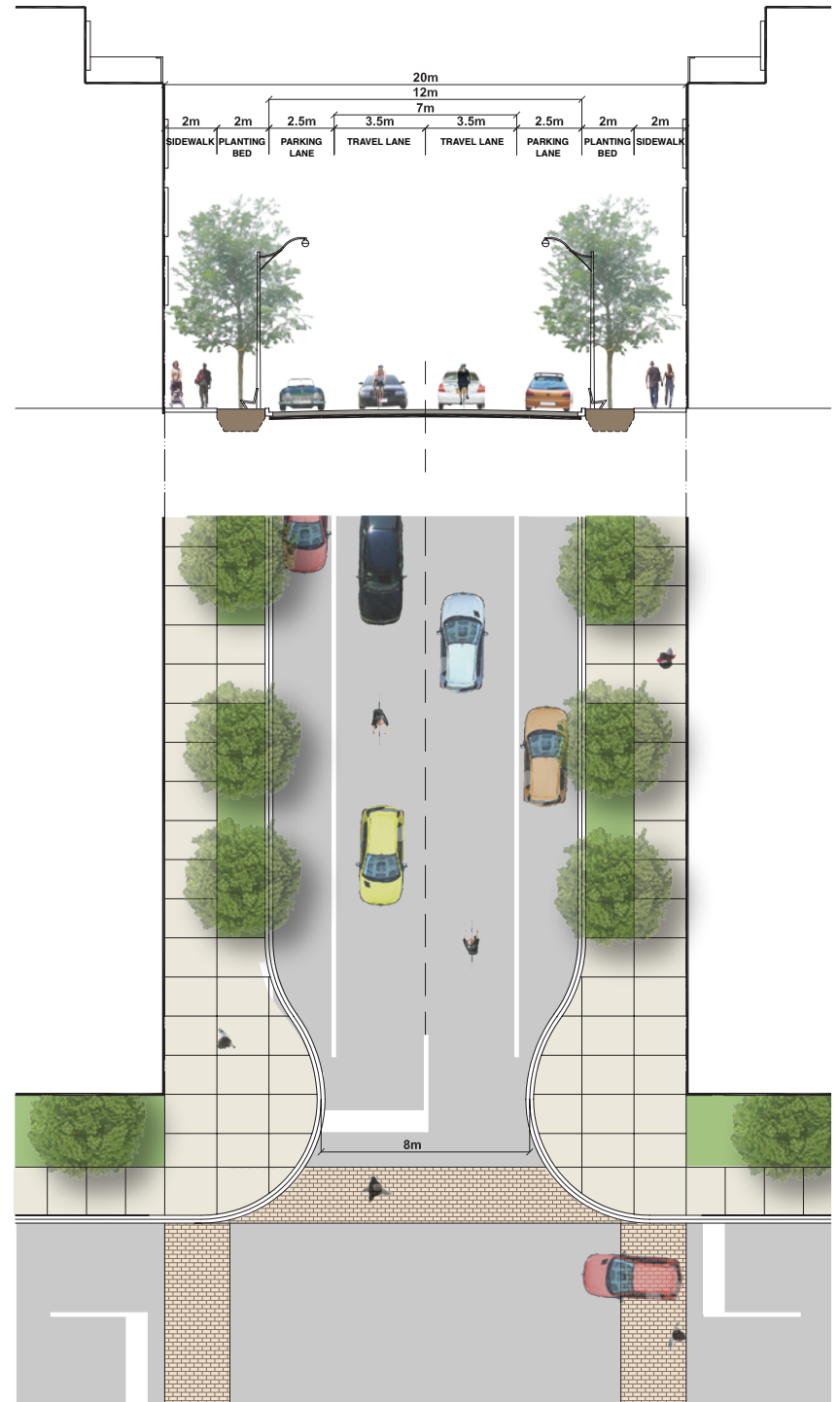
- Wider (12m) paved surface
- Wider (3.5m) travel lanes
- Wide (2.5m) parking lanes
- Trees between curb and sidewalk, in narrow planting beds or trenches
- Possibility of distinctive crosswalks
- Buildings typically set back 0 to 3m from ROW limit
- Designated Collector or Major Collector

### Services & Utilities

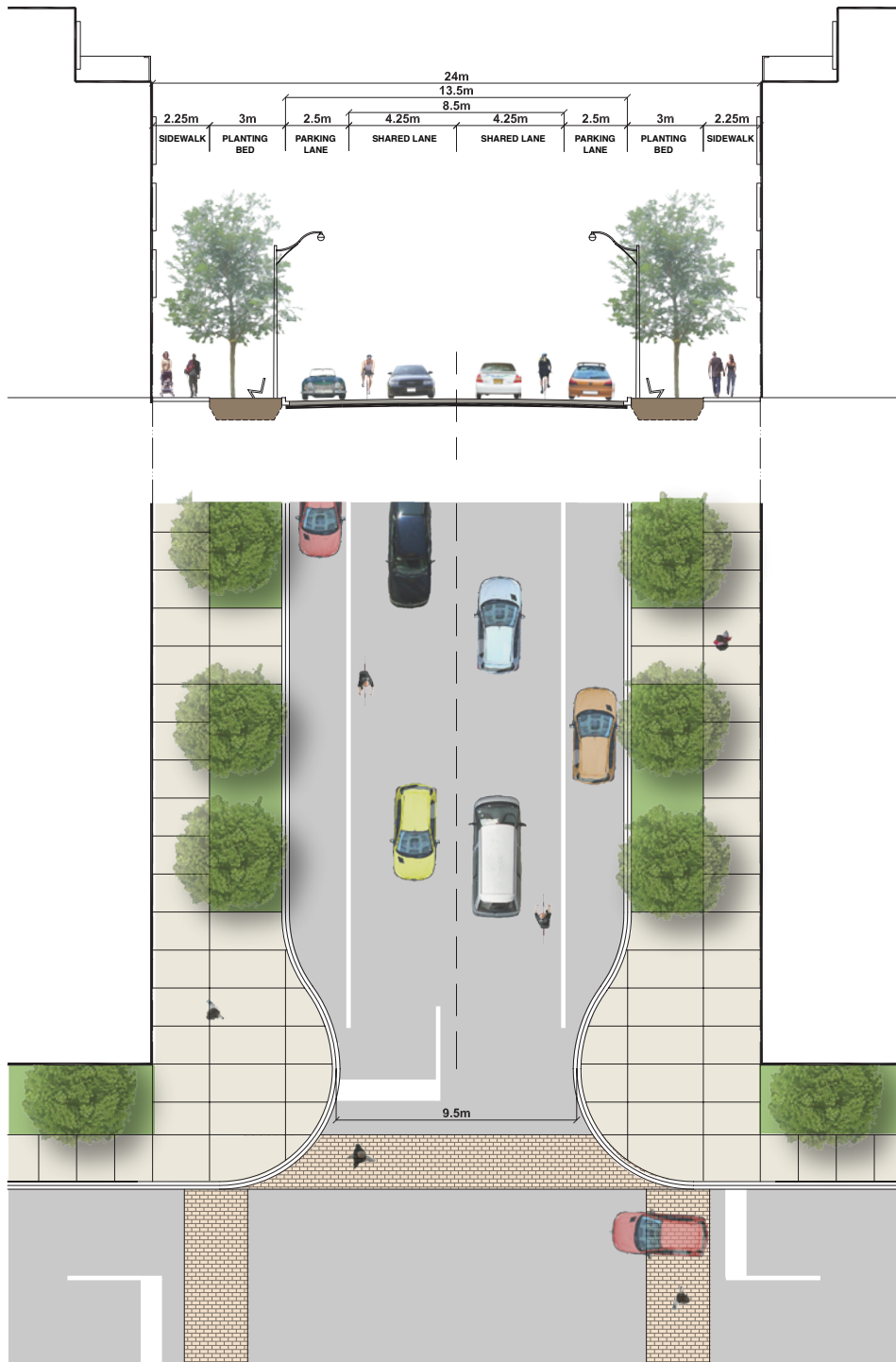
- Curb and catch basin drainage
- If electrical distribution is underground, appropriate space in the road edges is required for ducts, cable chambers, and padmounted equipment. Easements and/or vaults in buildings may be required.
- If electrical distribution is overhead, trees under lines need to be less than 6m height at maturity, and overhead restricted zone building setback requirements apply.
- See section 5.8



A-7







**Potential Application**

- New roads where highly "urban" character is desired in a narrow corridor, such as in Mixed Use Centres.
- See Tables 7-1 and 7-2.

**Defining Characteristics**

- Wide (13.5m) paved surface
- Wider (4.25m) shared use lanes
- Wide (2.5m) parking lanes
- Trees between curb and sidewalk, in wider planting beds or trenches
- Possibility of distinctive crosswalks
- Buildings typically set back 0 to 3m from ROW limit
- Typically designated a Major Collector

**Services & Utilities**

- Curb and catch basin drainage
- If electrical distribution is underground, appropriate space in the road edges is required for ducts, cable chambers, and padmounted equipment. Easements and/or vaults in buildings may be required.
- If electrical distribution is overhead, trees under lines need to be less than 6m height at maturity, and overhead restricted zone building setback requirements apply.
- See section 5.8



A-8

# Community Collector Demonstration

## 26m ROW Option 1 - Standard

### Potential Application

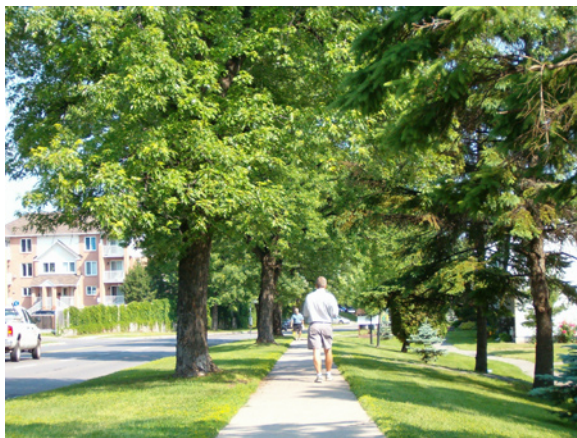
- New roads or reconstruction of existing roads within traditional 26m ROW.
- See Tables 7-1 and 7-2.

### Defining Characteristics

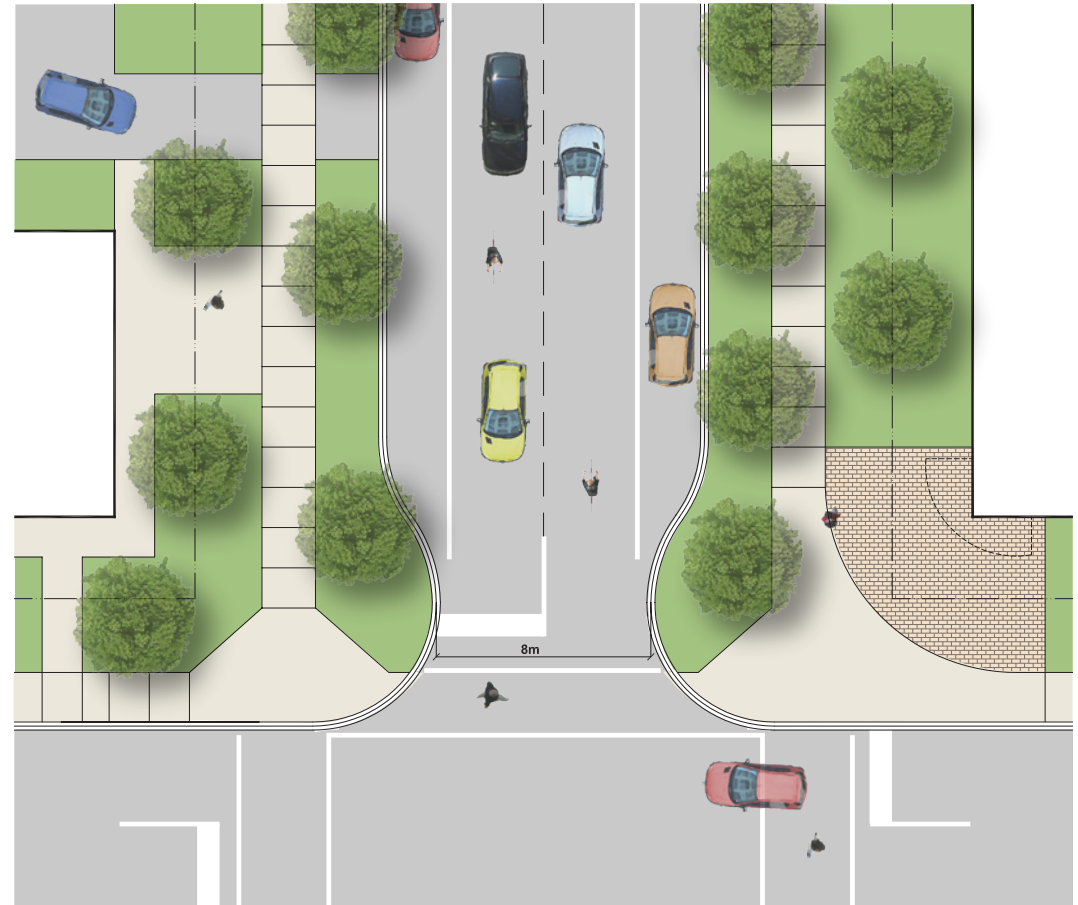
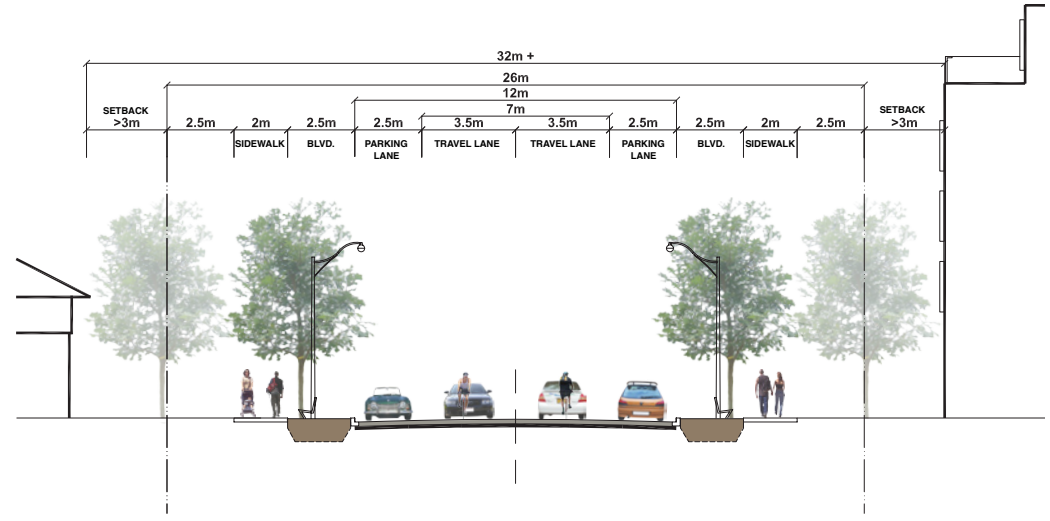
- Wider (12m) paved surface
- Wider (3.5m) travel lanes
- Wider (2.5m) parking lane
- Trees between sidewalk and curb in grassy boulevard
- Buildings typically set back 3 to 6m from ROW limit
- Typically designated a Major Collector

### Services & Utilities

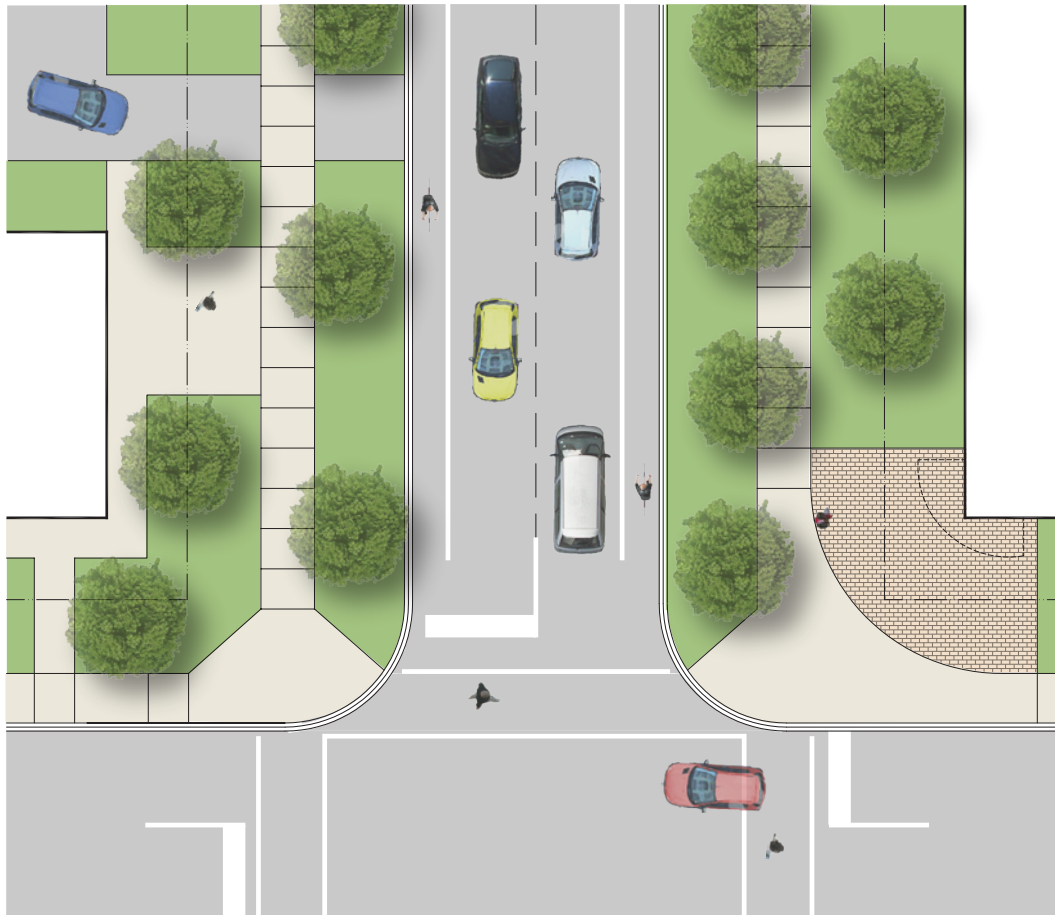
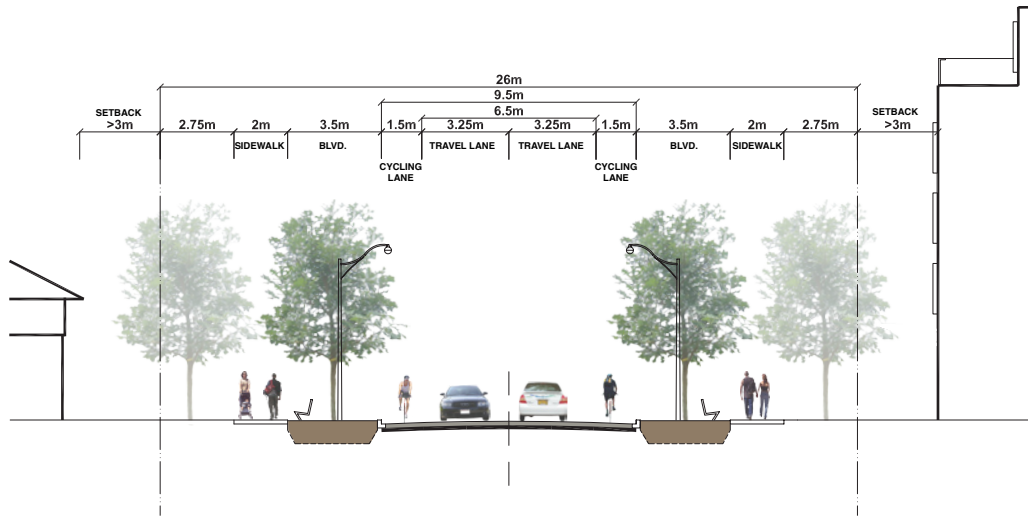
- Curb and catch basin drainage
- If electrical distribution is to be underground, appropriate space in the road edges is required for ducts, cable chambers, and padmounted equipment. Parallel access easements may be required.
- If electrical distribution is overhead, trees under lines need to be less than 6m height at maturity, and overhead restricted zone building setback requirements apply.
- See section 5.8



A-9



## Community Collector Demonstration Option 2 - Cycling Lanes 26m ROW



### Potential Application

- New roads or reconstruction of existing roads within traditional 26m ROW, along segments with on-road cycling routes designated in the Official Plan, and where on-road parking not required.
- See Tables 7-1 and 7-2.

### Defining Characteristics

- Very narrow (9.5m) paved surface
- Narrow (3.25m) travel lanes
- Dedicated (1.5m) cycling lanes
- No on-street parking
- Trees located along both sides of sidewalk in grassy boulevards
- Buildings typically set back 3 to 6m from ROW limit
- Designated Collector or Major Collector

### Services & Utilities

- Curb and catch basin drainage
- If electrical distribution is underground, appropriate space in the road edges is required for ducts, cable chambers, and padmounted equipment. Parallel access easements may be required.
- If electrical distribution is overhead, trees under lines need to be less than 6m height at maturity, and overhead restricted zone building setback requirements apply.
- See section 5.8



A-10

# Community Collector Demonstration

## 26m ROW Option 3 - Enhanced Areas

### Potential Application

- New roads in unique districts such as in Mixed Use Centres or design controlled neighbourhoods, and where enhanced on-road cycling and road edge drainage facilities are desired.
- See Tables 7-1 and 7-2.

### Defining Characteristics

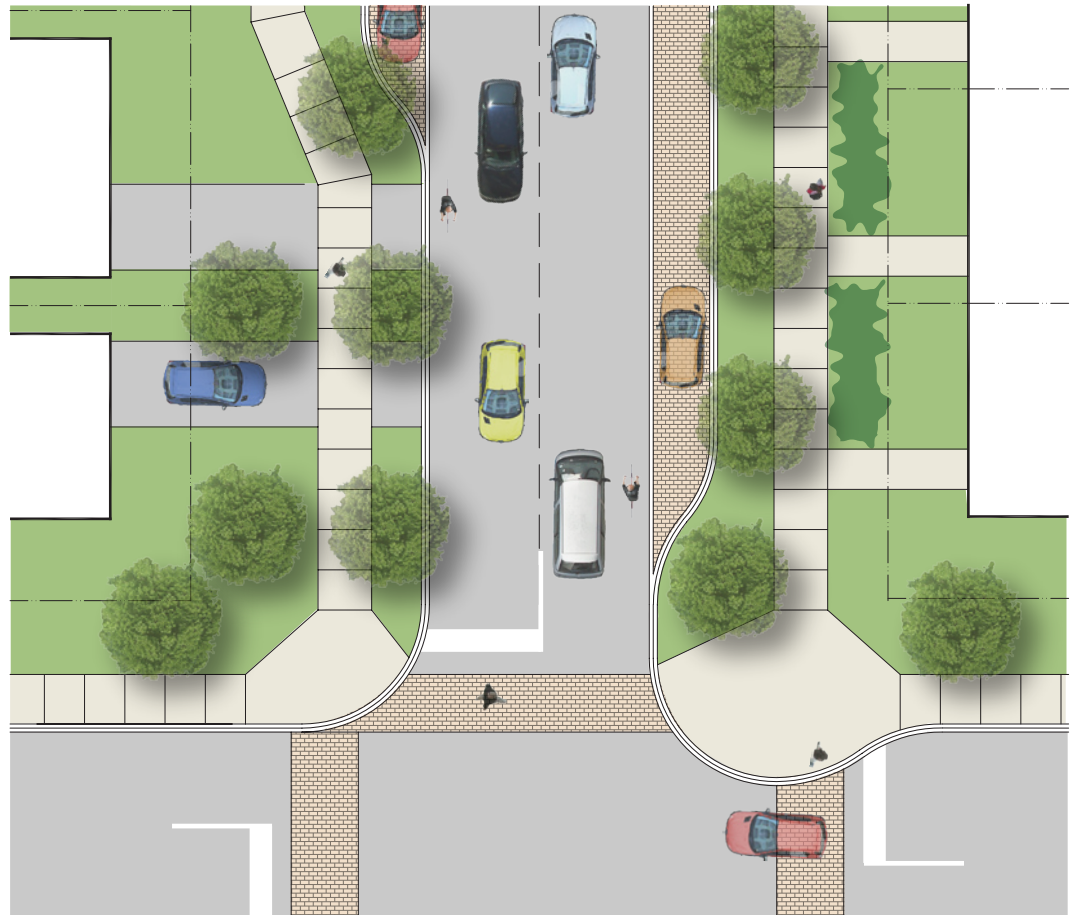
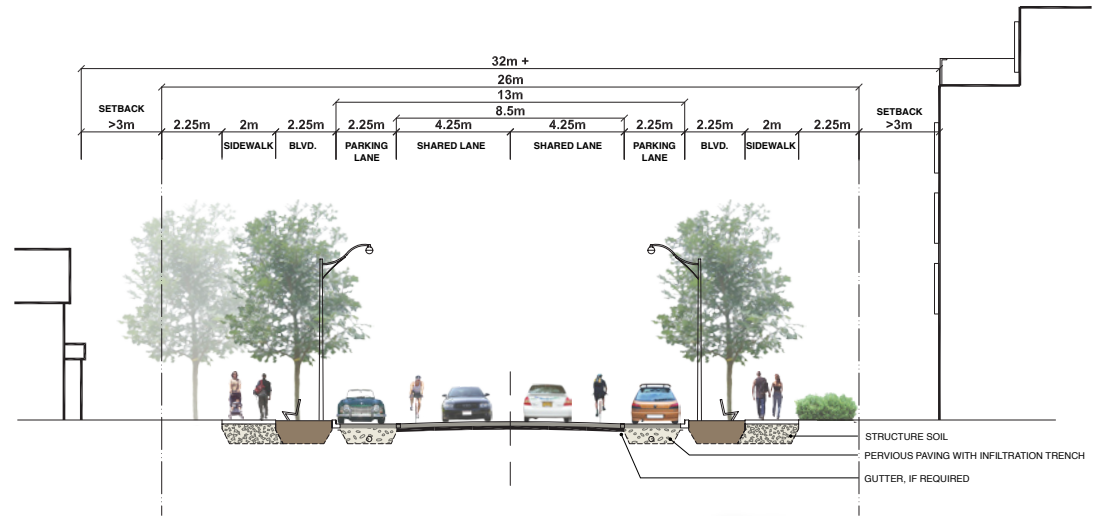
- Wide (13.0m) paved surface
- Wider (4.25m) shared use lanes
- Narrow (2.25m) specially paved parking lanes, with bump-outs
- Trees between curb and sidewalk in grassy boulevard
- Possibility of distinctive crosswalks
- Buildings typically set back 3 to 6m from ROW limit
- Designated Collector or Major Collector

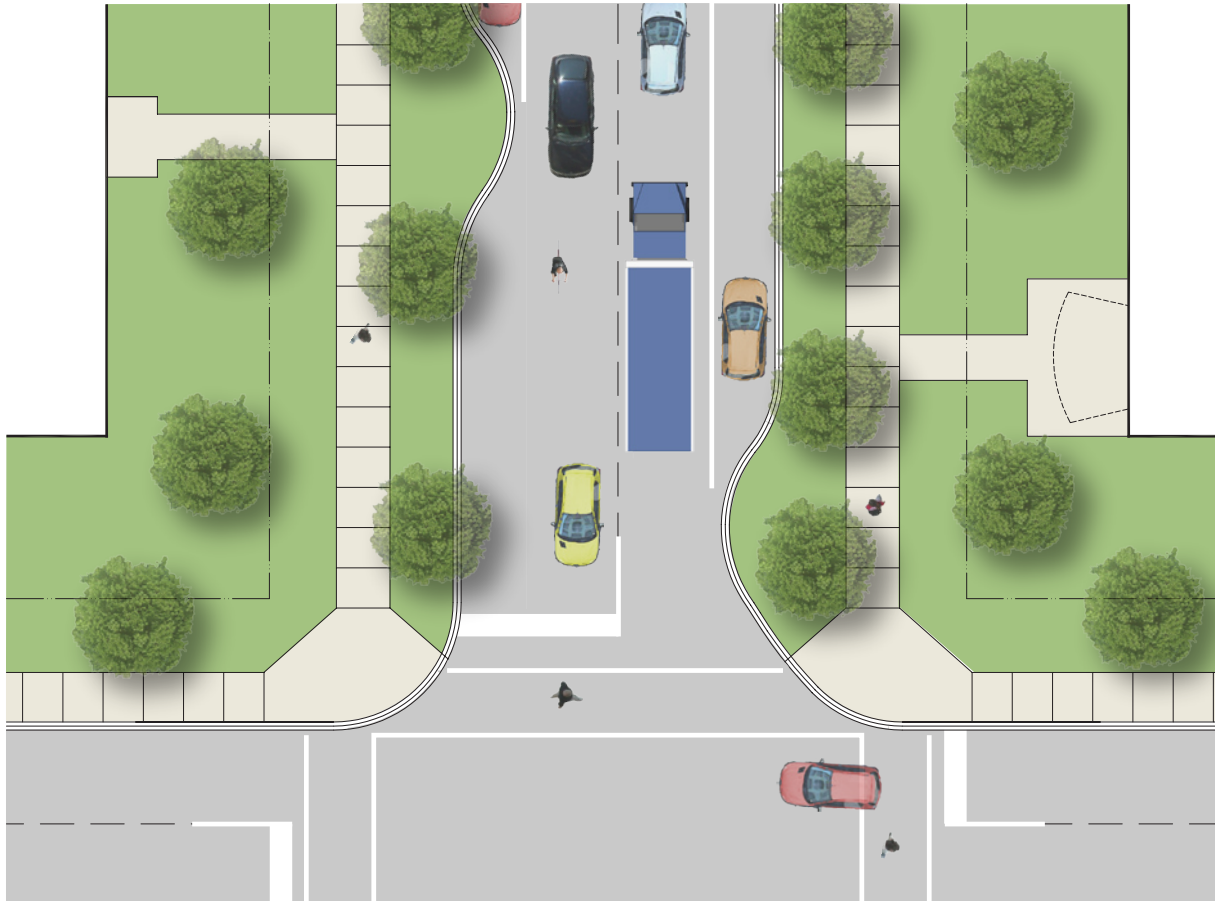
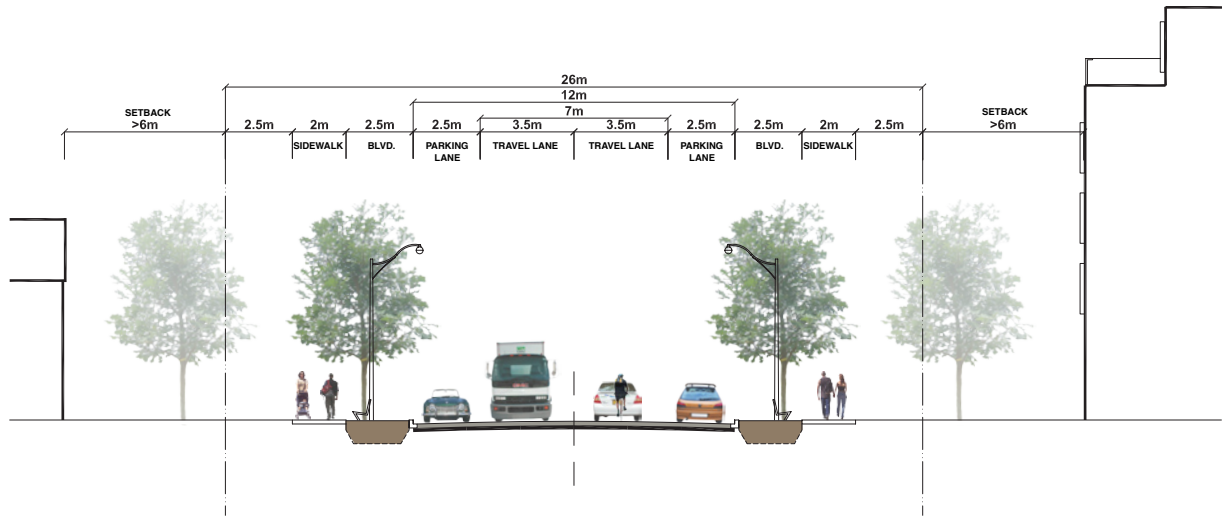
### Services & Utilities

- Curb and catch basin drainage, with pervious paving
- If electrical distribution is underground, appropriate space in the road edges is required for ducts, cable chambers, and padmounted equipment. Parallel access easements may be required.
- If electrical distribution is overhead, trees under lines need to be less than 6m height at maturity, and overhead restricted zone building setback requirements apply.
- See section 5.8



A-11





**Potential Application**

- New or reconstructed roads in designated Employment Areas, Enterprise Areas, or in smaller business parks in the Urban Area.
- See Tables 7-1 and 7-2.

**Defining Characteristics**

- Wider (12m) paved surface
- Wider (3.5m) travel lanes
- Wider (2.5m) parking lane
- Trees between sidewalk and curb in grassy boulevard
- Buildings typically set back 6m plus from ROW limit
- Designated Collector or Major Collector

**Services & Utilities**

- Curb and catch basin drainage
- If electrical distribution is underground, appropriate space in the road edges is required for ducts, cable chambers, and padmounted equipment. Parallel access easements may be required.
- If electrical distribution is overhead, trees under lines need to be less than 6m height at maturity, and overhead restricted zone building setback requirements apply.
- See section 5.8



A-12

# Rural Collector Demonstration

## 26m ROW

### Potential Application

- New or reconstructed Collector Roads in the Rural Area.
- See Tables 7-1 and 7-2.

### Defining Characteristics

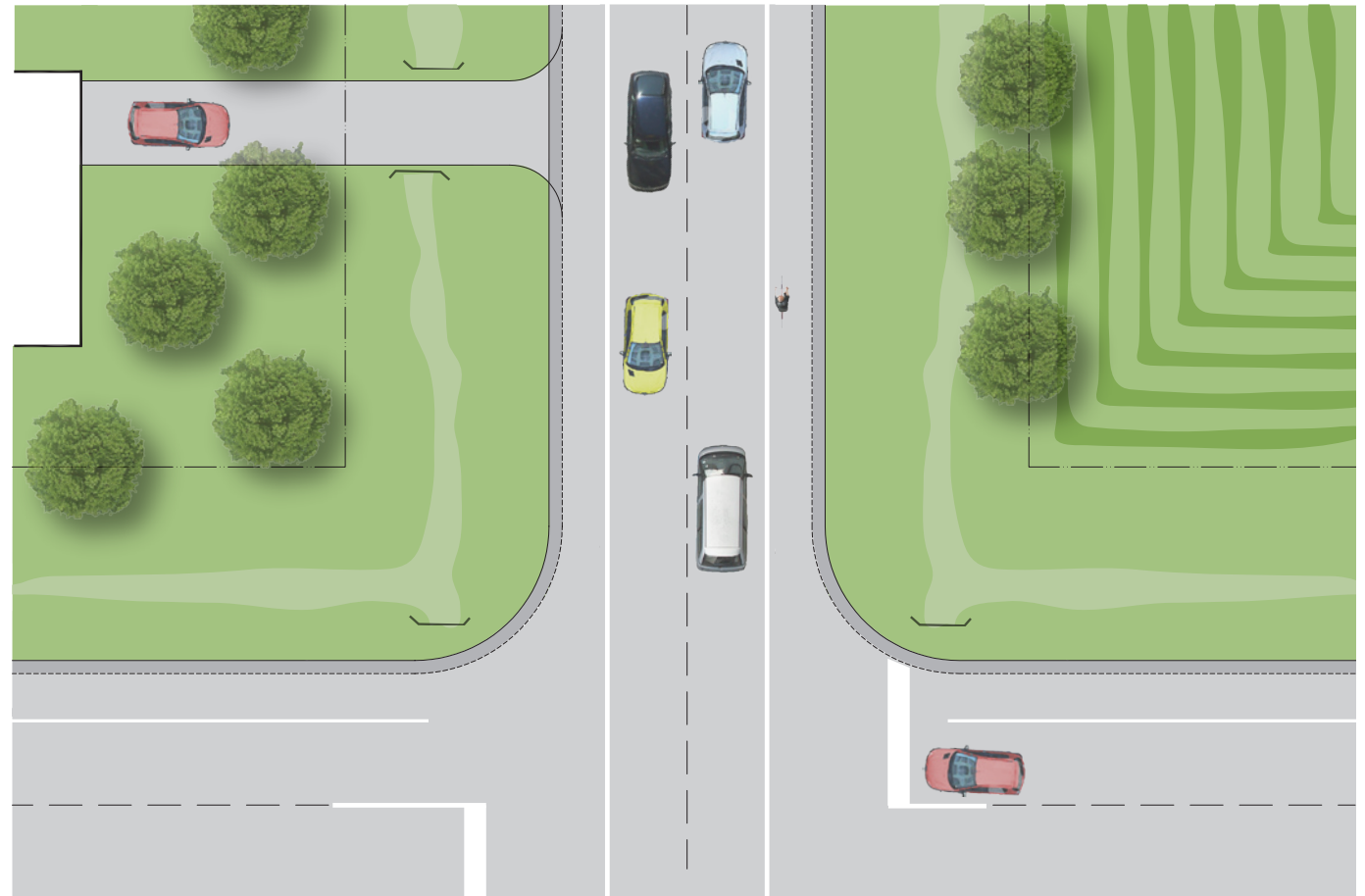
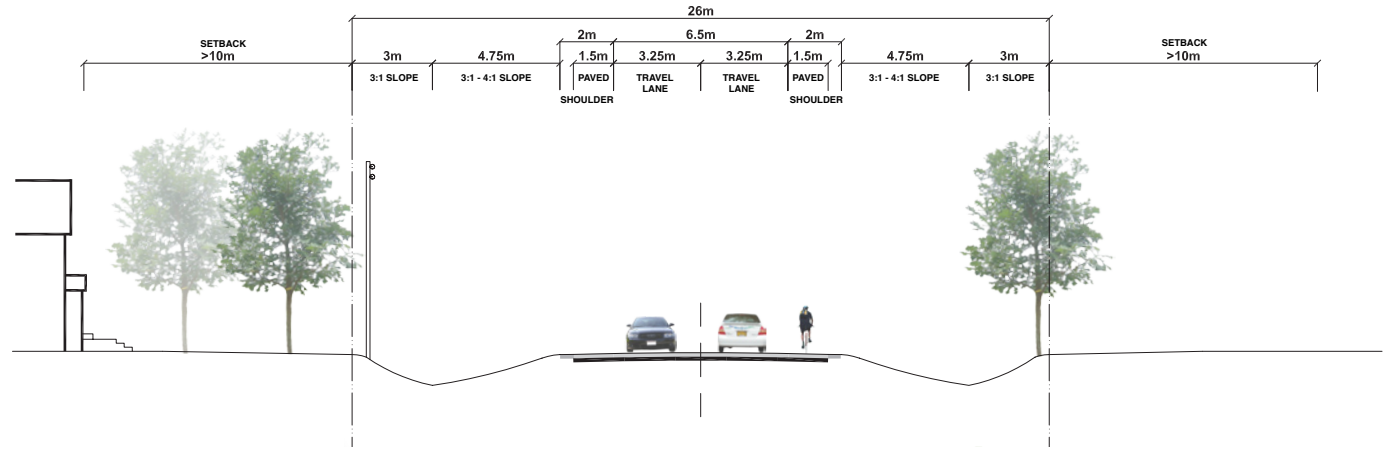
- 6.5m paved surface
- 3.25m travel lanes
- Potential for narrow (1.5m) paved shoulders that benefit cyclists and farm vehicles
- Trees located outside the ROW
- Buildings typically set back 6m plus from ROW limit
- Designated a Collector

### Services & Utilities

- Roadside ditch drainage
- As electrical distribution is overhead, trees under lines need to be less than 6m height at maturity, and overhead restricted zone building setback requirements apply.
- See section 5.8

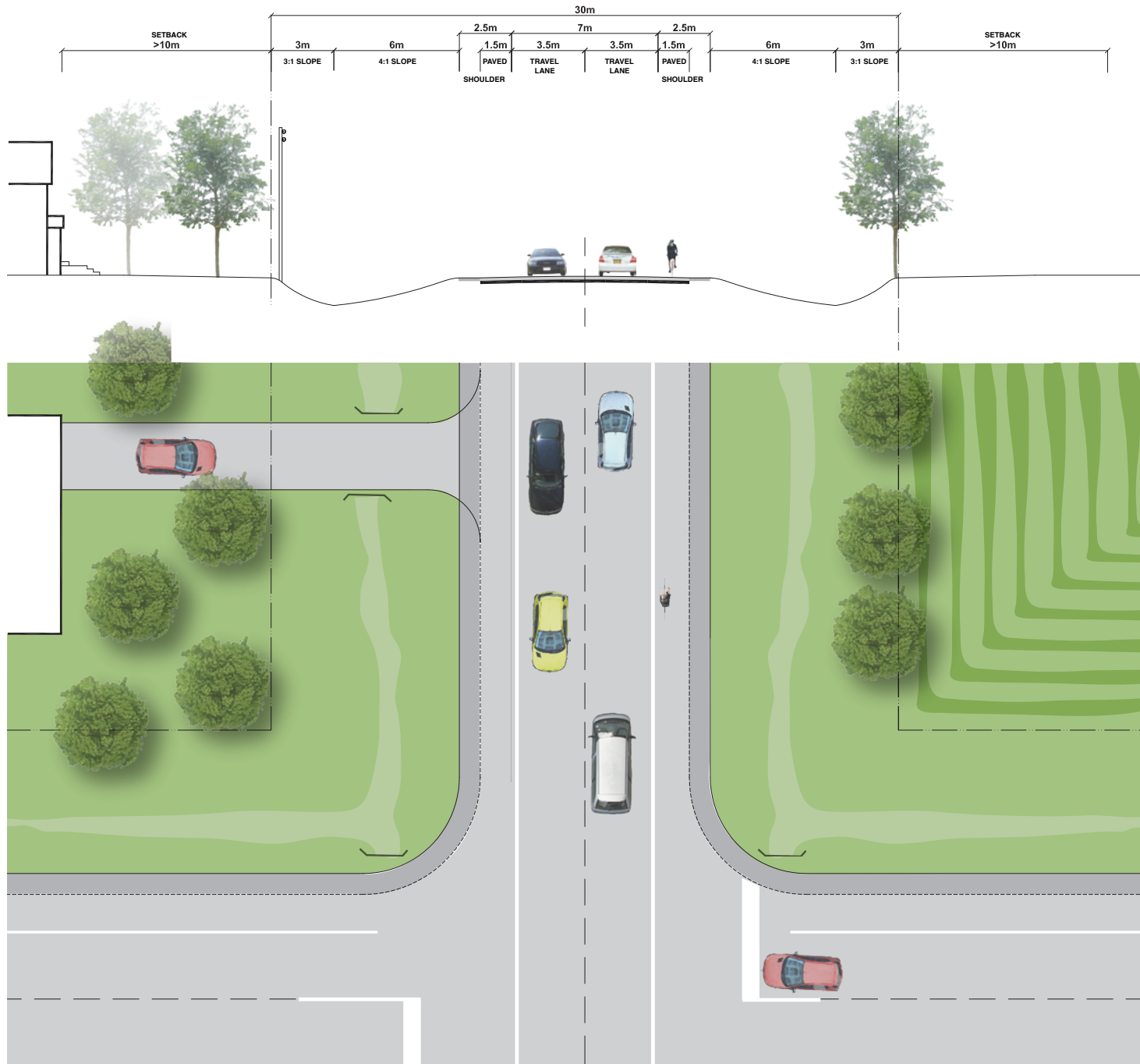


A-13



## Rural Arterial Demonstration

# 30m ROW



### Potential Application

- New or reconstructed Arterial Roads in the Rural Area.
- See Tables 7-1 and 7-2.

### Defining Characteristics

- 7.0m paved surface
- 3.5m travel lanes
- Potential for narrow (1.5m) paved shoulders that benefit cyclists and farm vehicles
- Trees located outside the ROW
- Buildings typically set back 6m plus from ROW limit
- Designated an Arterial

### Services & Utilities

- Roadside ditch drainage
- As electrical distribution is overhead, trees under lines need to be less than 6m height at maturity, and overhead restricted zone building setback requirements apply.
- See section 5.8



A-14





**Table 1: Specifications for Right-of-Way, Adjacent Lands, Network and Road Edge Components**

ROW Component	Road Type	Key Design References	CONSTRAINED AREAS	URBAN AREA			RURAL AREA		
	Criteria or Point of Reference		All Types	Neighbourhood Collector	Community Collector	Business Area Collector	Rural Arterial	Rural Collector	Village Collector
<b>ROW Width Range</b>			20 m or less	20 – 26 m	20 – 26 m	26 m	30 m	20 - 26 m	20 - 26 m
<b>Adjacent Lands Components</b>									
Building Height-to-Width Ratio	<i>From building face to building face</i>	1	1:1 to 1:2	1:1 to 1:2	1:1 to 1:3	1:1 to 1:3	-	-	-
Building Setbacks	<i>From building face to ROW limit</i>	1	0 m	0 – 6 m	0 – 6 m	0 – 6 m	0 – 6m+	0 – 6 m +	0 – 6 m+
Corridor Width		1	20.5 m or less	20– 30 m	20 – 42 m	26 – 36 m	30 – 42 m+	26 – 36 m+	26 – 36 m+
<b>Network Components</b>									
Block Length	<i>Distance between intersections</i>		-	50- 100 m	50 – 250 m	150 – 250 m	-	-	-
Number of Lanes	<i>Travel Lanes</i>		2	2	2	2	2	2	2
<b>Road Edge Components</b>									
Boulevard Width	<i>Between Curb and Sidewalk</i>		-	0 – 3 m	0 – 3.5 m	0 – 3.5 m	-	-	-
	<i>No Sidewalk</i>		-	N/A	N/A	N/A	11.5 m +/-	9.75 m +/-	9.75 m +/-
Light Standard Offset <sup>d</sup>	<i>From Traveled Asphalt White Line (No Sidewalk)</i>	2	-	-	-	-	4.0m	1.5-3.0m	1.5-3.0m
	<i>From Barrier Curb</i>	2	0.6-1.5m	0.6-1.5m	0.6-2.4m	0.6-2.4m	-	-	-
Tree Offset	<i>Tree Centreline, From Curb</i>		0.75 m	0.75 m	0.75-1.5 m	1.5 m	-	-	-
	<i>Tree Centreline, From Sidewalk</i>		0.5 m	0.5 m	0.5 m	0.5 m	-	-	-
Ditch Fore-slope		3	3:1	-	-	-	4:1	4:1	4:1
Ditch Back-Slope		3	3:1	-	-	-	3:1	3:1	3:1
Ditch Depth		3		-	-	-	1.5 m	1.5 m	1.5 m
Fence Zone	<i>Flat area between ROW limit and Ditch Back-Slope</i>		N/A	-	-	-	0 – 2.0 m	0 – 2.0 m	0 – 2.0 m

Notes:  
 A. Offsets are measured to the centre of the vertical element unless otherwise noted.

- DESIGN REFERENCES:
1. Regional Road Corridor Design Guidelines, City of Ottawa, 2000
  2. Right-of-Way Lighting Policy, City of Ottawa, Draft, 2007
  3. Transportation Association of Canada (TAC) Geometric Design Guide for Canadian Roads (1999)

## Road Design Specification Guidelines

Table 2: Specifications for Roadway Components

ROW Component	Road Type	Key Design References	CONSTRAINED	URBAN			RURAL AREA		
	Criteria or Point of Reference		All Types	Neighbourhood Collector	Community Collector	Business Area Collector	Rural Arterial	Rural Collector	Village Collector
Dedicated Cycling Lane Width	<i>Adjacent to curb</i>	2,3	1.2m	N/A	1.5m	1.5m	1.5 – 2.0 m	1.5 m	N/A
	<i>Adjacent to on-street parking lane</i>	2,3	-	N/A	1.8 m	1.8 m	-	-	-
Shared Cycling & Vehicle Lane Width	<i>Adjacent to curb</i>	2,3	3.5 m	3.5-4.25 m	3.5 – 4.25 m	3.5 - 4.25 m	n/a	n/a	3.25 m
	<i>Adjacent to on-street parking lane</i>	2,3	3.0 m	3.0 m	3.5 m	3.5 m	n/a	n/a	n/a
Vehicle Lane Width	<i>Adjacent to curb</i>	3,4,5	3.0 m	3.25-3.5 m	3.25-3.5 m	3.5 m	3.5-3.75 m	3.25-3.5 m	3.5 m
	<i>Adjacent to curb, provides for part-time or full-time on-street parking</i>	3,4,5	3.0 m	N/A	3.5 m	3.5 m	n/a	n/a	n/a
	<i>Adjacent to other travel Lane</i>	1,3,4,5	3.0 m	N/A	3.0 m	-	3.5 m	-	-
	<i>Adjacent to Median</i>	3,4,5	3.0 m	3.0 m	3.0 m	3.0m	3.5 m	3.5 m	3.5 m
Curb Offset Width	<i>Additional travel lane width required as a buffer between road edge curb face</i>	4	0.25 m	0-0.25 m	0-0.25 m	0.25m	N/A	N/A	0-0.25 m
Opposing Lane Offset Width	<i>Additional travel lane width required as buffer between opposing vehicle lanes</i>	4	N/A	N/A	0.25 m	0.25 m	0.25 m	0.25 m	N/A
Vehicle Turning Lane Width	<i>Adjacent to Curb or Median</i>	3,4	3.0 m	3.0 m	3.0 m	3.0 m	3.0 m	3.0 m	-
	<i>Other Cases(minimum)</i>	3,4	3.0 m	-	3.3 m	3.3 m	3.3 m	3.3 m	-
Parking-Only Lane Width	<i>Located along curb, full-time vehicle parking, no cycling</i>	3,4	2.2 m	2.25-2.5m	2.5 m	2.5 m	n/a	n/a	n/a
Paved Shoulder Width	<i>For Traffic Safety</i>	2,5	1.2-1.5 m	-	-	-	1.5 - 2.0 m	1.5 m	1.5 m
Gravel Rounding Width	<i>From edge of asphalt</i>	4	0.5 m	-	-	-	1.0 m	1.0 m	1.0 m
Total Paved Surface Width	<i>From curb edge to curb edge or shoulder to shoulder</i>	-	<11.0 m	9.0 - 11.0 m	2 lane – 11.0 m 4 lane – 13 m	11.0 m	7 m	<11.0 m	<11.0 m

Notes:

- A. Offsets are measured to the centre of the vertical element unless otherwise noted.

## DESIGN REFERENCES:

- Ottawa Official Plan, City of Ottawa, 2003
- Ottawa Cycling Plan [Draft], City of Ottawa, 2005
- Regional Road Corridor Design Guidelines, City of Ottawa, 2000
- Transportation Association of Canada (TAC) Geometric Design Guide for Canadian Roads (1999)
- Ontario Ministry of Transportation Geometric Design Standards for Ontario Highways

## List of Photos

<b>1-1</b> Walters Road, Ottawa	<b>5-8</b> Labelle Street, Ottawa	<b>A-6</b> Potter Drive, Ottawa
<b>1-2</b> Aquaview Drive, Ottawa	<b>5-9</b> Springfield Road, Ottawa	<b>A-7</b> Dalhousie Street, Ottawa
<b>3-1</b> Crichton Street, Ottawa	<b>5-10</b> Crichton Street, Ottawa	<b>A-8</b> Mississaga Street, Orillia
<b>3-2</b> Ogilvie Road, Ottawa	<b>7-1</b> Donald Street, Ottawa	<b>A-9</b> Ogilvie Road, Ottawa
<b>4-1</b> SW 12 <sup>th</sup> Avenue, Portland, Oregon	<b>7-2</b> Den Haag Drive, Ottawa	<b>A-10</b> Donald Street, Ottawa
<b>4-2</b> NE Siskiyou Street, Portland, Oregon	<b>7-3</b> Aquaview Drive, Ottawa	<b>A-11</b> Queen Victoria Street, Ottawa
<b>5-1</b> Crichton Street, Ottawa	<b>7-4</b> Orleans Boulevard, Ottawa	<b>A-12</b> Den Haag Drive, Ottawa
<b>5-2</b> Sherwood Drive, Ottawa	<b>8-1</b> Kanata Drive, Ottawa	<b>A-13</b> Woodroffe Avenue, Ottawa
<b>5-3</b> Bathgate Drive, Ottawa	<b>8-2</b> Lakepoint Drive, Ottawa	<b>A-14</b> Woodroffe Avenue, Ottawa
<b>5-4</b> Sandridge Road, Ottawa	<b>A-1</b> Springfield Road, Ottawa	
<b>5-5</b> Sherwood Drive, Ottawa	<b>A-2</b> Donald Street, Ottawa	
<b>5-6</b> Orleans Boulevard, Ottawa	<b>A-3</b> City Park Drive, Ottawa	
<b>5-7</b> Matheson Road, Ottawa	<b>A-4</b> Sherwood Drive, Ottawa	
	<b>A-5</b> Donald Street, Ottawa	