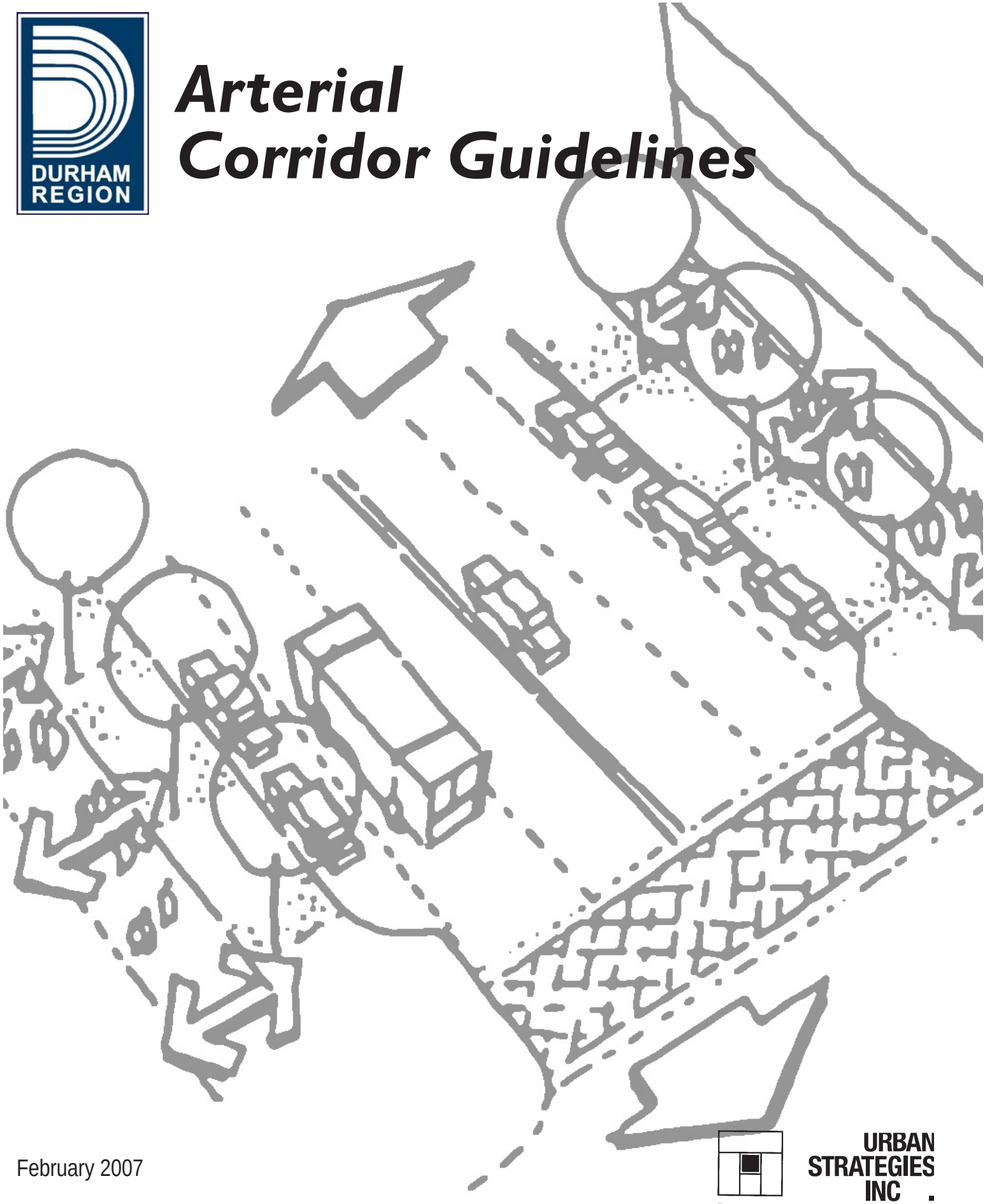
DURHAM REGION

Arterial Corridor Guidelines



February 2007

TSH

URBAN STRATEGIES INC.

Arterial Corridor Guidelines

On February 14th, 2007, Regional Council adopted the following recommendation with respect to this "Arterial Corridor Guidelines" document:

"THAT the arterial Corridor Guidelines be received for use as a toolbox of potential strategies and common reference points in the process of planning and designing arterial road corridors in the Region."

February 2007

URBAN STRATEGIES INC.

TABLE OF CONTENTS

THE VISION

1.0 Purpose Of The Guidelines

1.1 Study Purpose

Through the preparation of the Durham Transportation Master Plan, it was determined that there is a need to develop guidelines and implementation strategies for arterial corridors that will result in Rights-of-way becoming more responsive to the character of local and adjacent land uses while recognizing the specific activities that occur within, and adjacent to, arterial road Rights-of-way.

The Arterial Corridor Guidelines will assist in promoting a balance between mobility and liveability in the planning, design and construction of features within and abutting the public road allowance. These guidelines represent a toolbox of potential strategies and common reference points to be applied in the process of the planning and design of arterial road corridors by the Region of Durham, the various municipalities, the public and other interested parties. The guidelines are intended to supplement, not replace, existing transportation guidelines and design standards – broadening the conditions and issues that are considered in the design of arterial roads. For this reason, the emphasis of this document has been the integration of transportation issues with those of land use planning, development formats and the design of the public realm.

1.2 Approach and Application of the Guidelines

The Arterial Corridor Guidelines offer a variety of options that will assist in guiding the development of arterials over time. Local municipalities, elected officials, residents, private developers and other stakeholders will all play a role in implementing the recommendations and strategies outlined in these Guidelines. With this in mind, the guideline document has been organized so that it can be used in several ways:

1. The first portion of the Guidelines, Sections 2 through 7, address the theory and specific standards that should be considered in the planning of street networks and specific elements within these networks. For those who are interested in general issues regarding the planning of arterial roadways, these sections can be read sequentially, or one can refer to the table of contents for an index to items of specific interest.

2. Sections 8 and 9 illustrate the range and potential of various street types that may result from the application of the Guidelines. These street types build upon the Type A, B and C arterial road designations to show the diversity and complexity that can be created. For those who are interested in the application of the Guidelines to a specific arterial road, a matrix highlighting the potential interpretation and combination of these options is included in Section 9. Referring to the various categories listed, one can determine the illustrative section, or sections that are most relevant to the conditions they are working with.

3. For those interested in a more comprehensive process, and application of the Guidelines to unique conditions, Sections 10 through 12 outline the processes and the mechanisms under which the Guidelines may be applied. Due to the infinite variety of mobility and liveability characteristics along a road corridor, the illustrative cross-sections may not relate directly to a particular circumstance. By focusing on a design and visioning process rather than the application of a specific predetermined cross-sectional standard, this approach will allow guideline users to assess the corridor section and apply the appropriate corridor elements to achieve the desired "place" and function for their unique arterial corridor.

The Guidelines have been written in an action-oriented manner, rather than passive terms such as "may" or "should" consider. As such, they project a strong, affirmative message emphasizing the importance of effective actions for achieving a balanced transportation system. It is acknowledged that the Guidelines are not the only means of meeting this objective and applicability will be influenced by local conditions, requirements and constraints. The Guidelines can be adapted to such situations based on professional judgement.

2.0 An Evolving Vision for Arterial Roadways

2.1 Policy Background

Over the next 25 years, the number of people living in the Region of Durham is projected to grow substantially. Almost 470,000 new residents will call Durham home and over 230,000 new jobs will be created. To accommodate this growth, the Region has put in place a series of plans that set priorities for building strong, prosperous communities, healthy environments and an enviable quality of life.

Community Strategic Plan - lays out the community's vision for the future and indicates where the Region will focus its energies over the next three to five years to support achievement of this vision.

Regional Official Plan – provides policies and designations to address how land should be used and ensures that future planning and development will meet the specific needs of the Region and its residents.

Transportation Master Plan - identifies policies, programs and infrastructure improvements needed to manage anticipated transportation demands to 2021 and beyond, and to support the development pattern designated in the Regional Official Plan.

In concert with the Region's Community Strategic Plan, Official Plan and Transportation Master Plan, the Arterial Corridor Guidelines provides a guidance for the development of arterial roadway environment in Durham. Communities that are well-designed and planned from both a transportation and land use planning perspective are better able to attract jobs and investment. This is achieved through a planning process that is simple and streamlined, allowing the Region and its local municipalities to each play a key role in decision making. The guidelines that have been developed identify and protect Regional interests while promoting sound infrastructure planning, environmental protection, economic development and safe communities.

The Arterial Corridor Guidelines will help achieve compact, attractive, transit-oriented communities as envisioned in the Community Strategic Plan and Regional Official Plan. These guidelines will be a vehicle for coordinating decision-making on land-use planning, urban development, housing, transportation, and economic development, and for prioritizing infrastructure investments on transportation and other capital works initiatives.

Throughout the course of the development of the guidelines, meetings have taken place with key stakeholders and input has been collected from municipalities, community groups, other stakeholders and the public. Ensuring the guidelines are realistic and easily implemented requires collaboration among many groups: the development community, environmental, agricultural and transportation organizations, community groups, public officials and citizens. Working together, the Region and its local municipalities can make better decisions about our communities and the transportation infrastructure that supports them.

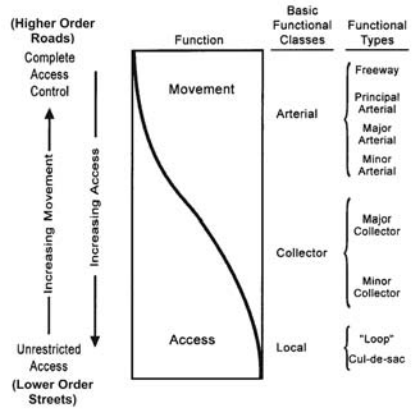
The guidelines provide a strategy and identify the tools necessary for implementation by:

- Defining the role of the arterial road system;
- Establishing public space principles;
- Determining an appropriate approach for balancing mobility objectives for vehicular movement and property access with liveability objectives for community design, landscape character, and non-auto modes;
- Defining roadway access management criteria;
- Providing design criteria for the roadway, boulevard and adjacent lands, such as road allowance widths, cross-sections, location of utilities and connections, in advance of development, where possible;
- Considering the most appropriate placement for pedestrian, cycling and transit facilities within the road allowance, subject to financial considerations; and
- Defining implementation measures.

The guidelines provide a further step in meeting the Region's community strategic objectives for a more integrated transportation system and liveable communities. Furthermore, the guidelines are consistent with recent Provincial and Federal initiatives (i.e., Places to Grow, Greenbelt Plan, Strong Communities, Brownfield Development, Kyoto Protocol, etc.) that aim towards protecting the countryside through greater controls on development within designated settlement areas. The guidelines will also assist in implementing the Province's objectives for centres and corridors, and greater intensification within settlement areas, by ensuring the optimal use of the Region's current transportation infrastructure and by accommodating new growth in an effective manner.

2.2 The Arterial Network

The Region of Durham currently employs a classification system for arterial roads, classifying arterials as Type A, B or C roadways. This classification system was reviewed and reconfirmed through the Region's *Arterial Road Classification Review*, attached in Appendix A. The objective of this classification system is to group streets into a hierarchy according to the character of the transportation service that they are intended to provide. This classification of roads assists in establishing, amongst other factors, the geometric design features for each group, consistent with the short and long-term operational needs of that group. In general, Type A and B arterials as defined in the Regional Official Plan (ROP) relate closely to the lower and upper ends of the major arterial classification identified by the Transportation Association of Canada respectively, whereas Type C arterials relate more closely to the minor arterial classification.



Basic Functional Classes

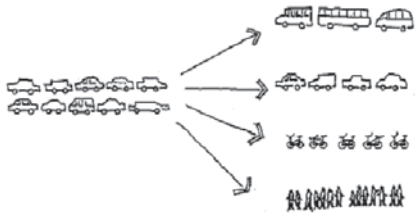
Local streets at the lower end of the classification spectrum primarily provide access, where through traffic and high operating speeds are discouraged. At the other higher end of the classification spectrum, arterials have been traditionally planned to optimize mobility and circulation within the urban areas, while restricting or eliminating direct access to adjacent lands.

A review of the Region of Durham's classification system confirmed that all three classifications are justified and are necessary in achieving the goals intended for the improvement and maintenance of the current grid system of roads.

In recognition of a more comprehensive role arterial roads play, in addition to their necessary movement characteristics, the Durham Arterial Corridor Guidelines have been developed to better respond to specific design constraints, land use policy and place-making initiatives of the Region and its partners.

2.3 A Renewed Vision for Arterial Roads

Arterial roads pass through the most diverse physical settings the Region has to offer, from rural and natural areas to residential, auto-oriented commercial and historic main streets. A more context sensitive arterial corridor strategy will promote the liveability and quality of the surrounding land uses, while maintaining the transportation capacity of the roadways.



The Arterial Corridor Guidelines accommodate a broad range of types of movement.

Arterial road corridors play many roles within the Region. These roads are a fundamental component of the transportation network that carries a broad range of private and service vehicles. While they must continue to provide the safe and efficient movement of goods and people, other considerations are increasingly being brought to the forefront regarding their design and planning, as outlined in the following objectives.

2.4 A Broad Range of Objectives for the Design of Arterial Roadways

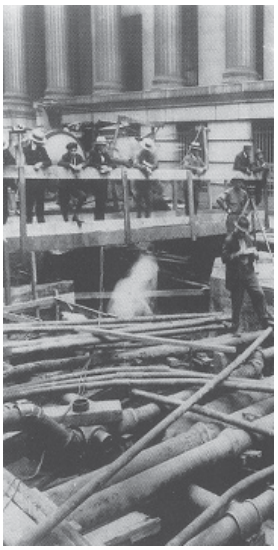
Successful arterial streets balance a broad variety of objectives, which at first glance may seem to be contradictory. For example, arterial corridors must provide vehicular access to surrounding development, yet provide set-backs so that this development is protected from the impacts of traffic. Or, a relatively narrow right-of-way may be desired to promote adjacent street related retail and an attractive pedestrian realm, yet additional street width may be required to accommodate transit that also supports street related retail.

Successful street environments often meet all of the following objectives in a way that balance each other to create a vital and attractive public realm, a healthy community environment and the right level of service in terms of pedestrian and vehicular circulation. The following are objectives that must be considered in the design of arterial roads.

Arterial corridors must accommodate many functions...

they carry ***vehicular traffic...***

support land uses...



provide space for utilities...

accommodate other modes of transportation...

and they are part of the public realm.

In terms of *public space and community identity*, they must consider:

- **Safety** and Security – Arterials should be as safe as possible for all users, pedestrians, cyclists, and those in transit and motor vehicles. Integration of all modes of movement is key to achieving this objective.

- **Comfort and Convenience** – In the design of arterial roads, one should strive to ensure the comfort of pedestrians and others within and adjacent to the road corridor. This can be achieved through providing protection from sun, rain, wind, snow, noise and air pollution, and lighting glare. Places that are comfortable are often perceived as convenient also. Amenities such as places to sit, transit and other shelters, as well as signage are important. Street design and circulation should be integrated with surrounding development. In terms of comfort and convenience for the motorist, arterial corridors should provide adequate signage, relatively direct travel routes, adequate parking, clearly delineated access points, and other amenities to promote way-finding and access.

- **Attractiveness and Character** – Arterial roads should be attractive, incorporating landscaping, street furniture, lighting, public art, signage, paving and other elements into a unified whole. In particular, areas of historical importance, natural beauty and cultural significance should be clearly identified and distinctive. The surrounding structure of the city should be reinforced in the design of roadways and include such features as gateways and other landmarks where appropriate.

- **Spatial Definition** – The design of road corridors should provide some degree of spatial enclosure to provide a human scale and sense of place. The nature and character of the elements that define the space of the corridor can vary greatly, depending on the circumstance. This enclosure can be created by multi-storey buildings at the property line, or rows of trees along rural roads. Spatial definition of the arterial corridor also improves appropriate travel speeds for motorists.

Urban arterials should provide a quality public realm.

Great streets can become the hallmark of a community, such as Commonwealth Avenue in Boston.

Balanced Multi-modal Movement accommodates pedestrians, transit and other modes of travel

Some arterials should be designed to handle trucking

In terms of ***the movement of goods and people***, they must consider:

- Multi-modal Movement – the design of every arterial road should consider the movement of pedestrians, motorists, bicycles, goods and transit in a holistic manner. The relative priority of each of these modes of movement will vary depending on the circulation requirements, street type, land use and overall form of the corridor. On some roads, the movement of cyclists, pedestrians and transit should have equal or greater consideration than that of private vehicles. In other cases, the movement of large and heavy vehicles must take precedence. The movement of emergency vehicles must always be a priority.

- A Continuous and Connected Network of Streets – Most arterial roads should be part of a continuous network of streets. The types of streets, and the frequency of intersections and connections, typically increase as the density and form of development transitions from a rural environment to a urban area to a regional centre or corridor.

The design and location of development adjacent to the road corridor will also effect movement and other conditions within the right-of-way. In terms of ***land use integration and sustainability*** consider:

- Vehicular Access – The design of arterial roadways must consider the access to adjacent development. In some cases, vehicular access may be directly from the arterial road. In other cases, vehicular access may need to be controlled and alternate strategies put in place to avoid unnecessary vehicular congestion and unsafe traffic conditions.

- Pedestrian Access – In every case, pedestrian access to development should connect directly to sidewalks within the road right-of-way. However, the nature of this access can vary greatly, depending on land use, building form and the general location of the development.

- Building Orientation – A coherent and logical sequence of arrival to development should be promoted in the design of the road corridor. In most cases this can be achieved through simply facing public, active facades and entries towards the street and the public realm. Where vehicle movement and large volumes of parking are part of the arrival sequence, other strategies must be put in place to ensure wayfinding is logical and intuitive. In every case, the public nature of the street must be supported.

- Environmental Sustainability – With regard to the design of arterial roads, sustainability can be addressed in two ways. First, during the construction and maintenance of arterial roads, efforts should be taken to minimize impacts on the environment, in terms of the materials or practices used. Second, the design of arterial roads should consider other broader environmental goals, such as the reduction of urban sprawl and the promotion of alternative transportation strategies.

- Utility Distribution – Provision of adequate space and clearances for utilities, both above and below ground. Where possible, underground utilities should be promoted.

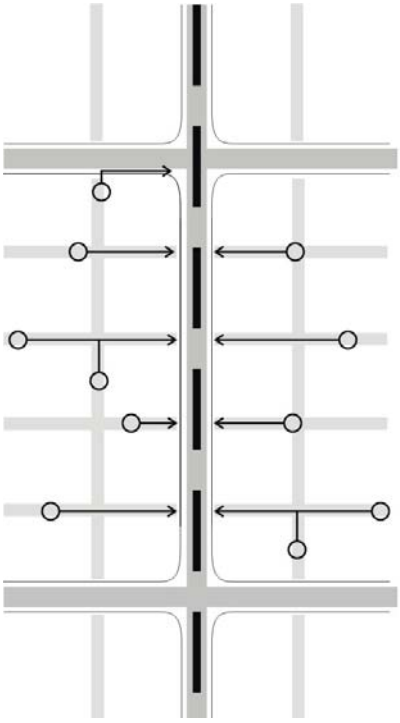
- Operations and Maintenance – Arterial roads should be based on designs that address the life-cycle costs and ease of maintenance of the infrastructure. Materials, construction techniques and scale of the road corridor elements should be selected to ensure durability and quality, while permitting traffic flow when reconstruction is taking place within the corridor.

THE GUIDELINES

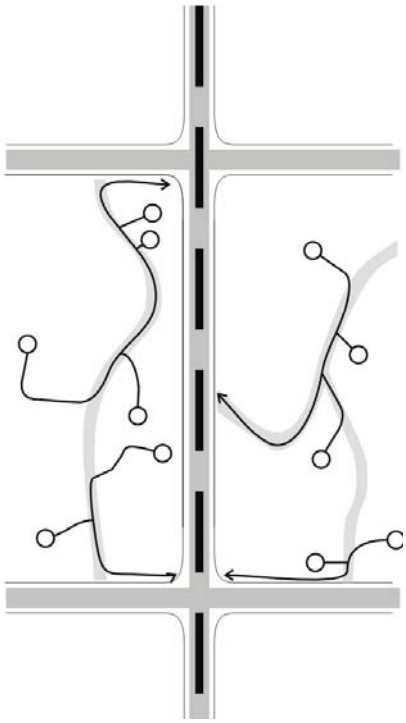
3.0 The Design of the Road Network

The overall pattern of streets and the relative ease of connection between all places within a region, city, or community, is directly related to the variety of land uses and types of development (e.g., historic downtowns, main streets, power centres and big boxes, entertainment districts, etc.) a community is able to support. The ability to provide effective transit service, efficient vehicular movement and a safe and convenient pedestrian environment is also linked to the character of the roadway network.

The regional arterial road network in Durham is based on the grid of existing concession roads, resulting in a connected higher-order arterial road network. The further sub-division of this network into an even finer grid of minor arterial, collector and local streets has resulted in urban and sub-urban environments. Where a finer grained division of arterials in urban areas has not been created, the following problems exist or are emerging:



Connected



Disconnected

Providing a network of connected streets provides multiple routes to access arterials, dispersal of vehicular ***traffic, and improved pedestrian*** *connections.*

- Congestion
- Increased capacity required on adjacent road(s) (e.g., increased number of traffic lanes)
- Increased right-of-way
- Reduced levels of service
- Traffic infiltration into established neighbourhoods
- Limited access along corridors
- Delays accessing property
- Restrictions on development due to transportation concerns (e.g., right-in, right-out accesses)
- Longer emergency response times due to congestion and more limited options for property access
- Increased difficulty, staging, and cost for road reconstruction and maintenance

As traffic congestion increases, accessing existing developments becomes a challenge, discouraging redevelopment to higher densities. Reinvestment in existing areas becomes less attractive as poor levels of service provide an incentive for development activity to be dispersed to greenfield areas. The continued development of a finer grid forming an interconnected network of arterials, as outlined in the Official Plans of both the Region and its area municipalities, is vital to ensuring the stability of neighbourhoods and commercial areas, and managing growth effectively.

In summary, the benefits of an interconnected network of arterial roads are as follows:

- Alternative routes disperse traffic, offer choice of routes according to preference and provide access during construction or peak periods.
- More convenient and accessible for pedestrians, cyclists, transit users, motorists and the disabled.
- Expands the possible function of arterials, providing opportunities for a broader array of transportation modes and activities.
- Maximizes the number of households within walking distance of transit stops.
- Minor arterials and collectors allow transit routes to run through subdivisions, not just along the perimeter, which minimizes walking distances and the need for transit users to cross major arterials.
- Visual permeability of surrounding development provides surveillance and increased security along both local streets and the arterial road.
- More hospitable and interesting views of the neighbourhood edge are created, giving drivers motivation to slow down without unnecessary distractions.
- Less difficult to navigate since directions and connections are predictable.
- Avoids bottlenecks/congestion on arterials and at entrances to subdivisions.
- Increases access to community amenities, contributing to quality of life by integrating communities rather than segregating them.

A variety of traffic and development conditions exist along arterials. These conditions often change over the length of an arterial road. As cities and their regions grow, arterial roads must evolve to accommodate increased levels of traffic, higher density development and new development formats. Indeed, the evolution of arterials is often necessary to limit traffic infiltration through established residential neighbourhoods,

provide the setting for new development and promote transit. When viewed in this context, it is not surprising that a great deal of attention should be paid to the creation of a roadway network that is flexible, accommodating change over time in response to future development and transportation objectives.

Achieving this flexibility in the design of an arterial network requires coordination between private development and public infrastructure. In particular, the development and movement networks adjacent to the intersections of major arterials will require comprehensive planning. The following are the guidelines that pertain to the design of the arterial network.

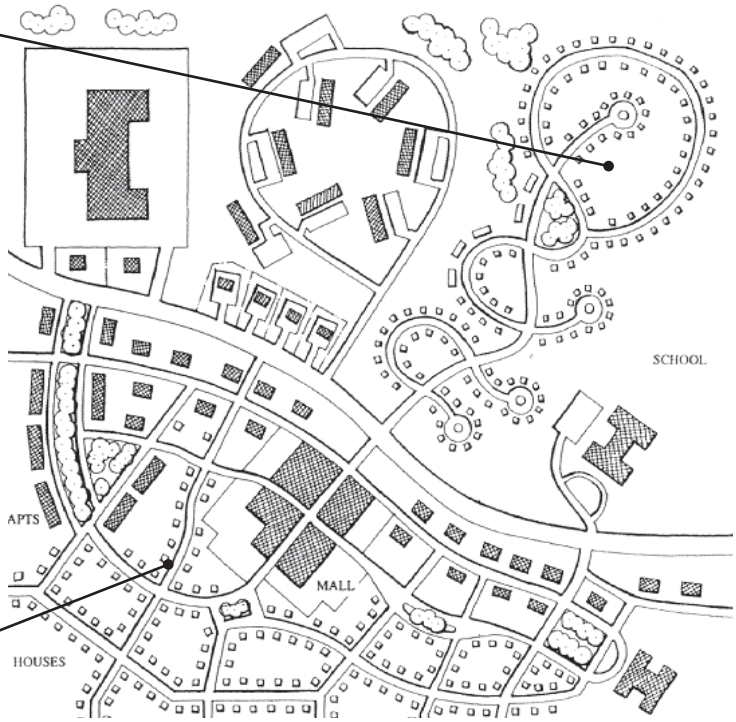
3.1 Continuous and Connected Network

As the intensity and density of development increases, from outlying rural areas to regional centres, the need for a finer grained network of roads increases. In rural areas, development density and traffic levels do not require the creation of a fine grained network of arterials, as they generally correspond to existing concession roads, which are under Provincial or Regional jurisdiction and are typically designated as Type A or Type B arterials.

Travelling into a urban environment that is no longer rural, but does not yet have the higher development densities found in regional centres or corridors, minor arterials (i.e. Type C), collectors and local streets have been created, providing a network of streets within the original concession grid. As urban areas develop, consideration is given to protecting this finer-grained road network.

In existing centres and corridors, the finest grained network of streets is most clearly demonstrated, where a diverse mix of uses, higher pedestrian activity and street related development types already exist or are proposed. In these areas, additional roads (including some roads that may have limited movements) should be promoted and planned, defining future development blocks and opportunities for intensification. The implementation of a finer grained network must have consideration for both the arterial classification criteria, and land use designations contained in the Regional Official Plan.

Limited alternative routes and segregated uses promote sprawl and limit ***options for addressing traffic*** *concerns.*



Alternative routes and mixed land uses provide ***more flexibility in the*** *range of development and transportation solution possibilities.*

1. Integrate the planning of arterial roads with individual community/neighbourhood plans.
2. Design arterials to promote, not prohibit, the creation of a finer grained network of secondary arterial, collectors and local roads. This is particularly important in regional centres and areas identified for development intensification. Such a finer grained network may contain minor "T" intersections and streets with limited turn movements.
3. Locate higher-density development along transit routes. Encourage compact mixed-use development through zoning, including residential, commercial and employment uses.
4. Ensure arterials do not act as physical barriers between open spaces and development on each side of the road. Minimizing the width of the arterial road and aligning local road intersections can help achieve this.
5. Provide walking routes to transit stops as directly as possible (i.e., a maximum 400 m walking distance from any residence to a transit stop).
6. Consider the creation of frequent pedestrian connections across arterial roads and ensure the permeability of pedestrian routes through neighbourhoods. The frequency and location of pedestrian crossings will vary, depending on the traffic characteristics, development type and format. The design and location of pedestrian crossings must be addressed on a site-specific basis.

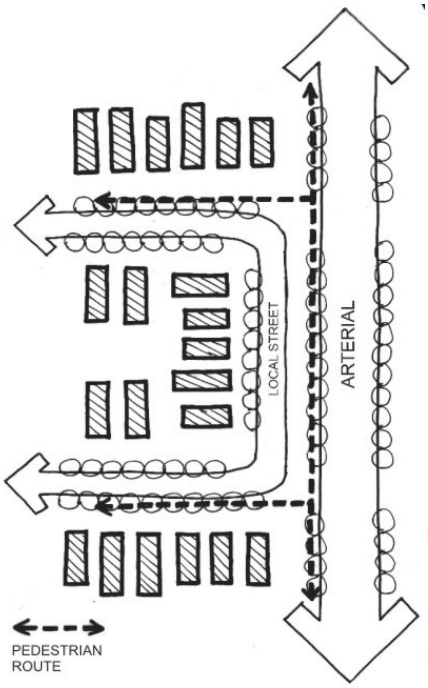
3.2 Frequency of Intersections

One of the key ways to plan for higher intensity development in the future is to anticipate this finer grain of roadway network, particularly in the areas around some of the intersections of major arterials and in regional centres. This means anticipating, as part of the planned road network, that private driveways may evolve into public streets, or that several access driveways may be consolidated, over the long-term.

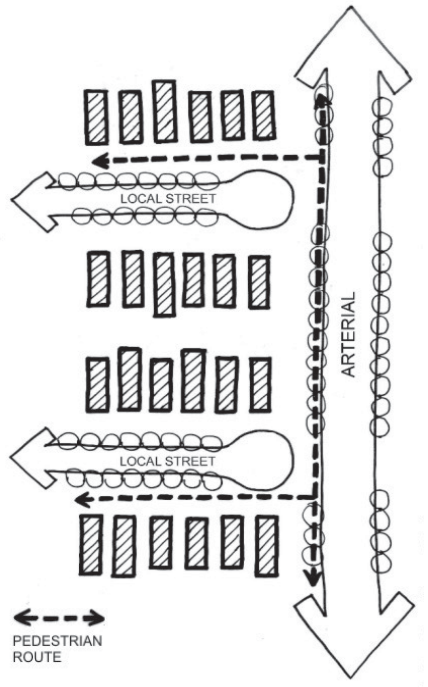
Another key to achieving this flexibility is to create intersections spaced so as to accommodate both pedestrian and vehicular movement. The historical grid in the southern part of Durham results in a spacing of roads roughly every 820 m in the east-west direction and a 2100 m in the north-south direction. This can result in an alternate spacing of signalized intersections every 300 and 500 m on east-west arterials. In a north-south direction, signalized intersections may occur at a spacing of every 700 m along Type A arterials and may also occur at approximately 500-550 m along Type B arterials. Planning for intersections at these intervals will help ensure the progression and optimization of traffic flow. Within this higher order grid, additional intersections may be considered that will accommodate local traffic and pedestrian movement. "Window Streets," minor unsignalized T-intersections, and turn and entry prohibitions are the preferred solutions at these intermediate locations to maintain corridor progression and protect traffic capacity along the major arterials, where warranted.

1. Anticipate the spacing of signalized intersections in a 500 m / 300 m split along east-west arterials. Under no circumstance should back to back 300 m spaced signalized intersections be considered. Along Type A north-south arterials, signalized intersections should be spaced 700 m apart. Along Type B north-south arterials, signalized intersections should be spaced approximately 525 m apart.
2. Consider turn and entry prohibitions at minor intersections, particularly as a strategy to promote the number and frequency of intersections, while ensuring the traffic capacity of the arterial is protected.
3. Where an arterial will operate as primarily a vehicular movement corridor, it may be difficult to provide both the recommended frequency of intersections and maintain the traffic carrying capacity of the road. In this instance, the ability of the road corridor to support other uses will be limited. However, consider the following roadway configurations to preserve some connectivity between the arterial road and surrounding development:

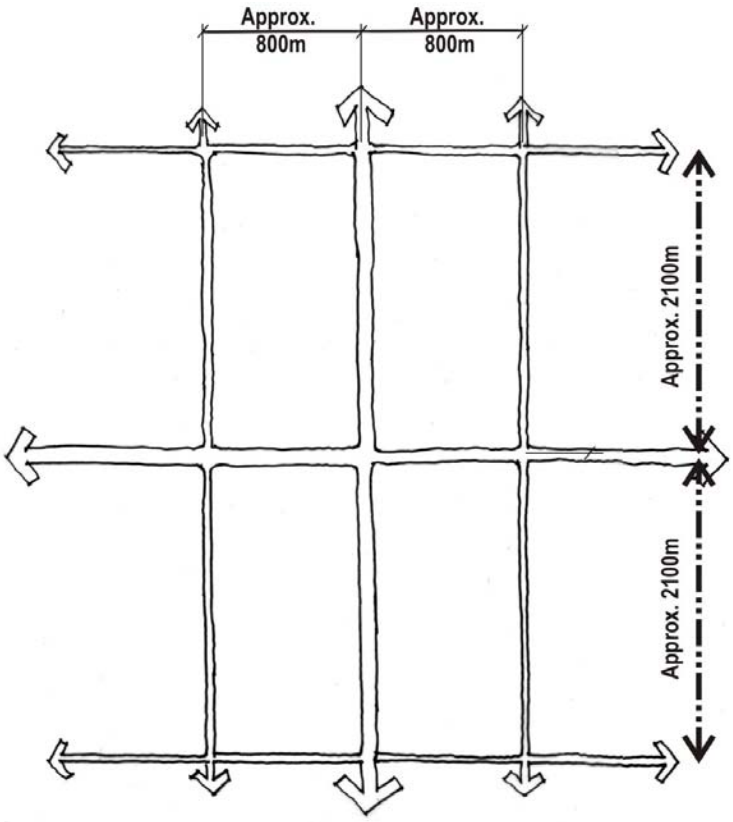
    - Parallel local street or access road – This configuration places a small-scale street parallel to the arterial road. This smaller street may have limited access to the arterial or may be accessed only from the streets within the adjacent development. With this configuration, development fronts both the local and arterial road, pedestrian and local vehicular circulation has frequent and direct access to the adjacent internal development, and vehicular circulation on the arterial road is minimized.
    - Parallel local loop street with a "Window" condition – This configuration is very similar to the previous one in that a portion of the local street runs parallel to the arterial. Development, particularly residential development is much more



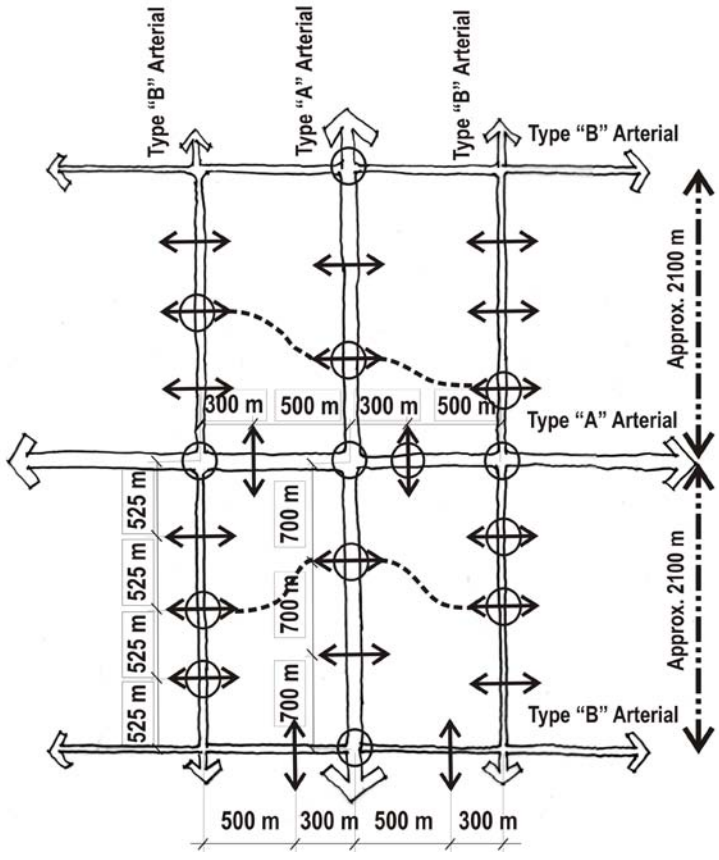
Window condition - crescent "loop"



Window condition - cul-de-sac



1. Working within the existing grid of concession roads



Signalized Intersection

Non - Signalized Intersection

Type C Arterial

2. .... there is a recommended spacing of signalized and non-signalized intersections that will ***best facilitate traffic movement*** *and support development*

likely to flank these roads however. The creation of the "Window" condition refers to the establishment of a direct visual and pedestrian connection from the local street to the arterial road. This connection serves as the spatial, if not vehicular, connection of the local street to the arterial road. This spatial connection should be generous in width and clearly identifiable as a public route.

- Cul-de-sacs with a "Window" condition – This configuration adapts the typical cul-de-sac or dead-end street to a situation where once again a strong spatial connection is made from the local street to the arterial road.

These street configurations are often applied as a means of avoiding the introduction of rear lotting, also known as reverse lot frontage, which requires sound attenuation walls or fences. Please see the further discussion of these conditions in Section 6.2, Building Orientation and Deployment.

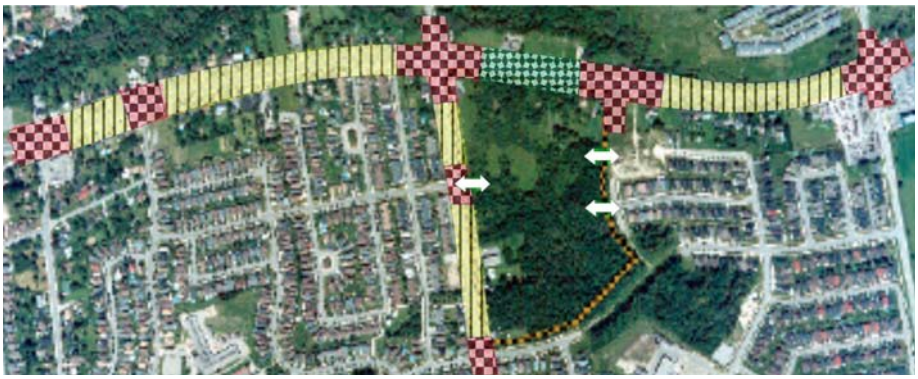
Use of raised median to restrict full turning movement

3.3 Mid-Block Access - Driveways and Drive-Throughs

Mid-block vehicular access is often required on arterial roads. The nature of this access can vary from individual residential driveways to parking lot entrances for large-scale development. In most instances, this vehicular access is both desirable and necessary.

As traffic levels increase on an arterial, mid-block vehicular access can become problematic for both pedestrians and drivers. Vehicles turning into and out of driveways present a hazard for pedestrians and cyclists and interrupt their travel. These unsafe conditions become even more acute if the land use and form of development are out of keeping with traffic and travel conditions of the roadway. In the most extreme conditions, traffic turning from the arterial will disrupt traffic flows on the arterial itself.

1. Consider the creation of an access management plan for areas where mid-block driveways and drive-throughs are in conflict with on-street vehicular movement. In urban areas, as roads become busier, vehicle access via driveways and drive-throughs may be limited and/or consolidated to avoid conflicts between turning vehicles and other users of the road.
2. Discourage driveways and drive-throughs in regional centres and corridors.
3. Consolidate driveways and drive-throughs to access more than one development where possible.
4. Consider the introduction of landscaped medians as a means of controlling driveway and drive-through access where traffic volumes are higher.



Development of access management plan

Full Movement Access - Restricted Zone

Full Movement Access - (shared access or cross-access easements if unobtainable)

Controlled Access - (limited to right in/right out due to raised median)

Recommended Full Access Points to Main Central Area

4.0 Supporting Adjacent Land Uses – The Design of Places Adjacent to the Road Right-of-Way

The roadway corridor is typically defined as the space between buildings on opposite sides of a street. It includes the road surface or platform on which the vehicles travel, the edge of road between the curb and property line, and any space that is part of the building setback from the property line. However, the road corridor is much more than simply the aggregation of these zones. The road corridor comprises most of the public space within a municipality, defining the character and image of each city. The design of the road corridor can assist in wayfinding for both pedestrians and vehicles by providing clearly defined places, gateways and landmarks that are easily understood.

In other words, road corridors define and incorporate a number of complex spatial relationships between uses, pedestrians and vehicles. They create identity, orientation, facilitate movement and provide the proper setting for economic development. The spatial relationships between movement systems and adjacent land uses within a road corridor are finely balanced—they concern much more than only the aesthetic quality of the street. For example, the edge of road area must mediate the impacts of automobile traffic between road platform and building entrance, providing both access and privacy to mention only two. The width of road corridors is also important, and can directly affect operating speeds for vehicles. Corridors that are too wide often cannot support a vital and active pedestrian realm, while corridors that are too narrow constrict movement and access.

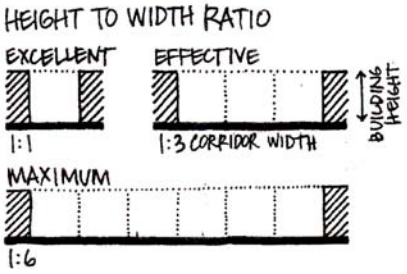
This section describes the spatial relationship within the road corridor in terms of its width and the relationship to buildings along its length. It also lays out recommendations regarding the integration of the design of adjacent development with the arterial corridor to ensure that streets support the surrounding environments and that streets and development can evolve together over time.

Trees, buildings, street lights and continuous and connected pedestrian routes reinforces the ***spatial definition of an arterial*** *corridor.*

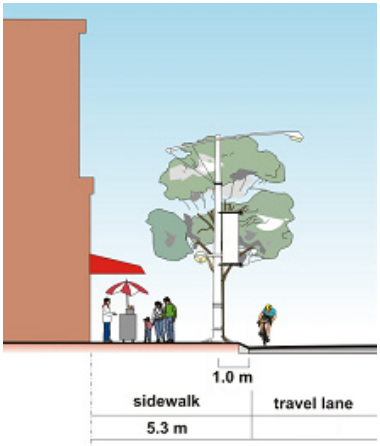
4.1 Spatial Definition of the Road Corridor

The design of arterial roads should consider the entire space between building faces on each side of the road platform, as this constitutes a considerable portion of the public realm and has a direct impact on traffic conditions.

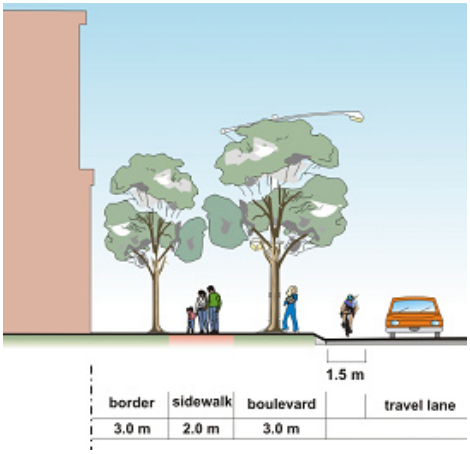
1. Define the linear space of the street. This can be accomplished with the placement of buildings, landscaping, light standards and other street furniture, or a combination of all of these elements. Continuous rows of trees and a consistent and connected pedestrian route will reinforce street spatial definition.
2. Design arterials with a maximum of 6 through lanes. Additional space may be required for auxiliary lanes and medians.
3. Locate, where possible, buildings with a consistent setback from the property line. Infill development should respect the location of existing buildings and reinforce a consistent setback.



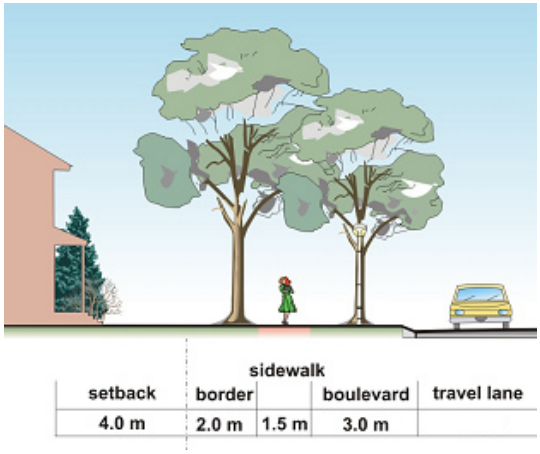
(The Technique of Town Planning, Operating System of the New Urbanism, Duany Playter-Zyberk Company, 1997)



Main Street Corridor

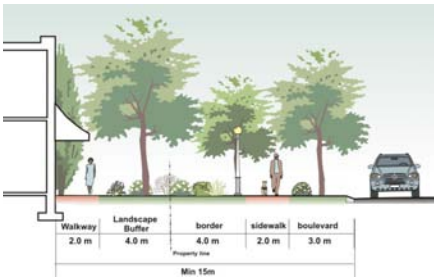


Higher Order Corridor



Residential Corridor

The dimension between the curb and building face should be 10 to 12 metres on residential streets, 4 to 6 metres on commercial main streets, and 7 to 10 metres on other higher order arterials



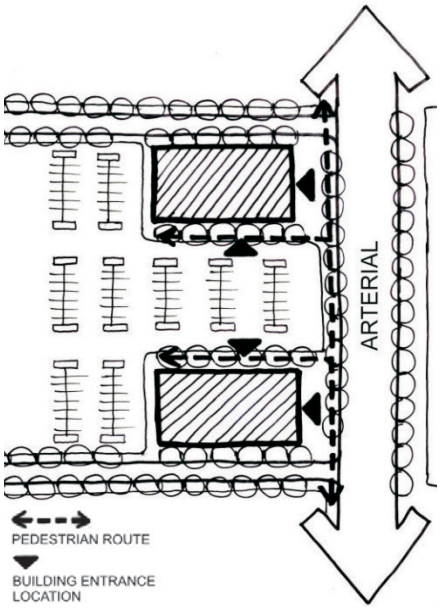
Industrial / Commercial Corridor

4. Allow for a typical dimension between the edge of pavement and property line of 4 to 9 m. This accommodates the location of utilities while balancing the need to spatially define the road corridor. Keep roadway corridor and right-of-way widths to a minimum, while still accommodating all functions of the arterial corridor. Maintain a dimension between the curb and building face of 10 to 12 m on residential streets, 4 to 6 m on commercial main streets, and 7 to 10 m on other higher order arterials. Prestige employment and office development may range from 15 to 20 m between the street curb to the face of the building.
5. Define the edge between the road corridor and adjacent surface parking lots with landscaping and other elements to reinforce the space and continuity of the road corridor. Low level screening, approximately 1 m high, will screen cars from view while providing visual access to signage and buildings beyond.
6. Infill existing surface parking lots with new development at the street edge where possible.
7. Keep the width of road corridors on which street / pedestrian related retail is desired to a minimum.
8. Encourage planted medians on wider streets to reinforce the spatial definition and continuity of the road corridor.
9. Encourage multiple storey commercial buildings in appropriate locations. Buildings that are several stories tall will define the road corridor more effectively supporting the use of transit. Building heights that are 1/3 the width of the road corridor, or higher, are often desirable.

4.2 Building Orientation and Location

The spatial relationship between the road corridor, building entrances and, in some cases, the interior of the buildings, provide safety for pedestrians and can assist in wayfinding for both motorists and pedestrians. Retail environments, in particular, will benefit from a high degree of design integration between the road corridor and adjacent development.

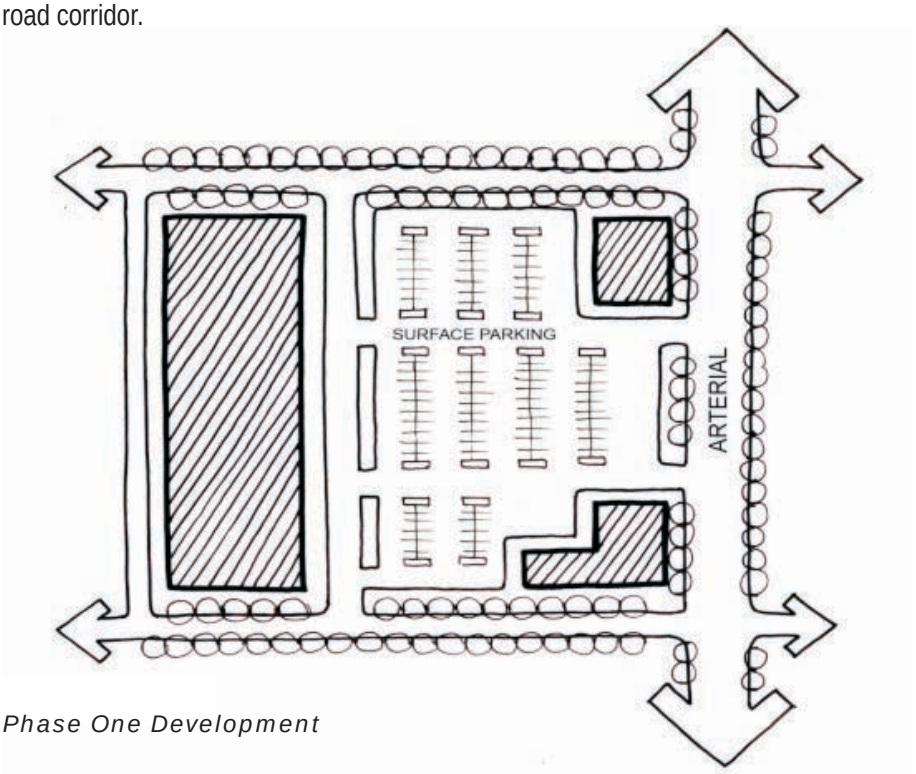
1. Face buildings towards the street, particularly where an active pedestrian realm is desired. Entrances that are oriented towards the street should be promoted. This will facilitate pedestrian activity and provide a clear identity for the development.
2. Encourage retail and other active uses at ground level to promote activity, "eyes on the street" and safety.
3. Encourage smaller commercial units to line the roadway corridor while maintaining visual connections to other commercial units behind them where large surface lots are planned as part of new commercial/retail development.
4. Encourage street walls of buildings to include windows and a variety of materials and surface treatments to animate the public realm and ensure "eyes on the street." Large blank walls are to be avoided. Landscaping may also be used to reduce the impact of large, featureless walls.
5. Locate buildings, particularly those with commercial or retail uses, as close to the property line as feasible. Setbacks generally should be between 0 to 4 m.
6. Intensify building densities with close proximity to major transit corridors in order to foster a transit supportive corridor.
7. Residential development may be set back further from the property line to ensure privacy, safety and further separation from noise sources. This setback can be up to 6 to 7 m with a total dimension from curb to building face of 10 to 12 m.
8. Avoid reverse lot frontage and sound attenuation walls wherever possible. Alternate frontage configurations such as the introduction of a parallel local street or access road, a "window street" configuration at the end of cul-de-sacs, or a parallel local loop road flanked by side-yards, should be explored.
9. Use, where possible, berms and landscape buffers to reduce the impacts of sound and pollution from arterial roads. If this strategy is used, incorporate these landscape elements into usable, programmed open spaces that can be used as amenities, such as parks or trail systems.
10. Design architectural, façade and other lighting treatment for buildings with sharp, full cut-off luminaries to prevent uplight and glare and avoid light trespass onto adjacent properties and the roadway.



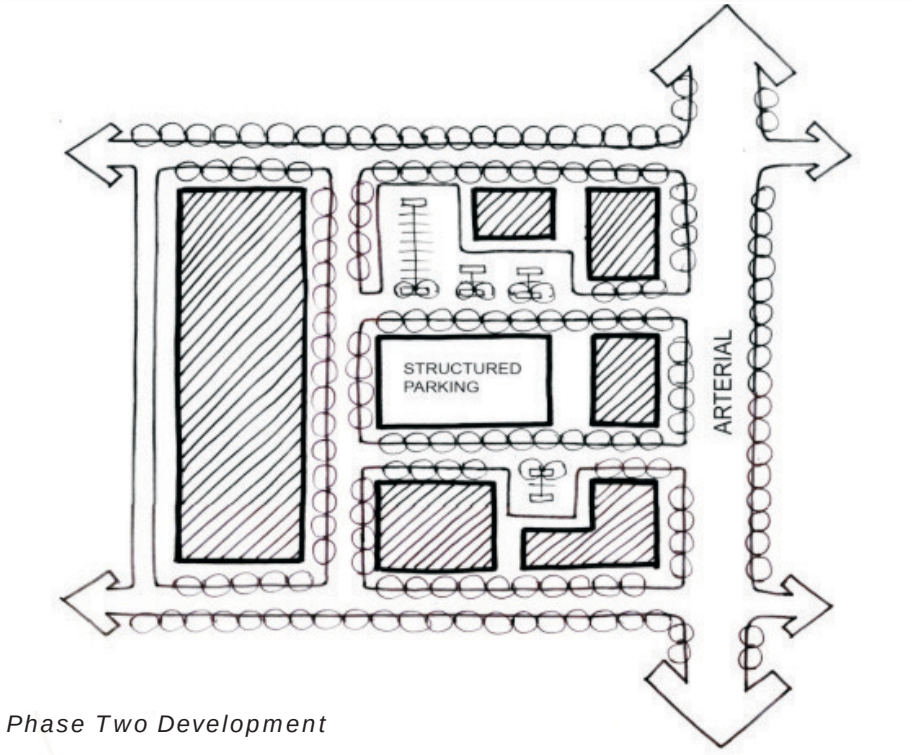
Promote the placement of parking to the side and behind buildings. Locate building entrances where they can easily be accessed from both parking and the arterial corridor.

4.3 Adjacent Parking Lot and Site Design

Although adjacent parking lots and other site development do not occur within the road corridor, the design of these places can have a significant impact on the character, role and function of arterial roads. These sites contribute to the visual character of the road corridor while on-site pedestrian networks can reinforce the pedestrian nature of the road corridor.



Phase One Development



Phase Two Development

Development should reinforce the edge of the corridor, while providing views to parking and other development beyond. As well, parking lots should be ***located and configured so as to*** *easily allow the introduction of additional development over time.*

The arrangement and design of parking lots and the overall arrangement of buildings can ensure that further intensification of development over time is not precluded. While the market may dictate an auto-oriented form as first phase development (i.e., a rear oriented plaza or power centre), the adaptability of the site to accommodate growth over time may be considered. This may include adding storeys to a structure over time, putting smaller stores in front, or extending buildings to the street line at a later date. Often this type of planning is not undertaken prior to the approval of development applications, and opportunities to intensify development over time are lost.

"Street-like" driveways with substantial vegetation.

1. Locate parking lots to the side and rear of buildings. This will minimize visual impact on the road corridor while continuing to provide visual connection to buildings set back within the development.
2. Design on-site driveways as "street-like" as possible with sidewalks, landscaping and possibly other amenities, such as lighting and benches incorporated into their design. Over time, these driveways may become public streets, providing development flexibility and the potential to further sub-divide sites.
3. Provide a continuous and connected system of sidewalks and pedestrian networks throughout the development. In particular, direct connections between sidewalks within the road corridor to all building entrances should be made. Sidewalks should be a minimum of 1.5 m wide.
4. Provide direct pedestrian connections to transit stops.
5. Locate bicycle racks and lockers adjacent to building entrances.
6. Encourage strategies to reduce overall parking requirements and promote intensification of development. This may include the promotion of shared parking, the promotion of different uses within a site so as to capitalize on parking at different times of the day. Other mechanisms to reduce the demand for parking could also be considered, such the promotion of carpooling and paid parking.
7. Screen garbage and service areas from view.
8. Consider parking lots as future development sites, so as to encourage intensification and minimize redevelopment costs. Parking lot size, shape and location should reflect this objective.
9. Employ a lighting design that uses full cut-off luminaries to avoid light trespass onto adjacent properties and the roadway.

4.4 Main Streets, Historic and Natural Areas

Hamlets, historic downtowns and heritage buildings, and natural spaces are some of the most valued assets of any community. They provide an important quality of place and identity for municipalities in which they are situated. They are both a link to the past and are often an anchor for future economic growth. The design of arterial roads through such centres is usually very unique, reflecting the specific history of each place. The balance between land use, built form and the transportation characteristics of the road corridor also tend to be very specific and unique. Any transportation or development initiatives within these places must work within these constraints to ensure these places remain places of beauty, history and economic growth.

1. Conserve the historic urban fabric along the road corridor to maintain diversity and enrich the experience of corridor users. This will often require specific and idiosyncratic design approaches to building setbacks and the width of the road corridor.
2. Avoid narrowing sidewalks and removing on street parking and / or landscaping. The presence of slow moving through-traffic, on-street parking and a quality public realm are all required to preserve and enhance existing retail uses in hamlets and on main streets.
3. Only consider a by-pass of a hamlet after detailed study, having regard for both the transportation and rural settlement provisions of the ROP. The creation of by-pass roads around hamlets can deaden the retail environment along historic main streets by removing much of the through traffic.
4. Examine unique design initiatives, such as higher order landscaping and streetscaping, for hamlets and other places of historic, cultural, or natural importance, in consultation with the public.
5. Integrate the design of the road edge with that of the adjacent open spaces, where arterial roads cross or are adjacent to significant natural areas and open spaces. The design of the road edge should be consistent aesthetically and uphold the same environmental standards.

Landscaping, on-street parking, and improvements to the pedestrian realm can promote street-related retail.

Before

After: Revitalization of historic downtown in conjunction with necessary infrastructure replacements

4.5 Noise Attenuation Strategies

Traffic on arterial roads adjacent to residential areas can cause noise that is disruptive to residents. This is especially true on high-speed, high-volume arterials next to subdivisions. Noise levels must conform to provincial and municipal guidelines. The traditional solution has been to build noise attenuation fences or walls. However, these fences or walls isolate the arterial road from the adjacent neighbourhoods, presenting a continuous barrier to pedestrian traffic and an uninteresting, unwatched and potentially dangerous environment for those walking along the arterial. Noise attenuation strategies should begin at the source of noise, with the design of the road itself. Remaining noise should be blocked without the use of fences or walls, if possible. If as a last resort noise fences or walls are required, every effort should be made to reduce their visual impact and avoid blocking pedestrian and bike access.

Land Use:

1. Promote development oriented to the street. Buildings should buffer sensitive noise receptors as opposed to other noise attenuation measures such as walls, fences and berms.

Road design:

1. Reduce noise at the source by reducing the speed of vehicles through design and transportation design consistent with the roadside environment.
2. Eliminate rattling maintenance hole covers as a source of noise by positioning them where vehicles will be less likely to run over them (i.e., at the centre of traffic lane).

Noise attenuation alternatives:

1. If a barrier is required, consider using berms and landscaped buffers, which should be incorporated into other open and recreational spaces.
2. Necessary land requirements should be determined in the development application process prior to draft approval (e.g., plans of subdivision), including keeping sight lines and sight triangles clear.

Attenuation fences and walls:

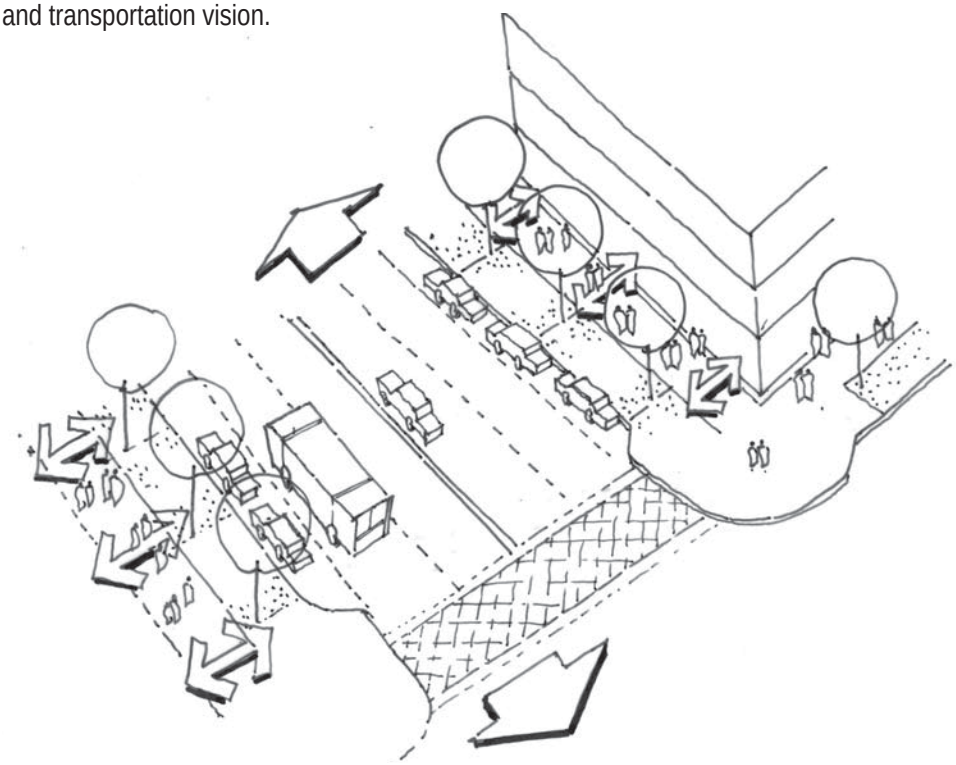
1. Avoid using noise attenuation fences or walls if possible. They should only be used as a last resort.
2. Integrate the design of attenuation fences and walls with their surroundings using a variety of designs, colours and textures, vines and other plantings. Attenuation fences or walls should be visually appealing. Select materials based upon life span and future maintenance.

Where noise attenuation walls and fences exist, they are a very dominant element to the public realm. If they are required, care should be given to their design to ensure that they are visually appealing.

5.0 Street Element Design Criteria

5.1 Sidewalks

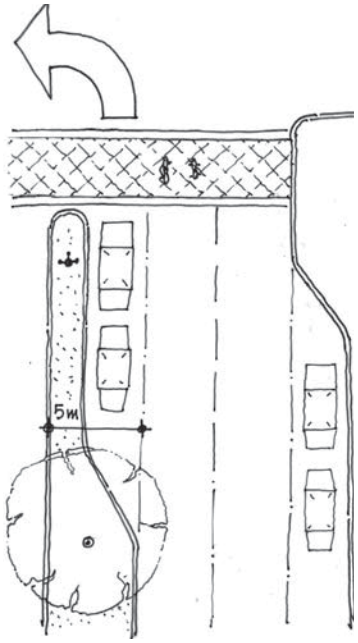
In urban environments, the efficient movement of vehicular traffic has often been prioritized, while consideration of the needs of pedestrians has received limited attention. However, it is pedestrian movement that achieves all the objectives of road corridors aside from movement of goods and vehicles. Pedestrians walking along a commercial street are more likely to enter shops and support businesses than drivers, who are passing through on the way to a destination. Integration of pedestrians with vehicular traffic is key, and improvements to the pedestrian realm should take place as urban environments mature. Setbacks, visual cues and physical buffers such as street furniture and parked cars protect sidewalk users from the negative impact of vehicles. The needs of pedestrians and drivers occasionally conflict; a balance needs to be reached that accommodates them both safely and is consistent with the local planning and transportation vision.



Coordination of pedestrian movement, land-uses and ***vehicular traffic is key.***

Location and dimension of sidewalks:

1. Provide unobstructed sidewalks along both sides of all arterial roads in urban areas.
2. Avoid combining recreational pathways with sidewalks if an alternative continuous route for the recreational pathway exists.
3. Use sidewalks to connect buildings and parking lots to roadside sidewalks and transit stops, either combined with or independent of driveways.
4. Design sidewalks with a minimum width of 1.5 m, although a minimum width of 1.8 to 2 m is strongly recommended to ensure adequate width for passing and accessibility. Before reducing the width of the pedestrian route to less than 2 m, consider where appropriate and to acceptable minimum standards, reducing medians, boulevards or lane widths.



Turning and parking lanes can be integrated into street landscaping strategy.

Care should be given to ensure turning lanes do not compromise the pedestrian environment.

It may be desirable to provide enhanced crosswalk material for "special places" or pedestrian dominant locations.

5. Increase sidewalk width to 3 m for locations where higher pedestrian levels of service are desired.
6. Provide a minimum 2 m wide clear pedestrian route, buffered by a 2 m wide roadside furnishing strip and a 0.25 m wide building frontage strip, for a total minimum of 4.25 m of sidewalk between the road edge and buildings for sidewalks on urban or main streets that have a strong pedestrian focus.
7. Locate sidewalks 3 to 4 m from the roadside curb, beyond the inner boulevard, in typical urban conditions.
8. Sidewalk and ramps leading to sidewalks should be designed with mobility challenged individuals in mind. Slope and curb cuts must be designed to allow for wheelchair access.

Sidewalk grading:

1. Slope the boulevard to allow water to drain away from the sidewalk, avoiding the formation of puddles and hazardous ice. The sidewalk should slope slightly toward the curb.
2. Ensure sidewalk continuity in terms of material and slope, to reinforce pedestrian priority. This means that when a sidewalk crosses a private driveway, grade transitions should be made on the driveway on either side of the sidewalk, leaving the sidewalk itself level.
3. Ensure that slope transitions on the sidewalk are as gradual and unobstructed as possible, in accordance with acceptable minimal standards, where a sidewalk crosses an intersection.

5.2 Crosswalks and Intersections

To encourage pedestrian presence on streets, perceived and actual safety and comfort must be priorities. At crosswalks, where drivers and pedestrians cross paths, both need to be aware of each other with enough warning to react. Crosswalks must not only give pedestrians opportunities to cross safely, their design should convey the importance of pedestrians as users of the road and contribute to a comfortable, pleasant experience.

Location of crosswalks:

1. Integrate at a minimum, pedestrian crossings into all street intersections. Pedestrian crosswalks should occur on all sides of the street.
2. Ensure that pedestrian crossings are a natural and convenient extension of the overall pedestrian network.
3. Consider the provision of additional pedestrian crossings in urban areas or places intended for further development intensification. Pedestrian crossing locations may be coordinated with parks and neighbourhood features and amenities such as schools. Crosswalks may be considered at some local window streets where these local streets meet arterial roads.

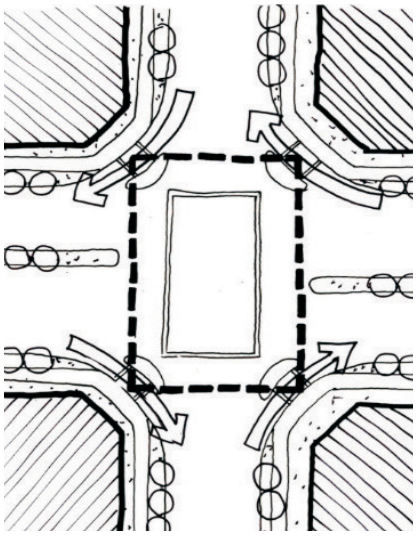
Crosswalks and turning lanes:

1. Consider merging turning lanes with through lanes at intersections where pedestrian priority is desirable, particularly on main streets and other streets with a commercial/retail focus. This will ensure the road platform is as narrow as possible at intersections where adjacent retail is most likely to succeed.

2. Consider providing measures, such as bollards, distinct paving materials and colours, to emphasize pedestrian priority, increase the visibility of crosswalks and improve pedestrian safety in appropriate locations, subject to considerations for cost and maintenance.
3. Orient curb ramps from the sidewalk in the same direction as the crossing, to direct visually impaired people in the right direction.
4. The integration of turning lanes into the design of an intersection is often desirable to facilitate vehicular movement. This is particularly the case on streets where the movement of vehicles is a priority. The intersection of two arterials generally requires the introduction of turning lanes.

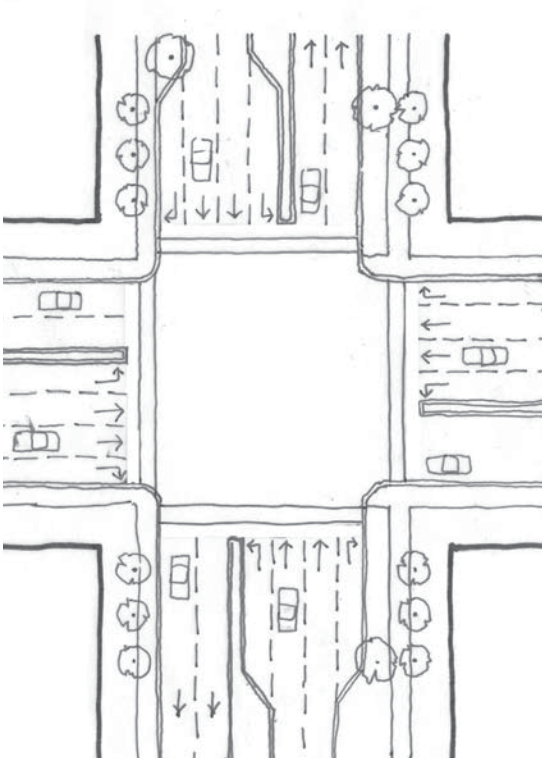
Pedestrian crossing signals:

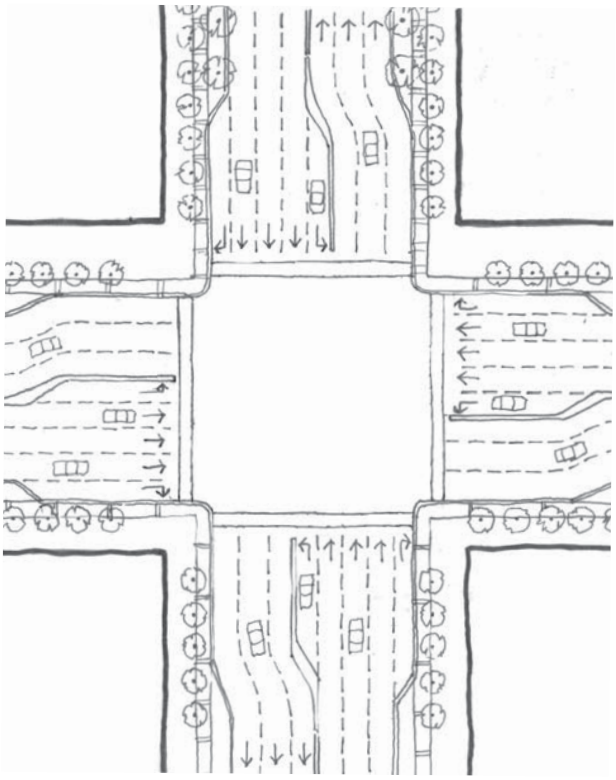
1. Consider including warning signs, audible signals, paint markings and distinct surface textures at crosswalks, to warn crossing pedestrians and guide them across the road, where required. Ensure sight lines are clear.
2. Provide pedestrian signals at all signalized intersections.
3. Pedestrian signals at intersections with very low volumes of pedestrian traffic may be activated by push-buttons. Locate push-buttons where they will be easily accessible for all pedestrians, including those with physical and/or visual limitations.
4. Time pedestrian signals with the slower walking speed of seniors and those with physical and/or visual challenges in mind, where required and appropriate.



Intersection with turning lane

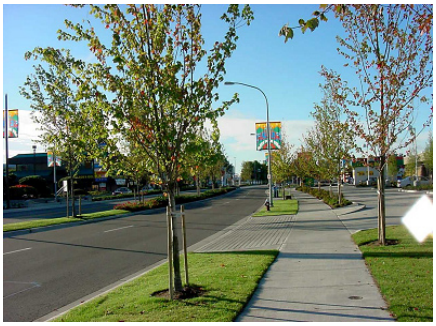
Crosswalk design should highlight the location and presence of pedestrian. The apparent width of streets should be minimized. Where turning lanes are required, care should be given to providing safe refuge for pedestrians waiting to cross.





The integration of turning lanes into boulevards

5.3 Landscaping



Trees and shrubs can help soften the hard surfaces along an arterial.

The use of planters, pavers and gardens reinforce the sense of "place".

Landscaping plays a substantial role in the creation of a comfortable, stimulating street environment. Trees and shrubs filter harsh sunlight and wind, moderating the sidewalk microclimate. The textures and colours soften the hard surfaces of the built environment, provide a richer sensory experience and connect people to nature in an urban setting. In addition to trees, shrubs, grasses, flowers and sod, the textures and colours of paving stones and other materials can also be used to create a more interesting environment, reinforcing the character and quality of place. A preferred plant list with suggested area of application has been included as an appendix to this document.

Choosing landscape elements:

1. Develop a Landscape Plan for consistent treatment of landscaping throughout the Region.
2. Evaluate environmental conditions and select vegetation that can tolerate the conditions it will be exposed to, including road salt, limited subsoil, heat, drought, wind and shade.
3. Select native plant species over non-native species, to preserve local natural heritage.
4. Plant a diverse mix of conifers and deciduous trees and shrubs to create an interesting landscape, preserve biodiversity and reduce the risk of losing all the plants to species-specific disease or infestation.
5. Select plant species that are easy to transplant and maintain, hardy and long-lived, with non-invasive roots.
6. Consider planting shrubs, grasses or flowers instead, if spatial or maintenance requirements conflict with tree growth.
7. Avoid planters for trees. They do not sustain a good growing environment for trees and therefore require additional maintenance. If space is so restricted that trees must be in planters, ensure planters are a maximum of 600 mm in height, that they are a minimum of 1500 mm X 1500 mm in width and length, have no bottom, are insulated, and do not impede sight lines and sight triangles.
8. Promote naturalization planting programs in public open spaces adjacent to arterials.

Where and how to plant:

1. Invest in the longevity of landscaping with proper planting and care. An environment that supports plant growth can be prepared during boulevard construction by laying 45 cm of suitable topsoil.
2. Plan the location of sidewalks, driveways and utilities around existing healthy trees.
3. Seek permission from adjacent landowners to plant on their properties, if the right-of-way is too narrow to support plantings.
4. Plant deciduous trees between the curb and the sidewalk to enclose and shade the pedestrian space, on narrow, lower speed roads with a high potential for pedestrian traffic. Plant trees 1.5 to 2.0 m from curb except where limited space requirements dictate otherwise.
5. Plant deciduous trees 8 to 10 m apart to provide a continuous canopy along the road corridor. Ensure placement of trees do not obstruct driver's view at intersections and driveways.

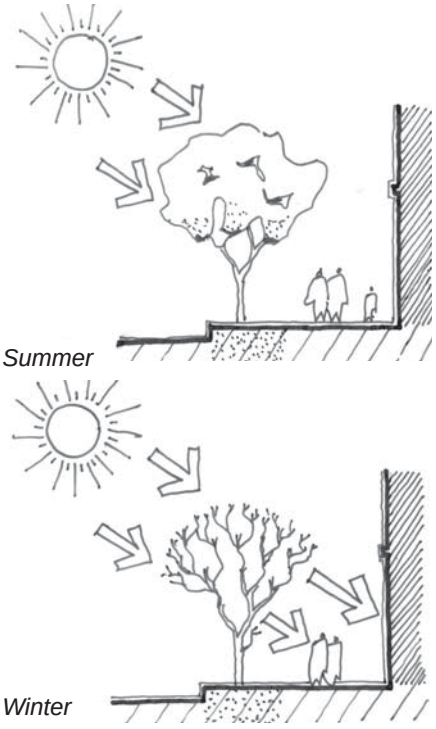
6. Plant trees at grade.
7. Plant trees further from the curb on wide, high-speed roads, to protect them from harmful salt spray, strong winds, fumes and heat reflected from the road.
8. Removal of a dead or live tree should be replaced with a tree of a similar species and size, or of a minimum 50 mm caliper.
9. Ensure that street tree planting on Regional Roads is undertaken to the specifications contained in the Regional Tree Planting contract.

Landscaping as protection:

1. Plant deciduous trees along sidewalks and recreational paths, to provide shade to pedestrians in summer and allow solar access in winter. Add coniferous trees as well, if space is available, to filter wind year-round.
2. Use boulevard plantings and street furniture to protect pedestrians on sidewalks from the elements and splashing from passing vehicles.

Other considerations:

1. Plant trees along parking lot walkways to make walkways easier to find and provide shade for pedestrians walking through the parking lot. The planting of trees along walkways must be balanced with the requirements for lighting for pedestrians.
2. Provide landscaping and distinctive surfaces at pedestrian crossings.
3. Consider using distinctive tree and vegetation species, such as flowering species, in places with a unique identity and profile.
4. Develop agreements between the area municipalities and the Region for the maintenance of landscaping.



Landscaping can improve pedestrian comfort

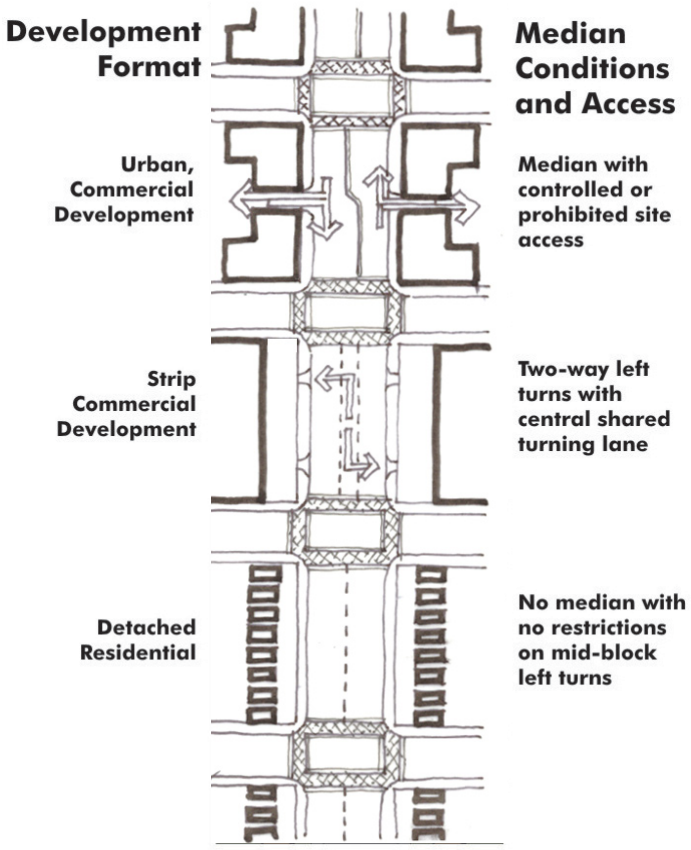
5.4 Landscaped Medians

Landscaped medians provide opportunities to add character to a streetscape, in addition to controlling traffic movement. Although landscaped medians can be found on a variety of roads, they are most important on wide rights-of-way, where they provide spatial definition and a comfortable sense of enclosure that encourages drivers to slow down and pedestrians to "live" in the space. Through landscaping, the median can contribute to the sense of place of a street or district.

When to use landscaped medians:

1. Provide medians within roadway corridors with a high number of travel lanes or where control of vehicle movement and turning is important. In these instances, medians will also provide a refuge for pedestrians.
2. Consider using medians to reduce the risk of high-speed head-on collisions on roads with high-speed traffic.
3. Use medians to protect vehicles in left turn lanes and control turning traffic on roads with many driveways and heavy traffic.
4. Provide landscaped medians on streets where a unique character or identity is desired.
5. Do not provide medians on streets with a narrow right-of-way, or on main streets where the spatial and visual connection between opposite sides of the street is paramount. Landscaped medians should only be considered if there is generous

The use of medians depends upon both the type of adjacent land uses and development format, as well as the need to control vehicular movement and access.



space for sidewalks and other elements within the roadway edge.

Treed median

Median design and landscaping:

1. Design the median width to be 5 m at intersections, so that a 3.25 m vehicle left-turn lane can be taken from the median while retaining a sufficient median width for pedestrian refuge, traffic signal infrastructure and signs. At other locations, a 4 m median width is sufficient for tree health and growth.
2. For medians without a hard surface, construct a 0.5 m wide salt strip around the perimeter of the island to eliminate winter kill due to salt exposure. This salt strip should be constructed of the same material as other hard surface island treatments, with a 2% minimum cross fall (e.g., interlocking brick, asphalt, or textured concrete).
3. Apply the same guidelines for landscaping for medians as for road edge landscaping, ensuring consistency with landscaping on the road edge and adjacent lands. Where a median does not have a hard surface, consideration should be given to planting grasses, shrubs and perennials Where trees are desired in landscaped medians, the use of continuous or individual planter boxes should be encouraged to protect trees from salt spray.
4. Consider irrigating a landscaped median at locations of unique character, where appropriate. Such treatment should not be considered as a standard practice due to the long-term maintenance concerns.

5.5 Street Furniture and other Amenities

Street furniture such as seating, phone booths, parking meters, bicycle racks, newspaper boxes, waste receptacles, transit shelters, planter boxes and mailboxes contribute to the safety, comfort and utility of public space. When they are designed and arranged with consideration for quality and aesthetics, these elements can also make a streetscape more attractive and interesting. Street furniture designed on a consistent theme can define the identity of a place or route, such as a historic area.

Paving can improve both the function and appearance of intersections.

Location of street furniture:

1. Consolidate benches and other roadside furniture such as bike racks, notice boards, newspaper boxes and refuse containers to encourage concentrations of activity.
2. Integrate seating into planters where appropriate.
3. Place sidewalk furniture, patios, vending machines and signs where they will not obstruct the pedestrian route or conflict with driver's sight lines.
4. Ensure that overhead objects such as patio umbrellas, awnings and hanging signs leave adequate space for pedestrians and cyclists to pass beneath.

Promoting design elements within the road corridor:

1. Identify priority corridors, such as historic areas, hamlets, regional centres and special commercial districts. Through the preparation of corridor studies or secondary plans, develop policies for these areas to coordinate design initiatives.
2. Consider encouraging owners in commercial areas to add their own street furniture, such as benches and shelters, in appropriate locations, subject to maintenance and liability agreements, when located in Rights-of-way. This furniture should be consistent with the site's particular context and streetscape concept.
3. Encourage the location of public art, including sculptures, wall murals, fountains, decorative walls, and custom designed furnishings, within or adjacent to the right-of-way to enhance the streetscape of priority corridors.
4. Where Business Improvement Areas (BIAs) or other business owners' group exists along identified Special Character streets (i.e. downtowns, main central areas, etc.), partnerships should be sought with these groups to encourage the upgrading and maintenance of the enhanced right-of-way features.

Street furniture can provide amenity and identity within an arterial corridor.

5.6 On-Street Parking

On-street parking on Dundas Street in Downtown Whitby

On-street parking can be an important component in the creation of a vital and active street. In particular, it should be considered where a main street retail environment is desired in certain regional centres and corridors, as it will promote walking and slow traffic, thereby improving the visibility of shops. It can also be used as short-term loading space for small commercial uses on retail streets and reduce development costs for small businesses by permitting parking to be provided on street. On-street parking is also a useful addition to residential streets and can serve as visitor parking.

1. Promote on-street parking on streets with land uses that are directly accessible from the corridor to promote retail and business uses and shield pedestrians from traffic.
2. Design parking lanes with a 2.75 m width. The exception to this is when they are doubling as a peak hour shared lane, in which case a typical travel lane width should prevail.
3. Avoid diagonal parking.
4. Ensure pedestrians at crosswalks are easily seen by motorists. This can be accomplished by not permitting parking adjacent to the crosswalk, or by extending the sidewalk out towards the travel lane for the creation of a “bump-out” at crosswalks. This strategy can also be applied at transit stops.
5. Do not consider on-street parking on streets with an operating speed of over 60 km/h.
6. Consider metering on-street parking to promote short-term parking.

5.7 Accommodating Bicycles

The Region is in the midst of preparing a *Regional Cycling Plan*. Through the development of this Plan, appropriate guidelines addressing the needs of cyclists will be incorporated into this document at a later date.

5.8 Transit and Shelters

Transit stops have the potential to be integrated into streetscapes, adding to street activity and a sense of place. Because transit stops are ubiquitous in urban areas along arterial roads, and often the first pedestrian destinations to appear in new developments, centres of activity can potentially develop around them. By clustering transit stops with shelters, street furniture, coffee shops and other amenities that attract people, gathering places can be created, while transit users and patrons of other services can enjoy the convenience of the combined activities.

Typical transit shelter - provides protection from the elements while providing clear visibility for safety.

Traffic flow:

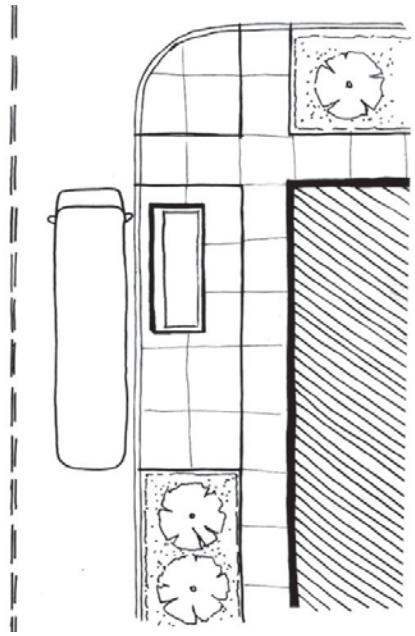
1. Coordinate bus movements with traffic flow to avoid conflicts.
2. Give transit vehicles equal or greater priority on the roads than private vehicles. Consider dedicated lanes for transit vehicles where appropriate.
3. Limit the use of bus bays to roads with speed limits of 80 km/h or greater, or where a site-specific safety hazard or need has been identified.
4. Provide bus stops at the near side of an intersection, letting passengers disembark adjacent to the corner where crosswalk lines and signal heads are located.

Pedestrian access:

1. Ensure that the maximum walking distance to a transit stop does not exceed 400 m for atleast 95% of all the residences.
2. Ensure that the maximum distance between pedestrian access points to an arterial road are generally no more than 250 m.
3. Position transit stops as close as possible to intersections and crosswalks.
4. Provide permeable street patterns allowing pedestrians to access public transit.

Transit stop design:

1. Provide concrete pads in the waiting and loading areas of transit stops. The pads should be flush with the sidewalk to provide accessibility to passengers using wheelchairs, and textured to provide tactile directional cues for visually impaired riders.
2. Ensure that the concrete loading pad is long enough to serve passengers exiting from all doors of transit vehicles, and at least 1.5 to 2 m wide, to accommodate wheelchairs.
3. Locate stand-alone shelters on the inner boulevard, adjacent the curb, to improve visual connections between the shelter and the approaching transit vehicle. This location will also promote a more compact roadway corridor and minimize conflicts with land uses, such as residential development. Only place stand-alone shelters in the outer boulevard (towards the property line) where roadway travel speeds are high and roadway corridor widths are generous. The integration of transit shelters with other uses or development may also warrant the creation of waiting areas in other locations. Regardless of the shelter location, visual connection



The concrete loading pad should be long enough to serve passengers exiting from all doors of transit vehicles, and at least 1.5 to 2 m wide, to accommodate wheelchairs.

Integration of transit shelters with other amenities and the design of adjacent open spaces

to approaching vehicles and direct pedestrian access to the vehicles must be provided.

4. Position transit shelters at least 1 m away from curbs and sidewalks to prevent accidental damage from snow maintenance equipment.
5. Use transit shelters that have transparent walls providing visual connection between waiting transit users and approaching transit vehicles. Transparent shelters will also provide visual surveillance of transit shelter areas, improving pedestrian safety. Transit shelters must be located outside of the intersection sight visibility triangle.
6. Consider providing an open, roofed shelter if budget or site-specific characteristics prohibit the construction of an enclosed shelter.
7. Choose transit shelter designs that reflect the identity and character of the local area.

Combining with other amenities:

1. Consider funding transit shelters through public-private partnerships. If advertising is to be included, it should not take priority over the shelter's functionality for transit users.
2. Consider building transit shelters into the base of buildings along transit routes.
3. Consolidate newspaper boxes, garbage receptacles, phone booths and other street furniture at bus stops for convenience and to encourage pedestrian activity. In particular, benches should be provided in transit shelters and / or at transit stops.

5.9 Public Signage

Public signs erected within the right-of-way are regulated by Provincial and Regional standards and are typically related to vehicle operation and parking regulations, or are provided for directional or information purposes.

1. Mount on-road signs on existing utility or light poles, where practical.
2. Design individual ground-mounted signs to be in scale with the adjacent buildings and the streetscape.
3. Locate signs in line with other features in the road edge such as parking meters, street furniture, light poles, and utility poles. Design and locate on-road signs so as not to obstruct the view of traffic signals and other important sight lines of pedestrians, cyclists and motorists.

5.10 Private Signage

Private signs erected within the right-of-way are regulated by Regional or local by-laws, depending on the jurisdiction of the road. Private signs erected outside the right-of-way are regulated by local municipal by-laws and are typically related to business exposure and promotion. In addition to providing this economic benefit, they can also provide the benefit of enhancing a corridor.

1. Locate signs such that their setback provides adequate sight lines for motorists, pedestrians and cyclists. Ensure by-laws regulating private signs incorporate a minimum set back of 1.0 m from the property line and appropriately sized sight triangle protection at vehicle and pedestrian access/egress points.
2. Where corridors are given "Special Consideration" such as a Main Central Area or historic downtown, regulate signage to be compatible with the area and/or recommendations developed through Secondary Plans or Corridor Studies with the adoption of new signage by-laws or amendments to the existing by-laws.
3. Promote the use of shared-use or joint-use signs to reduce corridor clutter.
4. Provide natural or other landscaped features at the base of ground mounted signs.
5. Design ground or wall-mounted signs to be in scale with adjacent buildings, land use and corridor "Street Type". Regulate sign area, mounting height and movement of signs (e.g. rotating signs).
6. Regulate the provision of portable or temporary signs to limit their numbers, location, set back from the right-of-way and size in order to reduce corridor clutter and ensure clear sight lines for motorists, cyclists and pedestrians.
7. Promote the use of wall-mounted over-head signs at a minimum height of 2.4 m to ensure adequate clearance for pedestrians and service vehicles that may use the sidewalks in pedestrian-oriented areas such as main streets.

6.0 Design and Placement of Utilities

6.1 Lighting

The Region is in the midst of preparing a *Regional Roadway Lighting Policy and Design Specifications*. Through the development of this Policy, appropriate guidelines will be prepared addressing lighting on roads and sidewalks, and will be incorporated into this document at a later date.

6.2 Above Grade Utilities

Utilities must be integrated into the right-of-way of arterial road corridors. Safety standards and concerns related to their placement must be observed, but utilities should not dictate the design of these spaces.

Visual impact:

1. Bury services and utilities, where practical, to minimize their visual impact.
2. Provide a 1.5 m to 2.5 m setback from the back of curb for hydro poles in typical urban settings. There must be a minimum 3 m separation between power lines and any physical development. For main streets and historical districts, a minimum setback from the back of curb for hydro poles is 0.25 m.
3. Locate utility poles 3 to 4 m from the property line on rural roads, and in accordance with existing guidelines for minimum sightline and sight triangle distances.
4. Minimize the visibility of utility accessories, such as utility boxes. This can be achieved by placing accessories in inconspicuous places, and/or by screening them with plantings. Ensure such screening does not interfere with access to the accessories. Utility providers should also be encouraged to consider innovative methods of containing utilities and determining locations for large utility equipment and utility cluster sites.

Consolidation:

1. Maximize the joint use of utility poles to minimize their number.
2. Maximize the shared use of utility trenches in new construction by planning for and installing them on a coordinated and integrated basis to be more efficient, cost effective, reduce right-of-way requirements and provide additional space for landscaping.

6.3 Below Grade Utilities

The provision of utilities is one of the primary roles streets play. The location of below grade utilities in a manner that is safe and efficient is necessary under all urban arterials. The separation of utilities is required to ensure adequate clearances for proper maintenance of utility lines and to reduce the risk of interference between different types of service. However, where the creation of relatively compact edge of road condition is desired, there may need to be the adoption of joint utility trenches and other strategies to achieve narrower overall edge of road dimensions. Typically, the design guidelines recommend a 6.5 m to 10 m edge of road overall dimension, providing ample space for the incorporation of below grade utilities. It is on main streets or other streets where a 4 to 6 m edge of road dimension is recommended where more urban standards will have to be considered. All underground utilities shall have a minimum 0.5 m of vertical clearance and 2 m of horizontal clearance from sanitary sewers, storm sewers and watermains.

Cable Utilities:

1. Use joint utility trenches where possible. They should be used for hydro, telephone, cable TV and other emerging technologies. They are typically 1 m deep, 2 m from sanitary sewer, storm water and water mains and 1 m from gas mains. Joint utility trenches may include gas lines in the future. Care should be given to ensure there is no interference with tree roots. Trenches can be located under boulevards or sidewalks.

Utility Pedestals:

1. Coordinate the location of utility pedestals with street design and landscaping. The most common approach to this situation is to align pedestals with street light poles or hydrants. The typical placement is 1 pedestal for every 8 residences within a subdivision.
2. Hydro transformers take up more space than other pedestals and are typically situated beyond the street right-of-way in easements but sometimes are within the corridor. Appropriately screen transformers in such a manner to allow easy access by the hydro utility.
3. Large above ground telecommunications infrastructure, such as Walk-in-Cabinets (WICS) and Outside Plan Interface Cabinets (OPI), shall be located and designed to be compatible with its environment and shall be permitted to be located within the public right-of-way or on private property through easements. Locations for these sites shall be determined early on in the planning process.

Gas Mains:

1. Gas mains are typically located close to the property line. Locate gas mains 1 m from other underground services and at a depth of 1 m.
2. In urban areas, place new gas mains on both sides of the arterial road, where possible, to minimize the number of gas mains running across it. This reduces future costs for gas services for new development and road reconstruction.

Sanitary and Storm Sewers:

1. Sanitary sewers are typically installed under the road platform in the middle of one traffic lane.
2. Storm sewers are typically installed with a minimum separation of 3 m from sanitary sewers and they typically are placed under the curb and gutter.
3. Sewer lines must be at least 2.5 m from a water main.

Water Mains:

1. Water mains are typically installed within the edge of road, and are preferably located on the opposite edge of the road from a sanitary sewer line. Where existing utilities are in conflict with the proposed watermain location, the watermain shall be shifted as necessary. They should be 2 m from cable, gas and hydro utilities and 2.5 m from sewers.

Conflicts:

1. Coordinate landscape plans with service/utility plans to minimize long-term conflicts with tree roots and branches.
2. Consider placing utility infrastructure 2 m underground or away from tree drip lines, considering the reach of the tree's roots at maturity to avoid damage from tree roots.
3. Consider subsurface or trenchless technology installation rather than tree removal to address conflicts with underground utilities if existing trees are larger than 150 mm caliper.
4. Replace trees that are removed as a result of utility works, with trees of the same or greater caliper where practical.

7.0 Maintenance

7.1 Snow Clearing and Street Cleaning

The life cycle and maintenance of a place are key concerns, affecting long-term cost, environmental sustainability and the perceived quality of the place and experience. It is important not to compromise the long-term longevity and quality of materials, plantings and furnishings to save on short-term costs. Maintenance requirements should be considered when deciding the placement and design of landscaping, medians, curbs and sidewalks, to avoid accidental damage. In Durham's climate, snow clearing is particularly important to ensure safe access for users of the road and sidewalks.

Keeping sidewalks clear:

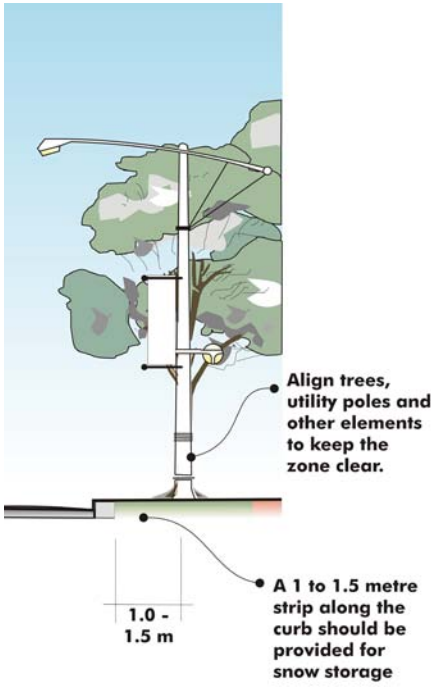
1. Clear sidewalks of snow.
2. Ensure that the clearing of snow and ice on sidewalks and pedestrian crossings is considered of equal importance to the clearing of roads and driveways, especially along routes with high pedestrian traffic.
3. Avoid pushing snow from the road onto the sidewalk if possible, and keep the sidewalk unobstructed by coordinating snow clearing efforts on the road and sidewalk, where sidewalks are located close to the curb.

Snow storage:

1. Provide a 1 to 1.5 m strip along the curb for snow storage.
2. Design bullnoses of medians to be contoured, to reduce the risk of maintenance vehicles damaging the curb.
3. Consider the spatial needs of snow maintenance activities when planting shrubs and building planter boxes, if space is limited on the inner boulevard.
4. Align light poles, utility poles and street furniture to leave space for snow storage.

Other considerations:

1. Consider planting coniferous trees or high shrubs outside the right-of-way in open, windswept areas to reduce snow drifting. Planting is preferable to snow fencing as screens in rural areas.
2. Develop appropriate policies and management practices to address conflicts between on-street parking and snow clearing and street cleaning.
3. Provide a 0.5 m wide salt strip around the perimeter of grass medians to eliminate winter kill due to salt exposure.



Provide an area to accommodate snow at the edge of streets

Street types and Typical Street Cross-Sections

Bringing all the elements together to create a street requires an idea about the kind of place it needs to be. To guide decision-making and evaluate options, a number of questions will need to be answered, such as:

- Is the arterial a focus for retail and commercial development?
- Does it have transit service?
- Is it a high profile place within the community, contributing to the city's identity and character?
- Is the arterial's role primarily for the efficient movement of vehicles?

Quite likely, the design of the arterial will have to address all of these issues to achieve an effective solution.

Section 8 describes eight street types, each describing a primary function or priority - (e.g. transit). The street types are symbolized as icons reflecting these priorities. In reality, arterial roads serve multiple functions, addressing multiple priorities. Section 9 outlines 15 typical cross sections, encompassing various street type combinations, to illustrate the application of the guidelines outlined in sections 3 through 7.

8.0 Street Types

8.1 Pedestrian Priority Street

- Priority should be placed on the safe and convenient movement of pedestrians
- Particular attention should be paid to the design of the public realm
- On-street parking may be encouraged
- Special character streetscaping maybe encouraged
- Urban development formats and street related retail may be encouraged
- In some instances, smaller travel lanes might be permitted

Pedestrian Priority

8.2 Special Character Street

- These are often main streets.
- They are high profile gateway or entry streets to a community, region or city.
- They play an important role in the identity of a community or development.
- These streets may receive higher than typical quality landscaping and enhanced streetscaping such as banners and distinctive lighting.

Special Character Streets

8.3 *Bicycle Supportive Street*

Bicycle Supportive

- These streets have a widened outside curb lane, a dedicated bike lane, or a parallel multi-use trail to provide additional space and safety for cyclists.
- Identification of these roads will be developed through the Region of Durham's Bicycle Plan and through the Bike Plans prepared by the local municipalities.

8.4 *Transit Supportive Street*

Transit Supportive

- Have a mixture of street related uses, often retail, that will benefit from the presence of transit users.
- Transit, and its related stops and other infrastructure, is physically integrated with both land uses and street design.
- A quality pedestrian environment is often desired.
- Development along these streets will be of higher density, providing a large number of potential transit users within walking distance.
- There should be a frequent number of intersections along these streets to facilitate pedestrian connections to surrounding development.

8.5 *Transit Corridors*

Evolution of transit corridor to include the introduction of bus rapid transit lanes and amenities

- Along these arterials, the priority is placed on the movement of vehicles with transit often accommodated in dedicated lanes or medians. This right-of-way may be within the road platform.
- At times this right-of-way may be located in tunnels beneath the road right of way to accommodate narrower arterial corridors or to ensure unimpeded pedestrian and vehicular movement.
- Priority is placed on moving relatively higher numbers of transit users a significant distance with the focus placed on the design of the areas, or nodes, surrounding stations.
- Stations along these corridors should be closely integrated with at grade uses, such as retail.
- Densities at station nodes should be relatively high to provide a large number of transit users within walking distance.
- Pedestrian connections to station areas should be direct and convenient.

8.6 *Vehicular Focused Streets*

- Sidewalks, streetscaping and other street elements would be provided, but the movement of vehicles would not be unduly impeded.
- Street right-of-way width would be generous to accommodate turning lanes at intersections.
- Driveway access may be restricted.
- Where frequent intersection spacing is not possible, other strategies such as "window streets" and service roads might be encouraged to promote an active street edge.


Vehicular Focused

8.7 *Rural Roads*

- These are arterials that have ditches to one or both sides of them. They are typically, although not exclusively outside of urban areas. They usually do not have underground services or sidewalks. They have a 2.5 m shoulder, depending upon design speed, to accommodate tractors and other farm implements. Where cyclist numbers warrant, 1.5 m of the shoulder may be paved adjacent to the travel lane and may delineated from the travel lane with solid white line. Otherwise, a 0.5 m should be provided and delineated from the travel lane for maintenance considerations and limited cycling use.
- Landscaping is recommended beyond the outer edge of the ditches as outlined in Section 7.1 to reduce snow drifting.


Rural

8.8 *Streets for Future Intensification*

- These arterials typically exist in areas that are designated commercial nodes and centres, or along corridors where development intensification is desired.
- As street related retail is often encouraged, street corridor width generally should not exceed 33 m to ensure visual and spatial connections between both sides of the road corridor.
- Urban development formats and densities should be promoted.
- Frequent intersections and pedestrian access should be encouraged. Where this is not feasible, a development pattern that can introduce a finer-grained pedestrian priority and transit supportive conditions should prevail.


Future Intensification

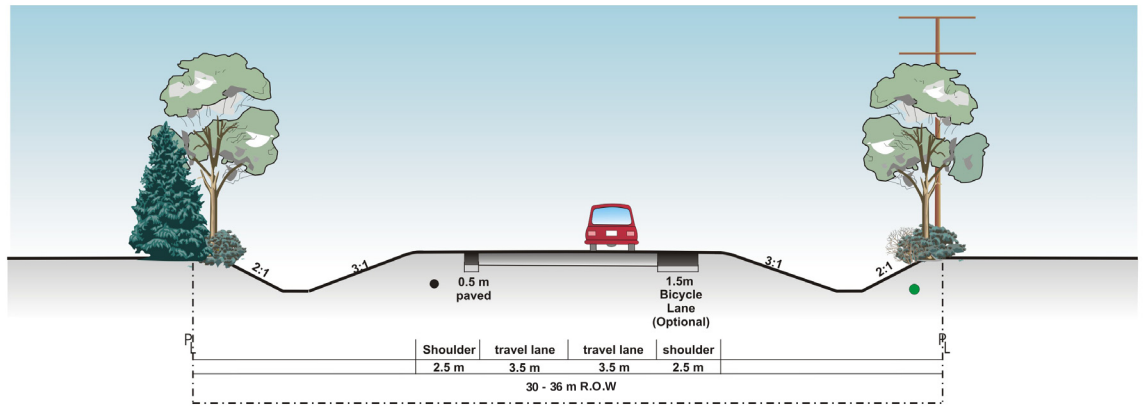
9.0 Typical Street Cross-Sections

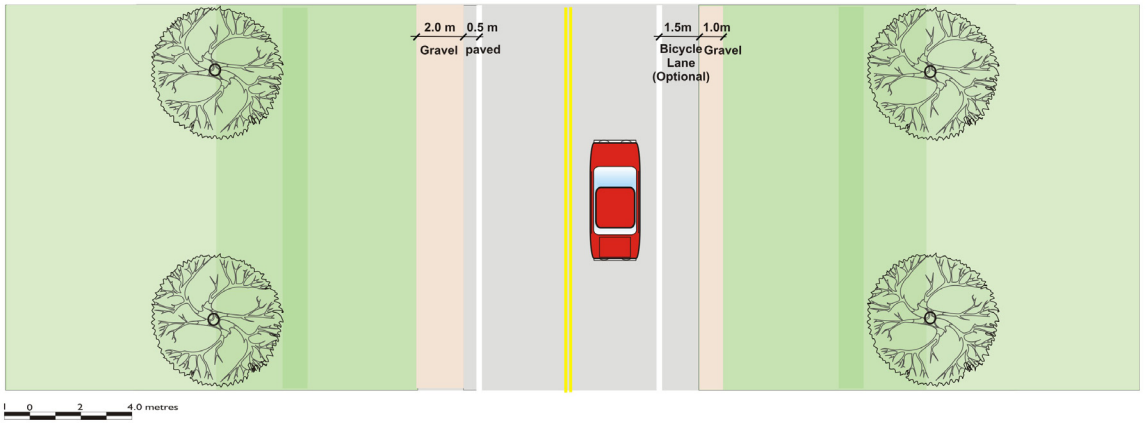
The following provides a description of the general characteristics, function and uses of 15 generic street cross-sections, which are to be read in conjunction with the pictorial representations, provided at the end of this section and Table 1.0 (Street Type Matrix with Corridor Considerations). As noted above these cross-sections are general in nature in order to provide the flexibility necessary to address various combinations of corridor functions and contexts. These cross-sections represent typical mid-block conditions. Right-of-way widths anticipate the potential introduction of turning lanes, and the subsequent widening of the roadway platform, at intersections on "A" type arterials, some "B" type arterials and vehicular focused streets.

9.1 Rural Arterials (01, 02)

These roadways have a typical rural cross-section, although they may be located within urban areas. They typically do not have below grade utilities and include ditches on either side of the road. They service local agricultural, commercial and residential uses as well as commuter traffic. Rights-of-way are generous to provide for ditches and potential widening if the arterials become urbanized. Local transit is typically not a priority, however the movement of farm vehicles, implements and trucks must be considered. There are usually no specific provisions for pedestrians or cyclists, however a generous paved shoulder is recommended to provide space for these users where numbers and special circumstances warrant. Travel speeds are typically high; thus driveway and local access roads are usually discouraged unless no reasonable alternative can be accommodated. Turning lanes are typically provided at major intersections. Parking along the road edge is not encouraged. Landscaping along these roadways is usually remnant natural vegetation. Consideration should be given to the preservation of trees and other natural elements to enhance the visual character and identity of these roads, and to protect from snow drifting in the winter months. Additional landscaping may be considered, particularly where these roads become key entrance routes to the Region, pass through areas of notable natural significance, or screen scrap yards and other unsightly uses.

Typical Durham Road Classification – A, B





Utilities

- Gas
- Water

* For specific guidelines regarding utility location see section 6

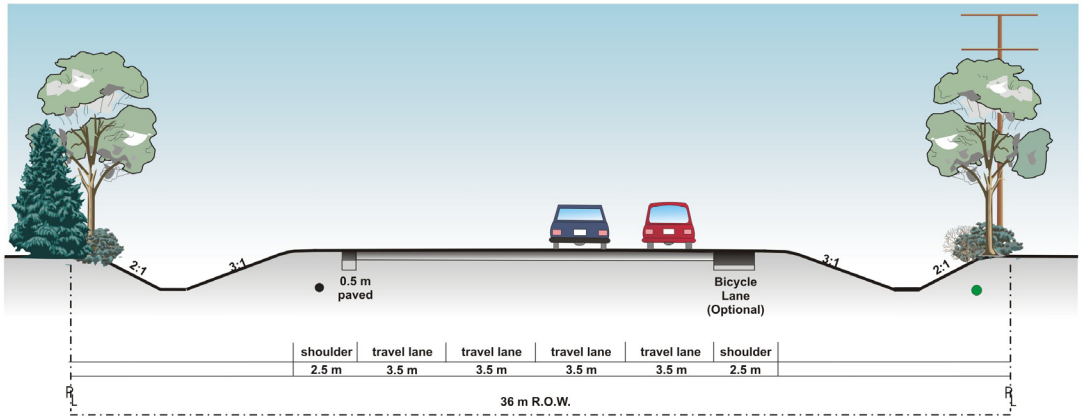
A B

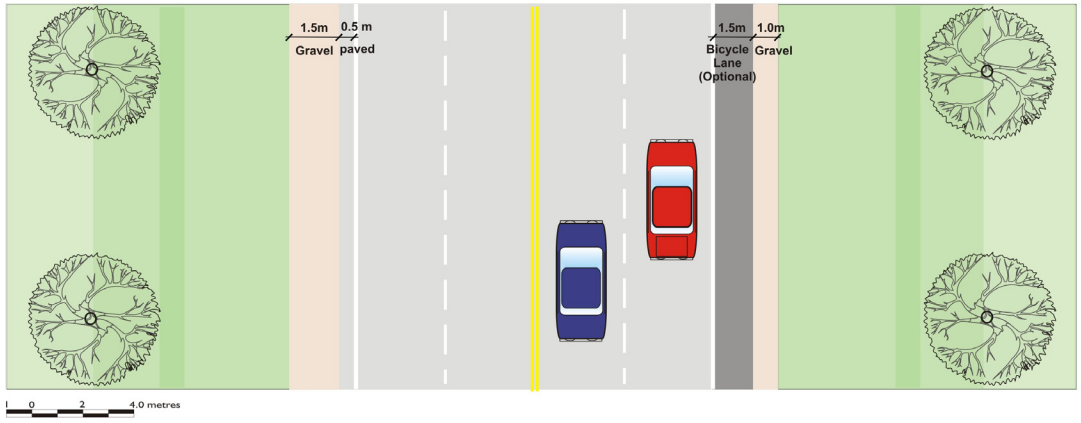
Rural

Vehicular Focused

Two Lane Rural

URBAN STRATEGIES INC .





Utilities

- Gas
- Water

* For specific guidelines regarding utility location see section 6

A B

Four Lane Rural

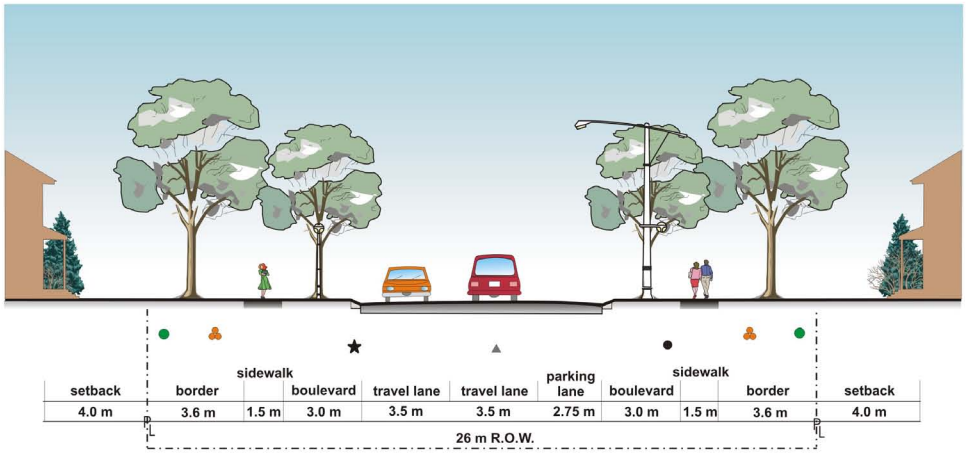
URBAN STRATEGIES INC.

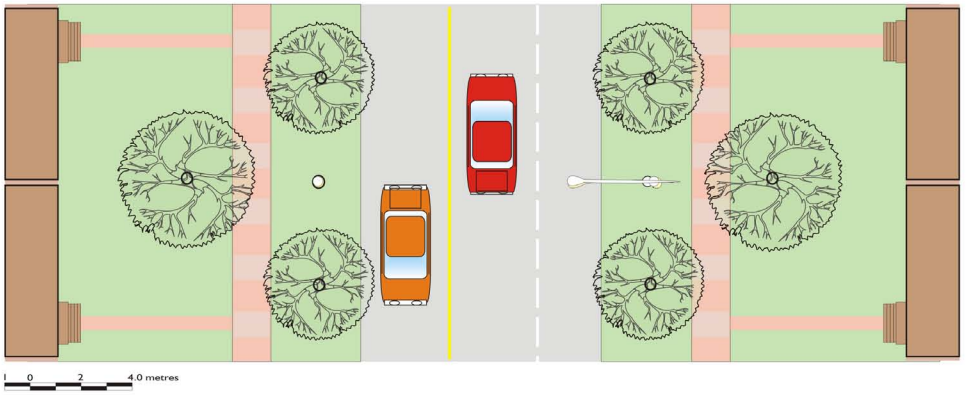
02 Durham Region
Arterial Corridor Guidelines

9.2 Residential Streets (03, 04, 05)

These arterials are typically lined with low to medium density residential development, however higher density residential development and a broader mix of uses may exist on wider roads. Rights-of-way are usually less than 30 m with a 10 to 12 m edge of road dimension between the street curb and the building face. On-street parking is typically encouraged as a source of visitor parking. Transit may exist on residential streets, but travel lane widths and other aspects of the street's design usually do not reflect this beyond signage and transit shelters. These streets are often considered good environments for cyclists, but specific improvements for cyclists are typically not required, as vehicular traffic is not heavy. The pedestrian environment is often a priority on these streets and the presence of children, the elderly and handicapped should be considered. Turning lanes are typically discouraged, but provided where warranted, particularly if they can be created through such measures as the conversion of a parking lane into a turning lane. Increased attention to landscaping and lighting may be considered. However, pedestrian level lighting may be recommended. Travel speeds should be relatively low and the introduction of driveways is usually easily accommodated.

Typical Durham Road Classification – B, C





Utilities

- Gas
- Joint Utility Trench
- Sanitary Sewer
- Storm Sewer
- Water

* For specific guidelines regarding utility location see section 6

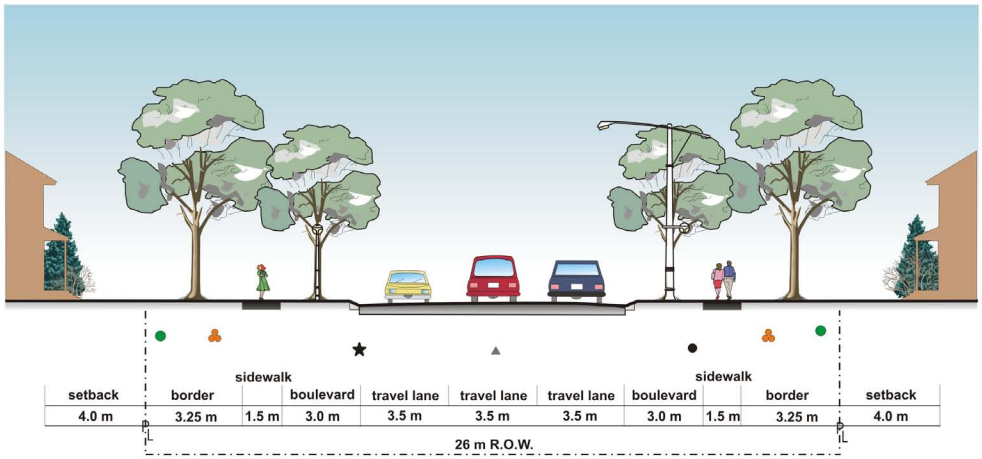
C

Pedestrian Priority

Two Lane Residential

URBAN STRATEGIES INC.

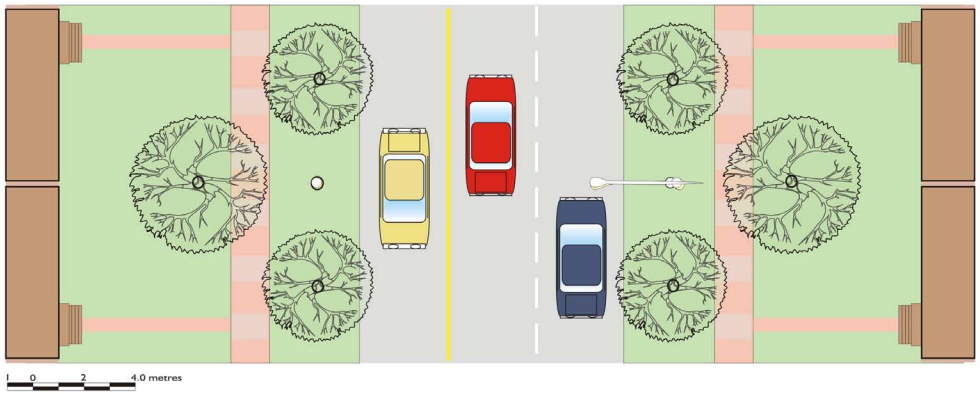
03 Durham Region
Arterial Corridor Guidelines



Utilities

- Gas
- Joint Utility Trench
- Sanitary Sewer
- Storm Sewer
- Water

* For specific guidelines regarding utility location see section 6

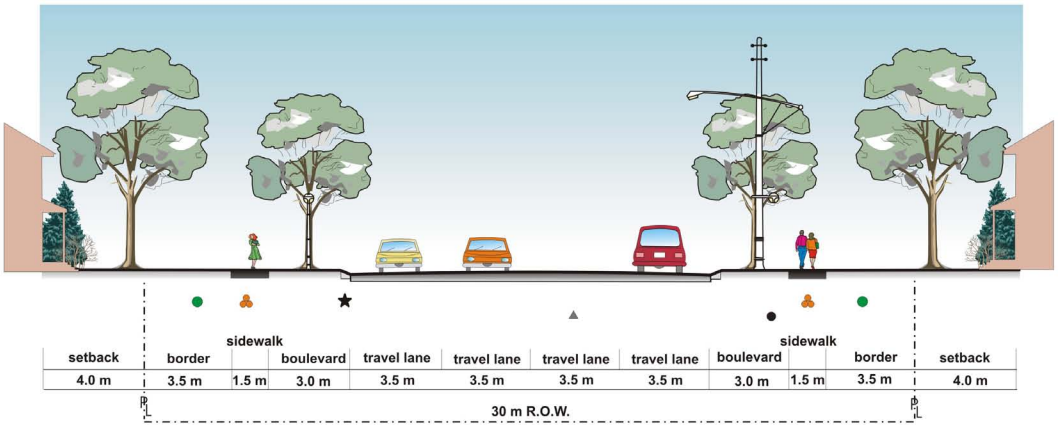


C

Pedestrian Priority

Three Lane Residential

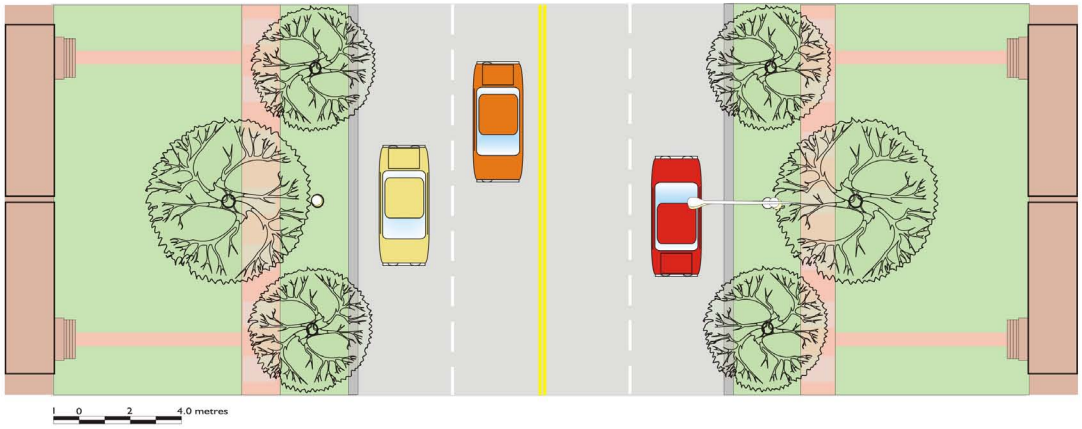
URBAN STRATEGIES INC.



Utilities

- Gas
- Joint Utility Trench
- Sanitary Sewer
- Storm Sewer
- Water

* For specific guidelines regarding utility location see section 6



B

C

Four Lane Residential

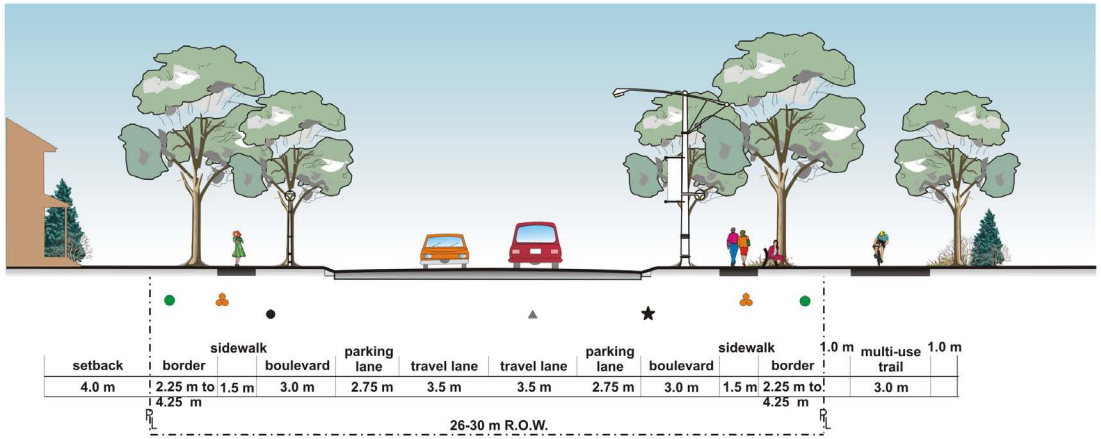
URBAN STRATEGIES INC.

05 Durham Region
Arterial Corridor Guidelines

9.3 Single-sided Streets (06)

These streets are usually unique and high profile places within a community or development. The presence of the open space provides a distinctive character and level of amenity. For these reasons, these streets are often the setting for high-profile employment or institutional uses, but they may also include residential uses. Given their higher profile, these streets are often good candidates for special landscaping and streetscaping, which should be integrated with the design of the adjacent open spaces.

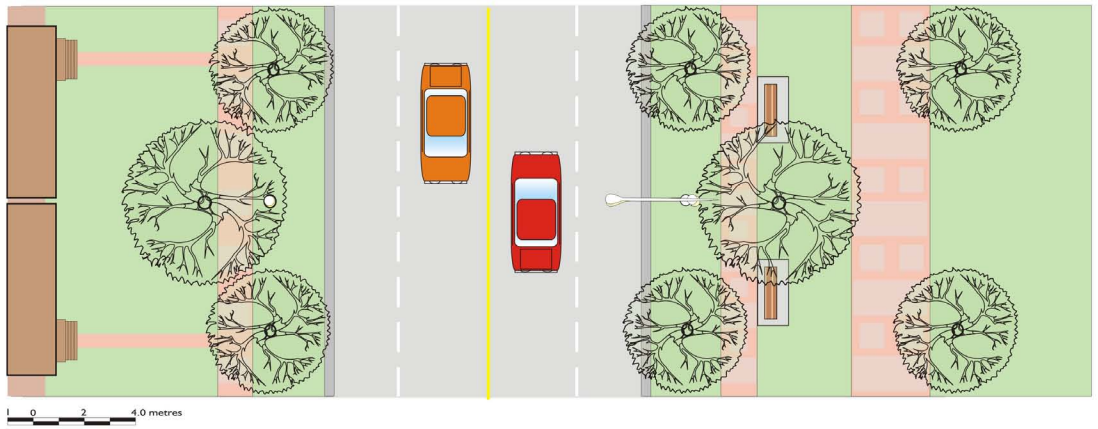
Typical Durham Road Classification – B, C

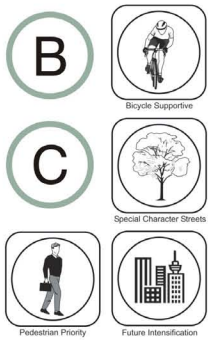


Utilities

- Gas
- Joint Utility Trench
- Sanitary Sewer
- Storm Sewer
- Water

* For specific guideline regarding utility location, please see section 6





Two Lane Single-Sided

URBAN STRATEGIES INC.

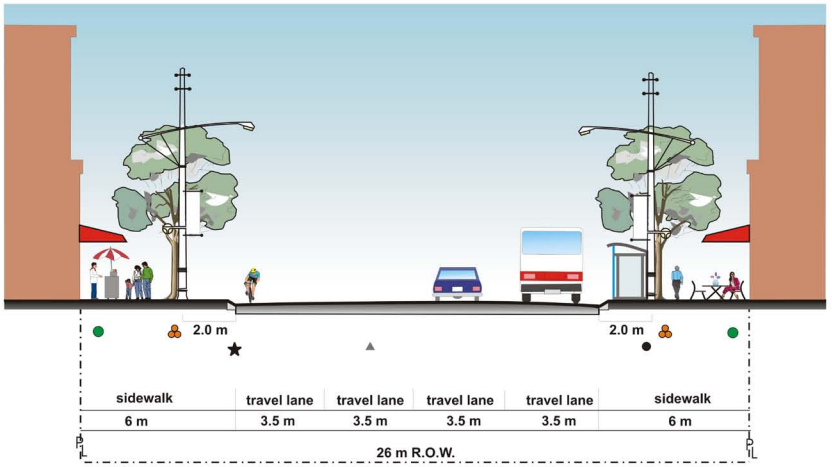
06 Durham Region
Arterial Corridor Guidelines

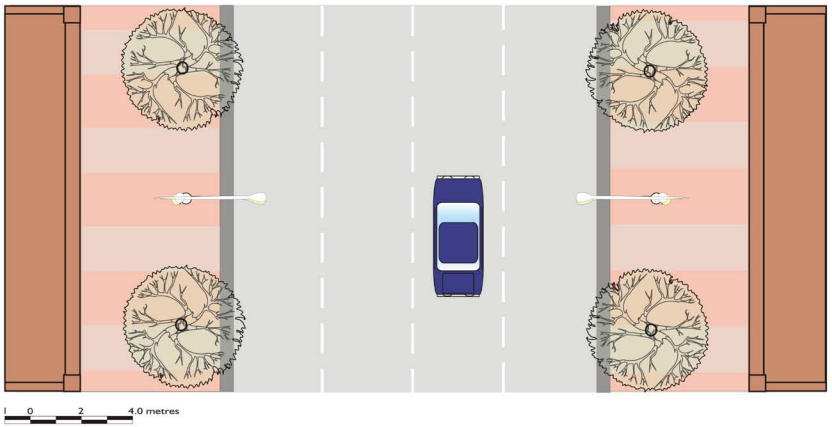
9.4 Main Streets (07, 08)

These mixed-use streets are typically found in hamlets and established urban areas, but they are increasingly emerging in new development as well. Street related retail is the predominant use, with direct spatial and visual connection to and across the street. There is also a high degree of integration between modes of travel with an emphasis on a generous pedestrian environment. These are transit supportive streets with higher density development. On-street parking is often provided with additional parking located nearby in structures or on surface lots at the rear of buildings. Due to lower travel speeds and/or the presence of parked cars, dedicated bicycle lanes are usually not present. Right-turn lanes may be provided where warrented, but pedestrian safety and the continuity of the public realm are priorities.

There is a great deal of diversity in the character and design of these streets, but their width is very consistent. These street corridors are usually a minimum width of 23 m, as narrower dimensions cannot accommodate the required volume of vehicles, pedestrians and transit necessary to support street related retail. Their maximum width is typically no more than 33 m, as greater distances between shop fronts are not conducive to street related retail.

Typical Durham Road Classification – B, C





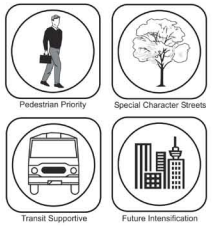
Utilities

- Gas
- Joint Utility Trench
- Sanitary Sewer
- Storm Sewer
- Water

* For specific guideline regarding utility location, please see section 6

B

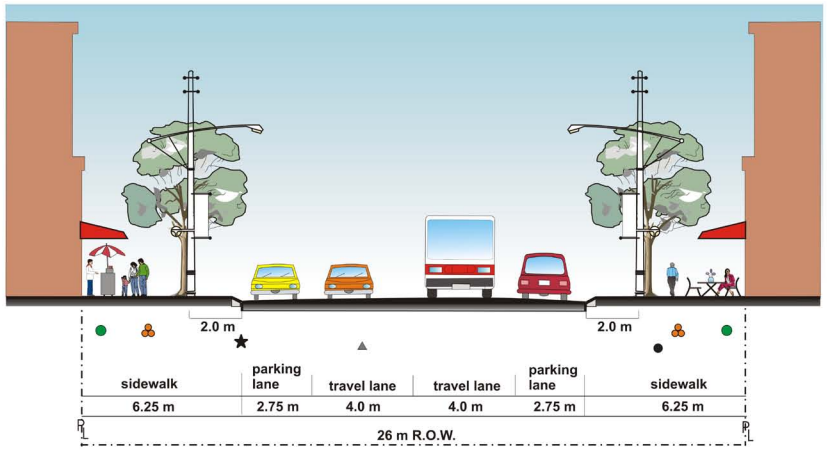
C

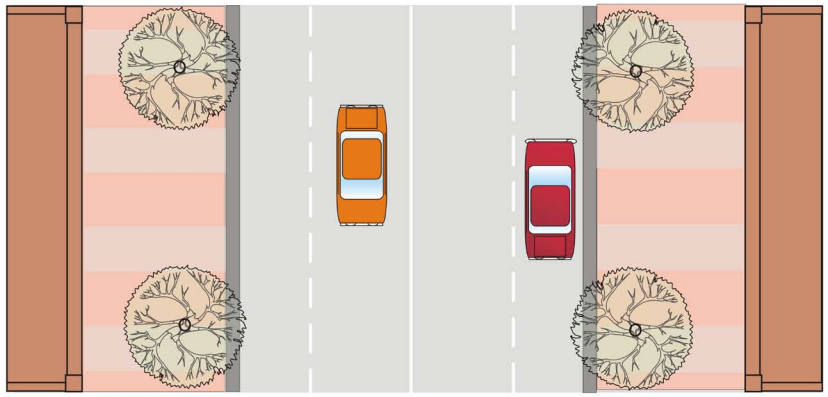


Two / Four Lane Commercial Main Street

URBAN STRATEGIES INC.

07 Durham Region
Arterial Corridor Guidelines





Utilities

- Gas
- Joint Utility Trench
- Sanitary Sewer
- Storm Sewer
- Water

* For specific guidelines regarding utility location see section 6

B

C

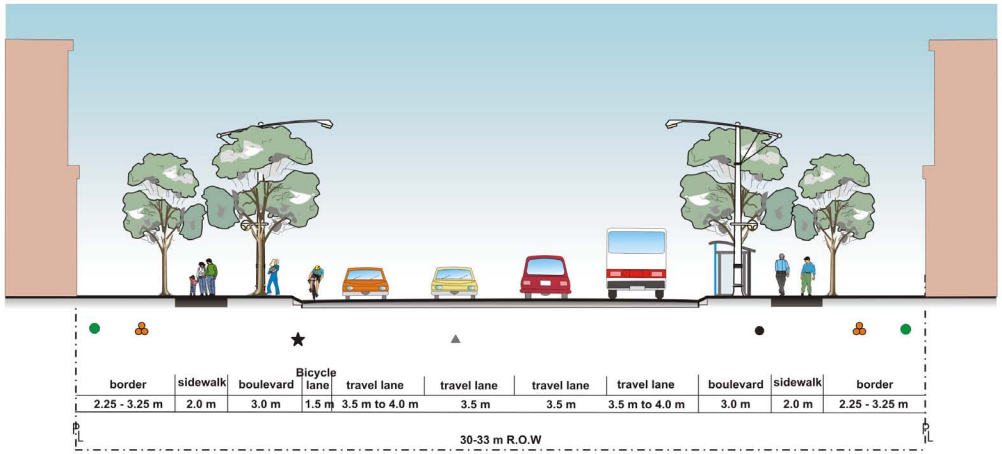
Two Lane Commercial Main Street

URBAN STRATEGIES INC .

9.5 Commercial Streets (09, 10, 11)

These streets have relatively wide Rights-of-way (30 to 36 m) with a mixture of uses along their length. On-street parking is typically prohibited with surface parking located adjacent to development. Transit is often present on these streets and there may be opportunities for the introduction of bicycle lanes. Driveway access should be limited or restricted and the introduction of medians may be considered where additional traffic control is desired. Turning lanes are common, and the width of right-of-ways accommodate the widening of the road platform at intersections.

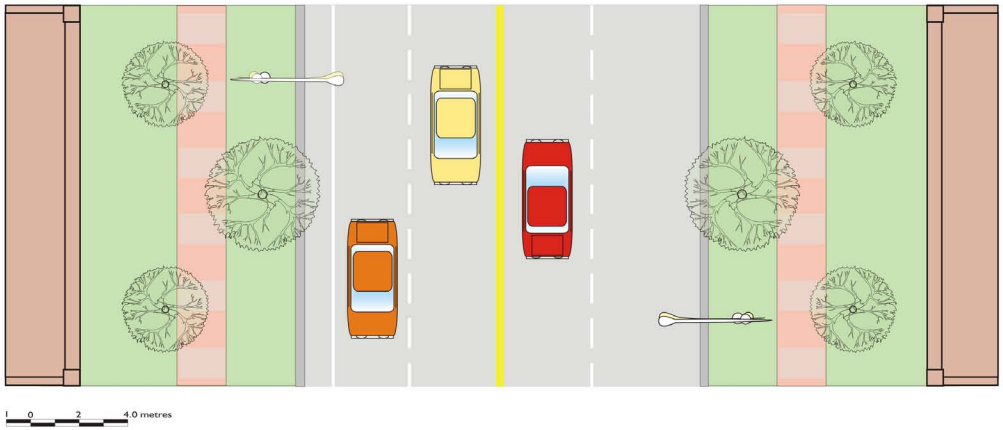
Typical Durham Road Classification – A, B, C

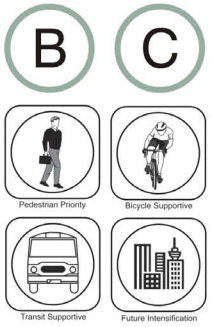


Utilities

- Gas
- Joint Utility Trench
- Sanitary Sewer
- Storm Sewer
- Water

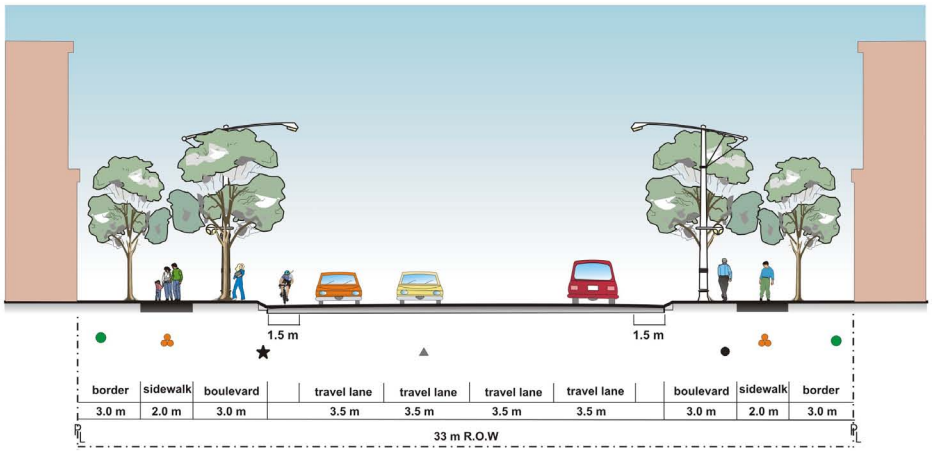
* For specific guidelines regarding utility location see section 6

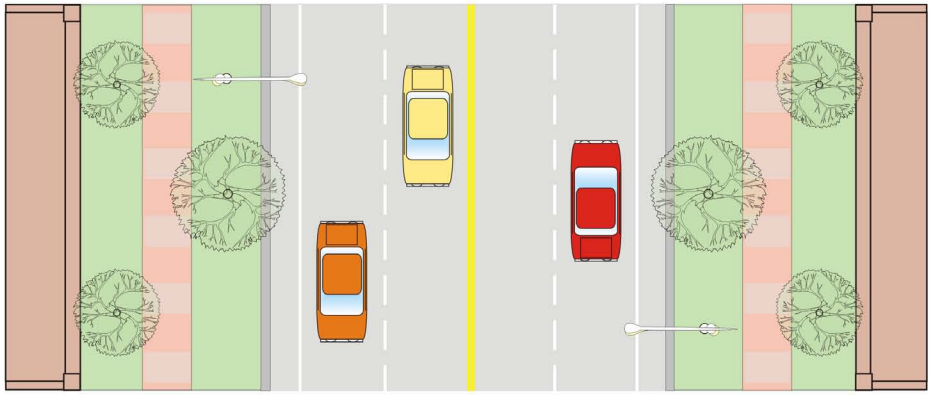




Four Lane Commercial

URBAN STRATEGIES INC.

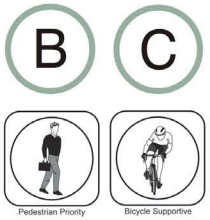




Utilities

- Gas
- Joint Utility Trench
- Sanitary Sewer
- Storm Sewer
- Water

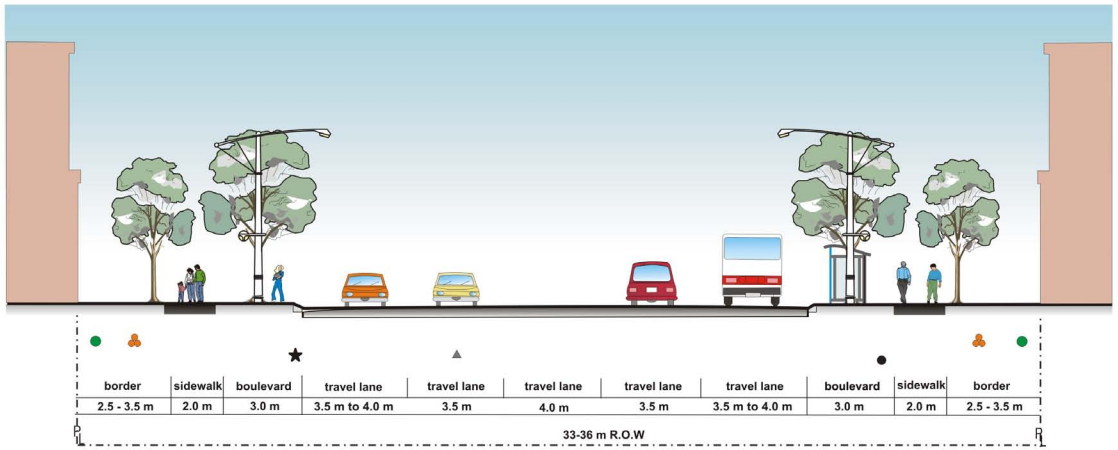
* For specific guideline regarding utility location, please see section 6

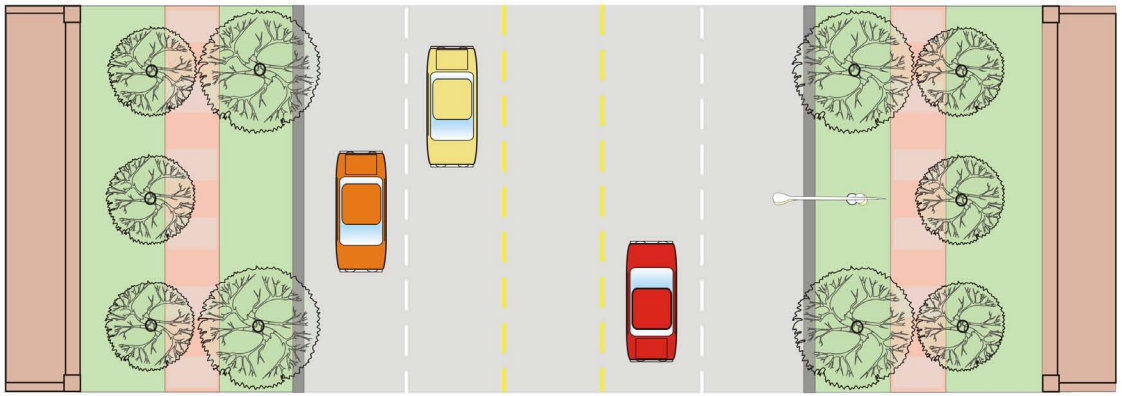


Four Lane Commercial with Bike Lanes

URBAN STRATEGIES INC.

10 Durham Region
Arterial Corridor Guidelines

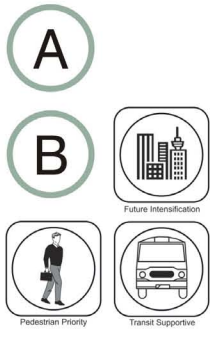




Utilities

- Gas
- Joint Utility Trench
- Sanitary Sewer
- Storm Sewer
- Water

* For specific guidelines regarding utility location see section 6



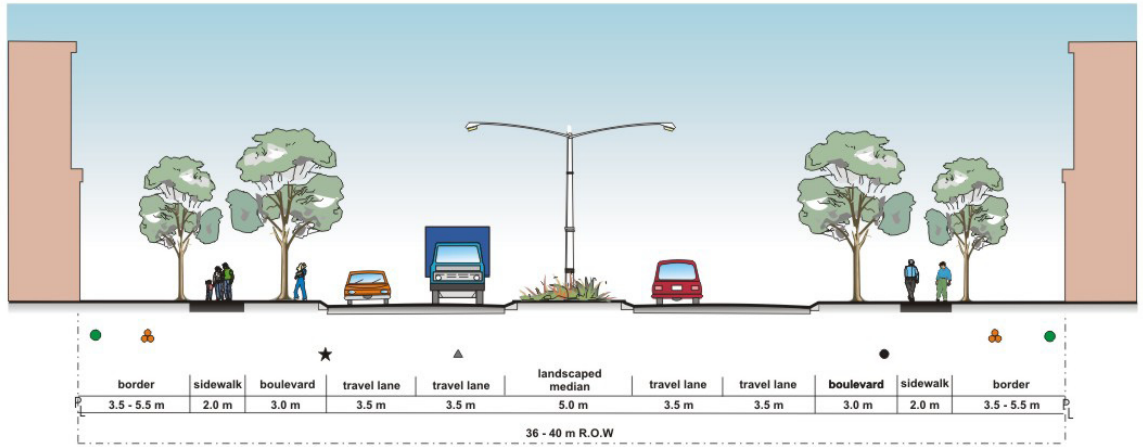
Five Lane Commercial with Centre Turning Lane

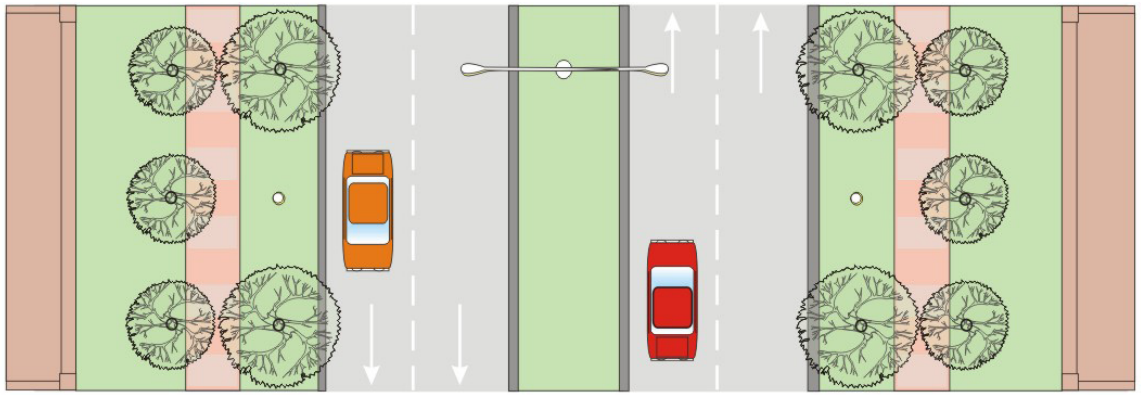
URBAN STRATEGIES INC.

9.6 Movement Focused Streets (12, 13, 14)

These streets may also have a significant commercial presence along their length, but their width usually implies traffic volumes are high and the potential for pedestrian and cycling volumes are low to moderate. Development is typically set further back from the curb line and wider right-of ways (36 to 50 m) are required to accommodate turning lanes at intersections. Parking is located adjacent to development. Transit may be included on these streets, but the width of the street and relatively larger distances between intersections and connections into surrounding neighbourhoods makes pedestrian oriented retail difficult to sustain. The provision of turning lanes is typical and the width of right-of-ways accommodates the widening of the road platform at intersections.

Typical Durham Road Classification – A, B





Utilities

- Gas
- Joint Utility Trench
- Sanitary Sewer
- Storm Sewer
- Water

* For specific guidelines regarding utility location see section 6

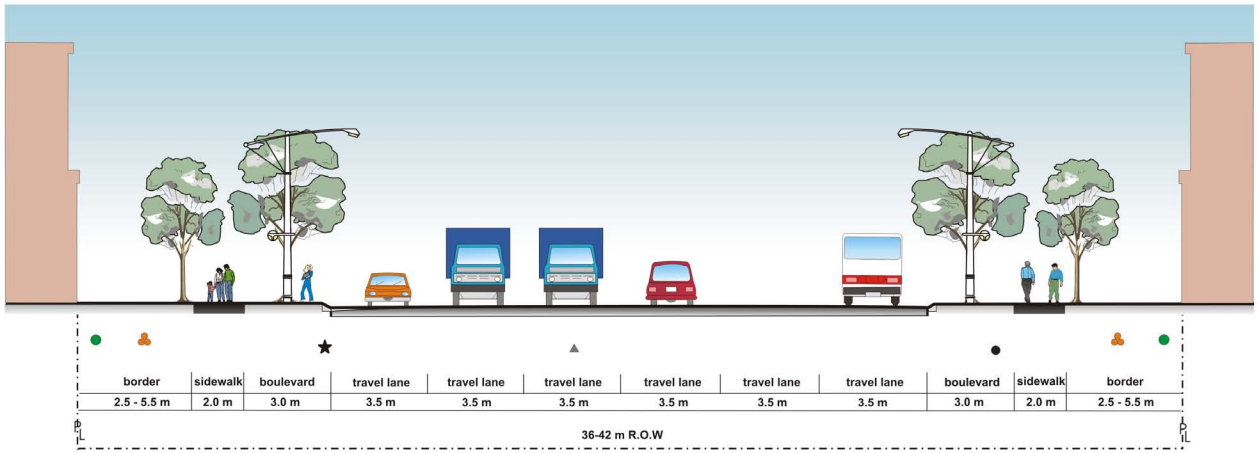
A

B

Four Lane Commercial with Median

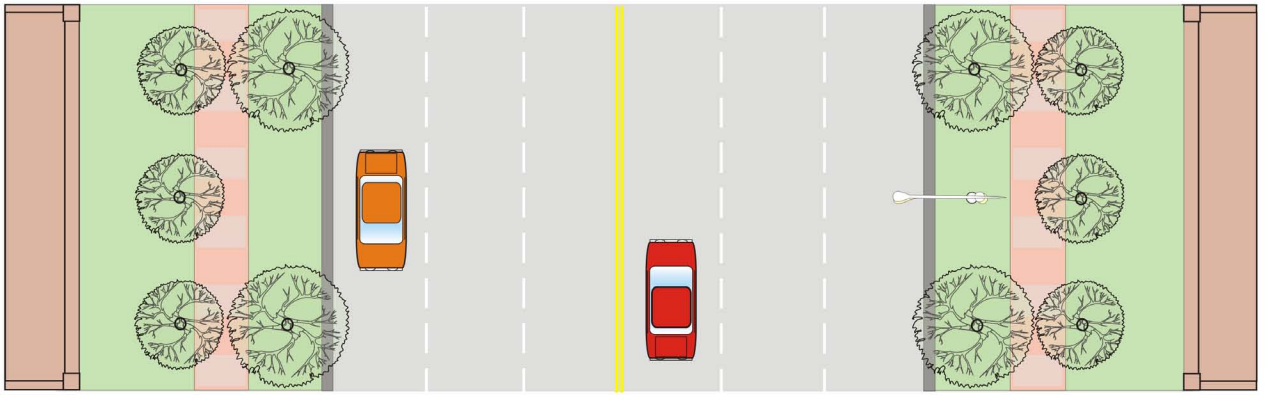
URBAN STRATEGIES INC.

12 Durham Region
Arterial Corridor Guidelines



border	sidewalk	boulevard	travel lane	travel lane	travel lane	travel lane	travel lane	travel lane	boulevard	sidewalk	border
2.5 - 5.5 m	2.0 m	3.0 m	3.5 m	3.5 m	3.5 m	3.5 m	3.5 m	3.5 m	3.0 m	2.0 m	2.5 - 5.5 m

36-42 m R.O.W



0 2 4.0 metres

Utilities

- Gas
- Joint Utility Trench
- Sanitary Sewer
- Storm Sewer
- Water

* For specific guidelines regarding utility location see section 6

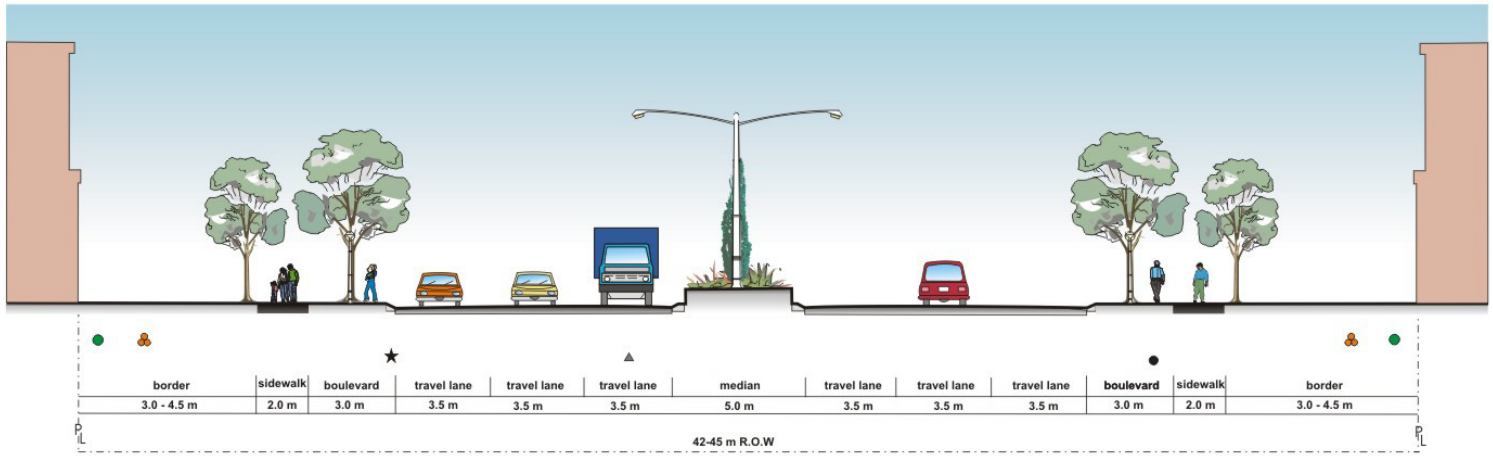
A

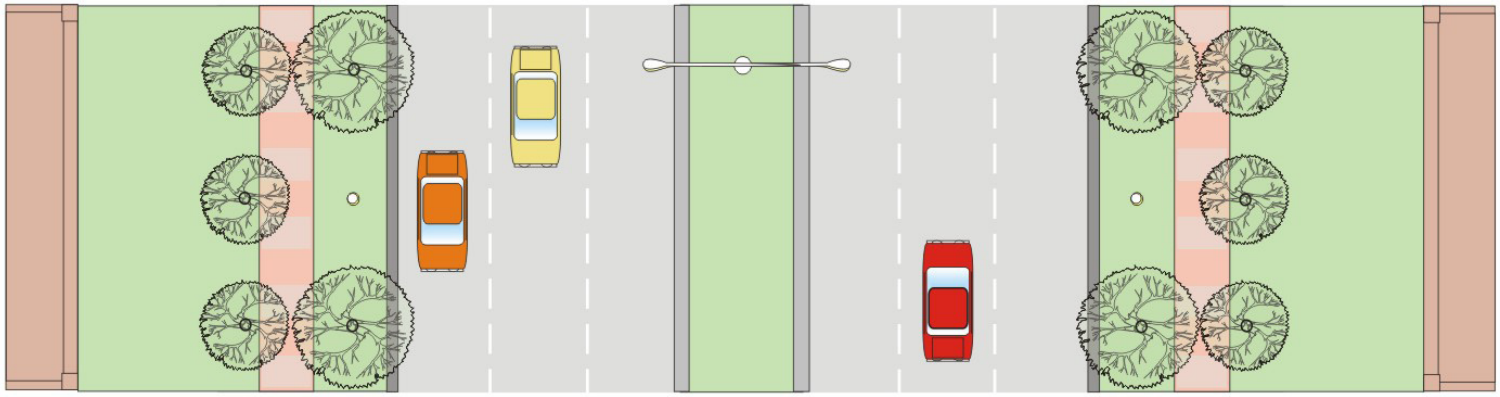
Vehicular Focused

Six Lane Commercial

URBAN STRATEGIES INC.

13 Durham Region
Arterial Corridor Guidelines





Utilities

- Gas
- Joint Utility Trench
- Sanitary Sewer
- Storm Sewer
- Water

* For specific guidelines regarding utility location see section 6

A

Special Character Streets

Vehicular Focused

Six Lane Commercial with Median

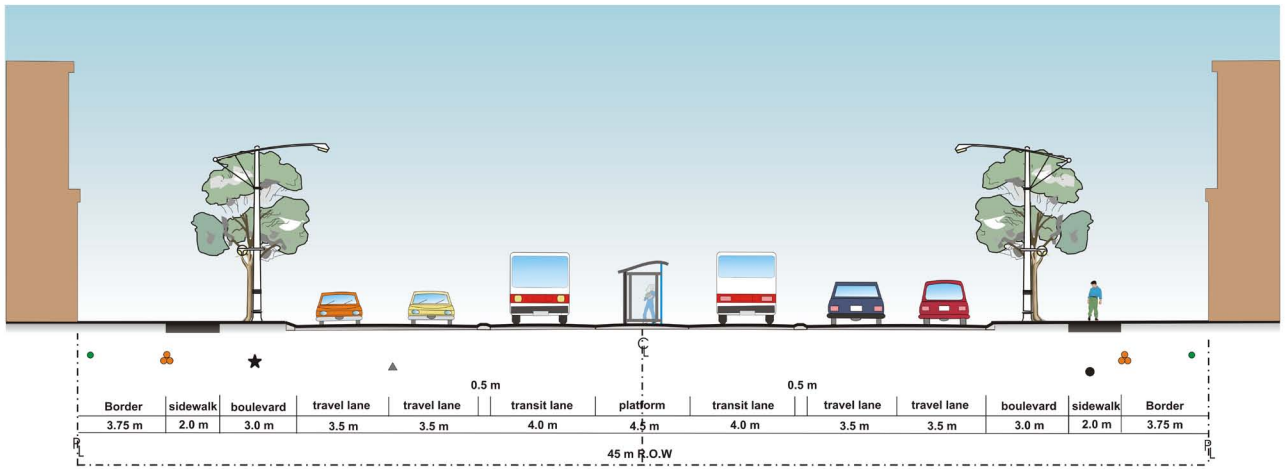
URBAN STRATEGIES INC.

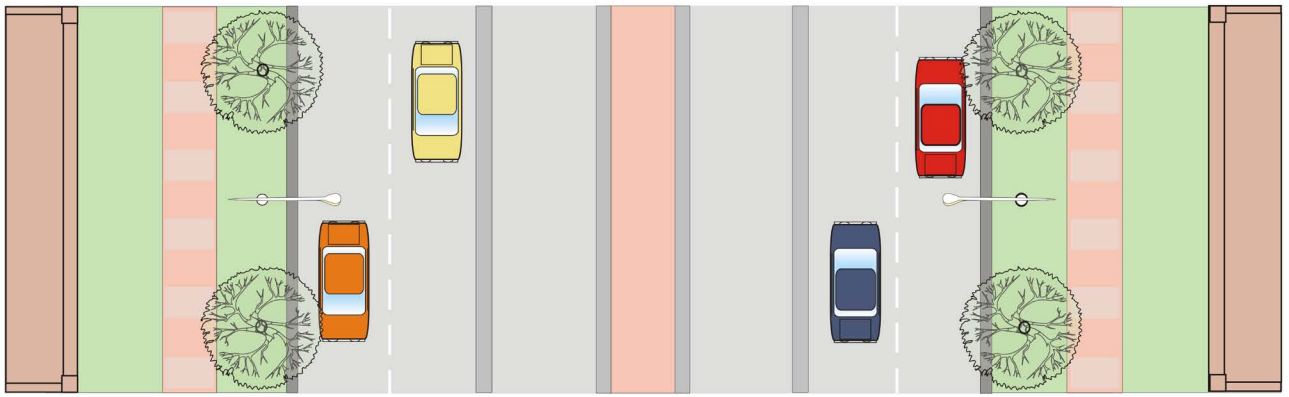
14 Durham Region Arterial Corridor Guidelines

9.7 Transit Corridor (15)

Transit corridors dedicate a portion of the right-of-way for higher order transit use, which can potentially evolve over time from dedicated bus lanes to light rail. A 45-metre right-of-way would allow for this evolution, accommodating a six-lane cross-section that includes two dedicated transit lanes and a platform/median. Through an intersection, this right-of-way width can accommodate turning lanes in the road platform at major intersections. Although these streets tend to be movement-focused, transit stop locations and transit-oriented development should be focused at the intersections with cross-streets.

Typical Durham Road Classification – A





Utilities

- Gas
- Joint Utility Trench
- Sanitary Sewer
- Storm Sewer
- Water

* For specific guideline regarding utility location, please see section 6

A


Transit Supportive


Vehicular Focused

0 2 4.0 metres

Major Transit Corridor

URBAN STRATEGIES INC .

15 Durham Region
Arterial Corridor Guidelines

Table 1.0 - Street Type Matrix with Corridor Considerations

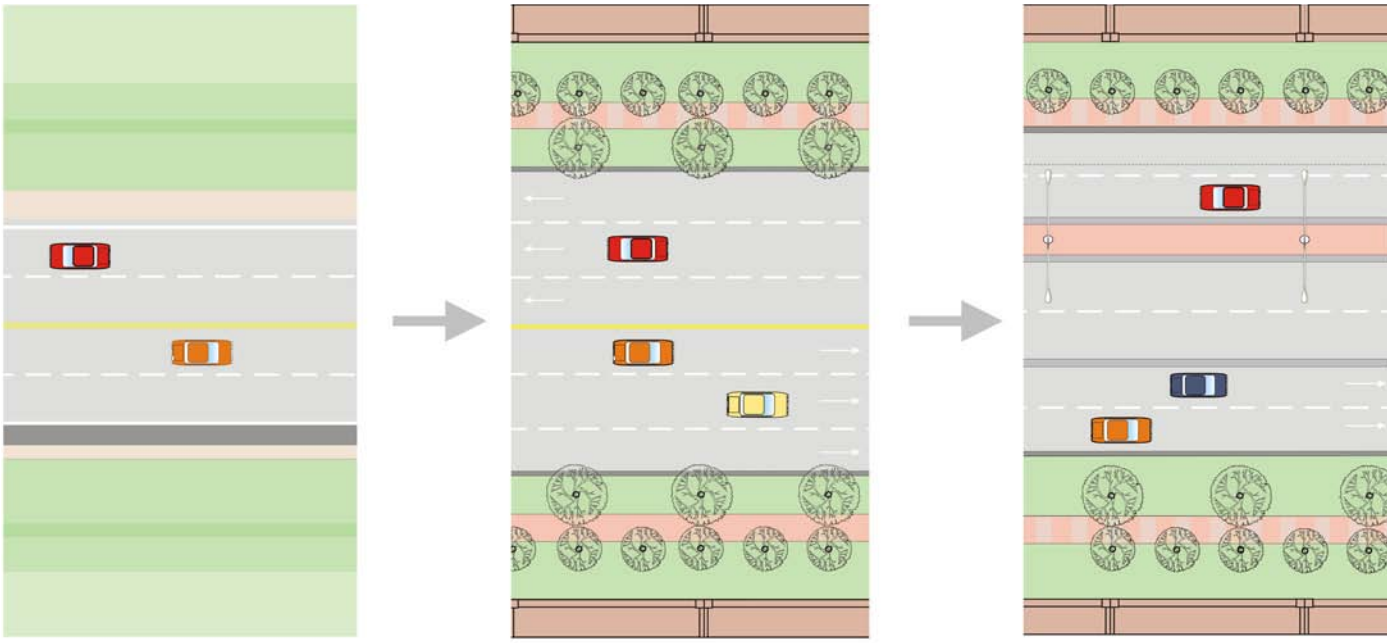
Road/Street Type	Rural Arterials		Residential Streets			Single-Sided Streets	Commercial Main Streets		Commercial Streets			Movement Focused Streets			Transit Corridor
Sub-Type	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Corridor Consideration	Two Lane Rural	Four Lane Rural	Two Lane Residential	Three Lane Residential	Four Lane Residential	Two Lane Single-Sided	Two/Four Lane Commercial Main Street	Two Lane Commercial Main Street	Four Lane Commercial	Four Lane Commercial with Bike Lanes	Five Lane Commercial with Centre Turning Lane	Four Lane Commercial with Median	Six Lane Commercial	Six Lane Commercial with Median	Major Transit Corridor
Pedestrian Priority			yes	yes	yes	yes	yes	yes	yes	yes	yes				
Special Character Streets						yes	yes	yes				yes		yes	
Bicycle Supportive (to be determined by Regional Cycling Plan)	on paved shoulder	on paved shoulder				multi-use trail			marked bike lane	marked bike lane					
Transit Supportive							yes	widened outside lane	widened outside lane		widened outside lane				dedicated transit/HOV lane
Vehicular Focused	yes	yes										yes	yes	yes	yes
Rural	yes	yes													
Future Intensification						yes	yes	yes	yes	yes	yes				
Land Uses/ Development Format	rural/ residential	rural/ residential	low-med density residential	low-med density residential	low-high density residential	residential/ institutional/ office	main street commercial	main street commercial	commercial - mixed use	commercial - mixed use	commercial - mixed use	commercial - mixed use	commercial - mixed use	commercial - mixed use	commercial - mixed use
Right-of-Way Width	30-36 m	36 m	26 m	26 m	30 m	26-30m	26m	26m	30-33m	33 m	33-36 m	36-40 m	36-42 m	42-45 m	45 m
Number of Travel Lanes	two	four	two	three	four	two	two/four	two	four	four	four with turning lane	four	six	six	four + 2 transit lanes
On-Street Parking			yes		optional	optional	optional	yes							
Driveway Access	permitted	permitted	permitted	permitted	permitted	permitted	limited	limited	limited	limited	limited	restricted	restricted	restricted	restricted
Median											optional	yes		yes	
Typical Arterial Classification	A,B	A,B	C	C	B, C	B, C	B, C	B, C	B, C	B, C	A, B	A, B	A	A	A

Implementation – Applying the Guidelines

In accommodating growth, municipalities are evolving to create opportunities for an improved quality of life for its citizens while trying to improve their tax base. Part of the management and planning for municipal growth includes the intensification of some arterial road corridors, but directing growth and change away from others. The key to realizing the stable evolution of an arterial road is to ensure that various aspects of the road corridor, such as its built form, use and movement, evolve in a coordinated and consistent manner.

The Arterial Corridor Guidelines are intended to illustrate how arterial corridors in the Region can be developed and how they should evolve. The Guidelines are intended as a reference and illustrative guide for the integration of all elements, layout of uses and modes of movement along arterial corridors, and to provide direction on where evolution should or should not occur.

Roadway function and design will evolve over time; rights-of-way widths should be planned to accomodate this.



Four Lane Rural

Six Lane Commercial

Major Transit Corridor

10.0 Roles and Responsibilities

The Province, Region and local municipalities have jurisdiction over all arterial road rights-of-way within the Region of Durham, with the exception of Highway 407, which is operated as an Express Toll Route (ETR) by a private consortium. It is the role of these levels of government to effectively plan, design and build the corridors of today and of the future to achieve the mobility and liveability objectives provided in the Regional Official Plan, local official plans, the TMP and these Guidelines.

Through the use of the design principles, recommended criteria for various road cross sections, and examples of street types provided in the Guidelines, government agencies will be better equipped to work towards an appropriate balance between functional

and aesthetic requirements of the various street types. This sense of balance is an important consideration in the Regional policy framework, including the Community Strategic Plan (CSP). As an "umbrella" document that establishes the framework for other Regional strategies, one of the six objectives in the CSP is to strengthen and integrate the transportation system. In this context, the role of the Region and area municipalities is to ensure that new policies and regulations are established in a manner consistent with the Guidelines. This undertaking would better guide development of adjacent lands in support of the types of corridor development envisioned in these Guidelines for a more balanced transportation system.

It is intended that the private sector will apply these Guidelines in the development application process, which essentially determines the built form, infrastructure and associated amenities provided adjacent to the right-of-way. Development applications for new and redevelopment of an arterial road corridor must be consistent with the principles set out in these Guidelines, and vision for the corridor developed through the public consultation process under various planning studies. The full extent of the corridor vision will take place incrementally, and may take a long time (i.e., 20 to 30 years) to complete.

11.0 Planning Toolkit

In order for the guidelines to act as a useful and meaningful link in the planning, design, construction and maintenance of an arterial road corridor, there must be a means for its implementation. As mentioned previously, prior to moving forward with any design concepts for a particular road corridor, a vision for that corridor must be in place. There is a number of planning tools under the Planning Act, Environmental Assessment Act, and Municipal Act which can then be used by the authority having jurisdiciton to implement the vision for an arterial road corridor.

11.1 Corridor Visioning

One of the ways in which cities, towns, villages and regions can set themselves apart from others is through the character of their roads. Within the arterial road hierarchy, the Region has a diverse combination of arterial road types, from two-lane rural cross-sections to six-lane urban commercial streets—often occurring over the length of the same road (e.g., Regional Highway 2). The Region also recognizes the importance of arterial road corridors in fulfilling various transportation functions, as exhibited in the TMP which identifies corridors for Strategic Goods Movement, "Main street" Highway 2 as the Region's most significant transit corridor, and other Major and Minor Transit corridors. Along with local municipalities, the public and other stakeholders, the Region must develop a vision for the character or street type for specific arterial road corridors as they relate to factors such as balancing different modes of travel, integrating adjacent land use, maintaining and preserving historic areas, creating economic growth, fostering environmental sustainability, and promoting individual community identity. With the aid of the Guidelines and relevant policies, a vision can be developed for a particular arterial road corridor as the need arises.

Corridor "visions" may be developed as part of a study, or may form part of a larger process.

In addition to the diversity in the characteristics within the right-of-way of an arterial road, there also exists diversity in the "street type" as outlined in Section 9. This diversity is created mainly by the land use adjacent to the corridor where the same road can travel through a town centre, commercial centre, regional centre, employment district, residential neighbourhood and rural agricultural lands-all exhibiting differing roadside environments. Over the length of the road it will perform a variety of functions and may have several competing objectives. Because of the diversity in both land use and transportation function it is important that a vision for a road corridor be developed prior to considering design options for all or part of the road corridor and should form the initial step in the corridor planning process.

In order to develop a vision that will have "buy in," it is important that as many individuals, agencies, landowners and special interest groups as possible that use, or will be impacted by the corridor, be involved in the process. The vision for a corridor may be developed on its own as part of a corridor study, or may form part of a larger process such as secondary plan, community improvement plan, or environmental assessment study.

The development of the vision for a corridor should typically include the following steps:

- Identification of the corridor;
- Identify stakeholders;
- Form a steering committee;
- Review existing and planned conditions;
- In consultation with stakeholders and steering committee, determine the strengths, weaknesses, opportunities and challenges for the corridor;
- Prepare and evaluate various design concepts for the corridor;
- Solicit input through charettes, workshops, seminars, meetings, surveys, etc.;
- Develop vision based on input and solicit comment from all parties associated with the corridor; and
- Review, finalize and gain endorsement of the vision.

Upon completion of a successful visioning process, "buy-in" from those parties impacted by the evolution of the corridor will be achieved towards establishing a clear vision for the corridor. Future detailed design and construction will become much easier as most stakeholders will have a firm grasp on the goals of the project. In addition, by having a vision in place for an arterial road corridor, it allows for smaller sections or components of the corridor, such as sidewalks or intersections, to be improved independently while maintaining a consistent vision of the corridor. By gaining endorsement of the corridor vision by the various levels of government, public, associated stakeholders and approval agencies, it provides a clear guide for the future evolution of the corridor regardless of future changes in councils and/or staff. Should it be decided that the vision be changed due to unforeseen circumstances, then the entire vision process should be revisited again prior to proceeding with the design or corridor modifications.

11.2 Regional Official Plan

The Regional Official Plan (ROP) defines the intent of Regional Council for the guidance of growth and development in Durham. The goals of the ROP include developing an integrated, safe and efficient transportation system, and achieving a balance between the provision of an accessible transportation system, comprised of an integrated public transit and road network, and the development of the Region. In building upon the ROP, the Guidelines articulate the broader goals and policies contained in the ROP for future planning of the transportation system and design considerations for adjacent land uses. The ROP also sets the functional classifications and general criteria designated for arterial roads and other facilities in the transportation network. Policy directions identified in the ongoing Regional Official Plan Review are consistent with, and supportive of the Guidelines.

11.3 Transportation Master Plan

The Regional Transportation Master Plan (TMP) is a strategic planning document designed to identify and address Durham's transportation needs to the year 2021 and beyond. The TMP proposed directions to refine ROP policies, with some of those directions related to the re-designation of several arterial road sections, a strategic goods movement and transit priority network, and the further development of centres and corridors. Other elements of the TMP, however, are independent of the ROP and its review; these elements include Regional road improvements, the establishment of a Transportation Demand Management program, and the development of a safety management strategy.

The Guidelines help to further detail the recommended directions for elements included in the TMP, in support of providing a greater balance in mobility between different modes of transportation.

11.4 Local Official Plans

In conformity with the ROP, local official plans provide further detail in designating land uses and the structure of the transportation system in planning for future growth and development. With respect to the transportation system, the local official plans not only reflect the Regional arterial road network, but also provide policies and designations for roads of local significance. With respect to land use, local official plans can designate sub-area plans such as special study areas, secondary plans, and/or community improvement areas, which provides much greater detail on the types of new or redevelopment adjacent to arterial road corridors. The local official plans, and process involved in the amendment of the plans, provide an important implementation framework for applying the Guidelines.

Amendments to a local official plan, which can include the development of the above sub-area plans, are important tools for implementation of the Guidelines. This is particularly true for development applications of a minor nature. For the Lake Ontario shoreline municipalities, the Region is the approval authority for "major" local official plan amendments, but the area municipalities are the approval authority for "minor" amendments. For Brock, Scugog, and Uxbridge, the Region is the approval authority for all local official plan amendments. Since many incremental decisions on development are made at a local municipal level, application of the guidelines in the overall development application process is essential in meeting both area municipal and Regional visions for specific arterial road corridors.

11.5 Secondary Plans

While more specific than the ROP or a local official plan, secondary plan policies are intended to provide guidance on the preparation of more detailed regulations for reviewing development applications such as draft plans of subdivision, zoning by-laws, and site plan control in a particular area of a municipality. As an integral component of the corridor visioning process, secondary plans are an important implementation

tool, and provide the framework for the design of specific arterial road corridors within a planning area. The design of communities and neighbourhoods at the secondary plan level is at a level of detail in which the Guidelines can have a significant degree of influence. A vision for arterial road corridors at the secondary plan level provides an opportunity for the comprehensive implementation of the Guidelines for a particular corridor, as opposed to a "piecemeal" basis at the development application stage (e.g., draft plans of subdivision or zoning by-laws).

11.6 Environmental Assessment (EA) Process

Road expansion projects, such as widening or extending an arterial road, are subject to the Municipal Class EA process. Phases 1, 2 and 3 of the 5-phase Municipal Class EA process provide an opportunity for establishing a community vision for an arterial road corridor, which include public consultation. As these three phases require an examination of the need and justification for the project, and an examination of alternatives and assessment of potential environmental effects, a vision for a road expansion or extension can be determined for a corridor area with public buy-in to the process. Once a vision is established, the detailed design and construction of the arterial road can be implemented in a holistic manner, and compatibility of that road with existing or future land uses can be better achieved.

Where possible, the EA process for road expansion projects should occur in tandem with the development of secondary plans, subdivision approvals, and other relevant development applications. This will help to ensure consistency in applying the Guidelines towards a vision for the corridor.

11.7 Draft Plans of Subdivision

The creation and review of draft plans of subdivision needs to incorporate the vision and directions set out in the Guidelines. Not only are lands adjacent to arterial road corridors and local streets included in draft plans of subdivision, but sections of arterial roads can also be implemented through the subdivision approval process. In the context of Durham, the authority for subdivision approval has been delegated to the Lake Ontario shoreline municipalities, while the Region is the approval authority for Brock, Scugog, and Uxbridge. For the delegated municipalities, the Region provides comments to the area municipality at various stages of approval to ensure that the subdivisions are being implemented in a manner consistent with Regional goals and policies.

The orientation of lots and local streets adjacent to arterial roads, and the frequency of intersections of local streets or collector roads to arterial roads, is largely determined in developing areas through the subdivision approval process. The Guidelines can further refine policies contained in the Regional and local official plans by providing criteria for achieving street front oriented development, such as window streets (avoiding reverse lot frontage), frequency of intersections, and pedestrian access from subdivisions to adjacent arterial roads.

11.8 Zoning By-laws

A zoning by-law controls land use within an area municipality by articulating how land and buildings may be used, where buildings and other structures can be located, and regulating lot sizes/dimensions, parking requirements, and building heights. While a local official plan (which may contain a secondary plan, community improvement, or special study area) sets out a municipality's general policies for future land use, the zoning by-law implements the local official plan by providing specific regulations for addressing new uses, or changes in existing uses, on developable lands.

Area municipal zoning by-laws are important as an implementation tool for the Guidelines with respect to the design and format of adjacent land uses. Recommendations made in the Guidelines (i.e., Section 5) can be incorporated in specific zones by amendment to the zoning by-law, allowing the corridor vision to be reflected in the zoning regulations in advance of the built form developing, or redeveloping.

11.9 Site Plan Control

Many types of new development are subject to site plan control, which further implements the zoning by-law and draft plan of subdivision (if applicable) by providing detailed designs and specifications for new construction or redevelopment. Site plan control is particularly relevant for commercial and mixed-use areas, which is important in consideration of the Guidelines as these areas generally front arterial roads. The design of sites have a significant impact on the character of an arterial road corridor; elements subject to site plan control can include the arrangement and design of parking lots, access driveways, orientation of buildings, walkways, landscaping and so forth.

For development applications such as plans of subdivision/condominium, zoning by-laws, and site plan control, a development application checklist for the Region and area municipalities would assist the implementation of the Guidelines by:

- Maintaining consistency in the approach of interpreting and implementing the Guidelines for different development applications in achieving a particular vision for an arterial road corridor; and
- Allowing for a standard set of elements to be included in site plan applications to better enable a comprehensive review of the development (e.g., the roadway centreline, right-of-way, building setbacks, sign details, landscape plans,utility placement, etc.).

12.0 Financial Considerations

The implementation of the Guidelines has implications on the costs for the construction, rehabilitation and maintenance of arterial roads. While certain sections of arterial roads will require upgrading to be consistent with a vision for that section over time, the Guidelines will also prevent "over-building" of infrastructure that may not necessarily be required for a section or type of arterial road. Through establishing a vision for sections or arterial road corridors, costs for road expansion or rehabilitation can be better anticipated as specific work projects are scheduled in Annual Servicing and Financing Studies containing the five-year capital works program. Text and a graphic representation will be added to explain how arterial corridors can evolve from existing sections - e.g. 2 Lane Rural evolution to 4 Lane Commercial with Median.

A vision for an arterial road corridor allows conditions to be set for adjacent new development, which can offset the costs of constructing new sidewalks, road widening, boulevards, and so forth. By anticipating costs for upgrading arterial roads and sharing those costs with the private sector, conditions for development approval can be better set "up front" rather than incrementally. Savings can also be potentially achieved in that more construction work is known ahead of time, and can be undertaken at the same time (helping to achieve "economies of scale") rather than over a period of several years.

GLOSSARY

Access management: the management of the location and basic dimensions of access to property, from a roadway.

Arterial road: a main road with relatively continuous routes that primarily serve through traffic, high traffic volumes and long average trip lengths.

Attenuation (noise/sound attenuation walls): structures such as walls or berms beside roads or railway lines, which serve to reduce noise.

Berm: A mound or small hill of earth constructed alongside roads or railway lines to reduce noise and/or hide the road from view.

Bike lane: a lane intended for the exclusive use of bicycles, within a roadway used by motorized vehicles.

Bike path: a bicycle facility, physically separated from roadways, where motor vehicle traffic, except maintenance vehicles, is excluded.

Bikeway: a roadway, or part of a roadway, intended for the use of bicycles, either exclusively or shared with other vehicular traffic or pedestrians.

Border: in the edge of road, the space between the sidewalk and the property line.

Boulevard: in the edge of road, the space between the travel lane and the sidewalk. Boulevards are usually planted with grass or trees.

Buffer: see Landscape Buffer.

Capacity (of roads): the maximum number of cars that a road can carry without becoming congested.

Centres (Regional Centres) and Corridors: corresponding to Central Areas and some arterial corridors where an appropriate mix of various land uses exists (or is planned to exist) without a single dominant land use or form, and contain development densities and patterns that support high levels of pedestrian activity and public transit service.

Central Area: as defined in policy 9.2.2 of the Regional Official Plan as areas where the main concentration of activities at the highest densities within urban areas are to be developed, providing a fully integrated mix of community, service, retail, recreational and residential uses. Central areas contain development patterns supporting direct pedestrian access to buildings and high levels of public transit service and pedestrian activity. Central areas are also focal points for art, culture, entertainment and assembly, containing public spaces and parks.

Collector roads: a type of road that funnels traffic from residential or rural areas to arterial roads.

Controlled access: the condition where the opportunity for access to a roadway is controlled by public authority.

Commuter cyclist: who is cycling between destinations as an alternative to driving or taking transit

Corridor (street corridor/road corridor): the space between buildings on opposite sides of a street. Includes the road platform and the edge of road.

Cross-section (or section): A diagram or drawing that shows features transected by a given plane. The transverse profile of a road showing horizontal and vertical dimensions.

Crosswalk: any part of a roadway specifically intended for pedestrian crossing, which may be so indicated by signs, lines, markings or other devices.

Curb: a structure with a vertical or sloping face along the edge of a lane or shoulder strengthening or protecting the edge of clearly defining the edge.

Curb cut: a ramp leading smoothly down from a sidewalk to an intersecting street or driveway.

Curb drop: the transition length required to decrease the curb height to accommodate a driveway or sidewalk ramp.

Curb return: the curved section of curb used at intersections or driveways in joining straight sections of curb.

Edge of road/street: the space between the curb and the property line.

Design speed: a speed selected for purposes of design and correlation of the geometric features of a road.

Façade: The face of the building, in particular the principal face of the building.

Frontage: The full length of a plot of land or a building measured alongside the road on to which the plot or building fronts. Lots with reverse frontage are situated with the road running along the back of the property.

Gateway: an area of special identity that serves as an entrance point to a definable part of a town or city such as central area or a unique historical area.

Geometric design: the selection of the visible dimensions of the elements of a roadway.

Grade: the height of the ground, expressed as a measurement above sea level. Grade is also used to describe the slope of a road. “At grade” means ground level.

Gutter: a paved shallow waterway provided for carrying surface drainage.

High-occupancy-vehicle (HOV) lane: a lane designated for the exclusive use of high-occupancy vehicles.

Infill: development on empty lots of land within an urban area (rather than on new undeveloped land outside the city or town).

Infiltration (traffic infiltration): the appearance of increased traffic on local roads resulting from congestion on arterial roads

Intersection: the general area where two or more roads join or cross, within which are included the roadway and roadside facilities for traffic movements.

Island: a defined area between traffic lanes for control of vehicle movements or for pedestrian refuge.

Landscape Buffer: a landform comprised of earth and / or vegetation that separates potentially antagonistic elements, as an area between two riviling zones that serves to lessen the danger of conflict.

Lane: a part of the travelled way intended for the movement of a single file of vehicles.

Local roadway: a roadway with the primary function of providing land access.

LRT: light rail transit.

Median: in the street platform, a planted or paved space between travel lanes. Medians usually separate travel lanes going in opposite directions. Not for vehicular use.

Mode: the manner of travel.

Network (road network, street network): a system of interconnecting roads.

Node: a connecting point in a network. In a street network, nodes are intersections or places that have special prominence or significance.

Parking lane: a supplementary lane intended for parking.

Platform (road platform/street platform): the surface on which vehicles travel.

Platform intersection: an intersection in which the area common to the two roadways is at the same elevation as the top of curb or sidewalk.

Property line: the legal boundary between different properties or between a property and the public realm.

Public lane: a narrow minor street, usually without sidewalks, located at the rear of lots for vehicle access to garages or other parking spaces and which also serves as a utility right of way.

Raised crosswalk: a crosswalk on a curbed street whose elevation is the same as the top of curb or sidewalk.

Recreational cyclist: often children or others who are cycling primarily for the experience of cycling in and of itself. It is a leisure activity.

Regional Centres: see Centres and Corridors

Retrofit: the reconstruction of an existing roadway with geometric improvements.

Reverse Lot Frontage: see Frontage

Right-of-way: the areas of land acquired for or devoted to the provision of a road which includes all travel lanes, sidewalks, boulevards and borders.

Roadside: the area adjoining the outer edge of the travelled way.

Roadway: that portion of a street or highway which is improved, designed or ordinarily used for vehicular travel, inclusive of the shoulder.

Salt Strip: a paved surface within the boulevard of a street or on a median, along the edge of the curb, opposite the travel lane. It is often difficult to sustain plant and grass life in these locations and the paved surface provides a durable and attractive alternative to bare soil.

Section (or cross-section): A diagram or drawing that shows features transected by a given plane. It identifies the transverse profile of a road showing horizontal and vertical dimensions.

Sapling: a young tree that has been recently planted.

Setback: the space between the property line and the building face.

Shoulder: that part of a roadway contiguous with the travelled way intended for emergency stopping, and/or lateral support of the roadway structure.

Sidewalk: a travelled way intended for pedestrian use, following an alignment generally parallel to that of the adjacent roadway.

Sight triangle: the triangle formed by the line of sight and the two sight distances of drivers, cyclists or pedestrians approaching an intersection on two intersecting streets.

Signalization: the use of traffic lights at an intersection to control the flow of vehicular, bicycle and pedestrian traffic.

Standard: a value for a specific design feature, which practice or theory has shown to be appropriate for a specific set of circumstances, where no unusual constraints influence the design.

Street furniture: equipment such as lights, planting boxes or furniture, such as benches, which are placed off the street to improve or enhance the comfort, convenience and aesthetic quality of the roadway environment. Street furniture can include bicycle racks, newspaper boxes, garbage and recycling containers.

Streetscape: the overall character, design quality, and particular physical elements of a street. Streetscape elements may include the paving materials, curbs, landscaping, lighting, and street furniture such as benches, water fountains, or bicycle racks.

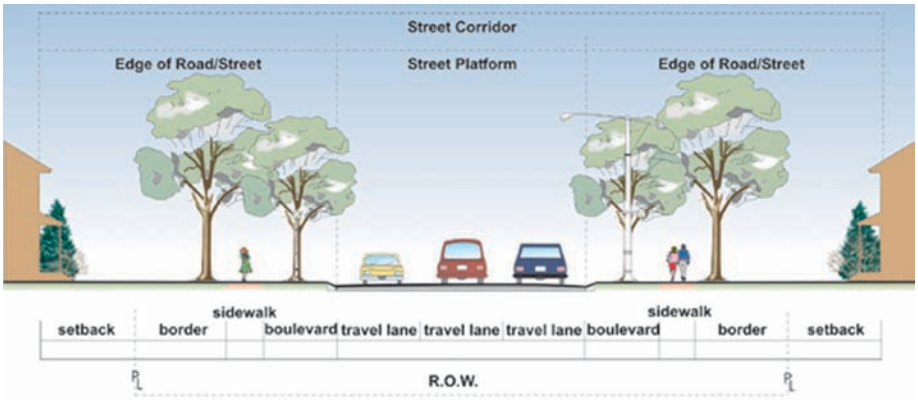
Streetscaping: the practice of applying aesthetic treatments to the street and its facilities intended to enhance the quality of the roadway environment.

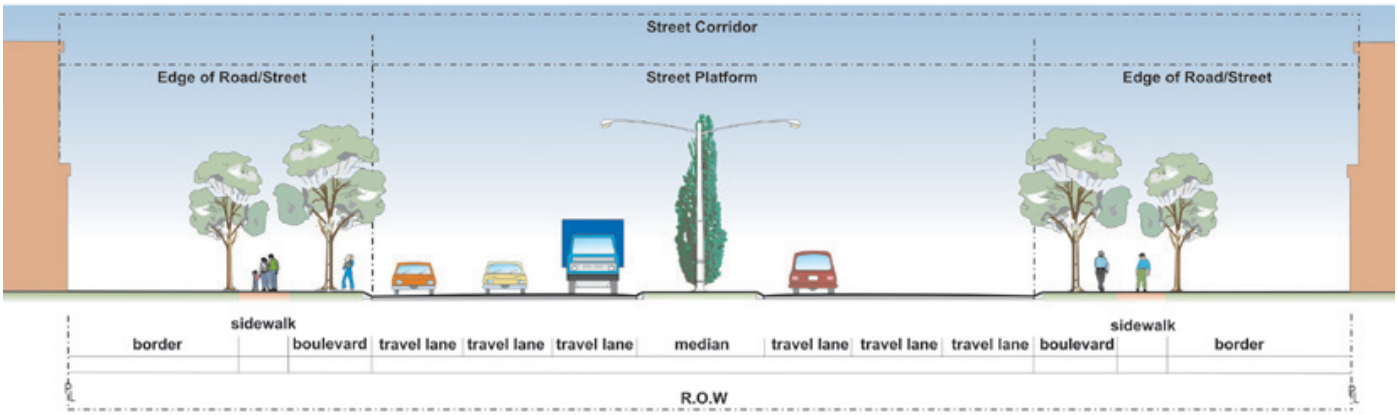
Subdivision: A housing development that is created by dividing a large parcel of land into many individual lots for sale.

Through lane: a lane intended for through traffic movement.

Transit lane: a lane intended primarily for public transit vehicles.

Travel lane: the part of the road on which vehicles travel. Arterial roads usually have one to three travel lanes in each direction.





Appendix A:

Arterial Road Classification Review

Arterial Road Classification Review

February 2007

URBAN STRATEGIES INC.

TSH

Table of Contents

1. Introduction

A goal of the Durham Regional Official Plan (ROP) is to develop an integrated, safe and efficient transportation system facilitating the movement of people and goods within the Region, and between the Region and other areas. The road network is a key element of this system, accommodating vehicular travel between points of trip origin and destination and providing direct access to abutting property.

A road network generally consists of a hierarchy of roads that provides for a gradation in function from access to movement. For example, the primary function of a freeway is movement, whereas at the other extreme it is the primary function of a local road to provide access. The network operates most efficiently if each class of road in the hierarchy is designed to serve its intended function and purpose (e.g. goods movement). Most roads are designed to serve multiple functions and purposes. However, mixing incompatible functions and purposes can impact mobility and liveability within a community. For this reason, roads are classified and designed based on their function and purpose, so that suitable design and operating criteria can be established to minimize, if not alleviate, conflicts between competing objectives.

The purpose of this report is to review and confirm the road classification system and criteria in the ROP, primarily as it relates to arterial roads. Specifically, the document:

- Describes the need for a road classification system;
- Reviews the current arterial road classification system and criteria in the ROP; and
- Provides direction for their refinement.

The results derived through this assessment will be used to update the transportation policies and schedules of the ROP through the ongoing Official Plan Review. The document will also serve as the basis for the development of detailed Arterial Corridor Guidelines for Durham. It is intended that the Region and area municipalities use the Guidelines as a reference in the preparation of corridor studies, land use plans, road improvement projects and Class Environmental Assessment studies, and in the review of development applications. The Guidelines recommend best practices and provide a matrix of road design strategies that are adaptable over time in both the urban and rural contexts.

It is expected that the application of the Arterial Corridor Guidelines will result in arterial roads that:

- Accommodate a wide range of transportation options;
- Support and are compatible with abutting land uses; and
- Create an inter- and intra-regional network that serves the diverse economic, social and environmental needs of the Region.

Preparation of this report relied largely upon literature from the Institute of Transportation Engineers (ITE) and the Transportation Association of Canada (TAC), supplemented with a research of current practices in other GTA municipalities.

2. Need for a Functional Road Classification System

A well defined road hierarchy is essential in meeting the mobility needs of communities, but just as importantly, it can help protect against the adverse impacts of motorized traffic in local neighbourhoods. While some roads should carry higher volumes of traffic at higher speeds, others need to be designed to accommodate lower volumes at lower speeds. This satisfies the commuting needs of the public while ensuring that neighbourhoods thrive between main traffic corridors. The absence of a hierarchy of roads would result in less efficient routes for traffic with associated increases in the time and cost of transporting people and goods. The quality of life would also decline, as motorized traffic would increasingly infiltrate neighbourhoods to avoid mounting congestion.

A functional road classification system establishes a "hierarchy" of roads that provides for a gradation in service from access to movement. In a functional system, each type of road serves a distinct stage of the trip making process, as shown in Figure 1. The concept is premised on the principle that roads do not operate independently, but are part of an interconnected system, with each type of road performing a particular *function* in moving traffic throughout the network and in providing access to abutting lands. The road system operates most efficiently and safely when each type of facility is designed and managed to serve a particular trip stage consistent with its position in the hierarchy. When a roadway attempts to prioritize both movement and access, neither function is well served. This compression of functions typically results in high collision rates, traffic congestion and excessive vehicle emissions and fuel consumption.

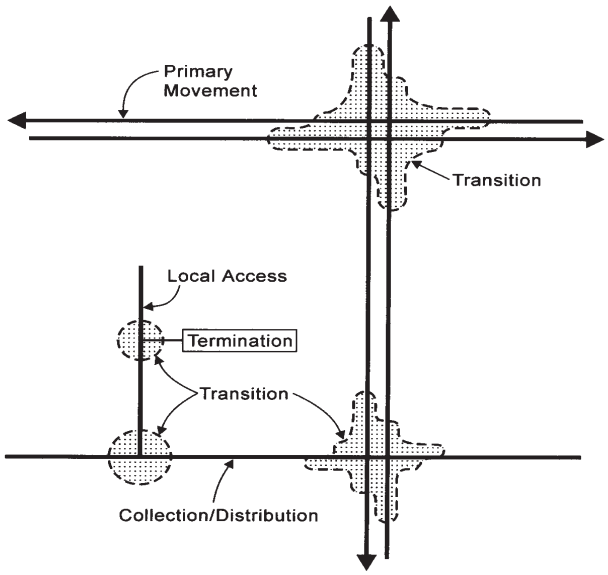


FIGURE 1 – Hierarchy of Movement in a Functional Circulation System
(Source – *Transportation and Land Development*, Institute of Transportation Engineers, 2002, p. 4-2)

The key objective of a functional road classification system is to ensure the orderly grouping of roadways in a framework around which authorities can plan and implement transportation projects, and effectively and safely manage their road systems. An effective classification system allows for the co-ordination of land use and

transportation, and helps in establishing appropriate right-of-way widths, roadway and boulevard design standards, traffic operations guidelines, and maintenance operations practices. It can also influence:

- The character of a community;
- Auto-dependency or the use of non-car modes such as walking, cycling and public transit;
- Access to facilities;
- Opportunities for locally-based business and employment; and
- The potential for social interaction and community formation.

The outcome of a properly classified road system is a network that safely and efficiently moves people and goods, and preserves the communities that exist between primary traffic corridors. A well-defined hierarchy of road types also assists in:

- Planning for the provision of a variety of modes and functions within road corridors;
- Identifying the effects of development in and on surrounding areas and roadways within the hierarchy, prior to making decisions;
- Designing roadways that have regard for accessibility, continuity, connectivity, efficiency, amenity and safety;
- Simplifying traffic control measures;
- Targeting roadway design to a specific range of traffic types and volumes, eliminating the need to "over-design" lower class roads, as major traffic is accommodated on higher order facilities;
- Providing road users and abutting communities a clearer understanding of the intended function and characteristics of particular roads; and
- Reducing overall network costs.

Two of the leaders in defining industry standards for road classification systems are the Institute of Transportation Engineers (ITE) and the Transportation Association of Canada (TAC). ITE is an international educational and scientific association, and one of the largest and fastest-growing multimodal professional transportation organizations in the world. TAC is a national association and forum for gathering and exchanging ideas, information and knowledge on technical guidelines and best practices. Both organizations have a mission to promote the provision of safe, efficient, effective and environmentally and financially sustainable transportation services in support of social and economic goals.

3. ITE Road Classification System

As with most classification systems, ITE supports a hierarchy of facility types based on road function.[1] The basic function is established based upon the relationship and trade-off between land access and traffic movement, as shown in Figure 2. Roads are classified into two broad classes:

- Higher order roads where traffic movement is the primary purpose and access is stringently managed. These routes are intended to carry through traffic and serve longer distance trips between centres; and

[1] *Transportation and Land Development*, Institute of Transportation Engineers, 2002.

- Lower order streets where land access is the primary purpose and traffic movement is impeded by the frequency of accesses. These routes are intended to carry locally oriented traffic between the higher order roads and their origin or destination.

Within these two broad groups, roads are further classified to reflect variations in terms of how land use is served.

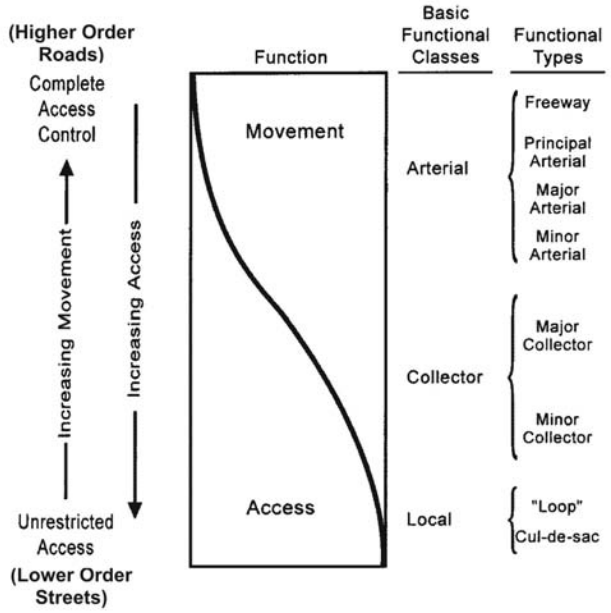


FIGURE 2 - BASIC FUNCTIONAL CLASSES and ROAD TYPES
(Source - Adapted from *Transportation and Land Development*, Institute of Traffic Engineers, 2002, pp. 4-4 and 4-5)

As Figure 2 shows, road systems are divided into three functional classes:

- Arterials – The primary function of arterial facilities is the movement of vehicles, with some consideration for access. Arterials are further divided into:

    - *Freeways* – The main function of freeways is the movement of higher traffic volumes at higher speeds with a higher percentage of truck traffic. A majority of trips on these facilities are inter-regional or longer distance trips. Access is typically provided by grade separations and ramps, with direct frontage access restricted. Owing to their unique geometric and access design, freeways are often considered a separate category distinct from other arterials.

    - *Principal Arterials* – The main function of principal arterials is to carry traffic within the community and between major activity centres of the region. In addition to serving many of the trips entering and leaving the urban areas, these roads accommodate travel passing through and connecting key destinations such as downtowns and commercial centres, employment areas, major residential communities and other activity centres within an urbanized area. Principal arterials are typically characterized by long and uniform signal spacings, non-

traversable medians restricting unsignalized access, flared intersections with channelization and auxiliary lanes, and higher posted speed limits. They play strategic roles in accommodating goods movement and higher-order transit facilities, and need to be operated with a focus on vehicular travel. Strident and proactive access management strategies are important to preserve the capacity and role of these roads, since abutting development densities are often relatively high due to their transportation capacity and transit potential.

- *Major Arterials* – These roads connect with the principal arterial system to accommodate trips of moderate length with a lower level of travel mobility and a slightly higher level of access. They distribute trips to geographic areas and serve major commercial and industrial areas. Major arterials typically vary from principal arterials with respect to intersection spacing and the frequency and design of unsignalized entranceways.

- *Minor Arterials* – On the arterial road hierarchy, minor arterial roads augment the higher order arterial system, carrying through traffic between communities within an urbanized area. They typically operate at the community level connecting local residential, shopping, employment and recreational facilities. The minor arterial system places relatively more emphasis on land access but still has specific limits on access points. Minor arterials may carry local bus routes and provide inter-community continuity but ideally do not penetrate identifiable neighbourhoods. Minor arterials also often act as "relief valves" for the higher-order arterials during peak travel periods and in the event of non-recurring incidents (e.g. collisions, emergencies, construction). As a result of the wider range of functions they provide and the broader range of land uses they serve, minor arterials can be very diverse in their cross-sectional composition.

- Collectors – Collector streets provide both access and movement within residential, commercial and industrial areas. They are typically discontinuous between residential areas, so as to avoid traffic infiltration through neighbourhoods. Lower density developments and community land uses such as schools and convenience retail are often located on collector streets.

- Locals – Local streets provide direct property access in residential, industrial, commercial and downtown areas. With local streets connecting primarily to collector roads, travel distances are short, speeds are relatively low and volumes are modest, as they serve their primary function of accommodating traffic from adjacent lands.

The final level in defining road classification relates to the development of more specific performance and design criteria, by suggesting typical cross-sections associated with the various road classes. ITE suggests an ultimate 6-lane divided cross-section for principal arterials, 4-6 lane divided cross-section for major arterials, and 4-5 lane undivided cross-section for minor arterials.

4. TAC Road Classification System

The TAC classification system separates roads on the basis of differences in traffic service, land service, design features, and operational needs associated primarily with adjacent land use. It is generally comparable to the ITE system in that roads are classified into freeways, arterials, collectors and locals. The design characteristics are specified separately for urban and rural roads. The TAC classification system is oriented more towards design applications, rather than for planning purposes.

In 1999, TAC updated its Geometric Design Guide.[2] This involved an extensive review of literature on safety aspects related to geometric design components including: alignments, intersections, interchanges, cross-section elements, roadside safety and other components of roadway design. The new guide provides a generic standard that municipalities and other government agencies can tailor and use to meet their specific road needs.

In describing the design characteristics, the TAC guide classifies arterials as major and minor, with specific criteria as described in Table 1.

Table 1 – TAC Geometric Design Guide for Canadian Roads

Criteria	Arterial Classes	
	Major	Minor
Traffic Service Objective	Traffic Movement Primary Consideration	Traffic Movement Major Consideration
Land Service/ Access	Rigid access control	Some access control
Travel Speed	Design Speed of 60-100 kph (urban) and 80-130 kph (rural) Average Speed of 50-90 kph (urban) and 60-100 kph (rural)	Design Speed of 50-70 kph (urban) Average Speed of 40-60 kph (urban)
Goods Movement	Accommodate all vehicle types, up to 20% trucks	Accommodate all types of trucks
Connectivity	Desirable connections - Collectors, Arterials, Expressways and Freeways	
Transit	Express and local buses permitted	
Cycling and Pedestrian Provisions	Cycling - Lane widening or separate facilities desirable Pedestrians - Sidewalks may be provided, separate facilities desirable	
Right-of-Way Width	20*-45** m	
Traffic Volume	10,000-30,000 vehicles per day (urban) Less than 12,000 per day (rural)	5,000-20,000 vehicles per day (urban)
Flow Characteristics	Uninterrupted flow except at signals and crosswalks	
Parking	Prohibited or Peak Hour Restrictions	Peak Hour Restrictions
Minimum Intersection Spacing	400 m	200 m

Notes:
* 20 m right of way is acceptable for retrofit conditions.
** Wider rights of way may be required to accommodate other facilities such as utilities, noise attenuation installation, bikeways and landscaping. For new roads, the immediate provision of wider rights of way may be considered to accommodate such facilities.

[2] *Geometric Design Guide for Canadian Roads*, Transportation Association of Canada, 1999.

5. Agency Practices

The Cities of Toronto and Hamilton, and the Regional Municipalities of York, Peel and Halton each define a functional hierarchy of highways, arterials and local roads within their respective Official Plans and supporting policy documents. In reviewing the designation of their arterial road networks, it was revealed that each municipality has established classification systems containing a range of functional, performance and design criteria:

- The City of Toronto designates a system of Major Streets, and classifies them in eight right-of-way widths, ranging from less than 20 metres to 45 metres or greater. The City has also adopted a new road classification system to consolidate and replace the various road classification systems inherited from its seven former municipalities. This classification system provides a full range of criteria for Major (having stronger access controls and rights-of-way ranging from 20-45 metres) and Minor Arterials (allowing more flexible property access with rights-of-way ranging from 20-30 metres). The criteria includes traffic movement versus property access, typical daily traffic volume (both directions), minimum number of peak period lanes (excluding bicycle lanes), desirable connections, flow characteristics, legal speed limit, accommodation of pedestrians, accommodation of cyclists, surface transit, surface transit daily passengers, heavy truck restrictions, typical spacing between traffic control devices, and typical right-of-way width.

- The Regional Municipality of York designates a road network comprised of eight right-of-way widths, ranging from 20-60 metres. The planned basic road widths shown in the York Regional Official Plan indicate the maximum widths that may be necessary to construct the roadway and ancillary utilities. The Region has also prepared a report entitled *Regional Streets: Standards for Rights-of-Way and Boulevards* which matches road rights-of-way to their expected function and use. This document refers to the TAC Geometric Design Guide for Canadian Roads in defining an integrated and enhanced approach to road design. Such approach balances considerations for traffic with those of urban design and livability.

- The Regional Municipality of Peel designates Major Roads in their Official Plan, and classifies them in nine right of way widths, ranging from 20-50 metres. The Region is in the midst of completing a strategic update of their Official Plan. The current Peel Official Plan provides general direction regarding access control, intersection spacing, and the accommodation of cyclists and haul routes. Peel Regional Council has also adopted a “Level of Service Policy” to ensure adequate *transportation capacity* on Regional roads. This policy outlines thresholds for the ratio of traffic volume to the capacity of the road.

- The Regional Municipality of Halton designates a network of Major Arterials and Minor Arterials. Major Arterials provide a high degree of access control, up to 6 lanes, with rights-of-way up to 42 metres. Minor Arterials provide an intermediate degree of access control, up to 6 lanes, with rights-of-way of up to 35 metres. The Region also designates Multi-Purpose Arterials that run through nodes or connect nodes. The Official Plan provides both functional (i.e. level of travel demand, goods movement, transit accommodation) and general design guidelines (i.e. level of access control, right-of-way width, number of travel lanes, requirements for HOV and/or transit priority lanes, adjacent land uses).

- The City of Hamilton designates arterial roads with rights-of-way ranging from 60 metres, where there is complete control of access to abutting land use, to 26-36 metres, when there is only partial or no control of access to abutting land use. The City defines arterial roads as strategic links in the road network needed to

carry out relatively high volumes of long distance traffic within, between or through Area Municipalities, and/or to provide access past major geographic barriers and to inter-regional highways.

As illustrated above, although there are similarities among the municipal arterial road classification systems, each of them has developed a system tailored to meet their own needs. The range of arterials varies between municipalities; however, right-of-way width, access control and travel speeds appear to be the most commonly used criteria to distinguish arterial road classes. To provide a framework for the development and management of the road system, particularly for use by planning and transportation staff, the City of Toronto and the Region of York have undertaken further studies to expand the array of criteria for arterials.

6. Review of the Regional Road Classification System

The Region and the area municipalities designate road networks in their Official Plans based on functional classification. The plans identify a freeway network, under the jurisdiction of the Province, intended to carry longer-distance travel to, from and through the Region. The freeway network forms the backbone of the Region's transportation system and connects to the arterial road network at grade-separated locations. The area municipal official plans also define local and collector road networks that serve abutting land uses. These roads, solely under the jurisdiction of the local municipalities, provide land access and collect traffic from the lower order streets and distribute it to the arterial road network.

Although the freeway, collector road and local road networks play an important role in the overall road system for Durham Region, the focus of this report is the arterial road network. Arterial roads fall under the jurisdiction of the Region, the area municipalities, or the Ministry of Transportation. The arterial road network in the southern part of the Region is based on the land survey system of Ontario, which resulted in basic spacing of approximately 2.1 km between east/west roads (concessions) and 0.82 km between north/south roads (lots). As development occurred and population and employment densities increased, the spacing of arterial roads in this part of the Region became more frequent to accommodate the increased traffic volumes. The more frequent spacing of arterial roads in the southern urban areas of the Region, and the less dense spacing in the northern and eastern rural areas, provides evidence of this evolution.

The 1976 ROP designated a road network of Type A and Type B arterials. During the 1991 ROP review, the network was refined to include Type C arterial roads. Criteria associated with the Type A, Type B and Type C road classes are contained in section 16 of the ROP (see Table 2).

Table 2 – Criteria for the Arterial Road Classes designated in the Current Regional Official Plan

Criteria	Arterial Classes		
	Type A	Type B	Type C
Traffic Service Objective	Movement of large volumes of traffic - 16.3.13 a) i)	Movement of moderate volumes of traffic - 16.3.13 b) i)	Movement of lower volumes of traffic - 16.3.13 c) i)
Land Service/ Access	Permit private accesses generally located a min. of 200m apart - 16.3.13 a) vii)	Permit private accesses generally located a min. of 80m apart - 16.3.13 b) vii)	n/a
Travel Speed	Highest vehicle speeds - 16.3.13 a) iii) Operating speed 70 km/h (urban) and 80 km/h (rural) - 16.3.13 a) v)	Moderate vehicle speeds - 16.3.13 b) iii) Operating speed 60 km/h (urban) and 80kph (rural) - 16.3.13 b) v)	Acceptable vehicle speeds - 16.3.13 c) iii) Operating speed 50 km/h (urban) - 16.3.13 c) v)
Goods Movement	Large volume of truck traffic - 16.3.13 a) i)	Moderate volume of truck traffic - 16.3.13 b) i)	Lower volume of truck traffic - 16.3.13 c) i)
Connectivity	Intersects with Freeways and other Arterials - 16.3.13 a) ii)	Intersects with other Arterials and collectors- 16.3.13 b) ii)	Intersects with other Arterials and collectors- 16.3.13 c) ii)
Transit	Accommodate high occupancy vehicle or bus lanes - 16.3.13 a) vi)	Accommodate high occupancy vehicle or bus lanes - 16.3.13 b) vi)	Integrated transit service - 16.3.20
Cycling and Pedestrian Provisions	Bicycle path networks as integral parts of urban area - 16.3.28 b) and 16.3.17 d) Safe and convenient movement of pedestrians - 16.3.28 a)	Bicycle path networks as integral parts of urban area - 16.3.28 b) and 16.3.17 d) Safe and convenient movement of pedestrians - 16.3.28 a)	Bicycle path networks as integral parts of urban area - 16.3.28 b) and 16.3.17 d) Safe and convenient movement of pedestrians - 16.3.28 a)
ROW width	36-50m - 16.3.13 a) iv)	30-36m - 16.3.13 b) iv)	26-30m - 16.3.13 c) iv)
Vehicle Priority	Accommodate high occupancy vehicle or bus lanes - 16.3.13 a) vi), 16.3.18	Accommodate high occupancy vehicle or bus lanes - 16.3.13 b) vi), 16.3.18	n/a

Based on a review of the ROP classification system and in light of industry standards and agency practices, the following conclusions can be drawn:

- While the number of road classes differs between agencies, and industry practices, the variation in the function of roads is well acknowledged. Most jurisdictions provide for a variety of road classes that are principally defined by the relationship between the movement and access functions of the road (i.e. the greater the emphasis on traffic movement, the more restrictive property access becomes, and vice versa).

- A road classification system based on roadway function is most common. This provides for a clear sense of how the roadway should be designed to meet the needs of adjacent land uses, while serving a variety of purposes (i.e. transit, goods movement).

- While traffic volumes are provided as a criterion for classification of arterials in some instances, they are generally outputs (or derivatives) of the roadway function and not their determinants. However, traffic volume targets are helpful in identifying the evolution of arterials within the system, by establishing meaningful thresholds for monitoring and assessing potential changes in arterial classes.

- The Regional Type A, B and C arterial road classification is very comparable to the principal, major, and minor arterial classes defined by ITE.

- In general, the criteria for Regional Type A and B arterial classes compare well with TAC's major arterial class (TAC). While they both serve as major mobility routes, designating them separately allows further distinction and flexibility in terms of their design for traffic movement and access control.

- The Regional Type C arterial class generally compares well with TAC's minor arterial class. These roads essentially serve as mid-block arterials that provide relief to higher order arterials. In the absence of these mid-block arterials, spacing between arterials would become excessively large, especially in the east-west direction, potentially resulting in heavy turning volumes at intersections and infiltration through residential neighbourhoods.

- A well defined hierarchical road network can assist in the provision of a safe and effective transportation system, to the satisfaction of a broad range of stakeholders. The criteria in the Regional arterial road classification system require further elaboration to provide improved direction for implementation. Consistent with the TAC Guide, it would be useful to specify more detailed criteria that define the three arterial road classes in terms of the variables shown in Table 3.

Table 3 – Classification Criteria

Traffic Service Objective	Roads of higher classification should serve inter-regional and regional traffic movements over relatively longer distances. Lower order classifications should cater to local traffic movements over shorter distances and provide access to abutting property.
Land Service/Access	Direct access from adjoining properties to roads of higher classification should be limited or restricted in recognition of their through traffic function, and for traffic safety and flow reasons. Lower order classifications should provide direct access to abutting lands where required, assuming the entranceway can be positioned in a safe location.
Traffic Volume	Roads of higher classification being the principal routes between traffic generating centres should accommodate higher traffic usage relative to roads of a lower classification, taking into account urban and rural differences.
Flow Characteristics	Roads primarily serving traffic movement should have traffic control and design characteristics that permit uninterrupted flow. On lower classification roads, drivers should expect interrupted flow due to the frequency of accesses and intersections, and the presence of more traffic control devices, parked vehicles and pedestrian crossings.
Travel Speed	The road cross-section and the roadside environment generally determine the operating speeds on a roadway. Speed limits are typically posted at the 85th percentile operating speed. Roads of higher classification with emphasis on long distance travel should be designed to accommodate higher operating speeds than roads of lower classification.
Goods Movement	Long distance commercial vehicle operation should occur on roads of higher classification and be discouraged on local roads.
Connectivity	Roads should connect to other roads with the same or similar functions, and to roads that are directly above or below them in the hierarchy.
Transit	Roads of higher classification should be the focus of more frequent and higher-order transit service, including express bus operations. Lower classes of road should accommodate bus operations of a more local nature.
Cycling and Pedestrian Provisions	On roads of higher classification, cycling and pedestrian activity should be restricted or provided for in separate facilities. On lower classes of roads, cycling and pedestrian activity should be encouraged, but would not require dedicated facilities.
Parking	Parking should be prohibited or restricted on roads of higher classification to provide for clearway conditions, while curbside parking may be accommodated on lower road classes.

Table 3 – Classification Criteria

Minimum Intersection Spacing	Roads of higher classification should have limited, appropriately spaced side road connections and should not be intersected by lower class roads. They may be grade separated or controlled at grade by well-co-ordinated traffic control signals. More frequent intersection spacing is acceptable on lower classes of road. These intersections may be controlled at grade using regulatory signs and other traffic control mechanisms, including traffic calming measures.
Right-of-way width	The cross-section of roads can range from divided, multi-lane facilities for higher classifications, through to two-lane undivided facilities for lower classes of road. This criterion is related to route capacity as well as manoeuvrability of heavy vehicles. The ultimate cross-section for a road generally evolves over time as traffic volumes increase. As such, right-of-ways should be of sufficient width to accommodate the ultimate cross-section.
Continuity	Roads of higher classification have longer continuous road sections, serve inter-municipal or inter-regional traffic and are characterized by higher volumes of through traffic. On the other hand, lower order roads have shorter, discontinuous road sections, serving shorter local trips and playing a key role in providing access to adjacent properties.
Cross-Section Features	Roads of higher classification tend to be higher capacity routes with relatively higher operating speeds and traffic volumes, with enhanced features such as acceleration/deceleration lanes, climbing and passing lanes, and intersection turn bays to improve traffic flow. Lower classes tend to have lower capacities with lower operating speeds and traffic volumes.
Vehicle Priority	Roads of higher classification are likely to provide priority capacity for particular modes/uses by way of bus lanes, truck lanes or transit lanes. Lower road classes generally provide for mixed traffic.
Network Spacing	The spacing of roads in the hierarchy normally relates to the density of activity occurring in the area. Roads of higher classification will be spaced more widely apart than the lower road classes, which provide for a completed grid to enable efficient traffic circulation.

7. Recommended Classification System and Criteria

As noted previously, arterial roads play a variety of roles within our Region and the current three-level (Type A, Type B and Type C) Regional arterial road classification system appears to be consistent with industry standards and should be maintained. In order that the network of arterial roads continues to meet the needs of businesses and residents of the Region, it is essential that a well defined set of criteria be developed to ensure its consistent implementation. Using the variables presented in Table 3, it is recommended that the criteria outlined in Table 4 be adopted as the basis for distinguishing each of the three arterial road classes.

Table 4 – Recommended Arterial Road Classification System

Criteria	Arterial Classes		
	Type A Arterial	Type B Arterial	Type C Arterial
Traffic Service Objective	Traffic movement primary consideration Predominantly serves inter-regional and inter-municipal trips	Traffic movement major consideration Predominantly serves inter- and intra-municipal trips	Traffic movement slightly more important than land access Predominantly serves intra-municipal trips
Land Service/Access	Rigid/Progressive access control Permit private access generally located a minimum of 200 m apart in Urban Areas Permit large scale commercial and industrial developments, mixed use developments and higher density developments with shared or combined access	Incremental/Progressive access control Permit private access generally located a minimum of 80 m apart in Urban Areas Promote higher densities with shared or combined access	Limited access control Promote higher densities with shared or combined access, or limit to single detached dwelling unit frontage
Typical Daily Traffic Volume	>10,000 AADT	5,000-40,000 AADT	4,000-20,000 AADT

Table 4 – Recommended Arterial Road Classification System

Criteria	Arterial Classes		
	Type A Arterial	Type B Arterial	Type C Arterial
Flow Characteristics	Uninterrupted flow except at traffic control signals	Uninterrupted flow except at traffic control signals	Uninterrupted flow except at traffic control signals and pedestrian crossings
Travel Speed	70 km/h urban, 80 km/h rural	60 km/h urban, 80 km/h rural	50-60 km/h
Goods Movement	Generally no restrictions	Generally no restrictions	Generally no restrictions
Connectivity	Connects with freeways and arterials	Connects with freeways, arterials and collectors	Connects with arterials, collectors and limited local road access
Transit	May serve as major and minor transit corridors, and as regional transit spines	May serve as major transit corridors, and as regional transit spines	May serve as minor transit corridors, and as local transit corridors and connectors to regional transit spines
Cycling and Pedestrian Provisions	Cycling provisions to be determined through completion of the Regional Cycling Plan Study Sidewalk on both sides with separation from traffic lane preferred for pedestrians	Cycling provisions to be determined through completion of the Regional Cycling Plan Study Sidewalk on both sides for pedestrians	Cycling provisions to be determined through completion of the Regional Cycling Plan Study Sidewalks on both sides for pedestrians, however, may not be required in industrial areas
Parking	Prohibited or peak hour restrictions	Prohibited or peak hour restrictions	Not recommended where traffic movement is impacted or it becomes a safety issue
Minimum Intersection Spacing	700 m intersection spacing in north-south direction *300 m/500 m intersection spacing in east-west direction Signalized intersections where required	525 m major intersection spacing in north-south direction *300 m/500 m major intersection spacing in east-west direction Some minor intersections (T-type) mid-block subject to possible future control, if necessary to maintain corridor progression Signalized intersections where required	300 m intersection spacing Some minor intersections with future control provisions, if necessary due to capacity and queuing considerations. Signalized intersections where required but not consecutive
Right-of-Way Width	36-45 m right-of-way 36 m for ultimate 2- 4 lane cross-section 40 m for ultimate 4-lane cross-section with channelized right turn lanes at intersections 45 m for ultimate 6-lane cross-section Maintain width through corridor for alignment of utilities and boulevard features 4-6 lanes within the Urban Area and 2-4 lanes outside the Urban Area	30-36 m**&*** right-of-way 36 m for ultimate 4-lane cross-section Existing/Future 4 lanes within the Urban Area and 2-4 lanes within the rural area	26-30 m** right-of-way, dependent on transit facilities, on street parking and established development (i.e. downtown) 2-4 lane cross-section within the Urban Area
Continuity	Continuous across regional areas or larger municipal areas	Typically continuous across several municipalities	Typically continuous within a single municipality with few spanning two or more; may be shorter and discontinuous sections when serving major traffic generators

Table 4 – Recommended Arterial Road Classification System

Criteria	Arterial Classes		
	Type A Arterial	Type B Arterial	Type C Arterial
Cross Section Features	Enhanced through development of supporting circulation system, roadway widening, raised medians, coordination of traffic signals consolidation of private accesses, reducing and controlling local residential street intersections, adding auxiliary lanes at intersections, channelized non-traversable medians, improved curb radii, and provision of right turn lanes		
Vehicle Priority	To be considered as part of strategic goods movement network Consideration may be given for transit priority measures including dedicated transit lanes, queue jump lanes, and priority signals	To be considered for goods movement Consideration may be given for transit priority measures including queue jump lanes, and priority signals	Predominantly passenger and service vehicles, low to moderate truck traffic (except in Centres and Employment areas)
Network Spacing	Generally 6.5 km between north/south and east/west arterials	Generally 1.6 km between north/south arterials and 2.0 km between east/west arterials	Generally, no less than 0.8 km between north/south and east/west arterials

Exeptions:

* In some cases, spacing for east-west arterials can be reduced to 300 m if signals are "coupled" provided adjacent intersections are a minimum of 500 m away.

** Reduced right-of-way widths will only be considered in locations identified as exceptions in the Area Municipal Official Plans in accordance with Regional policy.

*** Wider rights-of-way may be required to accommodate other facilities such as transit, utilities, noise attenuation installation, bikeways and landscaping. For new streets, the immediate provision of wider rights-of-way may be considered to accommodate such facilities.

Unless otherwise identified by another appropriate comprehensive planning process or Official Plan, a corridor study or Environmental Assessment shall be undertaken to identify any exceptions to the right of way widths identified in this Table.

The criteria in Table 4 are based upon the best practices identified in this Report and the Region's experiences to date. They provide clear direction for the planning, design, and operation of the Region's arterial road network, and should be incorporated into the Regional Official Plan.

8. Implications for the Regional Arterial Road Network

Reviewing the arterial road network in Durham both in light of existing and proposed criteria, it would appear that some Type C arterials exhibit the characteristics of higher order collectors, while a few appear to function as higher order arterials. It is for this reason that Type C arterial roads tend to raise the most questions as to their role in the Region's road network.

When looking at the arterial road network in the more urbanized areas of the Region it is evident that the Type C arterial roads "support" the Type A and B arterials by providing additional connectivity between the more significant arterials. This finer grid network of arterial roads allows for the routing of transit service into both residential and non-residential development areas, which is essential for ensuring the development of transit-supportive neighbourhoods. It also reduces walking distances, a key determinant of a transit-supportive arterial road network.

In addition to the transit-supportive function that the Type C arterials play, they also provide alternative routes for the dispersion of traffic, reducing demand on higher order arterials, especially at intersections, and potentially increasing levels of service on these roads. They also provide preferred routes for non-auto modes, in particular cycling and pedestrians, as these roads tend to be wider two-lane roads that can easily accommodate cyclists and motorists with adequate separation. The opportunity for cyclists on these roads will be further explored through the completion of the Regional Cycling Plan.

Considering that there is a significant difference between the functions of some of the current Type C arterial roads, it is recommended that the current network of Type C arterials be reviewed in light of the classification criteria for minor arterials presented in Table 4, with additional consideration of the benefits outlined above.

9. Conclusions and Recommendations

The concept of the three-level hierarchy of arterial roads defined in the current Regional Official Plan remains valid. However, it is recommended that the Arterial Road Classification System be refined to clarify the differences between the three arterial road classes.

With the proposed refinement of the Arterial Road Classification System, the framework is now set for the development of Arterial Corridor Guidelines - the second phase of this study. This phase will focus on the development of more specific design criteria that are applicable to each road type, pairing objectives for ***movement*** (i.e. roadway design criteria in terms of travel patterns, speeds and connectivity) with those for ***activity*** (i.e. urban design criteria in terms of levels of activity, location of access, and relationship to the street). The guidelines will provide a matrix of design opportunities that are adaptable over time in both urban and rural contexts, and will be used by the Region and its area municipalities during the preparation of site specific corridor studies and secondary plans, and the review of development applications.

To move forward with the review of the Regional Official Plan and the development of the guidelines, it is recommended that:

1. The current three-level (Type A, Type B and Type C) arterial road classification system be maintained in the Regional and area municipal Official Plans.

2. Type C Arterial Roads continue to be designated on Map B2 (Transportation System) of the Regional Official Plan.

3. The current network of Type C arterials be re-examined based on the classification and functional criteria recommended in this report, and accordingly, inappropriately designated roads be reclassified.

4. The classification and functional criteria for arterial roads contained in Table 4 be incorporated into the Regional Official Plan.

Appendix B:

Street Tree Species Possibilities

DECIDUOUS TREES		Mature	
Botanical Name	**Common Name**	**Height**	**Comments / Features**
Celtis occidentalis	Hackberry	20m	leaves and form resemble elm, native tree very tolerant of harsh conditions, interesting bark
Ginkgo biloba	Ginkgo	16m	slow-growing, extremely tolerant of urban conditions, columnar form, fan-shaped leaves, yellow fall colour
Gleditsia triacanthos 'Skyline'	Skyline Locust	16m	fine-textured leaves, yellow fall colour, tolerant of harsh conditions, upright form
Quercus macrocarpa	Burr Oak	20m	native, spring planting only, slow growing, hardy, yellow-brown fall colour, corky twigs
Quercus rubra	Red Oak	18m	native, spring planting only, fastest growing of oaks, dark green leaves, red fall colour
Tilia americana 'Redmond'	Redmond Linden	17m	Fast growing, pyramidal form.

ORNAMENTAL TREES		Mature	
Botanical Name	**Common Name**	**Height**	**Comments / Features**
Acer campestre	Hedge Maple	7m	dark green leaves, yellow fall colour, corky bark, urban tolerant, street/park tree
Acer ginnala	Amur Maple	6m	orange-red fall colour, single or multi stem, tolerates city conditions, bright orange-red fall colour
Acer tataricum 'Pattern Perfect'	Pattern Perfect Tatarian Maple	6m	Oval form. Adapts to dry soils. Red-orange fall colour.
Amelanchier canadensis	Serviceberry	8m	native, white flowers in spring, edible red fruit July-August, grey bark, single/multi stem
Corylus colurna	Turkish Hazel	14m	Pyramidal form. Leathery foliage.
Crataegus crusgalli var. inermis	Thornless Cockspur Hawthorn	6m	dark green leaves, bronze-purple fall colour, rounded form, white flowers in spring, red fruit, no thorns
Malus 'Harvest Gold'	Harvest Gold Crabapple	8m	upright form, disease and pest resistant, white flowers 1 week later than most crabs, small gold fruit remains through winter
Malus 'Prairifire'	Prairifire Crabapple	7m	maroon-dark green leaves, dark pink-red flowers, disease and pest resistant, persistent red fruit
Malus 'Robinson'	Robinson Crabapple	8m	upright spreading form, pink flowers, bronze-green foliage, disease and pest resistant, fast growing, persistent red fruit
Syringa reticulata 'Ivory Silk'	Ivory Silk Tree Lilac	7m	fragrant white flowers early July, yellow fall colour, single/multi stem, tolerates city conditions
Viburnum lentago	Nannyberry	6m	native, white flowers in spring, shiny green leaves, purplish in fall, single/multi stem, blueish fruit attracts birds