Halifax Complete Streets Guidelines

2021 DRAFT

Part A: Design Guidelines and Standards

Part B: Standard Details

Part C: Drawing Standards

HALIFAX

Part A: Design Guidelines

Contents

1.0 GENERAL

1.1 INTRODUCTION

This document was developed to provide consistency in design and construction of infrastructure among developers, consultants and contractors within the Halifax Regional Municipality (The Municipality). These guidelines are minimum standards to be met in the design of streets and associated infrastructure.

Halifax Water has similar servicing standards for water, stormwater and wastewater systems. “Halifax Water Design Specifications”, which can be found at https://www.halifaxwater.ca/halifax-water-specifications-forms .

This document provides guidance and sets standards for design and construction of infrastructure in the Municipal right-of-way; by suggesting limiting values for designs, and establishing uniformity of practice in the Municipality.

An electronic copy and links to other relevant documents, which can serve as supplementary resources during the design process, can be found in Appendix C, and online at https://www.halifax.ca/transportation/streets-sidewalks/municipal-design-guidelines-red-book .

1.2 APPLICATION

The Guidelines apply to all municipally owned infrastructure within the Municipality. This includes new construction or infills and retrofits where municipal service systems are altered.

The Guidelines are adopted by administrative order pursuant to the Halifax Regional Municipality Charter (2008, c.39), the Halifax Regional Subdivision By-Law, and By-Law S-300 Respecting Streets.

The designer shall provide for municipal service systems meeting these criteria but also consistent with cost-effective installation, operation and maintenance. The design of municipal services must be under the seal of a professional engineer, licensed to practice in Nova Scotia, and shall be designated as the engineer of record.

Where the designer proposes variations from this document and where the designer can show that alternate approaches will produce desirable results, such approaches may be considered for approval. See Section 12.0 for guidance on requesting design variances.

The Municipal Engineer's decision shall be final and binding in matters of design and construction.

Each submission shall be accompanied by a statement from the engineer of record that the submission is in accordance with the Guidelines, except, if there are variations, the designer shall indicate clearly, in all appropriate documents and plans, included with the submission, the specific variances from the Guidelines.

The acceptance by the Municipality of the design of proposed municipal infrastructure does not relieve the engineer of record of the responsibility for proper design nor does it imply that the

Municipality has checked the design exhaustively for compliance with this document or any other standards.

Where the Municipality has accepted a design that does not comply with the Guidelines, and where the engineer of record has not brought variations from this document to the attention of the Municipal Engineer, it is expected that the provisions of the Guidelines still stand.

The Guidelines cover the more common aspects encountered with roadway design. In cases where additional guidance is required, the latest editions the Nova Scotia Traffic Safety Act and Regulations, and applicable guides prepared by the Transportation Association of Canada (TAC), and the National Association of City Transportation Officials (NACTO) shall be used.

Where reference is made in this document to other guidelines the latest edition shall govern.

In addition to the design criteria set forth in the Guidelines, all systems shall conform to all other applicable codes and standards. In the event of a conflict, the more stringent requirements established by applicable authorities having jurisdiction will apply. No systems shall be constructed until the design has been approved by the Municipal Engineer, the approval process followed, and all applicable permits have been obtained from the Municipality and any other agencies having jurisdiction.

All plans, submissions, and calculations shall be in metric units.

1.3 DESIGN PHILOSOPHY

In December 2017 HRM adopted the *Integrated Mobility Plan* that committed to improving mobility choice through improving access to sustainable options like walking, bicycling and transit in a way that contributes to healthier communities. More information can be found at: www.halifax.ca/integratedmobility. A key direction of the *Integrated Mobility Plan* is to design the Municipality's right-of-way through a Complete Streets lens, which recognizes that some streets can be destinations and important publics spaces (streets as places), while also serving to the movement of people and goods (streets as links). Using a Complete Street approach provides streets that are safe, convenient and comfortable for people of all ages and abilities, and include various modes of transportation.

The Complete Streets approach can apply to all streets and is adaptable to urban, suburban and rural contexts. Street design standards are rapidly evolving as the priorities for streets evolve. The demands on streets are often highlighted in urban areas where streets serve many purposes for many people. Organizations such as the Transportation Association of Canada (TAC), The National Association of City Transportation Officials (NACTO), and the Canadian Institute of Transportation Engineers (CITE), publish guidance that has informed HRM's Complete Streets approach to design.

Because of the many ways that public infrastructure is used, it is important that public safety for all ages, abilities and street uses, be incorporated into the design of municipal systems. The Halifax Strategic Road Safety Plan is a five-year (2018-2023) plan that focuses on reducing

transportation related fatalities and injuries on roadways within the Halifax Regional Municipality. The plan sets a short-term goal of 20% reduction of fatal and injury collisions within 5 years (2023). The Halifax Strategic Road Safety Plan can be found at: https://www.halifax.ca/transportation/streets-sidewalks/road-safety.

Over time, an existing street's design features may no longer support its current function. HRM is an older city with streets still in use today that were designed and constructed many years ago during an era with very different mobility priorities. Regional population growth, geographic expansion and increased use of private vehicles has created increased traffic volumes and travel speeds that the existing streets often struggle to accommodate. Conversely, streets originally designed as major thoroughfares to accommodate high traffic volumes may no longer require that capacity. These streets offer opportunities for repurposing to accommodate, active transportation facilities for people to walk, roll and bicycle, additional green space, dedicated transit lanes and on-street parking.

1.3.1 Complete Streets Guiding Principles

As described in the *Integrated Mobility Plan*, the following are the prime considerations when using a Complete Street approach:

Streets support their intended functions and complement adjacent LAND USES:

Complete Streets are sensitive to the character, scale and needs of surrounding neighbourhoods and contribute to the long-term vision for communities. Appropriate street design balances the needs of all users and is linked to urban design, land use and a street's function.

Streets consider ALL AGES and ABILITIES:

Streets need to be safe, comfortable and enjoyable for all users including people of all ages, using a variety of transportation modes (walking, biking, transit, or car), with varying abilities, in all seasons.

Streets are MULTI-FUNCTIONAL and multi-modal:

Streets not only connect destinations, but can be important open spaces, social spaces, community hubs, gateways and destinations. Intersections are a critical part of the system and should be designed to meet the needs of all users. Depending on a street's role, space may be reallocated to meet the needs of different users.

CONNECTED NETWORKS are critical:

Keeping the larger transportation system in mind is critical for each mode. While it may not be practical to accommodate every need on every street, it is critical that good networks are available for all modes, especially when linking residences to major destinations, such as employment districts, shopping, schools, service centres and other community amenities.

The Municipality has developed proposed network maps for walking, bicycling, transit, and multi-use pathways in the *Integrated Mobility Plan*, the *Rapid Transit Strategy*, and the *Active Transportation Priorities Plan*. These maps are included in Appendix B – Maps. These maps may change from time to time as the plans are implemented. Updates will be included on the website.

Streets require COLLABORATION:

Creating a complete street requires cooperation, engagement and partnerships across municipal departments, as well as with other orders of government, communities, businesses and other organizations.

Streets contribute to the SUSTAINABILITY of the region:

Streets support environmental sustainability by accommodating active transportation and transit and improving local ecology through street trees and stormwater management. They also support social and cultural sustainability by creating public spaces and enhancing the economy by supporting business, commuters and goods movement.

1.3.2 Accessibility

Providing a level of accessibility to all users, including persons with disabilities, is an important consideration in municipal design.

Provincial Legislation

Recognizing the importance of accessibility in creating an equitable environment for all Nova Scotians, the provincial government has adopted the Accessibility Act (2017, c.2). The goal of this Act is to improve accessibility by preventing and removing barriers faced by people with disabilities, and to make Nova Scotia inclusive and barrier-free by 2030.The regulations associated with this legislation are not yet complete. The Municipality will continue to implement these regulations as they become available.

Accessibility in the Halifax Region

HRM is dedicated to providing convenient connections to daily destinations for people of All Ages and Abilities (AAA). Access to activities, such as shopping for healthy food, travelling to work or appointments and socializing, is an important component of wellness. Mobility options must provide people of all ages and abilities with the independence to pursue these activities, including those with physical, visual, auditory and mental disabilities.

Creating an accessible environment helps create barrier-free and safer journeys for everyone. The Municipality is improving accessibility by implementing requirements, such as:

- Pedestrian Through Zones that allow people to travel free of temporary or permanent barriers on sidewalks;

- Tactile Walking Surface Indicators that provide attention cues on sidewalks, at pedestrian ramps, at platforms, etc., for people with visual impairments;
- Curb Ramp designs to provide barrier-free street crossings that also help to orient people with visual impairments;
- ccessible Pedestrian Signals that provide audible cues for people with visual impairments;
- Developing accessible parking guidelines;
- Limiting slopes of streets, ramps, walkways and pathways;
- Focusing winter operations to maintain accessibility throughout all seasons;
- Providing accessible bus stops and safer and accessible routes to destinations from bus stops; and,
- Improving network connections, including consideration of travel distance for active and accessible transportation modes.

Further details on HRM's design guidelines for accessibility are featured throughout this document.

1.3.3 Emergency Management

Streets provide the means to address emergency management and emergency response within our communities. Streets are the primary means for residents to evacuate hazardous areas in times of emergency. Streets are also the primary means for emergency services to access residents at risk and deploy resources to mitigate emergencies. Appropriate street design considers allowance for the concurrent evacuation of residents and deployment of emergency responders efficiently.

1.3.4 Sustainability

Improving air quality and reducing greenhouse gas emissions by prioritizing walking, bicycling and transit will reduce air pollution and improve health outcomes resulting in fewer people suffering from cardiovascular and respiratory diseases. In Nova Scotia, transportation accounts for 27% of greenhouse gas emissions (as of 2019) and is the second largest source of emissions in the province, following electricity generation. Accounting for the projected growth distribution targets outlined in the Regional Plan, transportation emissions in the Halifax region are projected to increase by 6% over levels from 2011 by the year 2031 unless strategic action is taken (*HalifACT*, 2020).

To improve air quality and lower greenhouse gas emissions, the *Integrated Mobility Plan* recommends the Halifax region strive towards up to 40% of regional growth to occur in the Regional Centre, backed by the *Regional Centre Secondary Municipal Planning Strategy* (Centre Plan). By implementing the *Integrated Mobility Plan*, the number of private vehicles on the road is still projected to increase by 7%. However, the average length of private vehicle trips will decrease, and trips made by walking, bicycling and transit will increase considerably. The resulting greenhouse gas emissions should then be 2% lower than 2011 levels by 2031.

HalifACT, approved by Halifax Regional Council in 2020, is the Municipality's new climate plan which supports and complements the *Integrated Mobility Plan* and the *Regional Municipal Planning Strategy* to transition to a low carbon economy in an equitable, sustainable and rapid manner. To meet the Intergovernmental Panel on Climate Change recommendation of limiting global warming to 1.5°C, Halifax needs to reduce its emissions by 75% by 2030 and 100% by 2050 from its 2016 baseline. To succeed, the plan details a multitude of actions for the Municipality and the greater community, many of which are large in scale and aggressive in timeline. The plan not only focuses on reducing emissions but also in preparing and adapting to the impacts of climate change.

Considering infrastructure design from a climate lens is imperative to safeguarding residents and future-proofing our infrastructure and assets against climate impacts. As extreme weather events occur more frequently and with greater impact, it is increasingly important to consider green and resilient infrastructure as key actions for climate adaptation.

1.4 CONSTRUCTION, MATERIALS AND SPECIFICATION

Materials and all construction is to be performed in accordance with the Standard Specifications for Municipal Services, Part II (latest edition) as developed by the Nova Scotia Road Builders Association (NSRBA) and Consulting Engineers Nova Scotia (CENS) Joint Committee on Contract Documents (JCCD), except as modified by the HRM Supplementary Specifications for unit price tenders.

The NSRBA Standard Specifications for Municipal Services, are available at https://www.standardspec.ca/.

HRM's Supplementary Specifications can be found at https://www.halifax.ca/business/doing-business-halifax/procurement/terms-conditions.

2.0 MUNICIPAL STREETS

2.1 DESIGN PROCESS

2.1.1 Complete Streets Checklist

Stemming from the *Integrated Mobility Plan*, a "Complete Streets Checklist" was created to provide guidance through the planning and design process. It is intended to apply to recapitalization of streets, or projects with significant impacts to streets, such as full street rehabilitation, or significant excavation such as for water, wastewater or storm mains. It is not intended to apply to small impacts, such as individual lateral cuts.

A condensed version of the checklist is in Appendix D. A fillable PDF form of this checklist can be found at https://www.halifax.ca/transportation/streets-sidewalks/municipal-design-guidelines-red-book

2.1.2 Multi-Modal Level of Service Framework

Traditionally, streets upgrades have been identified based on a comparison of projected vehicular traffic demand (vehicle volumes) with available street capacity (number of lanes) at key locations such as major streets or intersections. Often, roadway or intersection analysis focuses on the "number of vehicles" or vehicle capacity that can be accommodated in the network rather than on the "number of people" or people moving capacity that can be accommodated in the network. This focus can undervalue the benefits provided by other mobility modes of transportation, most notably transit and active transportation. A car can carry 5-8 people depending on vehicle size, whereas a bus can carry 40-60 people in a similar space, as illustrated in Figure 2.1.1. It also does not explicitly consider how well other modes are, or could be, accommodated more adequately and safely. In addition to moving people, considerations must include goods movement, and emergency access.

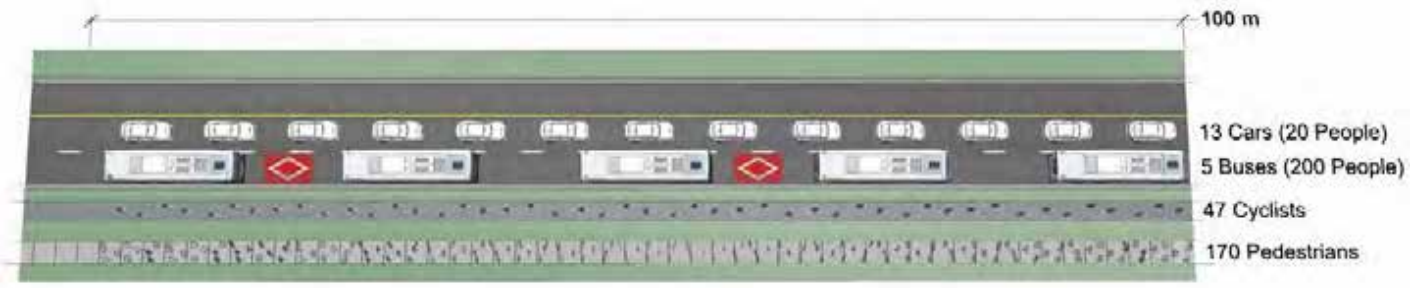

Figure 2.1.1 "People moving capacity" of different modes of transportation

A Multi-Modal Level of Service (MMLOS) is an evaluation tool that determines the degree of service provided to a street for **all modes of transportation**. It is an instrument that allows a municipality to make planning, design, and operations decisions for streets that consider the needs and objectives of all users. A complete MMLOS framework considers:

- The predominant modes of travel found on a street – pedestrians, bicycling, transit, trucks, emergency access/egress and private vehicles

- The three most common scales for mobility studies – networks, corridors, and intersections
- The three most common purposes for mobility studies – planning, design, and operations

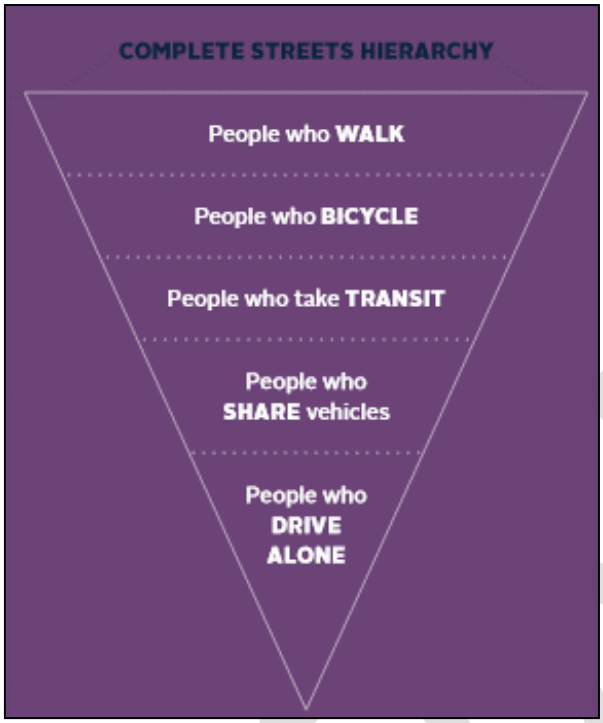

Figure 2.1.2 Complete Streets hierarchy for modes of transportation. Source: Integrated Mobility Plan

Figure 2.1.2 shows the Complete Streets Hierarchy for modes of transportation. Many of these modes overlap. For example, people often walk between destinations and transit stops or parking spots.

The MMLOS Framework, adapted by HRM in March 2019, provides further guidance on conducting MMLOS analysis for mobility projects within the HRM. The guide describes the preferred planning and design process for street corridors, segments, and intersections and HRM's methodology for calculating MMLOS for segments and intersections.

A PDF version of HRM's MMLOS Framework can be found online at https://www.halifax.ca/transportation/streets-sidewalks/municipal-design-guidelines-red-book

2.1.3 Pedestrian Oriented Design

A well-connected pedestrian network is the best practice for pedestrian access in and through neighbourhoods. Walkways and sidewalks can provide important links through communities, and parks and need to be designed appropriately.

Streets shall be designed to minimize pedestrian conflicts. While all streets shall consider pedestrians, Regional Centre streets should be designed with a "Pedestrians First" approach, as adopted in the *Centre Plan*. The "Pedestrians First" approach should also apply to suburban centres and rural centres.

"Pedestrians First" means:

- Narrower vehicle travel ways / shorter pedestrian crossing distances;
- Smaller turn radii;
- Slower design / posted speeds;
- Increased buffer for increasing volume and speed;
- Wider sidewalks for increased pedestrian volumes; and,
- Safer crossing opportunities.

Pedestrian facilities shall be provided to connect destinations, both public and private, including transit stops, shopping, school, and recreation. They should also provide clear sight lines, and sufficient lighting to enhance security.

Further guidance sidewalks and walkways can be found in section 2.4.

2.1.4 All Ages and Abilities (AAA) Bikeways

Bicycling is an ideal mode for short and medium length trips and can provide quick and convenient access to transit services in the region. Planning and design of bikeways for "all ages and abilities" (AAA) aims to enable use by people of all ages and with a variety of physical abilities. By having a connected and safer network of AAA bikeway facilities, bicycling can be a reliable and convenient option of transportation.

The *Integrated Mobility Plan* includes two maps which identify the Proposed All Ages & Abilities Bicycle Network (Figure B-0-1) as well as HRM's Priority Connections for Multi-Use Pathways (Figure B-0-2) within HRM. These routes are intended to connect people to important destinations, such as employment districts, shopping, schools, service centres, transit and other community amenities. This network includes 300+km of walking and bicycling facilities.

AAA bicycle facilities can include protected bicycle lanes, local street bikeways, or multi-use pathways. Considerations include traffic volume and speed, slope, widths, wayfinding signage, and connections to other components of the AT system.

See section 2.4.6 Bicycle Facility Planning and Design for more information on AAA bikeways.

2.1.5 Designing for Transit

Transit provides residents with an affordable, efficient and accessible way to travel in urban and suburban areas and provide connections between rural areas, business parks and the regional centre. Transit service in HRM is influenced by changes to land use, development patterns and street design. Conversely, transit service can shape land use and development.

The *Moving Forward Together Plan*, adopted in 2016, initiated the restructuring of the transit network and guided the implementation of service improvements. It proposed new service types, service guidelines, and performance measures, along with a network redesign.

In 2020 HRM adopted the *Rapid Transit Strategy*; a plan to build a rapid transit system by 2030. The Strategy builds on the vision of the *Integrated Mobility Plan*, aiming to improve sustainable transportation options and better support population growth, and further the goals of *HalifACT*. It proposes investments in high-quality transit service and infrastructure, a key to improving residents' mobility and building more sustainable, affordable, and equitable communities.

(a) In areas within the *Urban Transit Service Boundary*, established in the *Regional Municipal Planning Strategy*, the street network shall facilitate efficient operation of transit services, and designers shall emphasise transit operational needs when planning new street layouts. Designers shall consider the following criteria:

i. Street networks shall be designed to permit two-way transit service on the same street, where appropriate;
ii. Linear corridors are encouraged since an efficient logical transit route is a direct line between two origins / destinations;
iii. Priority winter maintenance operations is afforded to bus routes, therefore appropriate lane widths and snow storage areas are necessary;
iv. Transit corridors running through the middle of a neighbourhood are encouraged to bring service closer to more residents and destinations; and,
v. Transit routes shall be able to continue through adjacent neighbourhoods. Street layouts which would require transit routes to loop back on themselves mid-route are strongly discouraged.

(b) Local street networks within the *Urban Transit Service Boundary* shall also prioritize the convenience, directness and safety of pedestrian and bicycle access to nearby transit stops, Bus Rapid Transit stations and terminals. See section 2.2.5 for further guidance on design and placement of bus stops.

(c) Streets shall be designed to have convenient pedestrian access to nearby transit-served streets and stops.

(d) Construction phasing shall reinforce and maximize transit ridership by giving priority to servicing land uses that have the highest anticipated ridership and ensuring connectivity of transit routes via linear corridors in the earlier phase of development.

(e) Designers shall work with HRM staff during the design process for guidance on accommodating transit service.

2.1.6 Street Classifications

The street classification hierarchy recognizes different street types and their role in accommodating motor vehicle traffic, in addition to other modes of transportation. Local and collector streets are intended for short trips and lead to arterial streets, which facilitate longer-distance travel.

The street classification hierarchy influences jurisdictional priorities related to network operation, maintenance and planning. It also influences the use of and access to land. Street classification is an important planning and design input and needs to be considered in conjunction with transit, active transportation, goods movement and other regional network plans to understand the complete role of each street.

HRM street classifications align with TAC phrasing and are typically classified based on vehicle volume. Depending on the *Integrated Mobility Plan* designation, first or equal consideration may be made for other modes, such as pedestrian, bicycle or transit.

Street Classifications are as follows:

- Arterial
- Major Collector
- Minor Collector
- Local
- Industrial

HRM is working on updating street classifications for new and existing streets to create more diverse design guidelines based on adjacent land use and intended street function in the network for various modes. For example, a local street could have subcategories such as local commercial or local residential street. This will incorporate the Complete Streets approach to allow design to focus on a street's use.

2.2 GEOMETRIC DESIGN FOR STREETS

A Complete Streets lens must be applied at a network level, as street-level solutions alone will result in incomplete communities. More compact and connected street networks tend to have higher levels of people walking and biking and fewer vehicle kms traveled as compared to sparser designs.

In areas designated as "pedestrians first", consideration must be given for how streets can be human scaled. Land Use By-laws can enable construction of human-scaled buildings through such requirements as small setbacks, transparent and active building frontages, and streetwall and tower heights that mitigate wind and shading impacts. These Complete Streets Guidelines will describe how streets too can be human scaled by considering how short blocks and a dense pattern of streets and intersections increase network walkability, how wider streets decrease it, and how street and intersection design can consider on which routes it is necessary to shift priority from single occupancy vehicles to other modes such as transit and active transportation, in order to create complete networks for sustainable modes.

The following guidance is for the design of all streets. It is recognized that these guidelines are most applicable to greenfield and brownfield sites, and that reaching these standards for retrofit situations may be difficult due to limited space. However, these guidelines should be applied to the extent possible for infill and retrofit situations as well. Where there is existing lack of network connection, opportunities may be reviewed to reconnect neighbourhoods and the transportation network to address accessibility, transit connectivity, emergency response, network porosity, active transportation connections, etc.

2.2.1 Network Layout

An objective of the *Integrated Mobility Plan* is to "limit the expansion of the street network and focus any additional investment in street infrastructure on strategic upgrades that support the Municipality's mandate of encouraging a shift toward sustainable transportation modes".

Street layout, design, and control should express and reinforce street function and land uses in accordance with Section 1.3 Design Philosophy.

Street networks should include:

- short blocks;
- direct routes for pedestrians, bicyclists, transit and motorists between each neighbourhood and a mixed-use hub (which would ideally be a focal point for larger new developments);
- direct routes for pedestrians and bicyclists within each neighbourhood;
- sidewalks, bicycle facilities, boulevards and street trees where appropriate;
- a diverse set of street classifications;
- wider sidewalks and additional bicycle facilities on streets leading directly to pedestrian generators (e.g. schools, major transit stops, etc.);
- linkages to the public open space network; and,
- opportunities for streets to be experienced as part of the open space network through recreation, leisure, and social opportunity.

Requirements for street networks can be found below, as well as in the *Regional Subdivision By-Law*.

(a) Street networks must be continuous and create a connected grid network wherever possible. Grid networks provide:
   i. more than one access for emergency vehicles and more than one egress route in the event of an emergency,
   ii. ease of municipal services accessing individual lots, and,
   iii. improved accessibility of the neighbourhood by all modes of transportation, such as improved access to transit stops, and shorter routes for active transportation.

   Streets must be laid out in prolongation of existing streets, either in the same subdivision area or in adjacent subdivision areas. In a phased development, the minimum length of street which will be considered for approval by the Municipality is 150 m.

(b) To provide for future expansion of the HRM street network, an acceptable right-of-way access to adjacent properties must be provided and deeded to HRM in the form of a road reserve. This right-of-way may have to be wider than the typical road cross-section, or include construction easements, to allow for future construction of road without disturbing adjacent land. Road reserves must be located along the property boundary to provide for logical future connections, and shall be designed so as not to encumber adjacent property in terms of factors including but not limited to grade disparities and the location of watercourse and wetlands. The road must be built and graded to include Type 2 gravels, and services (water, wastewater, and stormwater), if required, must be provided to the property line. A guide rail shall then be installed near the entrance of the road reserve.

The subsequent developer of the adjacent property is then responsible for completing the construction of the entire road, including the portion on adjacent property. This includes removal of the guide rail, removal of the temporary bulb or tee (if one exists), installation of the remaining services (wastewater and stormwater mains, water main, curbs, etc.), grading the existing surface, and the installation and completion of the cross section.

(c) Culs-de-sac pose challenges for winter operations and limit access for transit, emergency vehicles and active transportation networks, and are discouraged. Cul de Sacs may be considered when their use avoids:

(i) development on steep slopes,
(ii) fragmentation of environmental corridors,
(iii) natural features,
(iv) when a temporary street layout is required ahead of a future urban expansion,
(v) when developing infill sites that are unable to create a through connection.

(d) In instances where culs-de-sac are deemed acceptable by the Municipal Engineer, the maximum permanent cul-de-sac length shall be 100 m in length, or 150 m where a walkway is located at the end of the cul-de-sac which connects to another street, or 400 m in rural areas, and must include:

(i) turning bulb as per the standard details,
(ii) have a right-of-way deeded to the Municipality,
(iii) and not have islands;

(e) The designer shall follow ecological requirements from Nova Scotia Environment, and shall consider the design of road networks to minimize the impact on the ecological integrity of an area, so as to maintain wildlife habitats, biodiversity and landscape connectivity, in accordance with the HRM Regional Plan and Halifax Green Network Plan.

(f) When designing a road network within the Urban Transit Service Boundary, the designer, working with HRM staff, shall consider current and future transit need and shall submit a proposed layout of bus stop locations for review, even in cases where transit may not be implemented in the near future. Routes and stop locations should use collectors and arterials.

(g) When designing a street network, the designer shall work with HRM staff to include logical extensions of HRM's existing and proposed transit, pedestrian, bicycle, and multi-use pathway networks, in anticipation of current and future needs and shall propose layout as part of the design, for review by staff.

(h) Other than culs-de-sac meeting the requirements of section 2.2.3, any lot in a subdivision shall have two or more independent street accesses to the existing street system, and these accesses shall, at minimum, be located at opposite ends of the subdivision.

(i) Where there is an approved phasing plan and subdivision agreement in place confirming that a second street access will be provided within a specified time approved by the Municipal Engineer, up to 300 lots containing a maximum of 300 dwelling units may be approved prior to the second access being provided.

(j) Where, in the opinion of the Municipal Engineer, it is impractical to provide a second access, up to 100 lots containing a maximum of 100 dwelling units may be approved with a single access.

2.2.2 Sidewalks, Walkways and Multi-Use Pathways

Sidewalks refer to concrete pedestrian pathways alongside roads, while “walkways” refer to pedestrian pathways located between roads, or street-to-street connections.

For walkways, sidewalks, multi-use pathways and other hardscape structures in the right-of-way, the geotechnical report shall recommend the depth and type of material to provide for structural support of the walkway / sidewalk / trail.

If road grades are not considered accessible, separate pedestrian facilities may be required to provide appropriate grades. Sidewalks and walkways shall be located and designed whenever possible so that the grade shall not exceed 4%. Sidewalks and walkways are to be designed such that stairs are not required. On streets where the maximum grade is 6%, the maximum sidewalk or walkway grade is 6%. Wider right-of-way width may be required to accommodate configurations to allow for reduced grades.

(1) Sidewalks

Sidewalks comprise the pedestrian through zone. See section 2.4.6 for further discussion.

(a) Sidewalk widths shall be in accordance with the standard details, including street cross sections. Sidewalks shall have a minimum of 1.5 m clear travel width (pedestrian through zone), that excludes utility poles, sign posts, and other obstructions, to accommodate winter maintenance vehicles and accessibility.

(b) Where space constraints in retrofit situations do not permit the inclusion of a boulevard, and sidewalks must abut the curb, the minimum width of the sidewalk shall be 2.1 m

(c) In locations with curbs, pedestrian ramps shall be installed on both sides of each road at all roadway intersections where there is sidewalk, and at Canada Post community mail box locations.

(d) Pedestrian ramps require tactile walking surface indicators as per standard details.

(e) All concrete shall be placed in accordance with the HRM Supplementary Specifications and may be subject to a Quality Management Plan during cold weather, as directed by the Municipal Engineer.

(f) The substructure of the sidewalk shall be as per directed in the geotechnical report.

(2) Walkways

Selection of locations for walkways shall take into account the requirements for pedestrian circulation for the neighbourhood, and provide convenient connections to nearby destinations. For example, if a walkway ends on a street with a single sidewalk, the sidewalk should be located on the side of the road to meet the walkway. If the layout of the development would

require a walkway to terminate opposite a single sidewalk then a second sidewalk from the walkway to the nearest appropriate roadway intersection shall be required. The following design criteria applies, for the most part, to walkways located between urban roads, or street-to-street connections:

(a) The walkway shall have a minimum right-of-way width of 4.5 m. At the discretion of the Municipal Engineer, additional easement or right-of-way width may be required to facilitate the walkway geometry, grading, lighting, construction and maintenance of Municipal infrastructure. Where the wastewater and stormwater easement is within a walkway, the easement shall be a minimum width of 6.0 m as per Halifax Water guidelines, and the easement shall be granted to Halifax Water prior to the transfer of ownership of the walkway to HRM.

(b) Principles of Crime Prevention Through Environmental Design shall be considered in the design of walkways, such as site lines, lighting, visibility from well-travelled areas, etc.

(c) The travelled portion of a walkway shall be centred within the right-of-way unless approved otherwise and shall have a minimum width of 1.8 m. The clear width of the travelled way plus shoulder shall be minimum 3.0 m wide to accommodate a maintenance vehicle. Shoulders shall be graded appropriately to accommodate service vehicles and shall consider service vehicles when incorporating swales and slopes.

(d) A pedestrian ramp shall be constructed at each end of the walkway where curb and gutter is present. Pedestrian ramps shall be placed at all cross-walk locations.

(e) Where there are no adjacent public uses, each side of a walkway right-of-way shall be fenced. The fence shall be 1.2 m high and material shall be as specified in the Nova Scotia Road Builders Association and Consulting Engineers Nova Scotia Joint Committee on Contract Documents. Also refer to Standard Details in Part

(f) The right-of-way shall be graded to control surface water and major drainage within the right-of-way. Landscaped and sodded swales, catch basins, pipe and drains shall be provided to control erosion and maintain a safe surface. Swales, where required, shall not be located closer than 600 mm from the edge of the travelled portion.

(g) The substructure of the walkway shall be as per directed in the geotechnical report.

(h) Walkways shall be lighted and shall be oriented as to benefit from street lighting where possible. The maximum distance between lights on a walkway shall be 75 m. Lights shall be located to not impede service vehicles.

(3) Multi-Use Pathways

(a) Multi-use pathways including designated active transportation trails shall be in accordance with the details in Part B, and in consultation with the Municipal Engineer and other appropriate Departments of the Municipality.

(b) Trailheads to multi-use pathways with wider access ramps resembling driveways may benefit from the installation of a barrier (e.g. bollard, gate, etc.) to discourage vehicle access. Bollards shall reflect light to enhance their visibility. Removable bollards may be

considered provided their base is flush or lower than street level. See section 3.3.7 for guidance on bollards in the Regional Centre.

(c) Further guidance on multi-use pathways can be found in section 2.2.3 Bicycle Facility Planning and Design.

2.2.3 Bicycle Facility Planning and Design

In order to determine the appropriate type of bicycle facility for a street, it is important to consider how this street functions within the network, for all road users and functions. Candidate networks for bicycle facilities have been identified in municipal priority plans (e.g. *Active Transportation Priorities Plan* and *Integrated Mobility Plan*) and expansion to the network will be considered on an ongoing basis.

Planning and design processes establish what type of bicycle facility should be constructed. The factors that influence selection of the preferred facility type are established in professional planning and design guidelines, such as TAC and NACTO. These decision-making frameworks consider factors such as speed and volume of vehicle traffic. Each street should be considered individually for the most suitable bicycle infrastructure for that street.

(1) Bicycle Facility Types

(a) *Local Street Bikeways* provide designated local street routes for bicyclists that are optimized for convenience, comfort, and connectivity, where motor vehicles and bicycles share the right-of-way. Because local street bikeways generally avoid main or busy roads, way-finding signage and pavement markings are necessary to direct bicyclists and to inform vehicles. These facilities can be considered AAA. Figure 2.2.1 shows an example of a local street bikeway on Vernon Street.

(b) *Painted Bicycle Lanes* do not have any physical barriers between bicyclists and motor vehicles. The buffer can be delineated by painted lanes. The buffer is especially important if the bicycle lane runs alongside designated parking spaces. Figure 2.2.2 shows an example of a painted bike lane on Lower Water Street.

Figure 2.2.1 Local street bikeway on Vernon Street

Figure 2.2.2: Painted bike lane on Lower Water Street

(c) *Protected Bicycle Lanes* are exclusive bicycle facilities that are physically separated from motor vehicle traffic, and distinct from the sidewalk. Methods of separation may include flexible or rigid bollards, planters, rows of parked vehicles, grass or treed median, concrete barriers including curbs, or any other type of physical barrier. A key factor in determining the separation approach is whether the facility is interim (0-3 years) or more permanent. Interim projects would typically feature elements such as planters and bollards. When using curbs and concrete barriers for separation, breaks will be required for driveways, side streets, and access for waste collection. Consideration to emergency vehicle access will be made in the selection of separation types. Existing professional guidelines, such as NACTO, have further detail on the design considerations when using these separation elements.

Protected bicycle lanes can be unidirectional or bidirectional and are an attractive facility to people who would normally be uncomfortable riding on the road in traffic. Important considerations include sufficient width, frequency of driveways and side streets, and traffic volumes. These facilities can be considered AAA. Figures 2.2.3 and 2.2.4 show examples of protected bike lanes in Halifax.

Figure 2.2.3 - Unidirectional bicycle lane on Hollis St

Fig 2.2.4 - Bi-directional bicycle lane on Rainnie Dr

(d) *Multi-Use Pathways* are spaces that are shared by bicyclists and pedestrians. They must be separated from traffic, typically by a boulevard, curb or ditch. They can require bicyclists to travel at lower speeds in order to safely share the space with pedestrians. Safe transitions to the street network must be considered. These facilities can be considered AAA. Figure 2.2.5 shows an example of a multi-use pathway in Halifax.

Figure 2.2.5 - Multi-use pathway on Beaufort Avenue

(e) *Paved Shoulders* are spaces on the side of paved roads, delineated by a painted line, that may be used by bicyclists. Such facilities are typically located in a more rural context and are not considered AAA.

(2) Bicycle Lane Width and Surface Guidelines

(a) An unsettled gutter can create a catching edge and cause a hazard to bicyclists Therefore gutter pans are not included in lane widths for bicycles.

(b) Painted bicycle lanes are recommended to have a width of up to 2.0 m from edge of gutter, minimum width of 1.5 m edge of gutter.

(c) Protected bicycle lanes are recommended to have a curb to curb width of 2.0 m per lane, with minimum of 1.8 m per lane. These widths do not include the gutter pan.

(d) Multi-use pathways have a recommended total travel width of 4.0 m, with minimum of 3.0 m.

(e) Bicycle lanes that are part of the roadway, including all paved shoulders, shall have the same pavement structure as the adjacent lanes. For separate facilities such as trails, refer to the details in Part B.

(f) Cross slopes shall not exceed 2%, however where this is not possible, for short distances the cross slope could be a maximum of 4%.

(g) Stormwater shall completely drain off bicycle lanes to avoid water pooling.

(h) Gutters shall be located out of the travel way and be bicycle friendly.

(3) Midblock Considerations

Midblock considerations for interactions with bicycle lanes include transit stops, accessible parking, loading, and crosswalks. These interactions are most complex for protected bicycle lanes.

(a) There are a number of options for managing interactions where protected bicycle lanes cross transit stops. The options depend on the availability of space for the degree of separation that can be achieved between road users.

  (i) The preferred option where space allows is to direct the bicycle lane behind the transit stop (sometimes called a transit island). Transit islands require transit users to cross the bicycle lane between the shelter and transit stop at marked crossings, where bicycles would yield. Transit islands limit conflicts between bicyclists and loading / unloading transit users. Designers must consider accessibility for pedestrians crossing the bicycle lanes..

  (ii) In constrained situations, bicycle lanes may be transitioned to a raised bicycle lane at transit stops. By having a raised surface, it is easier for transit users to board and alight. The change in elevation, as well as paint and signage, indicates to the bicyclist the oncoming conflict point. Bicyclists are expected to yield to

transit users, however it should be made clear that transit users cannot use the bicycle lane to wait for their bus. An example of this is shown in Figure 2.2.6.

Figure 2.2.6 - Bus stop / raised bicycle lane on South Park St

(c) Accessible parking spaces abutting bicycle lanes shall be located to the nearest access to the sidewalk. This is generally the start / end of a block or near a crosswalk. This provides access to a ramp onto the sidewalk as well as access around barriers that may be in place for a bicycle lane. Where this is not possible, a break in separation shall be considered as well as a ramp to access the sidewalk.

(d) Loading zones must not impede bicycle lanes, and should be located strategically to allow easy access around bicycle lanes and prevent stopping or parking in bicycle lanes. Breaks should be placed to allow access to the sidewalk, as well as ramps.

(e) Mid-block crossings shall provide space on either side of the bicycle lane for pedestrians to evaluate traffic and to increase their visibility to oncoming traffic, and shall provide adequate site lines for all users. A change in elevation of the bicycle lane at crosswalks indicates for bicyclists to use caution and yield, and improves accessibility for pedestrians; otherwise, a ramp is required.

2.2.4 Transit Priority Measures

Transit Priority Measures (TPM) are street infrastructure or other interventions which reduce the impact of traffic congestion for transit vehicles, allowing more efficient and reliable transit service. When TPMs are required, the guidance from this section shall be followed.

Strategic street links on which TPMs will most benefit the transit system are identified *transit priority corridors* (Figure B-0-3, and Figure B-0-4 in Appendix B). Transit priority corridors

include a series of TPMs, with the effect of each one adding up to provide considerable overall service benefits including reduced overall delay and improved reliability. TPMs may require trade-offs on a street including less capacity for private vehicles. Table 2.1 lists four types of TPMs described in this document that are broadly encouraged for use in HRM. This is not intended to be an exclusive list; other types of TPMs may be recommended where appropriate.

The approach to designing a street for transit depends on whether it has been identified as a transit priority corridor:

a) On transit priority corridors, designers shall work with HRM staff to determine appropriate types of TPMs to include in the street design; and,
b) On streets that have or are anticipated to have transit service, but are not transit priority corridors, designers shall include TPMs, especially on congested segments where transit may be delayed.

HRM's Multi-Modal Level of Service Guidelines shall be used to help designers determine appropriate measures to provide the desired level of transit service. See section 2.1.2 for further information on Multi-Modal Level of Service Guidelines.

Table 2.1 Types of Transit Priority Measures

TPM Type	Section	Benefit	Recommended for
Transit priority lane	2.2.4	Allows buses to bypass congestion	Transit priority corridors
Transit signal priority	2.3.3	Reduces bus waiting time at signalized intersections	All signalized intersections on transit priority corridors; signalized intersections with high congestion on other streets
Queue jump lane	2.3.3	Allows buses to bypass traffic queues at intersections	Intersections with high congestion; often used in conjunction with transit signal priority
Turn restriction	2.3.3	Prevents turn-related congestion at intersections	Strategically chosen intersections where turning vehicles present problems for transit operation
Bus bulb	2.3.3	Having transit stop in the live lane, maintains its priority in traffic	Bus stops in urban/suburban areas next to on-street parking

2.2.4.1 Design Considerations for Transit Priority Lanes

A transit priority lane is a portion of a street for the preferential or exclusive use of transit vehicles, sometimes allowing limited use by other vehicles, such as for right-turns.

(a) Transit priority lanes are used as priority access routes for emergency vehicles, and shall be designed and implemented with this understanding.

(b) Transit priority lanes are typically designated for transit use by signs and markings.

(c) Design considerations for transit priority lanes includes:

(i) Signage: Transit priority lanes must be clearly marked with appropriate signage in accordance with the TAC Manual of Uniform Traffic Control Devices.

(ii) Pavement markings: Pavement markings must be used to differentiate the bus lane from adjacent travel lanes or parking/loading areas. Pavement markings shall be in accordance with the TAC Manual of Uniform Traffic Control Devices.

(iii) Physical separation elements: Where transit priority will be provided full time and other vehicles or bicycles do not need to enter or cross the transit priority lane, physical elements can be used to separate the lane from other travel lanes. Separation elements may include vertical curbs, rumble strips, bollards, low concrete domes, or grassed boulevard. Winter maintenance, waste management and emergency vehicle access to adjacent properties must be considered prior to implementation of physically separated transit lanes.

2.2.4.2 Types of Transit Priority Lanes

Transit priority lane types shall be selected based on investigations such as traffic studies and consultation with HRM staff.

(1) *Curbside transit lane*: places buses in the right-most travel lane against the curb. Figure 2.2.7 illustrates the curbside transit lane located on Gottingen Street in Halifax.

(a) Curbside transit lanes should be considered on streets where on-street parking is not essential curbside parking is not necessary. In constrained right-of-ways there may be required trade-offs such as on-street parking or loading. A curbside transit lane can permit different uses, such as parking at times of day or night when transit priority is not needed.
(b) It is recommended to use curbside transit lanes adjacent to wide sidewalks or landscaping elements where right-of-way width exists, to provide lateral separation between buses and pedestrians.
(c) Consideration must be given to whether right-turns will be permitted from curbside transit lanes. If vehicles waiting to make a right-turn (e.g. due to high pedestrian volumes) will regularly hold up buses, right-turn restrictions should be considered (Section 2.2.5.3).
(d) Full-time curbside transit lanes may include some physical separation from the adjacent travel lane.

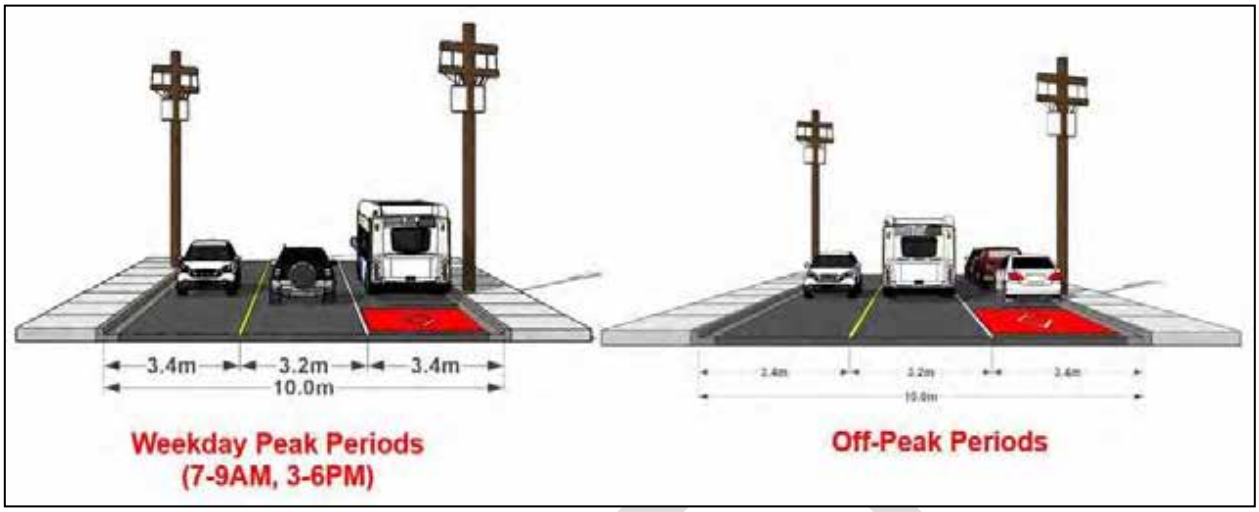

Figure 2.2.7 – Sketch of Gottingen Street curbside transit lane, constructed in 2019.

(2) *Offset transit lane*: places buses in the right-most travel lane, but offset from the curb by on-street parking, curb extensions or raised bicycle lanes. Design of offset transit lanes should consider the following:

(a) Offset transit lanes should be considered on multi-lane streets with other curbside uses such as on-street parking or loading, maintaining space for these uses.
(b) Offset transit lanes should be combined with bus bulbs (Section 2.3.6) to further facilitate transit efficiency.
(c) Since other vehicles may have to cross the transit lane to access the curb, offset lanes cannot generally be physically separated from travel lanes.

(3) *Centre transit lane:* places buses in the centre of the street, to the left of vehicle lanes in the same direction. Design of centre transit lanes should consider the following:

(a) Centre transit lanes should be considered on transit priority corridors where high frequency transit service (such as Bus Rapid Transit) operates, as it eliminates conflicts with curbside uses.
(b) Traffic making left turns from a centre transit lane should not be permitted. Where left turns are required, a dedicated turning lane and signal phase should be used.
(c) Centre transit lanes require boarding islands, dedicated space in the centre of the street for passengers to wait and board buses. Accessible connections between these islands and the sidewalk are required.
(d) Full-time centre transit lanes may include some physical separation from the adjacent travel lane.

2.2.5 Bus Stops

(1) Location of Bus Stops

Bus stops shall be located in accordance with the following:

(a) Within the area served by transit, bus stops will be spaced to ensure that a minimum of 90% of all residences will be within 500 m of at least one bus stop.

(b) Bus stops shall be placed near intersections, adjacent to passenger generators or at popular destinations. Bus stops shall not be closer together than 250 m, except in the Regional Centre or commercial main streets and within major trip generators where closer spacings may be warranted. Stops may be further than 250 metres apart, provided that larger stops spacings still allow the majority of origins and destinations to be within a 500 m walk. In areas of lower density, stops shall be approximately 500 metres apart. Stops shall be sited adjacent to pedestrian infrastructure like sidewalks and crosswalks for accessibility, network connectivity and be well-lit for user comfort and safety.

(c) Bus stops are to be designed such that they meet accessibility standards. This means that a bus pad of 2.5 m must be present which allows for the bus ramp to be deployed and 1.5 m for accessibility devices to complete a turn. Bus pads which are not connected to sidewalk panels must include a pedestrian ramp to the street to allow for navigation by those using mobility devices. See details in Part B for bus stop specific details.

(d) Bus stops cannot be considered accessible if the surrounding network connections are not accessible.

(e) Bus stops which have a high volume or are expected to have a high volume of passengers shall allow additional space for queuing passengers, such that they do not interfere with pedestrian traffic patterns. This may require a larger bus pad, a bus bulb or other designated waiting area for passengers.

(2) Bus Shelters

(a) Shelters may be considered where:

i. there are more than 100 passenger boardings per day;
ii. there are 50-99 boardings per day, and the stop is located adjacent to a destination such as a community centre; or,
iii. environmental conditions warrant a passenger shelter, i.e., the stop is located in a particularly exposed or windy location.

(b) Designers shall work with HRM staff to determine appropriate locations for shelters and if power and/or data should be provided to a shelter.

(c) Shelters shall match HRM standards and minimize variations in an area in order to facilitate maintenance and repair. All transit shelters are to be installed on a concrete pad in accordance with the standard details. The entrance to the shelter shall be installed facing the sidewalk.

(d) If an ad shelter is required, the ad panel is to be installed on the end of the shelter which faces away from oncoming traffic. This allows transit riders to have an unobstructed view

of their bus approaching from within the shelter, and allows the transit operator visibility to those who may be waiting. These shelters require electricity and a local disconnect as per the standard details. Do not place fixed elements within 1.5 m of the face of the ad panel, to allow for the ad panels to open.

2.2.6 Curb Extensions / Bump-Outs

Curb extensions, or bump-outs, visually and physically narrow the roadway in a localized area. They increase the safety of pedestrian-vehicle conflict areas by providing shorter crossing distances for pedestrians, making pedestrians more visible to drivers, and act as traffic calming by encouraging more cautious driving and slower vehicle speeds.

Curb extensions may be used to mark the gateway of a special district, or to align a bus stop with a parking lane. They may also be considered to provide room for street furniture, and to enhance opportunities for sidewalk patios. Planting street trees in extensions further narrows the perceived width of the street, increasing traffic calming.

(a) Curb extensions can be installed at intersection corners or mid-block. Curb extensions are designed based on street context and street classification. Use of curb extensions shall be determined during the function design stage, through consultation with HRM staff.

(b) Curb extensions shall be designed such that design vehicles can navigate narrowed intersections with adequate site lines.

(c) Use of street trees, planting and street furniture in curb extensions shall not impede visibility of pedestrians or signage.

(d) Design considerations of curb extensions shall include, but not limited to, street drainage, cross slope of street and widened sidewalk, remaining lane turning width, and turning templates for design vehicles.

2.2.7 Design Speed

The applicable design speed shall be in accordance with Table 2.2.

2.2.8 Vertical Alignment

(a) The minimum and maximum grades shall be in accordance with Table 2.2.

(b) The minimum centre-line grade of any street shall not be less than 0.5 percent. The minimum centre-line grade on a cul-de-sac shall be such as to provide a minimum curb or ditch grade of 0.5 percent.

(c) The grade of a minor road at an intersection shall match the cross section of the major street at that point. The grade shall continue for a minimum of 20 m from the intersection and shall not exceed 4 percent. This distance will be measured along the centre-line of the intersecting street, from where the centre-line intersects with edge of the travelled way of the major street.

(d) The grade of a cross slope shall 2 percent for accessibility of pedestrian crossing, with a maximum allowable grade of 4 percent throughout.

(e) The maximum centre-line grade of cul-de-sac bulbs shall not exceed 6 percent.

(f) Cul-de-sac shall be graded to drain from the centre to the curb or ditch.

(g) Curb elevations at intersections, critical grade locations, and bulbs of cul-de-sac shall be shown on drawings at a minimum 3 m spacing.

(h) Road reserves shall be graded to provide for logical connections, so as not to encumber adjacent property and future connections. Grade of proposed streets shall transition to road reserve at a maximum of 8 percent back to existing ground / natural topography.

(i) Minimum K values for vertical curves shall be in accordance with Table 2.3.

(j) For non-illuminated roadway conditions, headlight control values must be used for sag vertical curves. Refer to TAC Geometric Design Guide for further guidance.

(k) For illuminated conditions, comfort control values may be used where there is adequate street lighting to better match design grades with existing grades.

Table 2.2 Geometric Design Parameters for Streets

Parameter	Local [1]	Local 50	Local Industrial	Minor Collector	Major Collector	Arterial
Speed (km/h)	30-50	30-50	30-50	50-60	50-60	50-80
Min. Grade	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
Max Grade	8%[2]	8%[2]	8%	6%	6%	6%
Min. ℄ Curve Radius	20 m	100 m	100 m	see TAC	see TAC	see TAC
Stopping Sight Distance Requirements	45 m	65 m	65 m	TSD	TSD	TSD

TAC Transportation Association of Canada Geometric Design Guide for Canadian Roads

TSD Turning Sight Distance

(1) Local culs-de-sac, p-loops, or crescents which are less than 400 m in length.

(2) Steeper grades may be considered under exceptional circumstances and where transit and/or destination access is not needed or anticipated, and where not on a bicycle route. In these cases, alternative reasonable accessible sidewalk connection / pedestrian route must be demonstrated.

Table 2.3 Minimum K Factors to Provide Stopping Sight Distances on Vertical Curves

Design Speed (km/h)	Crest Vertical Curves	Sag Vertical Curves	
	Rate of Vertical Curvature (K)	Rate of Vertical Curvature (K)	
		Headlight	Comfort
30	2	4	2

40	4	7	4
50	7	12	6
60	13	18	9
70	23	25	12
80	36	32	16
90	see TAC	see TAC	see TAC
100	see TAC	see TAC	see TAC
110	see TAC	see TAC	see TAC

2.2.9 Super Elevation

Super elevation encourages speed and may be hazardous to large vehicles, and is not encouraged in HRM. Local streets generally shall not be superelevated unless there are safety or drainage concerns. Where superelevation is used it shall be carried out in accordance with the TAC Geometric Design Guide. The maximum superelevation rate is 0.04 m/m.

2.2.10 Horizontal Alignment

(a) The minimum curve radius to be used for collectors and arterials will be directly related to the design speed and shall be in accordance with the TAC Geometric Design Guide.

(b) The minimum centre-line curve radius shall be in accordance with Table 2.6.

(c) Tangent distances between horizontal reverse curves shall not be less than 20 m.

(d) Tangent distances between horizontal curves turning the same way shall not be less than 40 m.

2.3 INTERSECTIONS

Intersections shall be carefully designed to consider all modes of transportation, aiming to maximize safety and minimize the delay of moving people. Different treatments are appropriate for different intersections, and the design of a given intersection shall be considered in the context of the broader street network, vehicle flow, transit volumes and headways, pedestrian and bicycle volumes, collision history, and block length.

Intersections are major points of conflict for roadway users and have a significant impact on the mobility of pedestrians and bicyclists. The speed and ease with which users can move through an intersection is affected by signal timing, lane configuration, width of the traveled way, intersection design, streetscaping features, traffic volumes, and other factors.

The Multi-modal Level of Service Guide (see section 2.1.2) shall be used to assess the level of service for different modes as appropriate for each intersection.

Intersection design shall consider the following principles:

(a) Safety first: Intersections are where the most points of conflict occur between different street users. The design of intersections should first ensure safer crossing for the most vulnerable users.

(b) Predictability: Crossing movements and the correct path of permitted movements should be predictable. Simplify complex intersections where possible.
(c) Visibility: Ensure unobstructed sightlines among road users at intersections.
(d) Multi-modal: Analyze capacity from a multi-modal perspective, focusing on movement of people, rather than vehicles, including pedestrians, bicycles and transit and goods, depending on the street context.
(e) Accessibility: Incorporate accessible design at intersections, such as tactile walking surface indicators, curb ramps or depressed curbs, accessible pedestrian signals, walk speeds at crossings for all ages and abilities, and access to transit stops, etc.
(f) Compact design and shorter crossings: Compact intersections tend to lower vehicle speeds and minimize pedestrian crossing distances.
(g) Placemaking: Depending on street context, an intersection can be repurposed to enhance quality of life with greening, street furniture, or public art, and can define the entrance to unique neighbourhoods.
(h) Maintenance and operations: Include considerations of snow removal and stormwater management, and management of assets such as curbs and street furniture.

2.3.1 Intersection Design Controls

(a) The maximum number of street approaches to any intersection shall be four.

(b) Intersections shall align wherever possible. Offset intersections will not be accepted.

(c) The minimum and maximum centre-line distance between intersections shall be in accordance with Table 2.4 and shall be laid out in such a manner as to not prejudice development of adjacent land.

Table 2.4 Minimum and Maximum Centre-line Distance Between Intersection

Intersections on this Road Class:	Minimum distance between intersections (m)*, **	Maximum distance between intersections (m)
Arterial	500	
Major Collector	150	500
Minor Collector	75	500
Local	60	500

*For speeds of 50 km/h and a cycle length of 60s. As speeds increase, the optimal intersection spacing increases proportionately. These same parameters can also be reduced for target speeds below 50km/hr, which may be considered in pedestrian oriented environments.

**Reductions in minimum distances may be considered for roundabouts in higher order roads.

(d) The minimum curb and edge of pavement radius for roads shall be in accordance with Table 2.5. Radii should be reduced where possible to reduce pedestrian crossing time and distance, and reduce the speed of turning vehicles. Radii should be designed in context, considering volume of users, and actual radius versus effective radius. Radii should be designed considering both design vehicles, which are to be accommodated regularly, and control vehicles, which are infrequent and may encroach into opposing traffic lanes. Design vehicles should be selected depending on the surrounding land uses and consider transit.

(e) Intersections shall be designed to allow emergency vehicles to turn between curb lines.

(f) Street line cut-back for right-of-way shall be calculated based on selected curb radii and sidewalk placement. At intersections the street line cut-back shall be measured from the extended street line intersection point (see detail in Part B).

(g) The angle subtended by the centre-line of intersecting streets shall be between 70 and 110 degrees.

(h) The centre-line shall be a straight line for a minimum of 10 m measured from and along the intersection of the centre-line of the approach street and the edge of the shoulder/curb of the street to which it is connecting.

Table 2.5 Radii at Intersections

Intersection Type	Curb and Edge of Pavement Radii *
Residential Local at Residential Local	5.0 m – 7.5m
Residential Local or Residential Minor Collector at Residential Minor Collector	5.0 m – 7.5m
Commercial Local / Commercial Local	7.0 m
Commercial Minor Collector at Commercial Minor Collector	10.0 m
Industrial Local / Industrial Local or Industrial Collector / Industrial Collector	5.0 m – 15.0 m simple radius, but must accommodate truck turning functions well, 3-centred curve permitted
Major Collector / Major Collector or Arterial / Arterial	5.0 m – 15.0 m simple radius, but must accommodate truck turning functions well, 3-centred curve permitted

*Additional design checks may be required based on intersection angle, design vehicle, and other factors to confirm appropriate radii.

2.3.1.1 Stopping and Intersection Sight Distance

(a) Minimum stopping sight distance as defined by the TAC Geometric Design Guide shall be provided for all driveways on all streets by designing in accordance with Table 2.2.

(b) Minimum stopping sight distance shall also be provided at intersections in accordance with TAC Geometric Design Guide.

(c) Minimum turning sight distance shall be as defined by the TAC Geometric Design Guide.

2.3.1.2 Roundabouts

A roundabout is a circular intersection where traffic goes one way in a counter-clockwise direction and vehicles yield upon entry. A roundabout provides another option for a controlled intersection, that is, instead of stop signs or traffic signals. Roundabouts can also provide opportunities for traffic calming and speed transition within neighborhoods.

(a) Roundabouts are to be designed in accordance with the latest edition of the TAC Canadian Roundabout Design Guide.

(b) The centre island can be landscaped using such treatments as trees, shrubs, flower beds, public art, etc. Landscaped features shall not encourage pedestrians to explore the centre island as this would create safety and operational issues.

(c) Roundabouts may not be appropriate for all situations. Roundabouts are best suited for applications such as:
- (i) Intersections where traffic flow is fairly even across all legs
- (ii) High speed intersections
- (iii) Intersections with high collision rates
- (iv) Intersections with high delays
- (v) Intersections with high left turn movements
- (vi) Intersections with unusual geometry
- (vii) Intersections that serve as gateways to communities

(d) Rectangular Rapid Flashing Beacons (RRFB) are required at crossings for multi-lane roundabouts to improve crossing safety. For single lane roundabouts, RRFB's may be considered, depending on site-specific factors including location, traffic volume, and speed.

(e) Roundabouts shall not be used on significant grades.

(f) Wider circulating lane width or truck aprons need to be considered where transit vehicles, large trucks and emergency vehicles will frequently use the roundabout. Transit and emergency vehicles should fit within the asphalt, while large trucks may use a truck apron.

(g) For urban roundabouts, buses and emergency vehicles shall be used as the design vehicle, and trucks shall be used as the control vehicle.

2.3.2 Intersection Design for Pedestrians

As the most vulnerable users, the safety and convenience of pedestrians must always be considered in intersection design, and should be assigned priority in the context of pedestrian oriented land uses, where appropriate. Depending on the street context, pedestrian-oriented design should consider:

(a) Lower motor vehicle speeds, using design controls.
(b) Reduced exposure to risk and conflicts, with clear visibility, shorter crossing distances, and adequate crossing time.
(c) Accessibility using curb ramps or depressed curbs, tactile walking surface indicators, accessible pedestrian signals, and sufficient walk time for all ages and abilities
(d) Adequate sidewalk and crosswalk widths given pedestrian volumes and the street context.
(e) Signalized crossing opportunities.

Pedestrian crossings at intersections should be designed considering “desire lines”, so that crosswalks align with the path of travel pedestrians are most likely to take.

2.3.3 Intersection Design for Bicycle Facilities

This section should be read in conjunction with section 2.1.4 – All Ages and Abilities (AAA) Bikeways, and section 2.2.3 – Bicycle Facility Planning and Design.

At all intersections, pavement markings, signage and signals provide direction to all users for path of travel and right-of-way priority. A bicycle is considered a motor vehicle in Nova Scotia Traffic Safety Act. Bicyclists should have the same or better right-of-way priority as other vehicles travelling parallel. Intersection design contributes significantly to the overall quality and safety of a bicycle facility. Priorities for bicyclist design in intersections include:

- Minimizing exposure to conflicts;
- Reducing speeds at conflict points;
- Identifying and communicating right-of-way priority;
- Providing adequate sight distance; and,
- Infrastructure to support bicycle operation, such as bicycle signals, bicycle boxes, etc.

(a) Design of intersections that connect bicycle facilities will depend on the type of bicycle facility. For example, a protected bicycle lane should incorporate as much protection as possible at the intersection. Painted bicycle lanes may not require protection at the intersection. Multi-use pathways and local street bikeways have intersection options that are specific to these facility-types.

(b) Where a high volume of vehicles, bicyclists, or pedestrians is expected or observed, separate designated crossing areas may be required.

(c) Bicyclists must remain visible to other vehicles through an intersection.

2.3.3.1 Elements of Protected Bikeway Intersections

The following elements in combination are used in protected bikeway intersection design. These may be used in different combinations depending on the facility type, intersection configuration and available area. Figure 2.3.1 illustrates the elements of a protected bikeway intersection.

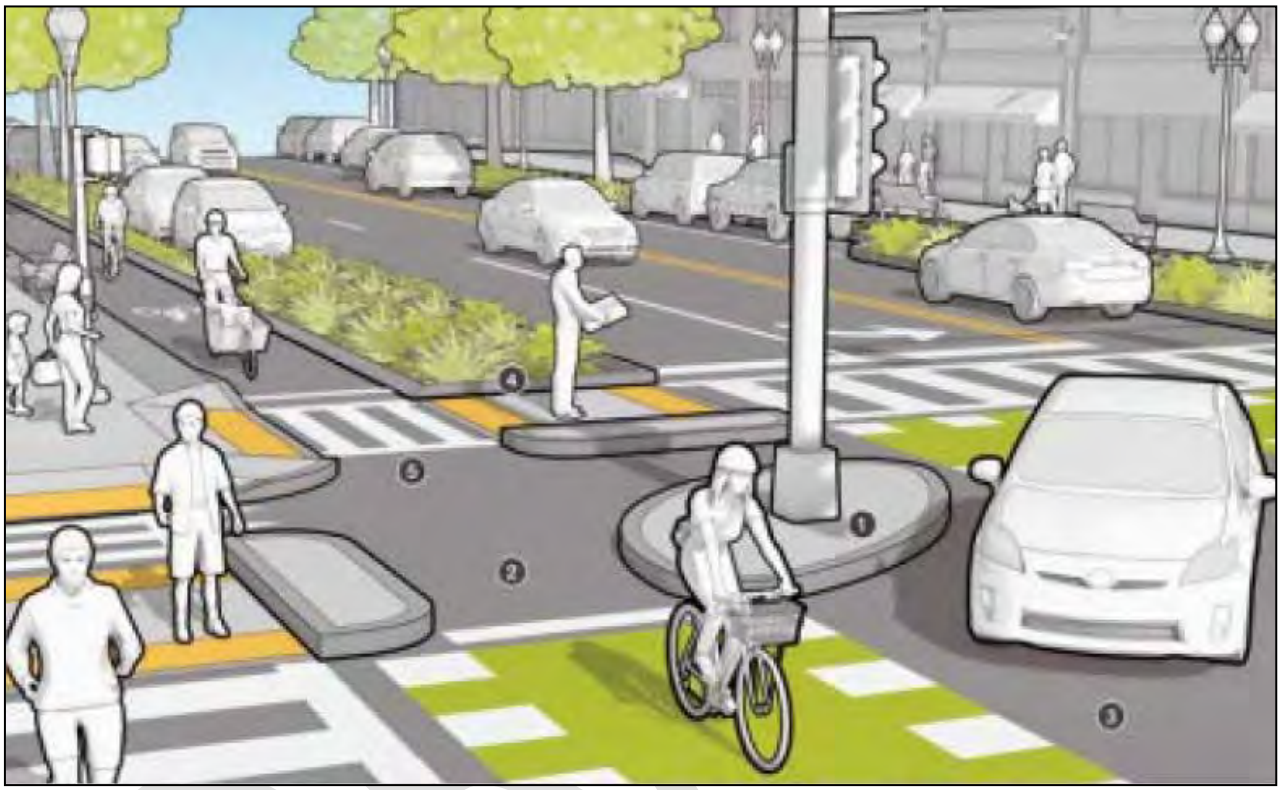

Figure 2.3.1- Protected Bikeway Intersection (Source: MassDOT)

(1) *Corner Refuge Island:* allows the bicycle lane to be physically separated up to the intersection crossing point. Protects bicyclists from right turning vehicles.

(2) *Forward Bicycle Queuing Area (Bike Box)*: provides space for stopped bicyclists in front of vehicles, within view of vehicles waiting at the stop bar. They shall be 2 m in length and minimum 2 m in width.

(3) *Yield Zone*: provides space for yielding during turns.

(4) *Pedestrian Crossing Refuge Island*: space between the street and separated bicycle lane where pedestrians can queue.

(5) *Pedestrian Crossing of Bicycle Lane*: provides indication of preferred crossing location to pedestrians and provides indication to bicyclists that pedestrians have the right-of-way.

(6) *Two-Stage Turn Queue Box (not pictured)*: should be considered where protected bicycle lanes continue up to an intersection. Provides a designated space for bicyclists to wait while performing a two-stage turn across a street. They shall be minimum 2 m deep, with width depending on bicycling volumes. Right turns on red must be restricted for vehicles.

2.3.4 Intersection Design for Transit Priority

This section should be read in conjunction with section 2.1.5 – Designing for Transit, and section 2.2.4 – Transit Priority Measures.

Transit priority measures at intersections may include but are not limited to:

(1) *Queue jump lanes* are short dedicated transit facilities leading up to intersections, allowing buses to enter traffic flow on the opposite side of the intersection at the head of the queue. They can reduce transit delay at intersections.

Queue jump lanes are most effective when combined with transit signal priority to allow buses to cross the intersection and re-enter the travel lane before other vehicles.

Queue jump lanes can be combined with right-turn lanes on intersection approaches without regularly occurring right-turn queues.

(2) *Turn restrictions* are prohibitions on vehicles from making right or left-turns at an intersection. Turn restrictions can be used strategically to improve transit performance by limiting delay due to slow turning vehicles, while also reducing conflict points that can improve pedestrian and bicycle safety.

(3) *Transit signal priority at intersections* is technology based on communication between transit vehicles and intersection signal controllers can be used to provide transit signal priority at intersections, reducing transit delay.

Transit signal priority can be used alone or in conjunction with physical infrastructure measures such as transit priority lanes (Section 2.2.4) to provide more reliable transit service on a street.

2.4 CROSS SECTION ELEMENTS

2.4.1 Right-of-Way

It is important to consider context of a street when re-allocating space for today's design needs. Due to the historic design of many streets within the Regional Centre, space can be limited, compared to more spacious right-of-way available outside the city core.

The cross sections for street classifications in Part B show a range of values for each element of the right-of-way. These are provided in order to ensure that the right-of-way is used to its full potential.

(a) Narrow lanes and roads are desirable, and wider dimensions for lanes are the exception rather than the defaults. Narrowing of travel lanes should be designed considering safety, capacity, and winter maintenance requirements to reduce the amount of asphalt surface, to reduce the pedestrian crossing distance, and to dedicate right-of-way allowance for other elements. It is expected that the engineer of record will use their design expertise to fit elements that meet the desired needs as best as possible.

(b) With the exception of lane widths, the use of minimums for right-of-way elements will be considered for retrofit situations when striving to fit an element in the right-of-way that wasn't originally planned, but is now required to advance the goals of a municipally approved plan (e.g. *Integrated Mobility Plan*, *Active Transportation Priorities Plan, Rapid Transit Strategy*, or *Moving Forward Together Plan*).

(c) Allowable minimums for individual cross section elements are provided to allow for give-and-take of the combined elements in retrofit situations. Avoid combining the use of minimums wherever possible. Minimum values for multiple or all elements of the cross sections will only be considered in extremely constrained areas and for short distances where possible.

(d) HRM will typically seek the full standard right-of-way width, regardless of the accepted width of individual cross-section elements, particularly in green field development.

(e) Additional travel lanes and turning lanes beyond what is shown in the cross sections in Part B may be warranted based on a Traffic Impact Assessment.

(f) Bicycle infrastructure may be required on any street type listed below, in coordination or continuation of the networks identified on the Proposed All Ages & Abilities Bicycle Network (Figure B-1) as well as HRM's Priority Connections for Multi-Use Pathways (Figure B-2).

(g) In retrofit situations, compromises may be required for boulevard width, snow storage, parking, bike infrastructure, etc., and engineering judgement and safety must be taken as high priorities when these compromises are needed.

(h) If required the Municipal Engineer shall make the decision on the final cross section design.

Street rights-of-way for various street typologies are presented in Table 2.8. The Municipality may require a greater width of right-of-way to facilitate vehicles, transit, active transportation, green space, construction and/or maintenance requirements.

Table 2.8 Street Rights-of-Way

Street Typologies	Right-of-Way
Regional Centre Residential - Local	17 m
Regional Centre Residential - Minor Collector	22 m
Regional Centre Residential - Major Collector	25 m
Regional Centre Commercial / Mixed-Use - Local	28.5 m

Regional Centre Commercial / Mixed-Use - Minor Collector	29.5
Regional Centre Commercial / Mixed-Use - Major Collector	28 m
Regional Centre Commercial / Mixed-Use - Arterial	30 m
Suburban - Minor Collector	23 m
Suburban - Major Collector	27 m
Suburban - Arterial	27 m
Rural - Local	25.5 m
Rural - Minor Collector	26.5 m
Rural - Major Collector	30.5 m
Rural - Arterial	36.5 m
Industrial - Local	20 m
Industrial - Minor Collector	23 m
Industrial - Major Collector	27 m
Industrial - Arterial	27.5 m

2.4.2 Right-of-Way Allocation by Street Type

This section highlights cross section requirements for each street type and should be used with the details in Part B. Refer to relevant sub-sections in this chapter for further guidance on individual elements.

2.4.2.1 Streets in the Regional Centre

While all streets must be designed with the safety and convenience of pedestrians in mind, Regional Centre streets should be designed with a “Pedestrians First” approach, as adopted in the *Centre Plan*.

Generally, these streets already exist within the network but may be subject to retrofit design. Depending on the goals of a retrofit project, and the space available, trade-offs are often required. For example, if a protected bicycle lane is needed on an existing street, a reduction in boulevard width or parking may be required.

(1) Regional Centre Residential Streets

Regional Centre Residential Streets are located within the Regional Centre and feature low density or multi-unit dwellings with little to no commercial uses.

(a) Regional Centre Residential Local:

Regional Centre residential local streets are typically two-way local roads consisting of a wide, “shared” lane with no painted centre-line. Local roads in residential neighborhoods typically have low vehicular volume and speed.

On-street parking is typically permitted on at least one side of local streets. With parking on one or both sides, these are intended to function as “yield streets”. This means the shared lane is wide enough to accommodate both vehicle directions but narrow enough that they must slow down before passing each other. If one or both vehicles passing is larger than a standard passenger car, one vehicle will need to yield to let the other pass. Periodic opportunities for passing should be provided, such as at driveways, or by occasionally restricting curbside use, approximately every 50m.

In most cases, the boulevard is grassed and should be wide enough to provide adequate soil volume for street trees. The sidewalk is a minimum of 1.5 m wide, but based on available space and expected pedestrian volumes from connecting areas could be up to 1.8 m wide. Any remaining space available between the sidewalk and abutting property is the frontage zone, up to 0.5 m wide. Some existing streets of this type have no sidewalks. A retrofit of these streets would seek to add a minimum of 1.5 m sidewalk on one side, where possible.

(b) Regional Centre Residential Minor Collector:

Regional Centre residential minor collectors may have parking on one or both sides, or parking may be permitted in off-peak hours. Where turn lanes are required, they should be formed by removing curbside uses in the area.

In most cases, the boulevard is grassed and should be wide enough to provide adequate soil volume for street trees. The sidewalk is a minimum of 1.5 m wide but based on available space and expected pedestrian volumes could be up to 1.8 m wide. Any remaining space available between the sidewalk and abutters is the frontage zone, up to 0.5 m wide.

(c) Regional Centre Residential Major Collector:

Regional Centre residential major collectors may have frequent bus and truck traffic. Parking may be on one or both sides, or may be permitted in off-peak hours. Where turn lanes are required, they should be formed by removing curbside use / parking in that area.

In most cases, the boulevard is grassed and should be wide enough to provide adequate soil volume for street trees. The sidewalk is a minimum of 1.5 m wide, 1.8 m preferred, but based on available space and expected pedestrian volumes could be up to 2.1 m wide. Any remaining space available between the sidewalk and abutters is the frontage zone, up to 0.5 m wide.

(2) Regional Centre Commercial / Mixed Use Streets

Regional Centre commercial / mixed use streets are located within the Regional Centre and feature low-density or multi-unit dwellings mixed with commercial uses, or primarily commercial use with little to no residential dwellings. Generally, these streets already exist within the street network and are subject to retrofit design. Increases to frontage zones should be considered where sidewalk cafes and patios are expected. For all Regional Centre Commercial / Mixed Use

streets, the frontage zone may be up to 3.0 m wide to allow for sidewalk patios and signage for businesses.

(a) Regional Centre Commercial / Mixed Use Local:

The travelled way for Regional Centre commercial / mixed use local streets will need to accommodate trucks for delivery. These streets may have a designated parking lane on one or both sides for loading and on-street parking.

The boulevard will typically be hard surfaced and feature furniture and street trees, but may be grassed and feature street trees. See Chapter 3.0 – Streetscape Elements for more guidance on furnishings and finishes in the boulevard. The sidewalk is a minimum of 1.5 m wide, and based on available space and expected pedestrian volumes, could be up to 2.1 m wide.

(b) Regional Centre Commercial / Mixed Use Minor Collector:

Regional Centre commercial / mixed use minor collectors may have transit and truck traffic. These streets may have a designated parking lane on one or both sides for loading zones and on-street parking. Where turn lanes are required, they should be formed by removing curbside use / parking in that area. Where curbside bus lanes are present, these curbside uses may be restricted.

The boulevard will typically be hard surfaced and feature furniture and street trees, but may be grassed and feature street trees. See Chapter 3.0 – Streetscape Elements for more guidance. The sidewalk is a minimum of 1.8 m wide, but based on available space and expected pedestrian volumes, could be up to 2.1 m wide.

(c) Regional Centre Commercial / Mixed Use Major Collector:

Regional Centre commercial / mixed use major collectors frequently have transit and truck traffic, and so have larger minimum lane widths. These streets may have two to four travel lanes, based on available area and/or as determined by a Traffic Impact Assessment. These streets may have a designated parking lane on one or both sides for loading zones and on-street parking. Where turn lanes are required, they should be formed by removing parking or loading in that area. Where curbside bus lanes are present, these curbside uses may be restricted.

The boulevard will typically be hard surfaced and feature furniture and street trees, but may be grassed and feature street trees. See Chapter 3.0 – Streetscape Elements for more guidance on boulevard furnishings. The sidewalk is a minimum of 1.8 m wide but based on available space and expected pedestrian volumes could be up to 2.1 m wide.

(d) Regional Centre Commercial / Mixed Use Arterial:

Regional Centre commercial / mixed use arterial streets have frequent bus and truck traffic, and so have larger minimum lane widths. These streets may have two to four travel lanes, as

determined by a Traffic Impact Study. These streets may have a median to control access, which will be grassed with street trees. These streets may have a designated parking lane on one or both sides to support curbside uses. Turning lanes, where required, may be formed by reducing the median width, or may be in addition to the median. Where curbside bus lanes are present, these curbside uses may be restricted.

The boulevard will typically be hard surfaced and feature furniture and street trees, but may be grassed and feature street trees. See Chapter 3.0 – Streetscape Elements for more guidance. The sidewalk is a minimum of 1.8 m wide but based on available space and expected pedestrian volumes could be up to 2.1 m wide.

2.4.2.2 Suburban Streets

Suburban streets are located outside the Regional Centre. While new streets in HRM are often suburban, HRM has a significant network of existing suburban streets, which would be subject to retrofits. They include both new designs and are typically new designs but are sometimes subject to retrofit. For all suburban streets, the frontage zone should be 0.5 m wide.

(1) Suburban Local: Suburban local streets are typically two-way local roads consisting of a wide, “shared” lane with no painted centre-line. Local roads in residential neighborhoods typically have low vehicular volume and speed.

On-street parking is typically permitted on at least one side of local streets. With parking on one or both sides, these are intended to function as “yield streets”. This means the shared lane is wide enough to accommodate both vehicle directions but narrow enough that they must slow down before passing each other. If one or both vehicles passing is larger than a standard passenger car, one vehicle will need to yield to let the other pass. Periodic opportunities for passing should be provided, such as at driveways, or by occasionally restricting curbside use, approximately every 50m.

In most cases, the boulevard is grassed and should be wide enough to provide adequate soil volume for street trees. The sidewalk is a minimum of 1.5 m wide, but based on available space and expected pedestrian volumes from connecting areas could be up to 1.8 m wide. Any remaining space available between the sidewalk and abutting property is the frontage zone, up to 0.5 m wide. Some existing streets of this type have no sidewalks. A retrofit of these streets would seek to add a minimum of 1.5 m sidewalk on one side, where possible.

Localized widening of the frontage zone may be required where community mailboxes are required.

(2) Suburban Minor Collector: Suburban minor collectors are typically residential streets. They may allow for parking on one or both sides of the street. Where turn lanes are required, they should be formed by removing curbside use / parking in that area. In most cases, the boulevard is grassed and should be wide enough to provide adequate soil volume for street trees. The sidewalk is a minimum of 1.5 m wide but based on expected pedestrian volumes

could be up to 1.8 m wide. It would be acceptable to have sidewalk on one side and a multi-use pathway on the other.

(3) Suburban Major Collector: Suburban major collectors have transit and truck traffic, and so have wider lane widths. These streets may have limited on-street parking. Turning lanes are to be included where required. The boulevard will be grassed and wide enough to provide adequate soil volume for street trees. The sidewalk is a minimum of 1.5 m wide but based on expected pedestrian volumes could be up to 1.8 m wide. It would be acceptable to have sidewalk on one side and a multi-use pathway on the other.

(4) Suburban Arterial: Suburban arterial streets must accommodate transit and truck traffic, and so have wider lanes. This street may have a median for controlled access. Parking is restricted on this street type. Turning lanes, where required, may be formed by reducing the median width, or may be in addition to the median. The boulevard will be grassed and wide enough to provide adequate soil volume for street trees. The sidewalk is a minimum of 1.5 m wide but based on expected pedestrian volumes could be up to 1.8 m wide. It would be acceptable to have sidewalk on one side and a multi-use pathway on the other.

2.4.2.3 Rural Streets

While not typical to rural cross sections, sidewalks may be appropriate in “rural village” settings. HRM staff are working to develop a “rural village street typology” for the next update to these guidelines.

(1) Rural Local: Rural local streets are typically residential streets. They shall consist of two lanes, with gravel shoulders.

(2) Rural Minor Collector: For rural minor collectors, turning lanes are to be included as required by a traffic impact assessment. A multi-use pathway is required, which is typically located outside the ditch.

(3) Rural Major Collector: For rural major collectors turning lanes are to be included as required by a traffic impact assessment. A multi-use pathway is required, which is typically located outside the ditch.

(4) Rural Arterial: Rural arterial streets may have additional travel lanes or turning lanes if warranted by a traffic impact assessment. A multi-use pathway is required, which is typically located outside the ditch.

This street may require medians if controlled access is necessary. If a median is present, turning lanes can be formed by reducing the median width in that area. Medians shall be depressed vegetated swales and shall include trees.

2.4.2.4 Industrial Streets

Streets located in industrial areas accommodate frequent truck traffic and sometimes transit, and therefore require wider lanes and radii to accommodate specific design vehicles based on use, e.g., oversized loads. Industrial uses often generate pedestrians, and therefore require sidewalks for pedestrian connectivity.

For all Industrial street types, the boulevard shall be grassed and wide enough to provide adequate soil volume for street trees. A multi-use pathway may be used in lieu of a sidewalk to accommodate active transportation.

(1) Industrial Local: A large proportion of the traffic on an industrial local street will be truck traffic. Sidewalks should be provided on one side at minimum, or both to provide connections for pedestrians to destinations or bus stops.

(2) Industrial Minor Collector: A large proportion of the traffic on an industrial minor collector will be truck traffic, and sometimes transit. Turning lanes are to be included as required. Sidewalks should be provided on one side at minimum, or both to provide connections for pedestrians to destinations or bus stops.

(3) Industrial Major Collector: Industrial major collectors must accommodate frequent truck traffic, and sometimes transit. Parking is restricted on this street type. Additional travel lanes or turning lanes may be required as warranted by a Traffic Impact Assessment. Sidewalks shall be provided on both sides.

(4) Industrial Arterial: Industrial arterials must accommodate frequent truck traffic, and transit. Parking is restricted on this street type. Industrial arterial streets may have additional travel lanes or turning lanes as warranted by a Traffic Impact Assessment.

This street may require medians if controlled access is necessary. If a median is present, turning lanes can be formed by reducing the median width in that area. Medians should be vegetated and include trees. Left turns from driveways may be limited in this area due to the frequency of larger and slow-moving vehicles. Sidewalks shall be provided on both sides.

2.4.3 Lane Width

(a) The lane widths for locals, collectors and arterials shall be in accordance with the details in Part B. Lane widths adjacent to concrete curb and gutter shall be measured from the edge of gutter.

(b) Narrow lanes and roads are desirable, and the wider dimensions within any ranges available are the exceptions rather than the defaults, to be used to accommodate uses as required.

(c) The minimum parking lane width shall be 2.4 m from face of curb. Parking lane widths include gutter pan, if present. If there is no gutter, minimum parking lane width shall be 2.4 m measured from face of curb. The decision on the street category and the parking allowances rests with the Municipal Engineer.

(d) The minimum lane width for lanes carrying transit and on truck routes is 3.3 m, not including gutter.

2.4.4 Shoulders (Roads with Rural Cross Sections)

(a) The minimum shoulder width (inclusive of shoulder rounding) for all rural roads shall be 2.0 m.

(b) Where the grade of the road exceeds 7%, an asphalt swale is to be installed along each side of the road (abutting the asphalt travelled way) with a runoff to the ditch every 30 m. At the discretion of the Municipal Engineer, the swale may be omitted from one side of the road if the road is graded to allow appropriate drainage (see detail in Part B).

2.4.5 Concrete Curb and Gutter (Roads with Urban Cross Sections)

Curb and gutter play important roles in storm water management, provide a barrier for adjacent vulnerable road users and street elements such as poles, signs, trees etc. The gutter detail at pedestrian ramps, placed according to standards provides an additional cue for visually impaired pedestrians to know they are entering a street. Concrete curb also provides a solid edge for snow removal equipment to follow during clearing events.

All concrete shall be placed in accordance with the HRM details in Part B and Supplementary Specifications, and may be subject to a Quality Management Plan during cold weather, as directed by the Municipal Engineer.

2.4.6 The Pedestrian Realm

The term ‘pedestrian realm’ refers to the part of the road right-of-way that is above the curb, and can be divided into a series of zones, each of which serve a distinct function (Figure 2.4.1).

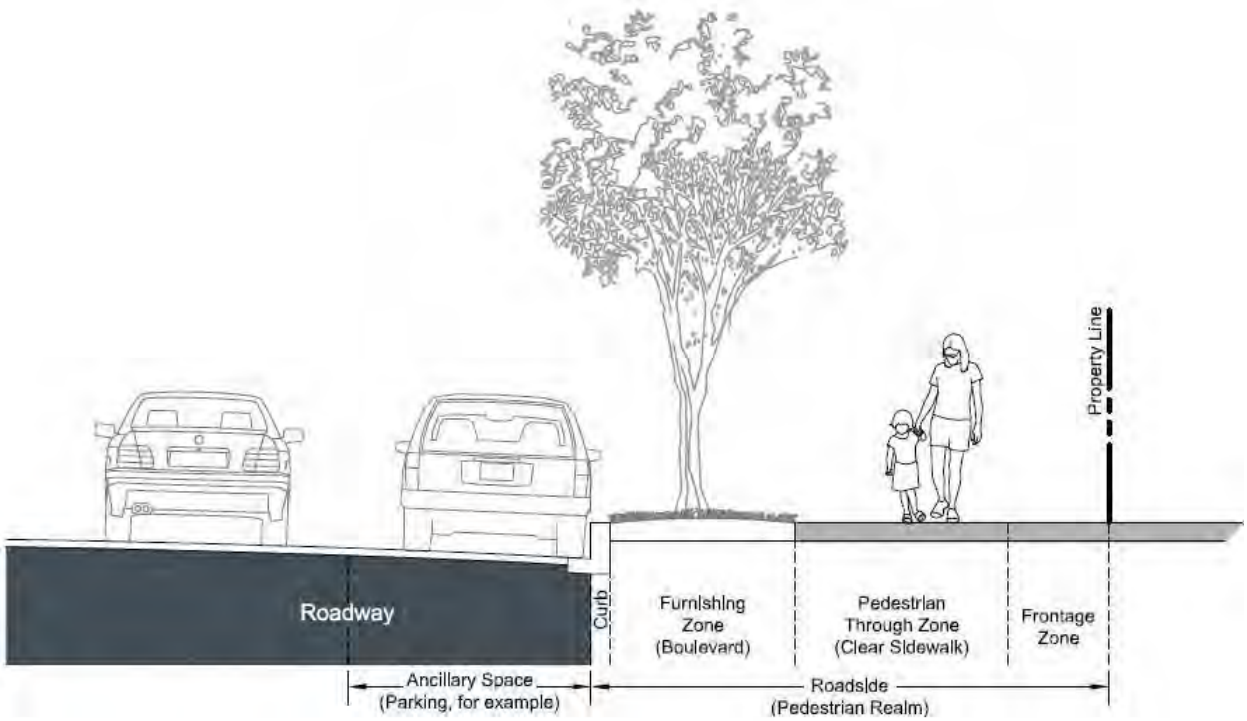

Figure 2.4.1- Zones of a Representative Urban Roadside

2.4.6.1 Boulevard / Furnishing Zone

Boulevard refers to the space between the pedestrian through zone (sidewalk) and the curb when it has a 'soft' surface (e.g. grass). This area is also referred to as a furnishing zone when it has a 'hard' surface (e.g. concrete, unit pavers, etc.).

On most streets this zone consists of grass planted with trees, but it is also occupied by various streetscape elements from signs, poles, and transit stops and shelters, to trees, benches, bicycle racks and more. This area is also used for snow storage. See section 2.4.2 and the standard details for further guidance on required boulevard widths (which are measured from back of curb). See section 3.2 for further guidance on streetscaping requirements for this area.

The decision whether to 'harden' the boulevard is informed by several factors and will be made at the discretion of the Municipal Engineer when some or all the following conditions are present:

(i) Boulevards are too narrow to support vegetation (i.e. less than 1.0 m);
(ii) Where high foot traffic has made the use of grass boulevards impractical (due to high pedestrian volumes wearing down the sod):
    a. Commercial frontages at ground level in pedestrian oriented areas (see section 3.1);
    b. High turnover in curbside activities (on-street parking/ loading)

c. Special edge treatments (e.g. unit pavers) are required on Map #301 (see section 3.2.3)

When hardened, hardscape tree planting options will be required in the furnishing zone (see sections 5.4.2 and 5.5) unless tree planting in the frontage zone is a viable option.

2.4.6.2 Pedestrian Through Zone

The pedestrian through zone is reserved for the movement of people walking and wheeling (see section 2.2.2). This area should be free of obstructions and generally consists of smooth broom finished concrete to support accessibility, easy maintenance, and a surface free of irregularities, though special treatments are sometimes desired or required (see section 3.2.2 and Maps #301 & #302).

The width of this zone is related to the adjacent roadway and land use characteristics, as well as pedestrian volumes. The minimum width of 1.5m is appropriate for areas of low pedestrian volume such as local residential streets and car-oriented commercial and industrial areas. Minimum widths of 1.8m are required on streets with transit stops, as well as collector and arterial roadways. In pedestrian oriented areas, particularly of a commercial or institutional nature, minimum widths of 2.1m should be provided, or more if volumes exceed 400 pedestrians in the peak 15 minutes.

2.4.6.3 Frontage Zone

The remaining part of the pedestrian realm, between the pedestrian through zone and the property line (or in the case of rural cross sections, between the ditch and the property line), may range in width from 0.5m and upwards (as shown in the details in Part B), and may be used flexibly:

- It may be needed for functional purposes such as stubbing of utility pole anchors / guy wires (for stability), as a buffer for sidewalk repair or ditch maintenance, as well as for snow storage.
- Alternatively, it can serve as the location for additional streetscaping elements, removing them from harm's way, as this area is less prone to vehicle damage (especially in winter). This is also a good location for trees, but only when the size of abutting building setbacks combined with the size of frontage zone are equal to or greater than the expected mature canopy diameter of the selected tree. In such cases, front yard setbacks may contribute to the soil volume available for tree growth, and result in larger, healthier trees.
- Finally, subject to applicable by-laws, a frontage zone can be used for commercial spill out (i.e. sidewalk cafes, retail displays, etc.).
- In exceptionally constrained retrofit circumstances, this zone may be omitted entirely at the discretion of the Municipal Engineer.

2.4.7 Medians

Medians separate opposing lanes of traffic on divided roads and may serve to:

- Prevent turns and through-movements to and from intersecting streets which can reduce or eliminate cut-through traffic and reduce traffic speeds by narrowing the roadway;
- Enhance intersection safety by reducing potential vehicle movements and conflicts, particularly left turns;
- Reduce risk of vehicle head-on collisions;
- Enhance pedestrian safety by providing a refuge to allow the street to be crossed in stages, or alternately by discouraging dangerous mid-block crossings entirely;
- Act as traffic calming elements or gateway features; and
- Beautify the streetscape with trees and/or vegetation, improving environmental quality and potentially incorporating stormwater infiltration.

The width for a raised median shall be 4.5 m. Under special circumstances, this may be reduced to 1.8 m at the Municipal Engineer's discretion, such as when turn lanes are developed at intersection approaches. Median width shall be measured from face of curb to face of curb.

While medians are beneficial and preferred, they may be omitted in retrofit cases where other elements are prioritized, at the Municipal Engineer's discretion.

2.4.8 Driveways

Driveways openings provide vehicular access to private property but introduce conflicts with vehicles, bicycles, and pedestrians. Multiple driveways to individual lots and extra-wide driveways amplify these conflicts. By-law S-300 Respecting Streets includes requirements for driveway location, width, and number intended to minimize such conflicts.

(a) Driveway access shall be in accordance with By-law S-300, By-Law Respecting Streets.

(b) Driveway ramps for residential driveways shall be dropped curb.

(c) High volume commercial driveways act as streets, and should therefore be designed as intersections, including requirements for tactile walking surface. Curb radius returns may be permitted on high volume commercial driveways.

(c) Driveways in rural areas shall incorporate concrete headwalls and culverts in accordance with Halifax Water requirements and HRM standard details. Driveway configuration shall incorporate the applicable road cross section elements including headwalls and culverts for rural cross sections and streets to accommodate ditches.

(d) When a bicycle lane crosses a driveway, it shall be made clear that the bicycle lane continues across the driveway and that a bicyclist has right-of-way over entering or exiting vehicles. For protected bicycle lanes, a break in the barrier is required.

(e) Continuity of sidewalk (material, cross slope, and width) shall govern with regards to driveways to not compromise the accessibility of the sidewalk.

(f) Consideration of grades shall be accommodated on private property, such that grades within right-of-way meet the details in Part B.

(g) Design of driveways shall consider use of adjacent space for municipal servicing requirements such as snow storage, green bins, etc.

(h) In an urban area with limited frontage zone, driveway site distance must be considered in early building design stages.

(h) Driveway grades within the street right-of-way shall be minimized to match the street cross section, as close as possible.

(i) A sidewalk crossing a driveway (pedestrian through zone) shall have a cross slope not greater than 2%.

(j) The maximum grade for a residential driveway outside the right-of-way shall be limited to 15 percent. The maximum grade for commercial and industrial driveways shall be limited to 8 percent and shall transition as per the details in Part B.

(k) For driveways and building access, the accessibility and continuity of connecting streets and sidewalks shall govern, ie, accessible crossfall slopes of sidewalks shall govern over driveway slopes.

(l) HRM is not obligated to approve the location of any existing curb cuts at any site subject to redevelopment (infill development). Existing driveway locations shall be modified in conformance with By-law S-300 Respecting Streets upon redevelopment of a site.

(m) Provided it does not eliminate vehicle access to an existing structure, HRM will undertake to modify driveway location in conformance with the By-law S-300 Respecting Streets upon rehabilitation of street / curb by HRM.

(n) Existing curb cuts may not serve as placeholders for future development and must be removed wherever the driveway it served will, or has been, removed.

2.4.9 Roadbed

(a) Roads shall be typically centred within the right-of-way and shall have a cross-slope as indicated on the details in Part B. Auxiliary lanes and drainage should be taken into consideration for cross-slope break. In these cases, the crown of the road shall be between lanes.

(b) The travel way and road surface widths for public roads shall be in accordance with the details in Part B.

(c) On sections where a guide rail is required, the roadbed width shall be increased by one metre on the side where the guide rail is to be installed.

(d) The designer shall assess the possible change in ground water movement caused by the development and shall be responsible for the design of corrective measures to prevent flooding or lowering of ground water table as a result of this ground water movement. If requested by the Municipal Engineer, the designer shall provide a report

prepared by a geo-technical engineer of on the effectiveness of the proposed corrective measures.

(e) A geotechnical report prepared by a professional engineer is to be submitted to the Municipal Engineer for review with the design drawings. The geotechnical report shall address the geological and hydrological aspects of the development and shall determine soil types.

(f) The geological section of the geotechnical report required under clause (d) shall include but not be limited to identification of:

- slope stability,
- presence of buried landfill,
- sieve analysis representative of road subgrade;
- rock types and elevations,
- poor subgrade materials such as quick soils, swelling soils, deep fills and highly organic deposits,
- highly erodible soils,
- frost susceptible soils; and,
- solutions to mitigate negative impacts.

(g) The hydrological section of the geotechnical report required under clause (d) shall include but not be limited to the identification of groundwater level and underground streams, notwithstanding allowances to be made for groundwater levels determined during dry weather conditions. If it is probable that the existing subgrade to a depth of 1.5 m below finished grade may be subject to frost heave, the engineer of record shall identify solutions to prevent frost damage.

(h) The street roadbed shall include as a minimum, the asphalt and gravel base structure shown on the standard detail for the classification of road required. Additional granular materials may be required depending upon the subgrade type, which are defined as follows:

- Silt/Clay Option 1: refers to materials with more than 25 percent silt/clay size particles
- Silt/Clay Option 2: refers to materials with more than 25 percent silt/clay size particles and are above optimum moisture content
- Granular Till: refers to materials with less than 25 percent silt/clay size.
- Rock Fill: refers to blasted rock fill.
- Rock Fill, 100mm: refers to blasted rock fill meeting the following gradation:

Sieve Size (mm)	Percent Passing
100	100
5	25 - 80
0.08	0 – 10

(i) For walkways, sidewalks, trails and other hardscape structures in the right-of-way, the geotechnical report shall recommend the depth and type of material to provide for structural support of the walkway / sidewalk / trail.

2.4.10 Paving

Echelon paving shall be used for all lifts of asphaltic concrete on new street construction, and when practical on retrofits.

2.4.11 Ditches

(a) Roadside ditches shall be constructed as per the rural road standard details and Halifax Water requirements.

(b) Ditches should be located within the right-of-way. In cases where grading of the ditch, such as false ditches, may require additional easements to help water reach drainage structure or outlet, provide any required easements outside right-of-way in favour of Halifax Water

For further guidance on stormwater management, see Chapter 4.0 – Stormwater Management.

2.4.12 Cut and Fill Slopes

(a) Steep slopes can create a hazardous situation and an on-going maintenance cost. The street and service systems are to be designed such that steep slopes are avoided if possible. More gentle slopes are preferable and steeper slopes may require guide rail.

(b) For common excavation, side slopes in cuts shall be no steeper than 3:1 (horizontal to vertical) with the following exceptions:

  (i) If the cut slope is 1.5 m or less in height (measured from top of ditch or top of curb), a 2:1 slope may be permitted.

  (ii) If the cut slope is greater than 1.5 m in height, a 2:1 slope may be permitted if a geotechnical report is provided.

(c) For rock excavation, side slopes in cuts shall be no steeper than 1:2 (horizontal to vertical). On rock cuts over 1.2 m high (measured from top of ditch or top of curb), a safety fence, as per the standard details, shall be provided on private property. On cuts greater than 1.2 m in height, a 1:1 slope may be permitted to waive the requirement for a safety fence.

(d) All overhanging and loose rocks shall be removed from the slope. The Municipal Engineer may require slope stabilization of rock faces (e.g. wire mesh, shotcrete, etc) if unsafe conditions exist or the rock is susceptible to weathering. Geotechnical reports may be required to confirm stability of rock face.

(e) Embankment slopes shall be a maximum of 2:1. More gentle slopes shall be required for less stable material.

(f) For fill heights greater than 3 m with slopes steeper than 6:1, guide rails or other road safety measures will be required.

(g) Cut slopes for rural roads that do not intercept existing grade within the street right-of-way shall be benched beginning at street line for a distance of 3 m before the cut slope continues.

(h) The right-of-way shall extend to the backslope of the daylit ditch and/or bottom of fill slope, to prevent location of part of the road bed structure on private property.

(i) In all cases, the requirement for guide rail shall be reviewed. If required, guide rails shall be installed as per HRM standards. Refer to section 2.4.16.

(j) The Municipal Engineer may require certification from a geotechnical engineer that areas adjacent to streets or easements are and will remain stable.

2.4.13 Guide Rails

(a) In general, guide rails are to be provided on roads where fill heights exceed 3 m unless a slope of 6:1 can be provided.

(b) Guide rails may also be required to provide protection from other hazardous areas such as bridge piers, overhead signs, bodies of water, rock cuts, culverts, transformers, etc.

(c) Steel post guide rails shall be designed by an engineer to confirm embedment strength.

(d) Guide rails shall be installed as per the standard details and HRM Supplementary Specifications.

2.4.14 Signs

(1) For regulatory and municipal signs:

(a) Regulatory and municipal signs shall be included in the detailed design of any street, but the developer shall only be responsible to supply and install sign bases and posts; the Municipality will then supply and install the sign.

(b) At the discretion of the Municipal Engineer, and as approved by the utility owning the pole, utility poles may be used for signs if they are in the appropriate locations.

(c) Street name signs shall be erected at each intersection with one sign for each leg of the intersection and one post for each approach street. Refer to the details in Part B. Street name signs shall also be erected at the intersection of streets with pedestrian and multi-use pathways

(2) For other signs in the right-of-way, refer to By-Law S-801 Respecting Licensing of Temporary Signs, and By-Law E-200 Respecting Encroachments Upon, Under, or Over A Street, and applicable Land-Use By-Laws.

2.4.15 Utilities in the Right-of-Way

Utilities in the right-of-way shall be designed in accordance with the following:

(a) All water mains, wastewater mains, stormwater mains, natural gas pipelines, electrical, communication and other such utilities located within the right-of-way must have Municipal approval with respect to location, prior to their installation.

(b) The minimum pole setback shall be 450 mm from face of curb to near side face of pole for local urban roads and 600 mm for urban collectors and arterials. On rural roads, the

pole shall be set at least 1 m beyond the outside edge of the ditch where a ditch exists, otherwise set poles 600 mm inside street line.

(c) Refer to Section 9.0 for more information on utilities.

2.4.16 Sodded Areas

Sodded areas shall consist of a minimum of 150 mm of topsoil and sod. Hydroseed will be permitted on slopes beyond the right-of-way. More soil is required for landscaped or treed areas. See Chapters 3 and 5 for more information.

2.4.17 Vehicle Laybys

In general, the use of vehicle laybys is not supported. They cause challenges for pedestrian crossing, snow clearing, street cleaning, and persons with disabilities. Vehicle laybys will require a variance application to be considered by the Municipal Engineer, with the exception of vehicle laybys on rural roads for community mailboxes.

2.4.18 Retaining Walls

Retaining walls are not normally accepted as a means of handling grade differentials associated with streets or services in the Municipality.

Retaining walls can create a hazardous situation and an on-going maintenance cost as well as a future capital cost when the wall needs to be replaced. The street and service systems are to be designed such that retaining walls are avoided if possible.

In the extreme circumstances that a retaining wall is acceptable to the Municipality, the wall shall be designed in accordance with the following:

(a) Retaining walls shall be designed by a professional engineer licensed to practice in Nova Scotia with due consideration given to soundness of material, stabilization, safety, maintenance and other relevant features.

(b) As a minimum, retaining walls over 1 m in height must have a hand rail or safety fence incorporated into the design. The hand rail or safety fence must be a minimum of 1.05 m in height (see detail in Part B).

(c) New retaining walls shall be designed in accordance with HRM Supplementary Specifications. New retaining walls require certification to HRM's policy.

(d) Retaining walls, including footings, shall be located on private property unless approved by the Municipal Engineer.

(e) Wall material must be reinforced earth or concrete, or blocks. Loose stone stacked walls and boulder walls will not be accepted.

2.4.19 Community Mailboxes

Community Mailboxes are managed by Canada Post. Design and locations shall be in accordance with the following:

(a) Community mailboxes shall be located within the right-of-way, or parkland if approved by the Municipal Engineer, and shall be designed according to Canada Post standards.

(b) Community mailboxes shall be located on local streets wherever possible, on the side with sidewalks to ensure accessibility. Laybys may be required on rural local road applications (see detail in Part B).

(c) Community mailbox locations shall not be located

(i) within 30 m of a street intersection controlled by traffic signals,

(ii) within 30 m of the intersection of a major street,

(iii) within 8 m of the intersection of a local street,

(iv) 3m from any driveway,

(v) 9m from any intersection,

(vi) 5m from any hydrant,

(vii) 5m in front of or 24m behind a bus stop,

(viii) 2m from any utility pole or other above ground utility device, or,

(ix) 1m from any utility pole anchor.

2.4.20 Bridges

Halifax Water and HRM define "bridge" as "*a structure or structures erected over a water course or a drainage course, and having a passageway for carrying traffic or other moving loads within a road or street owned by HRM, and having an opening or span of greater than 3 meters*." A span of 3 meters or less is considered a culvert, and would typically be managed by Halifax Water.

In addition to supporting vehicular traffic over obstacles, HRM may use bridges to separate pedestrian or active transportation facilities from vehicular traffic.

Bridges shall be designed in accordance with the following:

(a) Bridges, including active transportation bridges and pedestrian bridges, shall be designed in accordance with the latest edition of the CSA Canadian Highway Bridge Design Code.

(b) New bridges accepted by the municipality shall conform to the Halifax Bridge Certification Policy.

(c) Bridges over water may require permits from other agencies having jurisdiction over the body of water. It is the responsibility of the developer to contact other agencies.

(d) Bridge material must be reinforced concrete. Timber bridges may be accepted for smaller Active Transportation bridges. Timber bridges will not be accepted for vehicular bridges.

3.0 STREETSCAPING

3.1 INTRODUCTION

The main way that people form an image of a city is by travelling along its streets. Streets are a component of the public realm, and like municipal parks and open spaces, are available for everyone to use. Street design can include aesthetic as well as practical considerations, in the same way that a building's design may have architectural as well as functional goals. Streetscaping can also support HRM's focus on transit, walking and bicycling by adding shade, places to rest, and beauty to the pedestrian realm.

This chapter carries out the direction of sections 9 and 10 of Regional Council's Administrative Order 2020-012-OP "Regional Centre Streetscaping Administrative Order", to require municipal design guidelines for various streetscaping elements. The chapter also reflects the principles of HRM policies such as *HalifACT*, *Centre Plan*, and the *Urban Forest Master Plan*.

While elements like sidewalks, trees, and streetlights are used on all types of urban streets, enhanced features (i.e. streetscaping) may be applied to streets with high ***place*** value, as these must support social and open space functions in addition to being corridors for movement. These streets are 'places' as well as transportation 'links' as discussed in Chapter 1.

The palette of elements used in any given area can define its look and feel, distinguish it from others, broaden its functionality, and support opportunities for social interaction. This section describes how various surface treatments, furnishings and other amenities can be used to support a street's function as a part of the public realm. Additionally, see Section 5.0 for guidance on urban trees, which are the single most important element in any streetscape.

High 'Place' Value

Pedestrian oriented 'districts' of a commercial, heritage, or institutional nature, especially on streets that form their spines ('main streets'); and in transitions from one place to another ('gateways');

Streets fronting regionally significant cultural or natural features (historic sites, waterfronts, parks);

Connections between regionally significant public places (i.e. major park to regional facility; streets with prominent views of landmarks or the water);

Streets with high pedestrian volumes (e.g. near major pedestrian generators i.e. transit, events)

3.2 SURFACE TREATMENTS

This section describes how the materials of the pedestrian realm may be enhanced. Map 301 Sidewalk Treatments and Furnishings, and Map 302 – Signature Streets in Appendix B, identify requirements for how the frontage zone (if there is one), pedestrian through zone, and

furnishing zone must be treated in streetscaped areas. Section 2.4 Cross Section Elements provides guidance on the width of these zones, which depends on the context.

3.2.1 Furnishing Zone Treatment

As described in section 2.4.6, the furnishing zone is located between the sidewalk and the curb and may require special surface treatments such as unit pavers to enhance area character where indicated on Map 301 – Sidewalk Treatments and Furnishings.

(a) Special surface treatments as described in Map 301 must be used when replacing 10 m or more of standard sidewalk (in length, along the curb) unless an exemption has been issued at the Municipal Engineer's discretion because none of the conditions for requiring this zone to be 'hardscaped' are expected to exist (see section 2.4.6).

(b) The use of decorative materials in the furnishing zone beyond Map 301 in Appendix B may be considered on sidewalks fronting important civic landmarks such as parks or buildings, subject to the issuance of a variance, and provided arrangements have been made for maintenance.

(c) Special furnishing zone treatments shall end in advance of curb ramps, which are an extension of the pedestrian through zone and should consist of poured concrete coupled with tactile warning surface indicators for accessibility.

3.2.2 Pedestrian Through Zone & Frontage Zone Treatment

While these zones generally consist of smooth broom finished concrete (see section 2.4.6) special sidewalk treatments may be required to enhance area character as shown on Map 301 – Sidewalk Treatments and Furnishings in Appendix B. These include exposed aggregate sidewalks, distinct scoring patterns and other accessible and cost-effective measures. The use of other materials in the pedestrian through zone, like unit pavers, is limited to a few signature streetscapes where special provisions for maintenance are in place, shown in Map 302 – Signature Streets, and Map 303 – Enhanced Maintenance Areas in Appendix B.

3.3 STREET FURNITURE AND AMENITIES

Street furniture and amenities provide for added comfort, convenience and enjoyment of pedestrian-oriented areas. They include elements like benches, bicycle racks, waste/ recycling bins, planters, bollards, public art, and more. These items encourage people to spend more time outdoors by providing areas to rest and socialize, help to keep the street orderly, and act as landmarks or simply elements to enjoy.

(a) The space on sidewalks can be limited and amenities must not encumber the pedestrian through zone or impede drivers' vision, especially of pedestrians at intersections and other crossings.

(b) Furnishing zones shall not be over crowded as clear space is required for several reasons including access to the sidewalk for emergency responders, loading and deliveries, transit passengers, and other pick up / drop off needs.

(c) Provisions shall be in place for the maintenance of all features within the street right-of-way.

The following guidelines are intended to assist with selecting and locating various streetscape amenities. In addition to the associated maps, various details are available to assist with confirming model type, colour, finish and other aspects of the various features.

3.3.1 General Guidelines

(1) Location

Street furniture and amenities are usually located in the furnishing zone (between the sidewalk and curb) but if there is space, they can also be placed in the frontage zone (between the sidewalk and private property) where they are less prone to damage by vehicles.

(2) Offsets

(a) Where curbside parking/loading is available, the preferred minimum offset for amenities from the face of curb is 600 mm, although a minimum offset of 450 mm is acceptable for elements with small footprints (i.e. posts, bollards, bicycle racks.).

(b) Amenities shall avoid infringing on the required pedestrian through zone (section 2.4.6), though this may be adjusted at the Municipal Engineer's discretion based on the need for the element in question, pedestrian volumes, and possibly other factors.

(c) The location of amenities shall avoid areas immediately opposite building entrances to avoid obstructing pedestrian flows in and out of buildings.

(d) Street furnishings and amenities must not interfere with pick-up and drop-off at accessible parking spaces, bus stops, and taxi stands.

(e) Streetscape elements must be a minimum of 1.5 m from fire hydrants and placement needs to consider impact to firefighting operations, including but not limited to the deployment of emergency vehicles, the positioning and use of ladders (both vehicle mounted and ground ladders) and the deployment of fire hose from hydrants (or other water supply points) to emergency vehicles and from vehicles to locations in and around buildings.

(3) Attachment to Sidewalk

Street furniture shall be surface mounted to flat concrete surfaces (or concrete beneath the surface, if a unit paver edge is present) with rust proof concrete anchors and tamper proof bolts.

(4) Consideration of Sidewalk Patios

Some streetscape elements will preclude opportunities for sidewalk patios. Should an adjacent restaurant or café make application for a sidewalk patio, they will be required to maintain an acceptable pedestrian through zone as per By-Law S-1000 Respecting Sidewalk Cafes.

(5) Ownership and Maintenance

Unless the amenity is approved as an encroachment under By-law E-200 Respecting Encroachments or is subject to a Service Level Agreement between HRM and another party (e.g. a Business Improvement Association), all street furniture and amenities must be owned and maintained by the municipality.

(6) Customization

The municipality prefers consistency among streetscape elements to support ease of maintenance and replacement. However, custom amenities meeting the basic safety and functional requirements of standard ones described below, may be approved at the Municipal Engineer's discretion. Consideration may be given to custom amenities if they serve a dual role (for example, as art) or arise out of collaborative efforts to support placemaking initiated by local groups such as business or resident's associations. Unless they are installed as formal encroachments, ownership of such custom items will remain with the municipality, who will not be bound to replace them if damaged or destroyed.

3.3.2 Seating

Seating contributes to the quality of the public realm by offering opportunities to linger in a space to rest, admire a view, socialize, read, or eat. Benches are a crucial component of age-friendly communities and encourage people of all ages and abilities to spend time outdoors.

(a) To ensure they are maintained, benches in the street right-of-way are considered at bus stops, along park frontages, and in Enhanced Maintenance Areas, as shown on Map 303. Street furnishing styles may vary by area. Refer to Map 301 – Sidewalk Treatments and Furnishings to confirm the appropriate furnishing style for any given area.

(b) Seating is considered accessible at heights between 430 and 485 mm from the ground. Accessible seating should also have an adjacent firm area of 850 x 1350 mm clear space that is not part of the route of travel, though this may not be achievable in many existing rights-of-way. Accessible seating should have clear space at the end of the seating for service dogs and people using wheelchairs, scooters, or strollers so they can sit alongside one another and with companions.

(c) A variety of seating options shall be used to support a range of users and functions; *e.g.*, benches with backs and armrests support age friendly communities, while backless benches offer choice in terms of which way to face. Providing places to sit roughly every 400 m also supports age friendly communities.

(d) While there is no exact formula to guide the number, dimensions, or precise location of benches, the following guidelines should be considered:
   (i) Benches can be placed in the furnishing zone or the frontage zone.
   (ii) When benches are parallel to the curb, they should be oriented towards the sidewalk, offering a view of sidewalk life (not of traffic).

(iii) Backless benches, or benches that need to face the street for some reason, must be offset 1.0 m minimum from the face of curb.
(iv) Where sidewalk widths allow, the creation of social spaces is encouraged by placing pairs of benches or seats facing one another, oriented perpendicular to the curb.
(v) Benches under trees offer shade and comfort; at key scenic locations - a view.
(vi) Raised planters can offer informal seating opportunities.

3.3.3 Waste/ Recycling Receptacles

A litter free street is an important element in creating a welcoming streetscape. Properly sited receptacles make it easy to keep litter to a minimum, ensuring a pleasant experience along busy streets. Litter-free streets are a first step towards attractive streets.

(a) Because receptacles must be emptied regularly and are therefore only considered in the street right-of-way at bus stops and in Enhanced Maintenance Areas (shown on Map 303), or where other arrangements for maintenance can be been made (e.g. park frontages).

(b) While there is no formula to calculate the number or precise location of required receptacles, they are needed most in pedestrian-oriented commercial districts. Locations with many shops close to the sidewalk, high pedestrian volumes, busy crosswalks, near food vendors, at bus stops, in plazas, and outside entrances of major venues are all good candidates for the location of receptacles.

(c) In busier areas, it may be beneficial to have receptacles at each end of a block, with more in the middle if block length exceeds 100 m.

(d) Separate receptacles from benches by 3 m to minimize nuisance smells for people enjoying public seating.

(e) In addition to being anchored to a concrete surface, waste receptacles may be pole mounted. Pole mounted bins shall not overhang the street or sidewalk to minimize potential conflicts with parked vehicles street-side and pedestrians with visual impairments on the sidewalk side.

3.3.4 Bicycle Racks

Bicycle racks encourage using bicycles for transportation and provide an alternative to the use of other vertical elements (trees, hand rails, etc.) as bicycle parking.

(a) Bicycle racks shall permit the locking of a bicycle by the frame and the front wheel with a “U” lock and support the bicycle in a stable position with two points of contact.

(b) Bicycle racks are installed in the street right-of-way in pedestrian-oriented commercial or institutional areas. For single racks, HRM uses *post and ring* style racks and a series of

inverted “U” racks are used for multi-racks. Refer to Map 301 to confirm the appropriate style for any given area.

(c) Bicycle racks can be placed in the furnishing zone or the frontage zone. They should be located close to the doorway they are intended to serve, ideally less than 15 m away.

(d) Bicycle racks shall be placed such that a bicycle locked to the rack does not infringe on the required pedestrian through zone.

(e) Racks are typically placed so that bicycles are oriented parallel to the curb. Clustering racks with other vertical elements helps buffer them from vehicle damage, but they must be at least:

(i) 2.5 m from fire hydrants
(ii) 1.8 m from other bicycle racks and driveways
(iii) 1.0 m from other verticals (i.e. poles, newspaper boxes, bus shelters, benches, etc.).

(f) If the furnishing or frontage zone is at least 1.8 m wide, racks may be installed so that bicycles are oriented at an angle, or perpendicular to the curb. In such cases, racks shall be spaced a minimum spacing of 1.0 m apart from eachother.

(g) Other considerations for rack placement include visibility (areas with higher foot traffic improve security through casual surveillance); weather protection (awnings and building overhangs shelter racks); and avoiding conflicts with vehicle doors (by placing racks between on-street parallel parking spaces). Refer to the Association of Pedestrian and Bicycle Professionals Bicycle Parking Guide for more information.

3.3.5 Horticultural Plantings

Horticultural plantings consisting of shrubs, perennials, and ornamental grasses can add beauty, colour, and ecological value to streetscapes. Planting beds can be located at grade, or in raised planters (see Chapter 5 - Trees). Subject to several considerations described here, these may be included in HRM streetscapes.

This section applies to municipally maintained horticultural assets in the street right-of-way, and not to “boulevard gardens” informally planted by residents, normally on local and minor collector streets.

(1) Plant Health

(a) Appropriate site and species selection are critical to building resilient and aesthetically appealing streetscapes in a harsh roadside environment where issues of salt intrusion, soil volume and quality, and susceptibility to drought are paramount. Selected species must be able to withstand these conditions and endure wear and tear from pedestrian and vehicular traffic, but invasive species shall not be used. Planting locations should

aim to minimize these negative site conditions to the extent possible as permanent irrigation systems will not be installed in the street right-of-way.

(b) Horticultural plantings consisting of annuals within the street right-of-way will not be accepted under the Streetscaping Program but may be installed in conjunction with HRM pilot projects or by other groups (i.e. Business Improvement Associations) if applicable service level agreements are in place. The location of containers for annuals should follow the general considerations for all streetscape elements contained in section 3.3.1.

(2) Safety

(a) Streetscape plantings should improve the comfort of the pedestrian realm through additional buffering, while supporting safety by protecting sightlines.

(b) On boulevards, the mature height of plants must be no higher than 1 m, or 600 mm if located within 10 m of intersections (or where visibility is otherwise a concern). Taller plants can be considered in medians, unless they are within 10 m of intersections.

(c) In roundabouts, planting is encouraged for reasons of safety as well as urban design. Planting the central island adds delineation making it clear that the central island cannot be driven across; limits visibility and thereby reduces speeds; discourages pedestrians from crossing to the centre; and can be a distinguishing feature associated with place recognition, wayfinding, and district identity. The inner and outer portions of the central island will have different limitations on plant height based on sight distance required, and the height and width of these planting zones will depend on the size of the roundabout.

(3) Maintenance

Unlike other streetscape assets, for which maintenance may be limited to periodic inspections and replacement when damaged, horticultural plantings require a regular program of pruning, weeding, mulching, litter removal, and occasionally watering – throughout each growing season.

(a) Appropriate service level agreements must be in place prior to accepting any horticultural assets in the right-of-way. In addition to selecting suitable species for the site conditions described above, the following should be considered to reduce maintenance needs:
    (i) The selection of spreading or mat-forming plants able to provide bed coverage and suppress weed establishment.
    (ii) Mass plantings with limited number of species per bed are easier to maintain and than highly diverse plantings.
    (iii) Consideration of worker safety and minimizing traffic impacts of maintenance activities: i.e. consider leaving a setback from the road for maintenance and safety purposes as well as for containment of plant material and soil.

3.3.6 Granite Curb

The curbs of the older parts of the municipality were traditionally granite but, over time, have been incrementally replaced with modern concrete curb and gutter for several reasons (including cost). Granite is a beautiful and durable material that echoes the city's historic past. Fragments of granite curb remain in downtown Halifax, and there is an opportunity to protect what remains, and expand the use of granite in relation to certain historic districts.

(a) As shown in Appendix B on Map 304– Granite Curb, granite curb shall be maintained where extensive lengths (e.g. greater than half a block) still exist.

(b) All new curb on the blocks surrounding Grand Parade and Province House must be granite.

(c) Future signature streetscaping projects should consider the use of granite curbs, particularly in approved Heritage Conservation Districts (refer to Community Plan for area being considered).

(d) Granite curbs shall be supported by concrete footings in accordance with the details in Part B.

3.3.7 Bollards

A bollard is a short vertical post or similar structure. Bollards may be used to define streetscape areas, visually separate or physically prevent motor vehicles from encroaching on pedestrian and bicycle spaces, protect other infrastructure from vehicles and/or maintenance activities, and to add colour and interest to streetscapes, and occasionally, to add pedestrian-scale lighting.

(a) Bollard spacing can depend on context and purpose. It may vary to sync with the rhythm of other streetscape elements, or they can be placed every 2 - 3m if intended to block vehicular access.

(b) Where bollards are located adjacent to a pedestrian route or space, they shall:

(i) be colour-contrasted with their surroundings; and
(ii) provide a clear width between bollards of at least 1.2m to allow the passage of wheeled mobility aids where access is intended between the bollards.

(c) Bollards used for streetscaping shall be made of materials with finishes that resist rust, corrosion and vandalism (e.g. galvanized, powder coated, stainless steel, concrete, granite).

There are rare instances of historic bollards existing within the right-of-way, mainly in older parts of the Regional Centre. In some cases, old cannons are used for this purpose, but others are of granite or cast iron. Historic bollards should be retained within the right-of-way, or may be relocated if required for reasons of accessibility or safety.

(d) The use of bollards is not required, and arrangements must be in place for their maintenance before they are allowed in the right-of-way.

3.3.8 Single Tree Planters

(a) Single tree planters (approximately 1m x 1m x 1m) may be used in limited circumstances to add small trees to the pedestrian realm where underground conflicts prevent them from being placed in the ground.

(b) Single tree planters must not block sightlines, and their use must be approved by the Urban Forester.

3.4 ORNAMENTAL STREET LIGHTS AND POLES

Street lighting serves to light the roadway as well as the pedestrian realm, and most critically, the areas where they intersect. It is important for both safety and aesthetic purposes. This section only deals with the subject of ornamental streetlights. Section 7.0 provides the technical requirements for lighting levels, power supply and more.

The types of fixtures, poles, and bases to be used in each area are identified on Map 305 – Street Lighting Plan.

3.4.1 Principles of Use

Ornamental poles and fixtures are used primarily in situations where power and communications services are located underground or otherwise not visible near the ornamental poles and fixtures. When used in conjunction with a high density of wood poles and overhead wires, the impact of decorative poles is diminished, and their use can even degrade the appearance of a street by introducing clutter.

Ornamental street lights and poles are used to enhance the character of a district and to compliment other street furnishings. Streetlights are not intended to match the lighting style of adjacent properties.

(a) Existing utilitarian streetlighting shall be replaced with ornamentals when:

(i) Significant lengths of sidewalk reinstatement are undertaken or required (30 m or more), and;
(ii) Overhead utilities are already underground (or required to be buried); and,
(iii) An ornamental style is specified on Map 305 – Street Lighting Plan.

Replacing existing light fixtures with ornamental poles and fixtures will trigger the need for a new lighting design to ensure minimum levels for safety and comfort continue to be met (see Section 7.0). This may result in the installation of additional poles as ornamental fixtures are typically mounted lower.

(b) The municipality will avoid switching from one ornamental style to another along the same street, unless there is a logical transition in the character of the street.

(c) In areas with overhead wires and wood utility poles, ornamental streetlights may be considered on the side of the street without wood poles or may be arm-mounted to the wood utility poles. Wood poles are generally owned by utilities whose requirements for loading / attachment must be met.

3.4.2 Coordinated Traffic Signal Poles and Hardware

(a) Black poles for traffic signals and signs, as well as black signal backing must be used in areas where ornamental streetlighting is used. This coordinates with and compliments the effect of the decorative elements.

(b) Black traffic signal and sign poles and backings shall be used in areas on Map 305 – Street Lighting Plan with the following streetlight styles:

- Holophane Pechina
- Holophane Washington
- Lumec Square
- Holophane Colombia Series
- Holophane Teardrop
- Schreder Yoa

3.5 SIGNATURE STREETSCAPES

Map 302 - Signature Streets identifies where numerous non-standard features are in use or approved, including but not limited to sidewalk and roadway materials, curb and parking area treatments, unique plantings, furnishings, and more. Significant investments have been made on these streets to support their roles as public spaces, and their integrity must be maintained.

When disturbed, these areas must be re-instated with their original features. Signature Streetscapes and their general components are illustrated on Map 302, but more detailed design guidance should be sought as needed when re-instating these areas following any disturbance (e.g. utility cut, adjacent development, etc.).

4.0 STORMWATER MANAGEMENT

4.1 GENERAL

A Storm Drainage System can be described as a group of interacting, interrelated, and interdependent elements carrying discharges in response to rain and snow. These discharges include overland flow, subsurface flow, groundwater flow, and snowmelt.

The Municipality is the administrator of subdivision and building construction in HRM. Within this context, and as empowered by the *HRM Charter*, the *Building Code Act*, and the *Planning Act*, it is an objective of the Municipality to facilitate and regulate the establishment of a complete and properly functioning Storm Drainage System to serve new building construction within HRM.

The Municipality works closely with Halifax Water on matters regarding stormwater. Stormwater drainage systems shall conform to *Halifax Water Regulations* and applicable bylaws. Halifax Water servicing standards for stormwater systems, "*Halifax Water Design Specifications*", can be found at https://www.halifaxwater.ca/halifax-water-specifications-forms .

Any Stormwater Drainage System within the core boundary of the Municipality shall be designed to achieve the following objectives:

- Prevent loss of life and to protect structures and property from damage due to a major storm event;
- Provide safe and convenient use of streets, lot areas and other land during and following rain and snow melt events;
- Adequately convey stormwater flow from upstream sources;
- Mitigate the adverse effects of stormwater flow, such as flooding and erosion, on downstream properties;
- Preserve natural water courses;
- Minimize the long-term effect of development on receiving watercourses; and,
- Provide safe, accessible outlet.

All stormwater drainage systems that discharge to a watercourse or wetland shall conform to any requirements established by NSE.

4.1.1 Roles and Responsibilities

Several parties are typically involved in the design, construction, and maintenance of the Community Systems providing off-street drainage. Their roles and responsibilities within the context of this section of the Design Guidelines are described as follows:

The Designer is responsible for the preparation of the design of the Community Systems (see section 4.3), such that when construction of the design takes place, the objectives of these guidelines are met. In carrying out this responsibility, the Designer is to provide for adequate initial construction such that undue on-going maintenance obligations are not placed on the homeowner or Municipality. The Designer is fully responsible for the design regardless of the acceptance of the design by the Municipality.

The Contractor is responsible for constructing the Community Systems in accordance with the design and in a good and workmanlike manner. It is required that the Contractor not deviate from the design without prior consultation with the Designer. If unusual or unanticipated site conditions are encountered during construction, the Contractor shall advise the Designer immediately.

The Subdivider is the owner of the land proposed to be subdivided and includes anyone acting with the subdivider's consent. With respect to lot grading and drainage, the subdivider is responsible for construction of the Community Systems identified by the Municipal Engineer as being the subdivider's responsibility. This will include construction works within easements, be they public or private, and in certain instances will involve pre-grading of entire lot areas to prevent ponding of stormwater or other drainage problems. Construction of grades along common lot lines and grading of entire lots where community grading concerns do not exist will generally not be required.

The Municipality is the administrator of the process associated with design, construction, and certification of the Community Systems. As part of this process, the Municipality may review, approve, and provide comment to the other parties, such as Halifax Water. It is to be understood that as administrator of the process, the Municipality does not assume any responsibility for the actions or shortcomings of the other parties.

Halifax Water is the owner, operator and maintainer for municipal water, wastewater and stormwater infrastructure within specific boundaries set by the Municipality. Halifax Water stormwater systems typically include stormwater mains, service connections from the stormwater main to the street lines and appurtenances, including stormwater ponds. Refer to *Halifax Water Regulations* for futher information.

It is expected that *the Homeowner* will be responsible for the usual maintenance of the Individual Lot Systems, and in some instances, of the Community Systems, eg. cleaning of storm drainage inlets, maintaining drainage swales free of vegetation and debris, and maintaining suitable slope protection. It is expected that homeowners will not block drainage routes, for example, placing excess snow at end of a driveway thereby blocking side yard drainage swales. Should the Homeowner alter any of the Community Systems, the homeowner is responsible for the implications of the alteration.

4.2 STORMWATER BEST MANAGEMENT PRACTICES

Stormwater Best Management Practices (BMPs) are measures used to mitigate impacts to quantity and quality of stormwater runoff resulting from development. BMPs use vegetation, soils, and other elements to mimic the natural processes required to manage stormwater and create healthier urban environments. BMPs may include vegetation planting, bioswales, and other landscaping to increase infiltration and evapotranspiration, and to increase permeable surface.

Stormwater BMPs can include "green infrastructure", which focuses on the vegetation and natural elements, or can include some "grey infrastructure" such as underground cisterns or oil/grit separators. HRM is working to implement stormwater BMPs using green infrastructure. Generally, these are methods that attempt to replicate the natural characteristics and infiltration components of an undeveloped system to the extent possible and reduce or prevent water body

quality degradation caused by typical urban development. Grey infrastructure will also be considered, but these practices often require more ongoing maintenance than other BMPs, and do not have the added benefits that vegetated “green” infrastructure offers.

Vegetation slows the flow of stormwater in several ways. It is a physical barrier, allowing some of the stormwater to evaporate, it also absorbs stormwater through leaves, bark and roots, using it for growth. Vegetation can also capture and absorb several nutrients from sediments.

During a rain event, the initial stages of stormwater runoff generated by the first 25 mm of rain fall is sometimes called “the first flush”. This stormwater collects the most sediment from impervious surfaces (such as parking lots, driveways, walkways etc.), and carries them downstream, increasing the concentration of nutrients along the way. By retaining the first flush from a single rain event, the concentration of nutrients downstream is reduced, which can result in an improvement to downstream water quality. Stormwater retention also decreases the flow rate of stormwater leaving individual sites. This results in improved flood resilience for affected areas and reduces the demand on municipal infrastructure.

The overall objectives of introducing BMPs are to minimize the adverse effects of stormwater runoff. An important part of the selection of BMPs is to preserve the natural features and develop a stormwater system that can reproduce, as closely as possible, the natural conditions of the undeveloped site. This approach stresses the importance of preserving natural storage, infiltration and pollutant filtering functions.

There is no single BMP that suits every site, and a single BMP may not satisfy all stormwater management objectives. Therefore, a combination of BMPs may be required.

4.2.1 The Hierarchy Approach

The Hierarchy Approach was adopted as part of the guiding principles for stormwater BMPs in HRM. The Hierarchy approach includes considering the following BMP methods, respectively:

(a) *Source Control* practices retain stormwater where it reaches the site (*i.e*. retain rain where it falls). Source controls at the lot level are the preferred method for controlling the impacts of stormwater.

(b) *Conveyance Control* such as vegetation swales and/or infiltration systems, can limit the flow as it moves across the site.

(c) *End-of-Pipe Control*, considered the last treatment opportunity prior to leaving a site, should be implemented only if source and conveyance controls are unable to achieve the necessary level of stormwater quality and quantity control targets.

Implementing the hierarchy approach throughout HRM will improve the overall downstream stormwater quality above and beyond the traditional approach of an end-of-pipe stormwater management facility. The use of stormwater BMPs upstream will decrease the requirements for end-of-pipe facilities. In general, end-of-pipe facilities are the least preferred approach, because

of the construction and maintenance costs, the consumption of land area, and the potential disruption of land features. For these reasons, stormwater BMPs often result in better Return on Investment results.

4.2.2 Developing Stormwater BMP Standards

The *Halifax Stormwater Management Standards* describes stormwater BMP options and considerations for development of private property. HRM and Halifax Water are working together to create similar standards for use in the public ROW.

Standardizing stormwater BMPs introduces a new category of assets for HRM. HRM is in generally in favour of Stormwater BMPs, however, more work is needed to develop standard details and to simplify maintenance practices.

These changes are underway and are expected to be completed for the next update to this document.

Stormwater BMPs may be considered in Community Systems (see section 4.3), providing maintenance requirements are minimal.

4.3 OFF-STREET DRAINAGE SYSTEMS ON PRIVATE PROPERTY

A complete and properly functioning Storm Drainage System includes a variety of components which may be grouped into two categories:

> *Community Systems* being those elements which serve two or more lots. For example, roadside ditches, culverts, roadways, curbs and gutters, street and backyard catch basins, pipes or conduits, retention ponds, watercourses, floodplains, and drainage swales and ground elevations along common lot lines or in easements.
>
> *Individual Lot Systems* being those elements which serve a single lot and are contained within its limits. For example, swales contained within lot limits, gently graded lot areas, slopes, roof downspouts, individual seepage pits, french drains, building lateral, parking lot catch basins and conduits.

An important group of elements in a Storm Drainage System are the Community Systems located outside of the street limits. Poor off-street grading and drainage can lead to unsafe conditions, extensive and costly maintenance, property damage, and loss of use of lot areas.

The primary purpose of this section is to facilitate and regulate good design and construction with respect to the Community Systems located outside of the street limits.

4.3.1 Objectives

The Community Systems shall achieve the following objectives:

(a) To prevent loss of life and to protect structures and property from significant damage and expense, including that which is expected to be experienced during a 1:100 year storm event.

(b) To provide for convenient and reasonable use of lot areas from overland flow during and following rain and snow events and from subsurface or groundwater flow, e.g. avoid continuously saturated backyard, significant continuous icing.

(c) To provide for safe use of lot and street areas, e.g. excessive depth of flow or stormwater storage, significant continuous icing.

(d) To avoid drainage problems or other conditions that result in unreasonable maintenance obligations on the homeowner or Municipality, e.g. significant or regular de-icing operations.

(e) To provide protection from erosion from surface flow, subsurface flow, or groundwater, e.g. slope stabilization.

(f) To direct stormwater away from buildings in order to especially prevent basement flooding and damage to the foundation drain.

(g) To prevent standing stormwater and soil saturation detrimental to buildings, driveways, walkways, landscaped areas and other use of the lot.

In addition to the foregoing, the Municipality requires information to demonstrate that the following overall Storm Drainage System objectives are achieved:

(h) To adequately convey stormwater flow from upstream sources.

(i) To prevent and/or mitigate the adverse effects of stormwater flow onto downstream or adjacent properties, such as erosion, or flooding due to inadequate downstream capacity or grading.

(j) To preserve natural watercourses.

(k) To minimize the long-term effect of development on receiving watercourses and groundwater.

(l) To maintain pre-development drainage patterns unless some motivating factor to change the pattern exists, e.g. conflict with other objectives (capacity).

In the case where Community Systems have been designed and/or constructed, it shall be an objective that the Individual Lot Systems conform to the Community Systems. Grades established at the lot limits by the Approved Subdivision Grading Plan are to be maintained, subject to variations permitted under the applicable by-laws.

In the preparation of a design that meets the above objectives, the Designer is encouraged to strive for an attractive living environment and consider factors such as the following:

- Aesthetic conditions relating to lot grading, e.g. creating space on the lot that is convenient as a play area, usually in a backyard.
- The preservation of desirable site features where practical, i.e. minimizing disturbance, retaining trees.

- Providing for variance in yard setbacks in accordance with land-use by-laws.
- Locating slopes and boundary lines such that tops and bottoms of slopes are at property boundaries.
- Avoiding excessively deep swales.
- Where swales and french drains are contemplated at the base of a significant slope, it is recommended that the swale be located at the toe of the slope.
- Locating driveways to allow convenient and safe ingress and egress.
- Creating consistent grading lot to lot.

4.3.2 Design Criteria for Off-Street Drainage Systems and Subdivision Grading

The Design Criteria for lot grading and drainage are to cover the more common aspects of design encountered in lot grading and drainage development. Local conditions may influence the design criteria and design requirements, for example, circumstances where soils are not free draining may require a flatter maximum permissible slope. Additional requirements affecting design are contained in other relevant documents, such as the National Building Code, and the Halifax Water Design Specifications.

The Design Criteria reflect the experience of the Municipality as related to typical design requirements. The Criteria are provided for information and will serve as the benchmark for review of Subdivision Grading Plans in typical circumstances. However, the Design Criteria are not considered rigid. To better meet the objectives, the Designer may want to propose alternate design approaches. This will not be discouraged by the Municipality. The purpose of the Design Criteria is to provide guidance for designers in the provision of drainage systems offering acceptable service which is consistent with best management practices and low initial construction and on-going maintenance costs and effort.

In designing Community Systems, the focus is on those drainage elements which affect more than one property, e.g. common backyard swales/catch basins, grading along common property boundaries. It is critical that the Designer ensure that sufficient Community Systems are in place and/or contemplated and depicted such that the Individual Lot Systems can be designed and constructed in a fashion that allows for a properly functioning overall Storm Drainage System for the Homeowner while striving for an attractive living environment. It is intended that Community Systems will not have to be altered as a consequence of design of detailed Individual Lot Systems. Therefore, it is strongly recommended that the Designer test the ability of the Community Systems to achieve the above stated objective by carrying out preliminary design of the Individual Lot Systems serving the lots in accordance with the requirements of any Lot Grading or Grade Alteration or other By-law that regulates the grading of land.

Community Systems are to be designed in accordance with the criteria below.

4.3.2.1 Ground Surface

(a) The area between the street right-of-way and the curb shall slope towards the curb at a minimum slope of 2% but not greater than 4%.

(b) The maximum slope shall be 3:1 (H:V) unless constructed on in situ rock. A steeper

slope may also be permitted by the Municipal Engineer if a geotechnical report is submitted that certifies the use of a steeper slope. The top and bottom of banks shall be rounded for convenient maintenance. Notwithstanding the foregoing, the Designer is responsible to design a suitably graded slope with appropriate surface treatment to provide for long term stability.

(c) Where a cut intercepts the groundwater table creating potential drainage and icing problems, special measures will be required to address potential drainage problem.

(d) Where areas are disturbed, stabilization is to be provided to prevent erosion.

4.3.2.2 Off-Street Swales

(a) Except for individual single family and duplex dwelling lots, provision shall be made to collect on-site all runoff from off-street areas in accordance with the applicable by-laws.

(b) Swales shall be blended into the landscape to the greatest degree possible in order to provide a natural appearance.

(c) The minimum grade along any swale shall be 2%. Less than a 2% grade may be used where underdrains are incorporated. In cases where an underground drain is included in the swale design, the minimum grade may be reduced to 1%. Designers are encouraged to use grades, where possible, that are steeper than the minimum.

(d) The flow from all swales which serve multiple properties shall be intercepted by catch basins at a maximum spacing such that the maximum depth of flow in the 1:5 year storm event is 100 mm or as otherwise directed by the Municipal Engineer.

(e) Where the swale intercepts groundwater, the swale shall incorporate underdrains, regardless of slope.

(f) The side slope for any swale shall be flatter than 33% (3 horizontal: 1 vertical).

(g) The maximum depth of flow in any swale shall be 250 mm in the 1:100 year storm.

(h) All swales shall be designed to accommodate the 1:100 year stormwater flow.

(i) An overflow route shall be provided to direct overflow to major storm drainage systems. The water level from a 1:100 year storm event along such route shall be lower than the lowest opening to the adjacent dwellings.

(j) Sharp corners shall be avoided in swale design.

(k) Steeply sloping swales shall have appropriate surface treatment to prevent erosion.

4.3.2.3 Off-Street Catch Basins

(a) Where a swale, which serves multiple properties, intersects a street, a catch basin,

located as close as practical to the curb or to the sidewalk, shall be installed to intercept flow from the swale.

(b) The flow from all rear yard swales serving multiple lots shall be intercepted by a catch basin(s) installed at the rear of the property.

(c) The grade of lots in the immediate vicinity of a rear yard catch basin shall be graded in a manner which will direct stormwater to the catch basin.

(d) Catch basins shall be located entirely on one property and shall not be located on any property line.

(e) Off street catch basins may be constructed using a 750 mm diameter concrete pipe, standing vertical with bell end up. An IMP R-361 (or equivalent) grate shall then be placed in the bell end. The catch basin lead shall not protrude into the catch basin by more than 75 mm and shall be grouted with a non-shrink grout and finished on the inside and outside of the structure. Note: This type of catch basin is not permitted in paved areas or areas where vehicle traffic is present.

(f) Any catch basins to be taken over by Halifax Water shall be constructed according to the Halifax Water Design Specifications.

4.3.2.4 Underdrains

(a) Underdrains are to be used to remove surface water and groundwater to drain wet areas and other areas of poor drainage, or where minimum slopes with respect to lot surface or swales cannot be achieved.

(b) Underdrains are not permitted to discharge onto street surfaces, walkways, or any location where there would be an impact inconsistent with the objectives of this document.

(c) Underdrains shall be located a minimum of 2 m distance from any part of the building foundation to avoid impacts to building foundations and/or adjacent structures when the underdrain is replaced.

(d) Where necessary to avoid icing problems on the street caused by stormwater flowing over the top of the curb, the Designer shall provide an acceptable method to intercept this flow (eg. french drain installed behind the curb).

(e) Small diameter pipe installed for "off-street" drainage such as rear yard drains, underdrains, etc., may be installed provided the following connection conditions are met:

- Off-street underdrains shall not be connected to the back or sides of an on-street catch basin.
- Off-street underdrains shall connect to the storm main via a lateral connection or to a manhole in the street right-of-way.

- Off-street underdrains may be considered, through the variance process, to connect to an off street catch basin.

4.3.2.5 Ownership

(a) Rear/side yard catch basins will be considered for ownership/acceptance by Halifax Water as an exception only. If accepted, it must be constructed to Halifax Water requirements. The designer will be required to demonstrate that there are no other physical means to providing adequate and proper drainage to the property(s). The request will also be assessed to ensure the infrastructure can be accessed for cleaning and maintenance.

(b) Catch basins located outside of the travel way, but located within the right-of-way, will be owned and maintained by Halifax Water.

(c) Underdrains and swales located outside of the right-of-way will be privately owned and maintained.

4.3.2.6 Easements

(a) Easements shall be provided for all swales which, in the opinion of the Municipal Engineer, require such legal conveyances. Generally, easements will be required when a significant number of lots depend on the swale.

(b) Public easements shall be provided for all catch basins and associated stormwater pipes constructed in conformance with HRM and Halifax Water Design Specifications.

(c) A minimum easement width of 6 m is required for public easements as per Halifax Water requirements.

(d) A minimum easement width of 4.5 m is required for private easement.

4.4 EROSION AND SEDIMENT CONTROL

Stormwater management systems shall be an integral part of overall site design and development.

The designer shall submit an erosion and sediment control plan in conformity with all applicable municipal and provincial regulations and guidelines. The plan shall include both short-term measures applicable during construction and long-term measures after completion of development.

Site design shall make optimum use of existing topography and vegetation and minimize cut and fill operations. During construction, site design shall prevent/minimize stormwater flows across or from the construction site. Development of the site shall be based on exposing a minimum area of the site for the minimum time.

The control plan shall include the following:

- Interception and diversion ditches to direct water around the construction site;
- Diversion berms;
- Sediment traps;
- Covering or seeding of topsoil or other soil stockpiles;
- Isolated stripping of land being developed;
- Vegetation screens or buffers;
- Filter bags in catch basins;
- Settling ponds.

Long-term environmental protection measures shall include designs to minimize erosion and sediment flow, protect outfall areas, minimize disruption of natural watercourses, utilize wetlands for natural filtration, and provide for ground water recharge when possible.

Protection methods shall be based on but not limited to the “Province of Nova Scotia Erosion and Sediment Control Manual and Guidelines for Use on Construction Sites”.

5.0 TREES

5.1 INTRODUCTION AND PURPOSE

Halifax Regional Municipality (HRM) has over 57 million trees within its boundaries, including 150,000 street trees in its urban core. This creates HRM's urban forest.

The importance of an urban forest cannot be underestimated. Benefits include improved air quality, carbon sequestration, shade, natural habitat, stormwater control, prolonged life of shaded asphalt, road noise buffering, as well as an aesthetically pleasing streetscape contributing to the physical and psychological well-being of our residents. The intent of this section is to encourage improved tree planting environments enabling larger growing trees within public streetscapes.

Street trees must be given a high priority as part of HRM's street infrastructure, recognizing them as an integral part of the overall streetscape. Utilities and other elements must be designed with tree preservation and planting in mind, ensuring trees will mature and thrive in the urban environment. Sufficient numbers of trees must be provided to obtain the benefits urban trees provide and create pleasant, attractive streetscapes for residents.

In increasingly complex urban environments, where there are competing priorities for space, every effort must be made to include trees.

5.2 GENERAL PLACEMENT

Trees are generally be placed between the sidewalk and curb, or in the frontage zone (between the sidewalk and private property). The following guidance must be considered as planting too close to roadways, sidewalks, and other streetscape elements presents conflicts with users, visibility issues, and structural instability of trees (i.e. if root spread is too limited).

5.2.1 Space for Trees

Trees shall be placed per the following requirements:

(a) Where sidewalks are required in new greenfield construction, the width of the boulevard / furnishing zone, (i.e. the distance between the back of curb and sidewalk) shall be in accordance with Section 2.4 – Cross Section Elements.

(b) In retrofit situations, boulevards may be reduced to 1.5 m in constrained circumstances recognizing that there may be competition for available space.

(c) Reducing boulevards below 1.5 m will necessitate the use of hardscape solutions to accommodate street trees (see sections 5.4.2 and 5.5) or may preclude street trees entirely unless they can be planted in the frontage zone. Reducing the boulevard's width below 1.5 m such that hardscape solutions are required, or trees are not considered in a design, will only be considered in retrofit situations to accommodate needed municipal infrastructure (e.g. sidewalks, bicycle facilities, bus lanes, etc.) following a prioritization exercise and subject to the approval of the Municipal Engineer.

(d) Where trees must be removed to facilitate new infrastructure or other construction activities, they shall be replanted in the future streetscape to ensure the sustainability of the urban tree canopy.

(e) Tree protection (e.g. tree guards or other means) is required for boulevards/ furnishing zones less than 1.5 m in width.

5.2.2 Offsets

Trees shall be offset per the following requirements:

(a) When planted between sidewalk and curb, trees shall be centred on the boulevard or furnishing zone (where utilities do not conflict).

(b) Where sidewalks are not required, trees shall be planted a minimum of 1.5 m from the curb.

(c) When planted in line with other streetscape elements (bicycle racks, benches, fire hydrants, streetlight poles, etc.) maintain offsets of at least 1.5 m.

5.2.3 Restrictions Due to Traffic Considerations

(a) Consideration should be given to roadway geometry and sight distance to pedestrian crossings, intersections and traffic controls. Do not plant trees within:

(i) 15m of a stop sign or traffic signal base.
(ii) 10m of the end of the radius of an intersecting street without stop control.
(iii) 10m of a crosswalk (crosswalk signs face in both directions on a two-way street).

(b) Trees must not impede transit operators' view of passengers waiting at bus stops and shelters. Do not plant trees within 10 m of a bus stop sign (near side only).

(c) Planting plans for the area 50 m from any intersection must be reviewed by the Traffic Authority, as there are instances where greater distances are required due to the horizontal curvature of the street or other issues.

(d) Placement of trees within 5 m in line with a sign is at the discretion of the Traffic Authority and Municipal Engineer. Where possible, plant trees on the far side of poles and posts.

(e) Signage is typically placed 2.0 m to 2.5 m from the ground, measured from the bottom of the sign. Consider tree species that could ultimately be trimmed to have their lowest branches above this height.

5.2.4 Considerations Due to Emergency Vehicles

Placement of trees needs to consider potential impact to firefighting operations, including but not limited to the deployment of emergency vehicles, the positioning and use of ladders (vehicle

mounted and ground ladders) and the deployment of fire hose from hydrants (or other water supply points) to emergency vehicles and from vehicles to locations in and around buildings.

5.2.5 Considerations Due to Buried Infrastructure

Do not plant trees directly over utility mains and avoid service laterals to the extent possible.

5.3 PLANTING AND MAINTAINING HEALTHY TREES

Avoiding monoculture plantings of single species, choosing the right type of tree for any given situation, and making sure the tree has an adequate volume of high-quality soil are critical factors to the success of urban trees.

This section focuses on different types of tree installations and options to achieve the right species mix, adequate soil volumes, moisture and nutrient levels – and improve the chances of long-term street tree survival.

5.3.1 Species Diversity

Diversity increases urban forest resilience to diseases and pests and can decrease the spread of contamination.

For new developments (or phases of), or any construction activities that require planting or replanting, unless approval by the Urban Forester has been received for an alternate approach, the following rules apply:

(i) If fewer than 10 trees are required, no more than 50% may be of the same *genus.*
(ii) If 10-40 trees are required, no more than 50% may be of the same *genus* and no more than 25% of the same Species.
(iii) If more than 40 trees are required, no more than 25% may be of the same *genus.*

The scientific names of each tree listed below consist of the *genus*, followed by the *species.*

5.3.2 Species Selection

The following species have been approved for use within the HRM right-of-way. In addition to the presence of overhead utilities (see note below), species selection should include consideration of tree canopy space and shadows, especially when planting trees near tall buildings. Additional species may be considered, subject to the approval of the Municipal Engineer.

Any species of *Fraxinus* (ash) are currently considered unacceptable for planting in HRM due to the influx of the Emerald Ash Borer pest.

Small

- *Acer campstre* (Hedge Maple) *[3]
- *Cercidiphyllum japonicum* (Katsura) *[3]
- *Corylus courna* (Turkish Hazel/Turkish Filbert)
- *Maakia amurensis* (Amur Maakia) *[3]

- *Ostrya virginiana* (Ironwood) *[3]
- *Pyrus calleryana 'Bradford'* (Brandford Ornamental Pear) *[3]
- *Pyrus calleryana 'Redspire'* (Redspire Ornamental Pear) *[3]
- *Syringa reticulata* 'Ivory Silk' (Ivory Silk Lilac) *[3]

Medium

- *Acer rubrum* (Red Maple) *[2]
- *Acer x freemanii 'Celzam'* (Celebration Autumn Blaze Maple) *[2]
- *Betula nigra* (River Birch)
- Catalpa speciose (Umbrella Tree)
- *Ginkgo biloba* (Ginkgo Biloba - male only) *[3]
- *Tilia cordata* (Little Leaf Linden)

Large

- *Celtis occidentalis* (CommonHackberry) *[2]
- *Fagus sylvatica* (Eurpoean Beech – tree form only) *[2]
- *Gymnocladus dioicus* (Kentucky Coffee Tree) *[2]
- *Juglans nigra* (Black Walnut)
- *Liriodendron tulipifera* (Tuliptree) *[2]
- Quercua macrocarpa (Burr Oak) *[3]
- *Quercus palustris* (Pin Oak) *[2]
- *Quercus rubra* (Red Oak) *[3]
- *Tilia americana* (Basswood)
- *Ulmus americana* 'Princeton' (Princeton Elm) *

,[2],*[3] *Planting Under Utility Lines*

(a) When replacing a mature tree removed due to construction, species indicated with *[2] are acceptable for planting under single, 2-phase and 3-phase single circuit distribution lines.

(b) Species indicated with *[3] are acceptable for planting under 3-phase single and 3-phase double circuit distribution lines. The Municipal Engineer shall confirm selection.

(c) When planting a tree where no tree existed previously, species indicated with *[3] are acceptable for planting under distribution lines.

5.3.3 Planting Guidelines

Tree planting (including soil quality, plant stock, staking and tethering, bark protection, straightening, mulching, watering, and maintenance during warranty period) shall be carried out

as per the specifications of the NSRBA Standard Specification for Municipal Services and HRM Supplementary Specification

5.3.4 Monitoring following Development/Construction

Trees planted during development or municipal construction activities shall be inventoried by project proponents regarding location and species. Inventories shall be provided to HRM staff at the time of planting and will be followed immediately with substantial completion inspection by the HRM Staff.

5.3.5 Soil Volume Requirements

The soil volumes, moisture, and nutrient requirements for trees are often compromised on city streets due to competition from other urban elements. This results in urban street trees that rarely reach their growth potential and rarely provide the environmental benefits of a mature tree. The main limiting factor for most street trees, particularly within the hardened furnishing zone of urban streetscapes, is the volume of soil available. In addition to this section, refer to the details in Part B.

(a) The following minimum soil volumes shall apply to street trees (medium to large):

- (i) Single street trees require a minimum of 23 m^3 of soil.
- (ii) Up to two trees can share a pit containing 23 m^3 of soil.
- (iii) For each additional tree in a continuous trench (a shared planting pit that accommodates several trees and their root systems in a streetscape design) there shall be an additional 11 m^3 per tree.

(b) When planting small trees under wires, the following minimum soil volumes shall apply:

- (i) 11m^3 per tree for single and double tree pits.
- (ii) An additional 5m^3 for each additional tree in a continuous trench.

(c) In situations in which it can be demonstrated that the required minimums cannot be achieved due to physical limitations of the site, a reduced soil volume may be considered, subject to the approval of the Urban Forester.

5.4 QUANTITIES OF TREES TO BE PLANTED

Trees planted directly in the grass strip between the sidewalk and curb (the boulevard) are a standard feature of streets world wide, cost effectively transforming them into elegant streetscapes with a range of benefits to people and the environment. When this grass strip is unavailable for various reasons (see section 2.4.6), specialized approaches are needed to achieve the required volumes of uncompacted soil cited in section 5.3.5.

This section describes the required number of trees associated with various situations.

5.4.1 Quantity of Trees Required in Grass Boulevards

(a) When planting trees in grass boulevards, trees shall be supplied at a rate of **one tree for every 10 m** (linear) of curb and/ or sidewalk being constructed or reconstructed, unless otherwise indicated in the Regional Subdivision By-law or at the discretion of the Municipal Engineer.

(b) Tree spacing may vary due to planting restrictions (i.e. required offsets; underground conflicts) but should be related to the expected canopy spread of the species planted.

(c) Attention to soil quality and quantity within the sodded boulevard is required to ensure that trees survive and thrive. The boulevard shall be backfilled with adequate growing medium following curb and sidewalk construction. Refer to the details in Part B.

(d) Where the boulevard is constrained or absent because it must be hardened, or the sidewalk must directly abut the curb, options for planting street trees in the frontage zone should be explored (i.e. between the sidewalk and the property line) or hardscape planting options must be used (section 5.5).

5.4.2 Quantity of Trees Required in a Hardscaped Furnishing Zone

(a) When planting trees in soil cells, raised planters, or a combination of the two, trees shall be planted at a rate of **one tree for every 20 m** (linear) of curb and/or sidewalk being constructed or reconstructed. This reduced rate recognizes the increased cost per tree associated with these options compared to planting in grass boulevards. Section 2.4.6.1 describes the conditions under which a hardened furnishing zone is appropriate.

(b) Tree spacing may also vary depending on the configuration of soil cells and planters used to enable sharing of soil volume between trees, allowing for some clustering of trees. Spacing may also be impacted by planting restrictions, but as above, it should be related to the expected canopy spread of the species planted.

5.5 HARDSCAPE STREET TREE PLANTING OPTIONS

At the Municipal Engineer's discretion, a hardened furnishing zone may be required as described in section 2.4.6.1. In such conditions, three planting options may be considered for planting trees, depending largely on the width of the pedestrian realm available:

(i) Soil cells
(ii) Raised planters
(iii) A combination of both above

This section is to be read in conjunction with HRM's standard details provided in Part B, and with reference to Section 3 for guidance on how tree planting is to be integrated with various sidewalk surface treatments, furnishings, and other streetscape elements. Refer to Map 301 – Sidewalk Treatments and Furnishings.

5.5.1 Soil Cells

A soil cell system is a rigid structural skeleton which can be placed under sidewalks and walkways that provides space for planting medium within its assembly. The cells are hollow on the inside and have open sides providing adequate uncompacted soil volume within, while permitting a hard surface above. Additionally, soil cells may be flexibly configured underground, accommodating various utilities.

Soil Cell Systems provide advantages such as:

- The ability to achieve significant soil volumes and tree growth potential while allowing pedestrian circulation overtop;
- Allowing various depths of soil cells to enable flexibility in excavation depth;
- The ability to be installed while maintaining an existing curb;
- Allowing flexible configurations to minimize conflicts with buried utilities;
- Acting as a stormwater 'best management practice' (BMP); and,
- Providing enough soil volume even when pedestrian realm is very narrow (3 m or less).

(a) Soil cells must support the expected loads on the surface above, which, even in the case of sidewalks and furnishing zones, include snow removal equipment and service vehicles.

(b) Refer to the details in Part B.

5.5.2 Raised Planters

A raised planter consists of cast-in-place concrete walls above grade containing enough soil volume for street trees.

Long raised planters, typically made of concrete or granite, can enhance streetscapes by increasing the soil volume available for trees while protecting them - factors that assist significantly with growing larger, healthier trees. Such planters can also provide benefit as informal seating areas when they are at least 430 mm high.

(a) The pedestrian realm must be at least 4.5 m wide to consider the installation of a raised planter and still meet minimum curb offsets and pedestrian clearance requirements.

(b) Where there is adjacent on-street parking or loading, planters should be no more than 14 m long, with a minimum 1.5 m gap between planters, to allow access between curbside uses and the sidewalk.

(c) Trees in planters are generally underplanted with sod, but ornamental perennials, grasses, or mulch may be used if arrangements have been made to maintain them free of weeds and litter.

(d) Raised planters create a barrier between the sidewalk and the curb. Drainage and icing prevention must be considered.

(e) Raised planters shall be offset 600 mm minimum from back of curb to avoid interference with vehicle doors in curbside areas available for stopping / parking / loading.

(f) To support visibility, the edges and top of the raised planter should be clearly defined by texture and colour-contrast from the surroundings.

(g) Maintenance planning must be arranged for watering, because planters do not receive runoff.

(h) Additional design coordination may be required with utilities due to continuous concrete footings.

(i) Refer to the details in Part B for details on Planters.

Figure 5.5.2 - Streetscape in Toronto with Raised Planters

5.5.3 Combination Raised Planter / Soil Cell

It is possible that either of these strategies used alone will not supply the minimum required soil volumes, or that the benefits of both may be sought in any given site. In such situations, raised planters can be combined with soil cells to achieve adequate soil volumes.

5.6 TREE PROTECTION

Trees near construction and demolition can face significant stress. Damage to trunks and branches, excavation of roots, compaction of soil, and changes to grades and drainage patterns can lead to an unhealthy or unsafe tree. In extreme cases construction and demolition work may contribute to the death of a mature tree.

Protection and preservation of mature trees on municipal land, including the preservation of the environmental conditions that support these trees, is considered a priority.

(a) A permit must be obtained for work around municipal trees further to the requirements of Bylaw T-600 Respecting Trees on Public Lands.

(b) Refer to Bylaw T-600 for information on required permits and tree protection measures during and after construction or demolition.

(c) Refer to the details in Part B regarding tree protection.

6.0 TRAFFIC SIGNALS

(a) Designers shall work with HRM staff for traffic signal design.

(b) Details for various traffic signal elements are included in Part B – Standard Details.

(c) Traffic signal design shall be in accordance with the *Nova Scotia Motor Vehicle Act*.

(d) Designers shall reference the latest edition of the *Manual of Uniform Traffic Control Devices for Canada (TAC*) for design guidance.

HRM is working on creating language regarding traffic signal guidelines. These changes are underway and are expected to be completed for the next update to this document.

7.0 STREET LIGHTING

7.1 GENERAL

HRM has a specific system for street lighting that permits a level of illumination that meets and exceeds the minimum requirements recommended by the Illumination Engineering Society of North American (IESNA) Handbook. These standards and design criteria described herein are unique to HRM and must be followed to ensure the street lighting design can be incorporated into the existing HRM network.

The general requirements for street lighting are as follows:

(a) HRM's Street Lighting Department must be notified of any addition or modification to HRM owned street lighting equipment. HRM's Lock-out/Tag-out Procedure must be followed before accessing HRM street lighting equipment.

(b) The luminaire shall be Light Emitting Diode (LED) technology, only. It shall be designed to properly light the roadway /sidewalk and shall provide maximum spill light cut-off beyond the sidewalk to reduce spill light and glare impacts on local residents as per the latest edition of the American Nation Standards Institute / Illumination Engineering Society Recommended Practice for Design and Maintenance of Roadway and Parking Facility Lighting (ANSI/IES RP-8). The luminaire must be International Dark-Sky Association compliant.

(c) For projects that impact the right-of-way, a lighting assessment is required to ensure the current street lighting standards are met for the impacted area. If the lighting assessment confirms a need for additional lighting, a detailed engineered lighting and electrical design for the area must be provided for review and approval by the Municipal Engineer. The costs associated with the design, the addition or upgrading of lighting for the area, and any associated electrical equipment including power supplies and connections to the existing street lighting system, must be incorporated into the project budget. For locations with decorative lighting according to Map 305 – Street Lighting Plan in Appendix B, the standards described in section 3.4 "Ornamental Streetlights and Poles" are to be followed.

7.2 DESIGN REQUIREMENTS

(a) For the development application, if the final subdivision approval, is before July 2nd, 2013, HRM is responsible for the lighting design. If it is after July 2nd, 2013 the developer is responsible. Designs are to be based on the latest edition of ANSI/IES RP-8 Roadway Lighting Design Guideline Manual and approved by the Municipal Engineer.

(b) Once the roadways have been built and NSPI has installed their infrastructure, the applicant will install the LED roadway lights and monitoring system based on the approved drawings.

7.2.1 Sub-Document Requirements for Lighting Design Process:

The designer will require the following:

(i) Required software: AGI32 14 or higher;
(ii) Latest edition of ANSI/IES RP-8 Roadway Lighting Design Guideline Manual;
(iii) Latest edition of ANSI/IES DG-19 Design Guideline for Roundabout Lighting;
(iv) Individual IES photometric files for each manufacturers LED being used in the design. This file is created using a Genome testing sphere by a third-party testing corporation and records all of the characteristics of the LED, which is used to plug into the AGI32 software and is provided by the Municipal Engineer;
(v) Roadway classification for each individual roadway in the lighting design, provided by the Municipal Engineer;
(vi) Pedestrian conflict for each individual roadway in the lighting design, provided by the Municipal Engineer;
(vii) Pavement type (always R3);
(viii) Light loss factors for each LED used in the design (varies), provided by the Municipal Engineer;
(ix) Bracket lengths available (1.8 m or 3 m);
(x) AutoCAD file to use as the template or backdrop for the design including street names;
(xi) Luminaire lighting templates which contain pre-loaded IES files for each individual fixture. (AEL Fixture IES Template **or** LED Roadway Lighting NXT IES Template);
(xii) ROAM NODE Spec Sheet Spring 2018 DSN_pdf.pdf;
(xiii) CIMCON DataSheet iSLC3100-7P-S.pdf; and,
(xiv) CMS Import File Template For Developers.xlsx, provided by the Municipal Engineer.

7.2.2 Design Procedure to Follow (using AGI32)

The is required to provide a detailed lighting design which meets HRM's current standards, as follows:

(a) From the latest edition of ANSI/IES RP-8 Roadway Lighting Design Guideline Manual, use IES RP-8 Table 2 to determine minimum roadway lighting requirements. IES RP-8 Tables 5, 6, 7, and 8 are to be used to determine minimum sidewalk/walkways/bikeways etc. (horizontal and vertical calculations required). This does not include mid-block crosswalks and crosswalks at intersections, only pedestrian areas where flow is parallel to traffic movement.

(b) For mid-block crosswalks/intersection crosswalks, use IES RP-8 Table 9 to determine minimum lighting requirements (horizontal and vertical calculations required).

(c) It is standard practice to start with the smallest available wattage LED and work upwards until the correct LED is selected to satisfy minimum requirements for each individual street. This will ensure that the roadway is lit as efficiently as possible. It is recommended to calculate intersections first due to their higher light level requirements which will help the adjacent calculations.

(d) Intersection requirements are listed in IES RP-8 Table 9, and an individual calculation must be done on each intersection within the design and labeled appropriately.

(e) All calculations are to be done using the calculations points – polygon method, grid set to 1.5 m x 1.5 m and text size 1 m. All calculations must be labeled by the street or crosswalk/sidewalk that they represent in the lighting design calculations and adjacent to their location on the design.

(f) Roundabouts require a calculation for each entrance and exit into and out of the roundabout for the crosswalks (vertical and horizontal calculations required). A horizontal calculation is required for the whole roundabout area. Refer to the latest edition of IES DG-19 for minimum requirements and measured distances for vertical measurements.

(g) When a new development creates a new intersection with an existing street the developer is responsible for lighting that new intersection as per latest edition of ANSI/IES RP-8. All existing light information can be provided to the designer by the Municipal Engineer. It is possible that existing lights in the new intersection will need to be removed and replaced if the intersection's light level minimum requirements increase.

(h) When a road is being extended or connects to another existing road, the lights that exist in the field must be inserted into the design due to their contribution to lighting the particular section of roadway. HRM staff can provide information on existing lights in the area as required including IES files.

(i) Drawings must be submitted through the appropriate HRM department and will be reviewed by HRM staff responsible for street lighting. If there are deficiencies in the design, it will be sent back, and the process will be repeated until the design is acceptable.

(j) Designers may round up i.e.; 5.06 lux can be rounded up to 5.1 lux.

(k) Luminaire height default is 8.5 m for wooden pole applications only. If mounting is on an aluminum light pole the height will be determined by the Municipal Engineer.

(l) The designer must submit the completed AGI file to HRM for approval.

7.2.3 Design and Installation Requirements for Lights Installed on Wood Poles

The purpose of this section is to guide a consultant or developer on what is expected by the HRM when installing an overhead street lighting system. In addition to the requirements in section 7.2.2, the following requirements shall be met:

(a) The designer is required to follow Nova Scotia Power's installation specification which details how the fixture is connected to Nova Scotia Power's infrastructure. These standards are listed in "LED on a Street Light Bracket" (see standard detail in Part B).

(b) The developer is required to install a monitoring network (node) on each individual fixture and in some cases some additional network equipment is required depending on

the location and proximity of the newly installed fixtures within HRM's street light network. These standards are listed in section 7.4.

(c) Before lights are installed, the engineer of record must verify from Nova Scotia Power that the lines have been strung and are all energized.

(d) Luminaires mounted on wood poles must comply with the details in Part B.

(e) Mounting heights will be determined by the position of the secondary conductors on the wood pole.

(f) Designers must comply with all regulations provided by Nova Scotia Power and communication utilities for spacing between luminaires and high voltage and communication conductors.

7.2.4 Design and Installation Requirements for Lighting Equipment Installed Underground

This section outlines the requirements for installation of a lighting system fed by underground power. In addition to the requirements in section 7.2.2, the following requirements shall be met:

(a) The type of ornamental or aluminum standard that the consultant/developer must use is dictated by a Map 305 - HRM Street Lighting Plan. (Refer to section 3.4 Ornamental Streetlights and Poles.) If the new installation is located in an area not indicated on Map 305 – Street Lighting Plan than the developer can select from the 9 styles preselected on the map. The Municipal Engineer will specify the light / pole for the design and for ordering purposes.

(b) The final lighting design, approved by HRM, must be stamped by the engineer of record. The drawing must abide by the current CEC (Canadian Electrical Code) and must also include the list of HRM's construction requirements noted in section 7.3.2.

- Sub-Documents/files required in addition to those listed in 7.2.3:
  - Pole Base template – To be determined when pole is selected;
  - Concrete Base detail – To be determined when pole is selected;
  - Electrical service and lighting controller – To be determined by the load and voltage of the selected poles and how big the development is; and,
  - Catalogue numbers and specification sheet of the selected pole and light – to be determined when the pole/head is selected.

(c) Once all the requirements above are met the developer must contact HRM staff to arrange a final inspection. The developer must first verify from Nova Scotia Power that the lines have been strung and are all energized. Once the inspection and deficiencies, if any, have been completed, HRM staff will accept the new street lighting system on behalf of HRM.

(d) The consultant/developer is required to install a monitoring network (node) on each individual fixture and in some cases some additional network equipment is required

depending on the location and proximity of the newly installed fixtures within HRM's street light network. These standards are listed in section 7.4.

7.2.5 Drawing Format Requirements:

- The drawing file must be in AGI32 format.
- All streets require a label to identify them within the design
- All LEDs require labels i.e.; Project Name, luminaire number, label, tag, tilt and mounting height
- Isolines are to be provided in 2 lux increments, line width = 0.3m, text size =1m, label increment of 15m
- Two drawing schedules are required: "luminaire schedule" must include arm length, light loss factor, LED description, arrangement, label and a "calculation summary" must include label, calculated type, units, average maximum and minimums, avg./min, max/min
- Designers are required to indicate the road classification/pedestrian conflict for each street they are using within the drawing by simply adding text under the calculation schedule.
- HRM require minimum average calculations, uniformity ratio, and veiling luminance calculations for each individual calculation. Veiling luminance calculations can only be done when a straight section of the roadway exceeds 83m.
- All sidewalks require a horizontal calculation and two vertical calculations at 1.5m in height at opposite directions as per ANSI/IES RP-8, latest edition. Sidewalk verticals EvMin is to be considered as an average value not a minimum value.

7.3 CONSTRUCTION AND INSTALLATION REQUIREMENTS FOR STREET LIGHTS

7.3.1 Electrical Distribution Service

Street lighting systems shall be single/three phase 120/208 volt or single/three phase 347/600 volt. The electrical distribution system shall be an un-metered service mounted on a wood pole or fed from an Underground Street Light Power Enclosure as shown in Part B: Standard Details.

7.3.2 General Construction Requirements and Notes for Street lighting

The following shall be included as notes on construction drawings when applicable, for clarity between designer and installer:

- Any modifications to any existing street lighting power enclosure shall be approved by the Municipal Engineer.
- All electrical circuits shall be identified using numbered wire tags.
- Minimum conduit size shall be 38 mm or 1 ¼".
- All underground electrical joints shall run to the nearest pole to avoid the usage of underground junction boxes, when possible. If unavoidable the location must be approved by the Supervisor of the Street Lighting Department.
- All wire runs shall contain an extra conductor as a spare.
- Grease all screws and bolts using never seize paste.
- Minimum wire size #8AWG R90 XLPE Simpull.
- Tape wire connectors with super 88 electrical tape.

- No split bolts. Use ISCO PBTD3-4 multi-port connector.
- Transformer base shall be grounded with ground lug. Bundy K2A26U and bonded to ground plate and also to incoming system ground.
- Overhead connections shall use KZEP 410 Tyco piecing connector.
- Every pole shall have a separate ground plate installed and bonded to pole through ground lug.
- Every pole shall have a fuse kit installed for every individual head using fuse kit (Amerace #65U and/or D65U).
- Set all poles on the concrete base not on the nuts, no grout. Orientate poles parallel to the roadway. Especially with Sitelink square poles due to their track channel system for mounting accessories.
- Pole concrete base must be aligned parallel with the curb or roadway, and must adhere to the details in Part B and HRM Supplementary Specifications regarding concrete.
- All pole wiring must adhere to the details in HRM Municipal Design Guidelines Part B.
- Street lighting power enclosure concrete base must adhere the details in HRM Municipal Design Guidelines Part B and HRM Supplementary Specifications regarding concrete.
- Street lighting power enclosures must adhere to the typical electrical cabinet layout, refer to details in HRM Municipal Design Guidelines Part B.
- A conduit layout/diagrams must be provided for all new power enclosures.
- Do not weld nuts.
- Lock washers on everything that requires an anchor bolt including decorative poles.
- Conduits must be cut off above concrete base 2” high not level with concrete base, and not any higher than 4”.
- Anchor bolt height above concrete base is not to exceed 4” to allow the socket to fit over it.
- Wire tags must be proper wire tags not duct tape, masking tape etc.. Also, each circuit including the neutral must be separately identified.
- The u-guard must be grounded to the main service ground.
- All underground conduit runs must adhere to the Underground trench detail shown in Part B – Standard Details.
- Typical LED wiring on a wooden pole shall adhere to the details in HRM Municipal Design Guidelines Part B.
- Stub post wiring detail with plugs, refer to the details in HRM Municipal Design Guidelines Part B.
- Wooden pole mounted services shall adhere to the details in HRM Municipal Design Guidelines Part B.
- For further detail on pole specifications, for everything including street light brackets, refer to the details in HRM Municipal Design Guidelines Part B.

- Pole mounted service no switch, refer to details in HRM Municipal Design Guidelines Part B.
- Post mounted switch, refer to details in HRM Municipal Design Guidelines Part B.
- For transformer base grounding; All the grounds in a transformer base must be joined together with the ground plate including the ground that goes back to the cabinet. This also applies to traffics grounds. No separate ground loops. Refer to details in HRM Municipal Design Guidelines Part B.
- Typical Relay Installation: Refer to details in HRM Municipal Design Guidelines Part B.
- Street Light conduit runs should minimize bends to 2 x 90 deg bends in each run pole to pole to reduce the extra effort to pull wire.
- Pole wiring to be done using #12/2 NMWU, refer to details in HRM Municipal Design Guidelines Part B.
- Transformer base doors and hand hole covers must face the sidewalk not the street.
- When a contractor makes an electrical connection off of an existing connection they must remove any faulty or damaged part of that connection and also pigtails are not permitted they must connect to the original connection point only.
- When a contractor mounts a street light bracket to a concrete pole or steel pole and is unable to drill the second hole for the bolts they must use ¾" stainless steel banding to secure the bottom part of the bracket.
- When a contractor mounts a light to a concrete or steel pole they must use ¾" stainless steel banding to support the liquid tight flexible conduit. Tie wraps are not permitted.
- Duct seal must be used to seal all incoming pipes into the main switch or controller to reduce humidity and condensation within the switch.

7.4 SMART NODE INSTALLATION PROCESS

HRM uses an adaptive control network to monitor the street lighting system. Each luminaire has a smart node installed on the photo cell receptacle that communicates in a mesh network to an Access Point. The Access point pushes all the information collected by the smart nodes on each light to a server with software installed on it called Street Light Vision (SLV). The SLV software is used to monitor and adjust the lights functions such as dimming/brightening or changing schedules/alarms etc. Developers will be responsible to purchase the nodes and Access Points (if required) and collect all the necessary information to fill out the smart node template which is used to import information into the SLV to activate the smart nodes on the network.

Step #1 – Lighting Design Approval

Submit a roadway lighting design to HRM for approval in accordance with Section 7.2.

Step #2 – Installation of the new lights in HRM's Corporate Database

Prior to the installation of any street light fixtures, export the AGI32 file from the approved lighting design to an AutoCAD file and provide to HRM staff to have the new lights added to the

HRM database. Allow two weeks for incorporation into the database prior to installation of any streetlight fixtures.

HRM will be provide notification when the lights have been added to the database. As part of this notification, the developer will receive a spreadsheet (Excel) with the required information to complete the Smart Node template spreadsheet, which will also be provided by HRM.

Information provided by HRM will include:

- FX numbers for each light
- SS numbers for each light
- Lat and Longs for each light
- District for each light

Note: the lighting design software assigns a number to each fixture, this number will be used to identify the fixture so it can be paired to a node.

Step #3 – Order Material

After receiving the required spreadsheets from HRM, the required nodes, fixtures, brackets and access point(s) (if required) can be ordered.

Smart Node Order Information 2 provided to select from;

Manufacturer – CimCon Lighting Inc.
Part # ISLC-3100-5pin-s-a-g-CATC20 120 Volts
Part # ISLC-3100-5pin-s-a-g-CATC20 347 Volts

Manufacturer – Acuity Brands ROAM Node.
Part # DSN-127(120-277V)-BK-0-G-[blank]USM4-DSTY Suffix “YHZ”
Part # DSN-347(347)-BK-0-G-[blank]USM4-DSTY Suffix “YHZ”

Step #4 – Complete Smart Node Template

Using the information from the spreadsheet provided by HRM and the approved lighting design, fill out the Smart Node spreadsheet.

Each smart node has a serial number and a MAC ID which appear on two bar code stickers on the side of each node. These must be entered into the smart node spreadsheet using a handheld scanner or inserted manually. Each smart node is unique to a particular light fixture and needs to be assigned using the fixture number from the approved lighting design to identify each node and fixture as a pair.

Save the smart node template using the developments name or file number and provide a copy to HRM.

When installing fixtures and nodes in the field, they must be installed as a pair based on the assignment created in the smart node spreadsheet. If they do not match, the monitoring system

will place the node in the wrong location and flag an error. Correcting such errors will be the responsibility of the developer.

Step #5 – Installation Inspection

After the equipment has been installed, notify HRM of completion so that HRM staff can upload the smart node file into SLV and then physically check to ensure everything works.

8.0 TRENCH REINSTATEMENT

8.1 INTRODUCTION

This section documents the requirements for reinstatement of trenches within the HRM rights-of-way. This document does not address trench excavation procedures, trench design, or associated safety related issues.

Notwithstanding the following, the nature and extent of the required reinstatement of the cuts will be at the sole discretion of the Municipal Engineer based upon field assessment of the section of roadway prior to the permanent reinstatement.

8.2 BACKFILL MATERIALS

The backfilling of trenches within roadways requires placement of the following material types;

8.2.1 Embedment Materials

Embedment material is designed to provide a protective layer surrounding the utility and is comprised of the bedding layer, the haunch layer, and the cover layer. Bedding material shall be Type 1 gravel, or under limited conditions sand or clear stone (for example, around natural gas pipelines). Type 1 gravel shall meet all specification requirements of the NSRBA Standard Specifications for Municipal Services.

Bedding material separating the trench base and service utility shall have a minimum compacted thickness of 100 mm. Haunch and cover layers shall be placed at a maximum thickness of 200 mm prior to compaction. All embedment material shall be compacted to a minimum density equal to 95% of Standard Proctor density. Sand used as embedment around natural gas pipelines does not require the same level of compaction; however, the compaction requirements must be achieved for all other layers and the expectation is that the sand layer does not negatively impact on the street and sidewalk related infrastructure. The use of clear stone shall be restricted to those conditions where the trench base holds excessive free water or conditions that prohibit the use of specified materials. The clear stone shall be surrounded with geotextile fabric to prevent migration of fines into voids in the clear stone.

8.2.2 Structural Fill

Structural fill shall be placed immediately over the embedment material and extend to the subgrade for street gravels. Structural fill shall be placed in uniform layers not to exceed 300 mm before compaction. The top 300 mm of structural fill shall be compacted to a minimum density equal to 98% of Standard Proctor density with the underlying structural fill compacted to a minimum of 95% Standard Proctor density.

Structural fill may be suitable naturally occurring material or imported fill similar in composition to naturally occurring material. In either case the material shall be free of excessive organics or deleterious materials and be moisture conditioned to within ± 3% of the optimal moisture content as determined by the Standard Proctor test. Where natural occurring clayey soils are utilized as structural fill moisture conditioning in the form of drying may be required. The determination of “suitable natural occurring material” will be at the discretion of HRM. Controlled density fill or unshrinkable fill may be approved by

HRM for use in small quantities in tight or restricted-access areas where placing and compacting of fill or gravel is difficult. Controlled density fill shall not interfere with natural subsurface drainage patterns and be located a minimum of 600 mm below ground level to prevent differential frost movement. Controlled density fill shall meet the requirements of the NSRBA Standard Specifications for Municipal Services.

8.2.3 Type 1 and Type 2 Gravel

Type 1 and Type 2 gravels shall be placed between the structural fill and the asphaltic concrete at the thickness specified in the street classification standard details. Type 2 gravel may be replaced with Type 1 gravel on shallow trenches. Gravels shall be compacted to a minimum density equal to 100% of Standard Proctor density.

8.3 ASPHALTIC CONCRETE

Asphaltic concrete shall meet HRM's Supplementary Specification for hot mix asphalt concrete. The asphaltic concrete shall be placed over a Type 1 gravel base. The thickness, number of lifts and type of asphaltic concrete placed in any trench excavation shall be in accordance with the standard detail for the street classification. Asphaltic concrete shall be compacted to a minimum of 92% of the theoretical maximum density based on comparative loose mix samples recovered from the project.

Specific requirements pertaining to the remediation of pavements are provided below;

(a) The pavement thickness shall not exceed that specified for the street classification in the standard detail for the street classification irrespective of pavement types (rigid, flexible, cobble stone).

(b) Asphaltic concrete shall be placed with an asphalt spreader on streets where the PCI is greater than 60; the trenches are longitudinal and wider than 1.5 meters.

(c) Where a concrete layer directly underlies the asphaltic concrete, the concrete shall be replaced with asphalt, and the replacement thickness of asphalt shall be the lesser of 250 mm or the combined thickness of the existing concrete and asphalt structure.

(d) Shallow Trenches are those with a maximum depth of 1.2 m, and are typically for gas lines, telecommunication or electrical conduits and other utilities.

(e) Deep Trenches are those deeper than 1.2 m, and are typically for water, wastewater and stormwater mains, but may include other utility pipes or conduits.

(f) Except for local streets, the asphaltic concrete joint shall be located outside the wheel path of vehicles.

(g) On streets that have a PCI greater than 40, the existing asphaltic concrete shall be cut back far enough that the edge is above gravel and soil that has not been disturbed by the excavation. The minimum cut back shall be 200 mm for shallow trenches and 300 mm for deep trenches.

(h) Prior to placement of asphaltic concrete, the edges of the existing asphalt shall display smooth vertical cuts (full depth asphalt cut is required; however, if asphalt is greater than 250 mm a variance may be approved) which are in a straight line along the outside of the trench and parallel to the pavement cut on the opposite side of the trench. For longitudinal trenches the minimum distance between jogs (approximate 90 degrees to the edge of the pavement) shall be 5 meters, with no more than 4 jogs along any 50 meter section of trench. Jogs are normally not permitted for transverse cuts. Asphalt cuts are not to end at manholes or valves, and shall be a minimum of 1 meter from these structures.

(i) The asphalt edges shall be clean and dry prior to applying a uniform application of tack coat which shall be allowed sufficient time to cure prior to the placement of joint sealant and asphaltic concrete.

(j) Adhesive joint sealants such as Denso Reinstatement Tape or equivalent shall be used on construction joints on roadways which have a PCI greater than 40. This requirement may be waived in isolated areas where the existing asphalt is in such poor condition that placement of joint sealant is not practical.

(k) At the discretion of the HRM representative Type C-HF asphalt may be utilized for the full depth of reinstatement, and for Local roads Type C-HF may be replaced with Special Type C. Individual lift thicknesses shall not exceed 75 mm for Type B-HF and 50 mm for Type C-HF asphaltic concrete. The Municipal Engineer may consider one lift up to 125 mm for narrow and shallow utility trenches with the expectation that the compaction requirements are met. In addition, the surface course shall not exceed the design thickness as specified in the standard detail for the street classification.

(l) The proposed trench asphalt cut on a street with a PCI greater than 40 shall be moved to the following locations if within one meter of the:

- edge of existing pavement.
- edge of concrete curb or curb and gutter.
- existing asphalt joint (provide a new clean cut).

(m) Where more than 75% of the street asphaltic concrete pavement width is removed for a trench and the PCI of the street pavement is greater than 60 the existing asphaltic concrete on each side of the trench (to the full width of the street pavement) shall be milled and paved to a thickness of 50 mm. Where the street asphaltic concrete pavement width removed is between 50% and 75% and the PCI of the street pavement is greater than 60, the existing asphaltic concrete on each side of the trench shall be milled and paved to a thickness of 50 mm to the nearest existing longitudinal asphalt joint. If the existing asphaltic concrete in the above two cases is less than 75 mm, the full depth of the asphalt shall be removed and replaced.

(n) The surface of the asphalt patch shall conform to the cross-section of the street surface to within 6 mm when checked with a 3 meter straightedge placed in any direction. There shall be no noticeable pavement marks or “ripples” caused by rolling and compaction of the asphalt.

(o) Trench reinstatement between October 31 and May 1 shall be as per HRM Supplementary Specifications.

(p) Trenches that are open to vehicle or pedestrian traffic shall be reinstated with permanent or temporary asphalt (minimum of 50 mm thick) within 5 business days for Local Streets and 3 business days for Collector and Arterial Streets. Temporary asphalt placed between May 1 and October 31 shall be replaced with permanent asphalt within 45 days or by October 31, whichever comes first. Temporary asphalt placed between October 31 and May 1 shall be replaced with permanent asphalt by June 15.

(q) Refer to Part B: Standard Details; Shallow Trench Reinstatement, Deep Trench Reinstatement and Trench Backfill and Reinstatement – Testing.

8.4 CONCRETE CURB, SIDEWALK, AND DRIVEWAYS

Concrete curb, sidewalk, and driveways shall meet the requirements of the HRM supplementary specifications.

Concrete curb shall be placed such that the minimum distance between any joints in the existing or proposed curb is 1.2 m.

8.5 TESTING AND ENGINEER'S REPORT

An Engineer's Report is required to certify that the requirements have been met.

The requirements for bedding, haunch, cover, and structural backfill are included in the standard detail for Trench Backfill and Reinstatement – Testing; however, the Engineer's Report for these materials will only be required when the total length of trench for the project exceeds 100 meters, or when the HRM inspector has reason to believe that the specifications for those materials is not being met by the contractor. Compaction tests may not be required on the Type 2 gravel in emergency situations.

The engineer of record shall be a registered professional engineer licensed to practice in the Province of Nova Scotia who is in good standing with Engineers Nova Scotia and experienced in the testing requirements of this specification. The engineers report shall be submitted to HRM within 2 weeks of completion. Maintain copies of all test results for a period of 2 years after the test date and if requested, make them available to HRM.

8.6 WARRANTY PERIOD

Any Contractor carrying out work under an HRM Streets and Services Permit is deemed to have become familiar with this specification and hereby agrees to carry out the trench reinstatement in accordance with this document. The utility cut shall have a warranty as stipulated in By-law S-300. Any deficiencies identified by HRM shall be rectified within the time requested by HRM.

9.0 UTILITIES

9.1 NATURAL GAS

9.1.1 General

(a) Natural gas pipelines proposed to be installed within municipal streets shall be located so as to not interfere with, damage or impede maintenance access to any existing municipal infrastructure.

(b) The gas distribution system shall be designed, installed and maintained to meet or exceed the standard set out in all applicable Federal, Provincial and Municipal enactments, codes and specifications, and the Canadian Standards Association (CSA) Oil and Gas Pipeline Systems Standard.

(c) Warning marker tape shall be installed with natural gas pipelines installed using open trench techniques.

9.1.2 Engineering Plan

(a) Prior to any work within the street right-of-way, a detailed engineering plan must be submitted.

(b) For elevated pressure pipelines, a plan and profile are required which accurately depict the location, depth and dimensions of proposed pipelines and existing water, wastewater and stormwater mains, service connections and other underground utilities within 3.0 meters of the proposed gas pipelines and also including pavement surface, curbs, drainage ditches, sidewalks, trees, street lights, fire hydrants, curb stops, valve boxes, property lines and other relevant features, with respect to the construction to be undertaken.

(c) For plastic (PE) distribution pipeline, and engineering plan is required which accurately depicts all the information noted in 10.2.1 with the exception of depth information, unless otherwise required by the Municipal Engineer.

9.1.3 Installation Within Existing Streets

(a) Trenchless technology methods shall be considered, whenever possible, with particular consideration for crossing of sidewalks, curbs, driveways and in the vicinity of trees.

(b) Unless otherwise authorized by the Municipal Engineer, separation of gas pipelines from water, wastewater and stormwater mains shall be approved by Halifax Water and separation from conduits and duct banks shall be as approved by Nova Scotia Power, Aliant and other telecommunications utilities as applicable.

(c) Gas pipelines shall not be located within the bounds (tops of slope) of a drainage ditch.

(d) Where there are existing structures (buildings, retaining walls, etc.) located at or near street lines, gas pipelines shall be located to accommodate the future reconstruction of such structures.

(e) Gas pipelines shall be located such that the primary root systems of trees are not damaged.

9.1.4 Installation Within New Streets

(a) All service connections which cross under the vehicular traveled way must be installed before completion of street construction.

(b) Required service laterals shall extend from the main to 1.5 m outside the road right-of-way.

9.1.5 Street Restoration

This section applies to the restoration of existing streets after the installation of natural gas pipelines.

(a) All construction shall meet the requirements of the Trench Reinstatement section, HRM Supplementary Specifications together with the NSRBA Standard Specifications for Municipal Services (Blue Book).

(b) All surfaces shall be restored to the same or better condition as previous to the pipeline installation to the satisfaction of the Municipal Engineer.

10.0 STREETS AND SERVICES ACCEPTANCE REQUIREMENTS

10.1 GENERAL REQUIREMENTS

Prior to the Halifax Regional Municipality accepting streets and services, the applicant must submit the following:

(a) Record drawings, certified by a professional engineer licensed to practice in Nova Scotia, in 3 mil Mylar and electronic AutoCAD/Civil3D format prepared in accordance with the record drawing procedures contained in this document and a digital ASCII file containing three dimensional coordinates for all critical points, i.e. manholes, inverts, valves, water, wastewater and stormwater mains, underground utilities, sign posts, curbs, sidewalk, trees, etc.;

(b) Detailed records of all actual construction costs and quantities breakdown for each street;

(c) All warranty deeds for streets, walkways, easements, parkland, and any other property being conveyed to the Municipality to be conveyed to the Municipality, in the specified form, at no cost to the Municipality;

(d) Three copies of the final plan of subdivision showing the entire constructed Municipal street and all drainage easements or rights-of-way outlined in red; road reserves, walkways and parks outlined in yellow and easements outlined in green.

(e) A certificate of title prepared by a solicitor, in the specified form, certifying that the conveyed lands are free from encumbrances;

(f) Certification by a Nova Scotia Land Surveyor stating that all services have been installed within the boundaries of the streets, easements, walkways and any other land(s) reserved for public purposes; and that the as-constructed centre-line of the public street coincides with the final legal subdivision plans of the public street;

(g) Certificate of Compliance from a professional engineer licensed to practice in Nova Scotia certifying that all works have been inspected and are completed according to the approved engineering drawings and specifications;

(h) Copy of the Certificate to Construct from NSE and Professional Engineer's Certification of Compliance with NSE requirements for site stabilization and erosion control.

(i) A final copy of the Geotechnical Materials Testing Report prepared by a certified professional engineer licensed to practice in Nova Scotia, including confirmation of materials, the thickness, and compaction of subgrade, and in accordance with section 4.4.1.4.

(j) Warranty Security for one year in the amount of 10% of the actual costs of the streets and services.

(k) Where services such as power-lines, communications, gas mains, etc., are placed within HRM right-of-way, HRM requires certification from the service provider that infrastructure has been designed and installed to their requirements.

10.2 STORM DRAINAGE SYSTEM REQUIREMENTS

(a) Submission and acceptance requirements to Halifax Water Design Specifications, and as per Chapter 4 – Stormwater Management of this document.

10.3 STREET LIGHTING REQUIREMENTS

(a) Submission and acceptance requirements in accordance with Chapter 7 – Street Lighting of this document.

10.4 STREET REQUIREMENTS

(a) Professional Engineer's Certification of Inspection and Completion at the following stages of street construction:

- after clearing (pre-construction).
- after grubbing (before culvert and drain installation).
- at subgrade prior to application of any gravels.
- prior to surfacing gravel being applied.
- prior to paving.
- Final (prior to acceptance of services by the Municipality).

(b) Copies of laboratory and field tests of materials (sieve analysis, density tests, concrete compressive strength tests, etc.), confirming that the specified standards for the materials were achieved;

(c) Professional Engineer's Certification of asphalt mix, materials and plant placement are in compliance with HRM asphaltic concrete specification requirements.

(d) Testing and Engineer’s Report as per the Trench Reinstatement section.

(e) New bridges accepted by the municipality shall conform to the Halifax Bridge certification policy, and shall be certified by a professional engineer licensed to practice in Nova Scotia.

11.0 OFF-STREET

11.1 MUNICIPAL PROPERTIES

HRM is working on creating language regarding guidelines for work on Municipal Properties. This may include HRM owned Parks, as well as HRM owned Municipal Facilities. These changes are underway and are expected to be completed for a future update to this document.

12.0 VARIANCE REQUEST PROCESS

As discussed in section 1.2 of this document, where the designer proposes variations from this document and where the designer can show that alternate approaches will produce the desired results, such approaches may be considered for approval. The designer shall, in the first instance, consider such factors as safety, nuisance, system maintenance, operational costs, life cycle costs, environmental issues, natural topography, configuration of the bulk land, etc. The designer shall provide the Municipal Engineer a rationalization of these same factors in considering alternate approaches.

When a design variance has been requested, the engineer of record shall submit the request in conformance with the requirements as outlined in this section of this document. The engineer of record shall take into account the elements as outlined above. Each variance request will ultimately be assessed through the Variance Request Committee, and where practical, the Municipal Engineer shall provide a final decision in writing within 15 business days upon conclusion of the Variance Request Committee meeting. Where a request has been denied the applicant may consider additional options and resubmit for review.

Approved variance requests may be considered for inclusion into the next edition of this document and will be determined by the Variance Request Committee.

The following format is to be used by the engineer of record requesting an engineering design variance as it relates to this document. These requests may originate from internal or external parties.

The completed submission is intended to provide a detailed overview to the Variance Request Committee on the variance and is to outline all factors considered as part of the applicant's recommendation.

12.1 Submission Requirements:

(a) Each design variance must be submitted by the engineer of record, and provide a detailed description of the following:

- Identify the variance request and provide a brief description. What "design variance" is being requested and why? What standard and/or guideline is the "design variance" contrary to (i.e., this document, specific TAC guidelines, a variation, etc.)? Are there other standards and/or guidelines (i.e., NACTO, AASHTO, Federal Highway Administration, CSA, ITE, Transportation Research Board, etc.) that are accepting of the design variance?
- Identify key criteria that should be considered in the variance request.
- Prepare and present an engineering analysis in order to consider the design exception as acceptable.
- List mitigative factors that support the design exception.
- Provide a description with respect to how the requested variance meets the considerations as outlined in this document. Pursuant to this document, "The designer shall in the first instance consider such factors as safety, nuisance,

system maintenance, operational costs, life cycle costs, environmental issues, natural topography, configuration of the bulk land, etc. The designer shall provide the Municipal Engineer a rationalization of these same factors in considering alternate approaches."

- Outline the recommendation based on the above.

(b) The applicant is to identify if any consultation (i.e., HRM department, private sector consultant) was conducted and is to provide an overview of the recommendations from the consultation process.

(c) The applicant is required to include relevant reports, studies, cross sections and/or detailed engineering plans (where applicable) as part of the submission.

APPENDIX A – GLOSSARY AND ACRONYMS

GLOSSARY

Approval: The approval of the Municipal Engineer.

Accessible: Planning, design and programming that enables access by people with a variety of physical and mental abilities.

Active Transportation: Human-powered, personal travel chosen as an alternative to motorized travel; includes walking, running, hiking, the use of a wheelchair, bicycling, cross-country skiing, skateboarding, canoeing, rowing or kayaking.

All Ages and Abilities (AAA): Planning, design and programming that enables use by people of all ages and with a variety of physical abilities.

Barrier-free: Design that enables access by people with or without a variety of physical abilities.

Bicycle Facility: An umbrella term referring to a variety of treatments that make riding a bicycle safer and more comfortable e.g. bicycle lane, multi-use pathway, etc.

Bikeway: Routes or pathways used for bicycling.

Bollards: A short post designed to guide traffic and protect from vehicle intrusions. Bollards can be manufactured and installed to withstand significant vehicle impacts, but they can also be used as visual barriers. Many bollards also contribute decorative elements to complement building and landscape designs.

Boulevard: The part of the street right-of-way between the sidewalk and the curb, surfaced in grass or other vegetation (but when surfaced in hard materials like concrete or unit pavers is referred to as the ‘furnishing zone’).

Charter: The Halifax Regional Municipality Charter, 2008, C. 39, as amended.

Contractor: Any person who, for another person, carries out work or supplies labour for the alteration, construction, demolition, excavation, or development of land or a structure.

Complete Streets: An approach to planning, design, operations and maintenance of roads, sidewalks, landscaping and rights-of-way that enables safe, convenient and comfortable travel and access for users of all ages and abilities regardless of transportation mode (e.g. on foot, on a bicycle, using transit, in a private vehicle). It recognizes that public streets are also places that can serve a social, economic and ecological function.

Control Vehicle: A vehicle that design must accommodate for infrequent use, but encroachment into the opposing traffic lanes, multiple-point turns, or minor encroachment into the streetside is acceptable. A condition that uses the control vehicle concept arises when occasional large vehicles turn at an intersection with low opposing traffic volumes (such as a moving van in a

residential neighbourhood or once-per-week delivery at a business) or when large vehicles rarely turn at an intersection with moderate to high opposing traffic volumes (such as emergency vehicles).

Council: The Council of the Municipality.

Curb Extensions: A treatment that increases the width of a sidewalk while also reducing the width of a street to shorten pedestrian crossing distance, improve visibility, reduce traffic speeds and improve off-street amenities. Curb extensions, which can be located on intersection corners as well as at mid-block, are commonly referred to as 'bump-outs' or 'neck downs'.

Curbside Uses: Primarily refers to parking and loading. May also specifically include accessible parking, taxi stands and waste collection.

Decorative Paving Band: Typically, a strip of small concrete 'bricks' located between the sidewalk and the curb, when grass becomes too challenging to maintain in this zone (e.g. due to high pedestrian volumes or intense curbside use). This element enhances area aesthetics and can define the edge of the pedestrian through zone, as there may be obstacles such as poles, trees, bicycle racks and other street furniture within the zone of the paver edge.

Density: A measure of the number of people or housing units occupying a given area of land. The measure may reflect the general character of the housing types in a neighbourhood.

Engineer of Record: A person who practices professional engineering and is a registered member, in good standing, of Engineers Nova Scotia. Referenced in this document, as the professional engineer under whose signature the engineering design is sealed.

Design Vehicle: A vehicle that the street or intersection design must be regularly accommodate without encroachment into the opposing traffic lanes. A condition that uses the design vehicle concept arises when large vehicles regularly turn at an intersection with high volumes of opposing traffic (such as a bus route).

Development: Includes any erection, construction, addition, alteration, replacement or relocation of or to any building or structure and any change or alteration in the use made of land, buildings or structures.

Ditch: An excavated or constructed open channel.

Frontage Zone: The right-of-way space "behind" the sidewalk, or between the sidewalk and the property line, or in the cases of rural cross sections, between the ditch and the property line. It is intended to allow space for guying and stubbing of utility poles for stability, or a buffer for sidewalk repair or ditch maintenance. In the Regional Centre, the frontage zone may be used for location of additional streetscaping elements.

Furnishing Zone: Part of the street right-of-way between the sidewalk and the curb, surfaced in hard materials like concrete or unit pavers (but when surfaced with grass is referred to as the "boulevard").

Green Infrastructure: Stormwater infrastructure, such as retention ponds, rain gardens, and bio-swales, that reduce and treat stormwater close to its source, providing water for plants and trees while naturally filtering the stormwater before it returns to local waterways.

Greenfield Development: Development in a previously undeveloped site.

Halifax Regional Municipality (HRM): The Regional Municipality established by the Halifax Regional Municipality Act and includes the area over which that body corporate has jurisdiction.

Halifax Water: (Halifax Regional Water Commission). The municipal water, wastewater and stormwater utility for the Municipality. Halifax Water is authorized to own and operate the water supply, wastewater and stormwater facilities for HRM.

Halifax Complete Streets Guideline: The current title of the Municipal Design Guidelines for Halifax Regional Municipality.

Halifax Water Design Specifications: The latest edition of the specifications in accordance with the Halifax Regional Water Commission Act and containing the minimum design standards and specifications for all municipal water distribution systems, wastewater systems and stormwater systems.

Infill Development: Development of vacant or under-used parcels within existing built-up areas that are already largely developed.

Land Use: The classification of the natural and built environment, as it exists or as prescribed by policy or regulation.

Link: The role of a street in serving as a facility for the movement of people through the corridor.

Local Street Bikeway: Designated routes for bicycling on quieter, local streets.

Median: The central strip separating opposing lanes of traffic. Often used for landscaping and trees.

Mixed-use: Different activities and building occupancies that are arranged close to one another. These different uses may be located on the same site, in the same building or along the same street.

Mobility: The ability to travel and move around the city easily and efficiently.

Multi-modal Level of Service (MMLOS): A framework used to evaluate transportation infrastructure, often applied when considering changes to existing streets and intersections. MMLOS ratings consider the level of comfort and delay felt by private vehicles, pedestrians, bicyclists and transit users and enables the analysis of “tradeoffs” of various allocations of the urban street cross section.

Multi-Unit Residential: A building which contains four or more residential dwelling units.

Multi-use Pathways: Three to four metre wide paved or crusher dust trails that form part of a network intended for walking, bicycling and other active modes.

Municipality: The Halifax Regional Municipality, body corporate, as under the HRM Charter.

Municipal Engineer: The Engineer of the Halifax Regional Municipality and includes a person acting under the supervision and direction of the Municipal Engineer, as defined in the Halifax Regional Municipality Charter.

Municipal Service Systems: Includes wastewater systems, water distribution systems, storm drainage and control systems, road/street systems, street lights, signal lights, sidewalk, curb and gutter, street trees, etc.

Non-Standard Features: Elements not included in the Municipal Design Guidelines but which may be approved for inclusion within the right-of-way through a formal variance granted by the Municipal Engineer.

Peak Hour: For transportation modelling, the “AM or PM peak hour” is a single hour that occurs during the morning or afternoon peak where the largest number of persons are commuting between work/school and home. The peak hour is different for each intersection and, each region and varies from day to day.

Pedestrian Oriented: Elements of planning and urban design that prioritize the needs and comfort of pedestrians. The intent is to create safer, comfortable and more enjoyable environments for people of all ages and abilities. Specific pedestrian orientated design elements include interconnected streets, short blocks, four way intersections, hard surfaced pathways and an extensive sidewalk network.

Place: The role of a street in serving as a destination for people to spend time.

Placemaking: A collective and collaborative approach to planning and design that aims to create or reinvent existing spaces as memorable, quality public spaces.

Planter: A large, immoveable, above-ground vessel for soil, typically planted with perennial plants and/ or trees (in contrast to “container”).

Professional Engineer: A registered/licensed member, in good standing, of Engineers Nova Scotia and is referenced in this document particularly as that person(s) under whose signature the plans are sealed.

Protected Bicycle Lane: Bicycle lane separated from motor vehicle traffic with a physical barrier between the bicycle and motor vehicle lanes.

Rapid Transit: Transit service separated partially or completely from general road traffic and therefore able to maintain higher levels of speed, reliability and vehicle productivity than can be achieved by transit vehicles operating in mixed traffic.

Refuge Island: means a protected space in the centre of the street facilitating bicycle and pedestrian crossings by allowing one direction of traffic to be crossed at a time.

Refuge Median: The strip of land between the lanes of opposing traffic on a divided road, enabling pedestrians to pause in a safer location while crossing.

Regional Centre: The urban core of the Municipality, including the Halifax Peninsula and Dartmouth within the Circumferential Highway, as defined in the *Regional Centre Secondary Municipal Planning Strategy* (Centre Plan).

Retrofit: Construction in existing built-up areas. This may include infill development, significant renovations, or recapitalization projects.

Right-of-way (ROW): A strip of public land including and bordering a street, road or pathway.

Sidewalk: The portion of a street between the curb line and adjacent property line or any part of a street specifically designated for pedestrian travel and separated from the travelled way.

Staff: The staff of the Municipality.

Stormwater Best Management Practice (BMP): means a structural, vegetative, or managerial practice used to treat, prevent or reduce water pollution, including green stormwater infrastructure such as retention ponds, bioswales, and green roofs.

Stormwater: Water from precipitation of all kinds and includes water from the melting of snow and ice, groundwater discharge and surface water.

Stormwater Runoff: That part of the precipitation which travels by surface flow.

Stormwater System: The method or means of carrying and controlling stormwater, including ditches, culverts, swales, sewers, drains, canals, ravines, gullies, pumping stations, retention ponds, streams, watercourses, floodplains, ponds, springs, creeks, streets or private roads, roadways or driveways.

Street: Any public road, street or highway owned and maintained by the Municipality or by NSTIR.

Street Furniture: Permanently installed or temporarily placed furniture, including but not limited to benches, tables, chairs; receptacles for waste and recycling; bicycle racks; bollards, and other pieces intended for use by the public, but excluding newspaper boxes, mailboxes, traffic and utility poles, and smoking receptacles.

Street Line: The boundary of a street.

Streetscape: The elements within and along the street that define its appearance, identity and functionality, including adjacent buildings and land uses, street furniture, landscaping, trees, sidewalks and pavement treatments, among others.

Subdivision: The division of an area of land into two or more parcels and includes any re-subdivision of an existing lot or a consolidation of two or more parcels.

Surveyor: A land surveyor who is a registered member in good standing of the Association of Nova Scotia Land Surveyors.

Tactile Walking Surface Indicator (TWSI): A textured ground surface feature to assist people who are visually impaired to navigate the surrounding environment.

Traffic Authority: The deputized traffic authority as defined in the Halifax Regional Municipality Charter, who has all the powers conferred upon a traffic authority by or under the Nova Scotia Motor Vehicle Act.

Traffic Calming: A combination of primarily physical measures that reduce the negative effects of motor vehicle use, alter driver behaviour, and improve conditions for all street users. Measures to slow the speed of traffic.

Transit Priority Corridor: A street in the transportation network that features measures to give increased priority to transit vehicles, such as dedicated bus lanes.

Transit Priority Measures (TPM): Tools used to reduce delays, improve reliability and increase the average operating speed. Some of the most common TPMs include: traffic signal priority, queue jumps, bus lanes that are separated from motor vehicles (e.g. busways, railways). TPMs can also include traffic regulations, such as “Yield to Bus” legislation.

Travelway: The portion of a road, sidewalk, or pathway in which people or vehicles travel.

Urban Forest: Every tree within the city. Includes all the trees in urban communities, including those in parks, along streets and trails, in natural areas and on private property.

Urban Service Boundary: Urban and suburban areas with piped water distribution, and wastewater and stormwater services.

Urban Tax Boundary: The area where Halifax applies a general tax rate to all applicable taxable properties.

Urban Transit Service Boundary: The outer limit for providing conventional bus service, as prescribed in the Regional Plan. It closely follows the Urban Service Boundary.

Unshrinkable Fill: A low strength cementitious material consisting of Portland cement, flyash, water, aggregates and admixtures suitable for backfill in underground service, utility trenches and structures.

Walkable: A single route or a network of routes, between points, that is relatively short, barrier free, interesting, safer, well-lit, comfortable and inviting to pedestrian travel.

Watercourse: (i) the bed and shore of every river, stream, lake, creek, pond, spring, lagoon or other natural body of water, and the water therein, within the jurisdiction of the Province,

whether it contains water or not, and (ii) all groundwater. As defined by the *Environment Act* 1994-95, c. 1, s. 1

Wayfinding signage: Signage helping to direct users from point to point, or confirming their progress along a route.

ACRONYMS

AAA	All Ages and Abilities
AASHTO	American Association of State Highway and Transportation Officials
BMP	Best Management Practices
CENS	Consulting Engineers of Nova Scotia
CSA	Canadian Standards Association
HRM	Halifax Regional Municipality
IESNA	Illumination Engineering Society of North America
ITE	Institute of Transportation Engineers
JCCD	Joint Committee on Contract Documents
LED	Light Emitting Diode
MMLOS	Multi-modal Level of Service
NACTO	National Association of City Transportation Officials
NSE	The Department of Nova Scotia Environment
NSRBA	Nova Scotia Road Builders Association
NSTIR	The Nova Scotia Department of Transportation and Infrastructure Renewal
PCI	Pavement Condition Index
RRFB	Rectangular Rapid Flashing Beacon
SLV	Street Light Vision
TAC	Transportation Association of Canada
TPM	Transportation Priority Measure

APPENDIX B – MAPS

Figure B-1 Map of Proposed All Ages & Abilities Bicycle Network (2022) (Source: Figure 17 of the Integrated Mobility Plan)

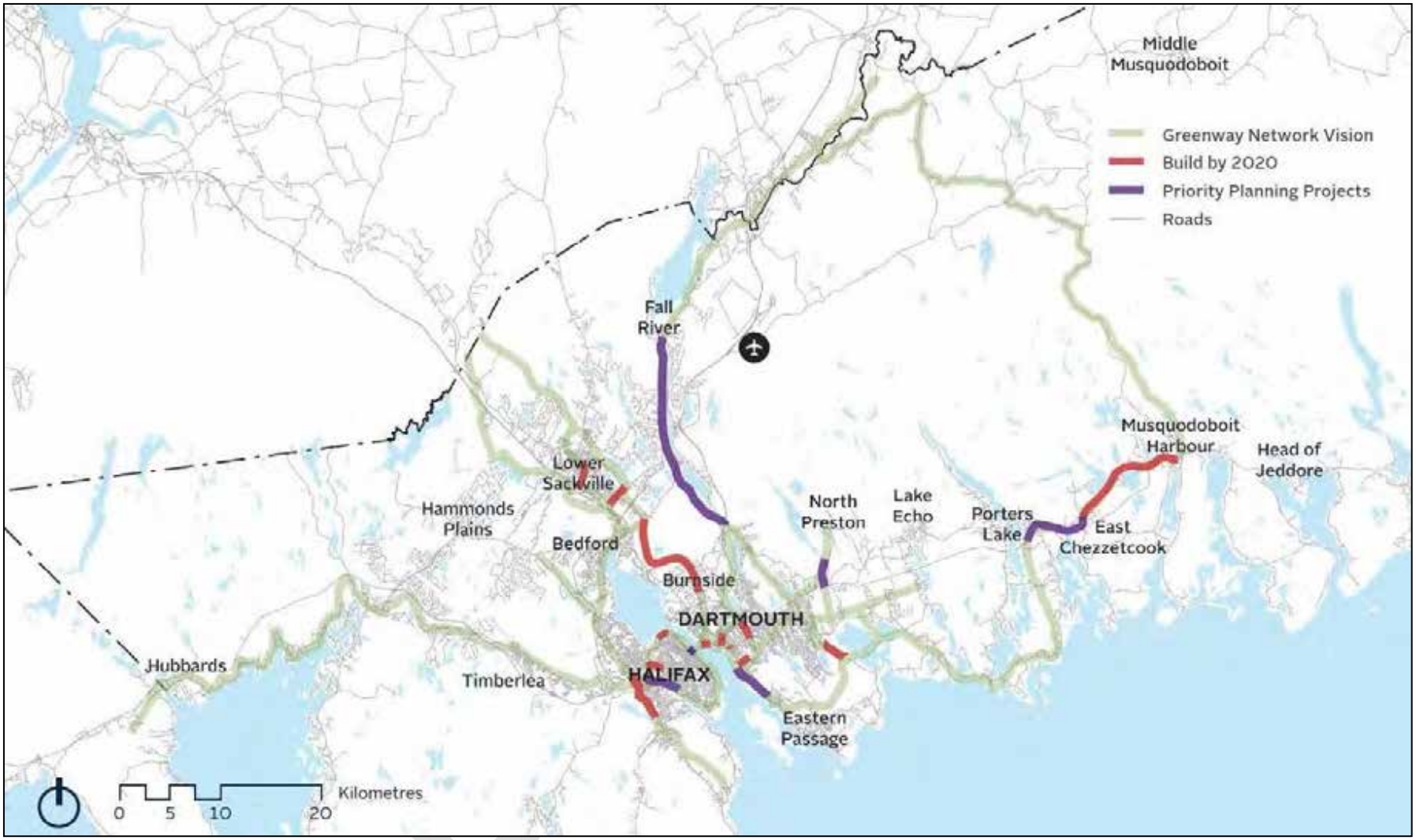

Figure B-2 Map of Priority Connections for Multi-Use Pathways (Source: Figure 18 of the Integrated Mobility Plan)

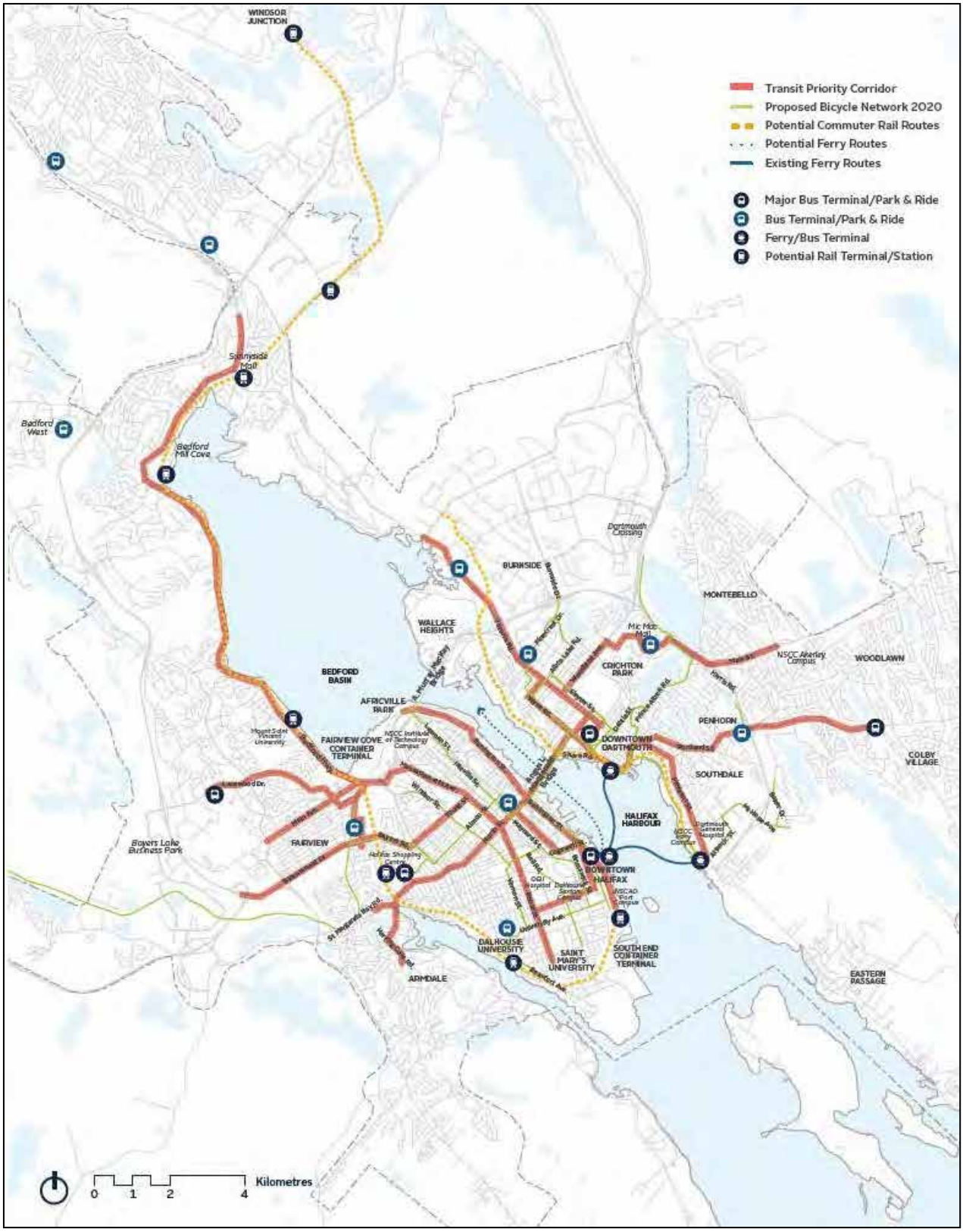

Figure B-3 Proposed Transit Priority Corridors Map (Source: Figure 20 of the Integrated Mobility Plan)

Figure B-4 Map of Transit Priority Lanes (Source: Figure 26 of the Rapid Transit Strategy)

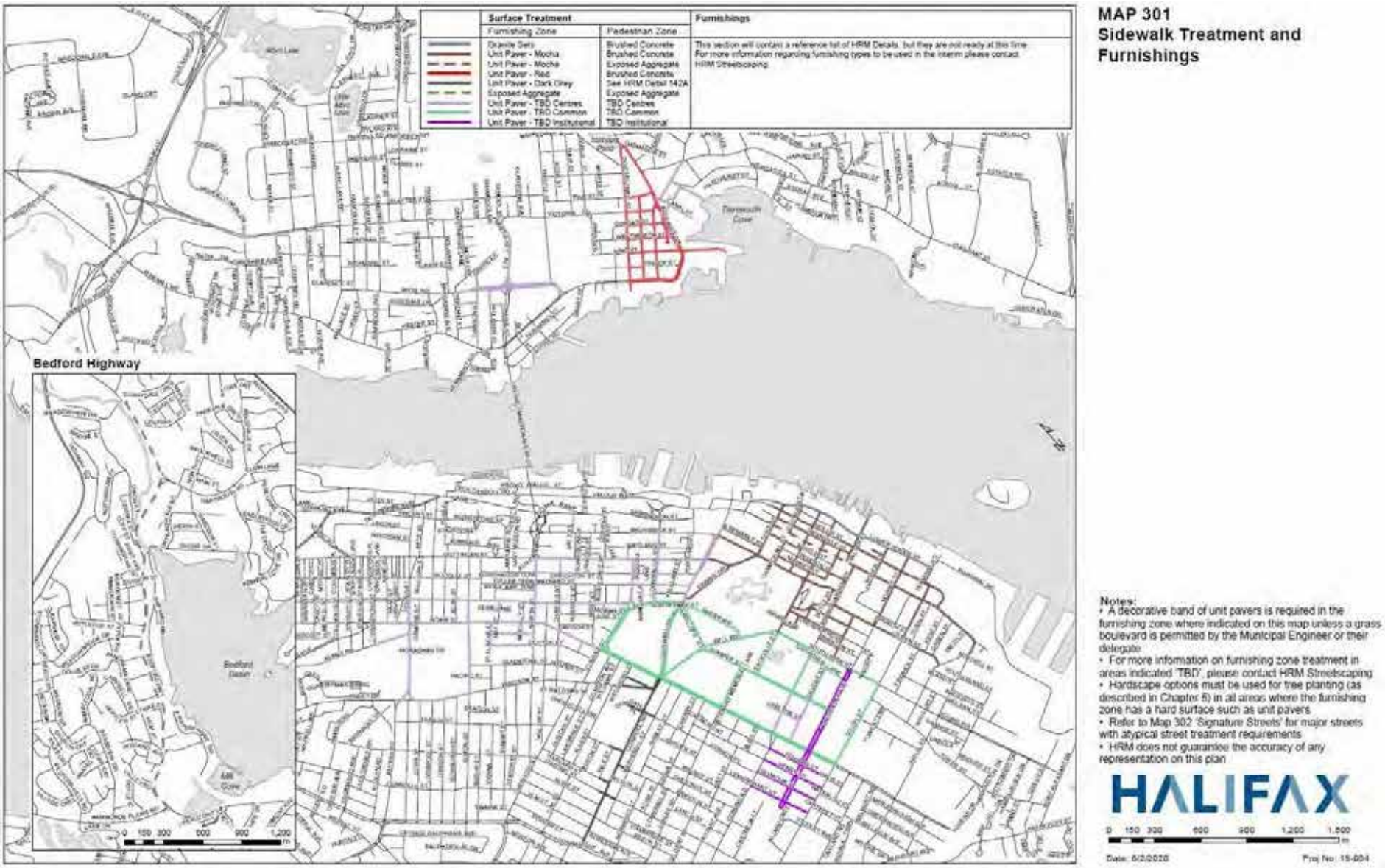

Figure B-5 Map of Sidewalk Treatment and Furnishings

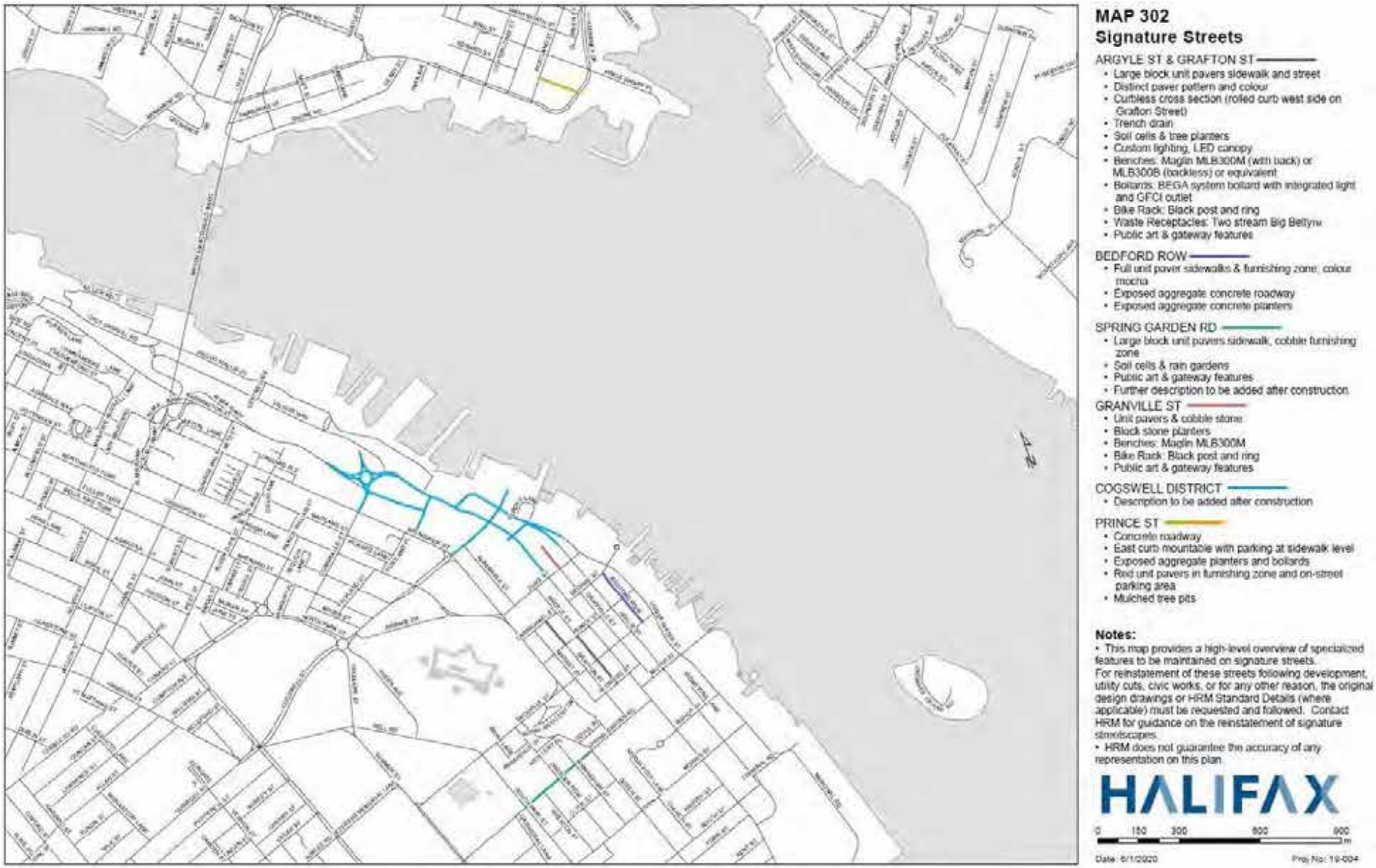

Figure B-6 Map of Signature Streets

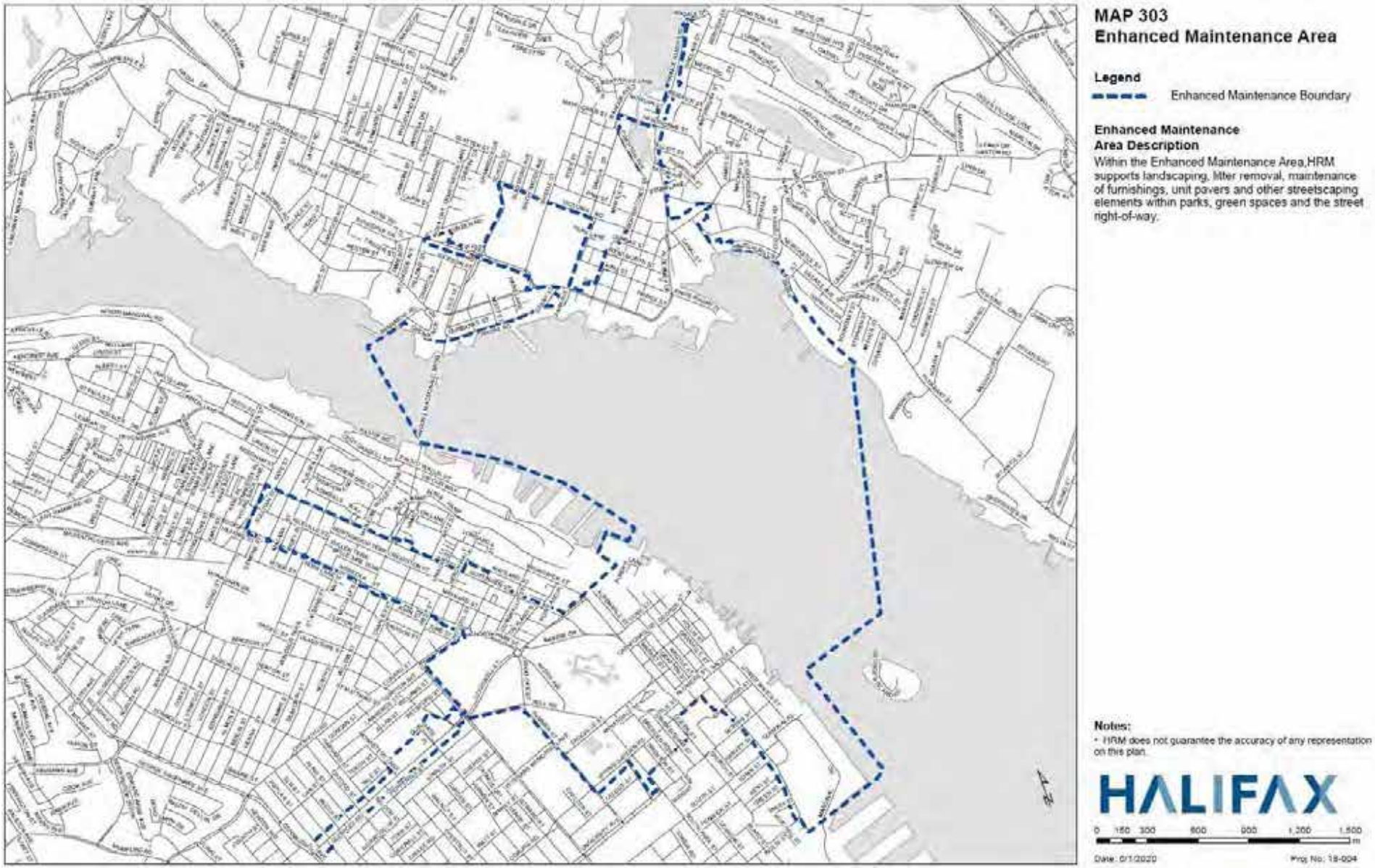

Figure B-7 Map of Enhanced Maintenance Area

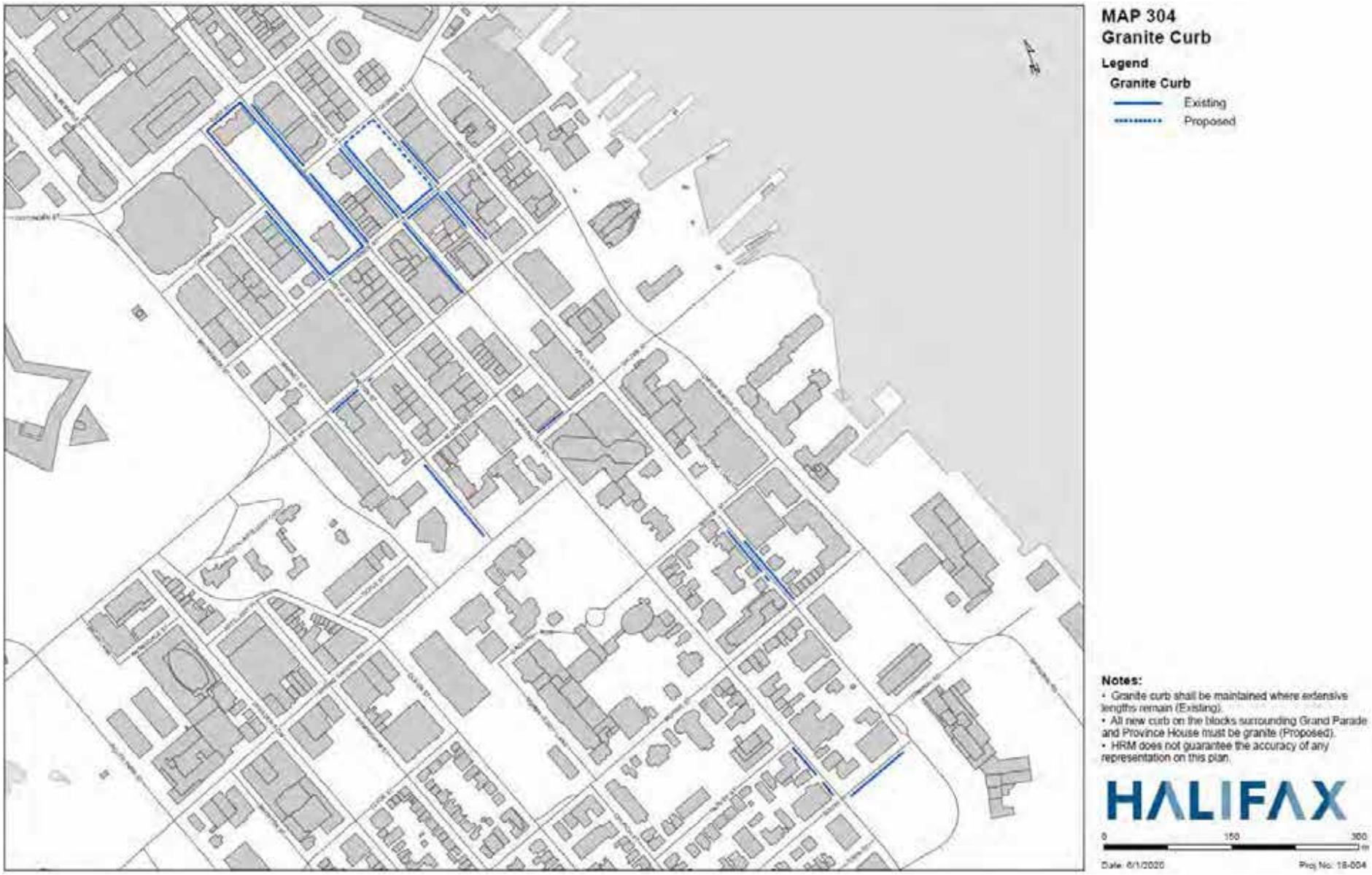

Figure B-8 Map of Granite Curb

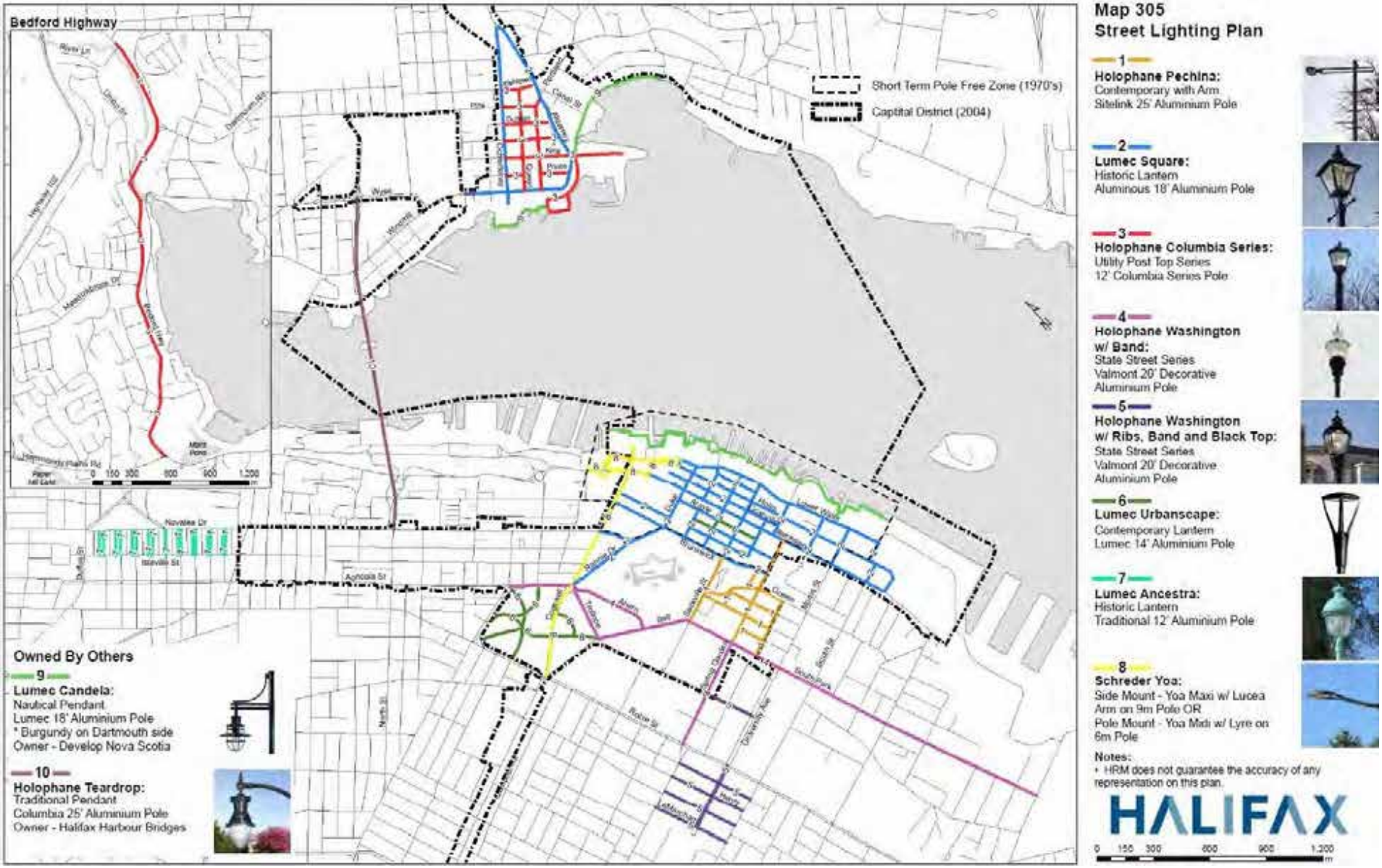

Figure B-9 Map of Street Lighting Plan

APPENDIX C – LIST OF REFERENCED DOCUMENTS

(1) Active Transportation Priorities Plan, “Making Connections: 2014-2019 Active Transportation Priorities Plan”, Halifax Regional Municipality, 2014, Link: https://www.halifax.ca/transportation/transportation-projects/active-transporation

(2) Bicycle Parking Guidelines, Association of Pedestrian and Bicycle Professionals: https://www.apbp.org/Publications

(3) Centre Plan, “Regional Centre Secondary Municipal Planning Strategy”, Halifax Regional Municipality, 2021, http://centreplan.ca/

(4) Community Plan Areas, Halifax Regional Municipality, Link: https://www.halifax.ca/about-halifax/regional-community-planning/community-plan-areas#PlanAreas

(5) Canadian Highway Bridge Design Code, CSA S6:19, Link: https://www.csagroup.org/canadian-highway-bridge-design-code/

(6) HalifACT Plan, “HalifACT 2050 – Acting on Climate Together”, Halifax Regional Municipality, 2019, Link: https://www.halifax.ca/sites/default/files/documents/about-the-city/energy-environment/HRM_HaliFACT_vIssued%20with%20Foreword.pdf

(7) Halifax Complete Streets Guidelines link: https://www.halifax.ca/transportation/streets-sidewalks/municipal-design-guidelines-red-book

(8) Halifax Regional Municipality Charter, Link: https://www.halifax.ca/sites/default/files/documents/about-the-city/energy-environment/HRM_HaliFACT_vIssued%20with%20Foreword.pdf

(9) Halifax Regional Municipality Legislation and By-Laws, Link: https://www.halifax.ca/city-hall/legislation-by-laws

a. By-Law E-200 (Encroachment By-Law): https://www.halifax.ca/city-hall/legislation-by-laws/by-law-e-200

b. By-Law S-300 (Streets By-Law): https://www.halifax.ca/city-hall/legislation-by-laws/by-law-s-300

c. By-Law S-1000 (Sidewalk Café By-Law): https://www.halifax.ca/city-hall/legislation-by-laws/by-law-s-1000

d. By-Law T-600 (Tree By-Law): https://www.halifax.ca/city-hall/legislation-by-laws/by-law-t-600

e. Administrative Order 2020-012-OP Regional Centre Streetscaping Administrative Order: https://www.halifax.ca/city-hall/legislation-by-laws/administrative-order-2020-012-op

f. Administrative Order 2020-010-OP Respecting Stormwater Management Standards for Development Activities: https://www.halifax.ca/city-hall/legislation-by-laws/administrative-order-2020-010-op

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APPENDIX D – COMPLETE STREETS CHECKLIST

Stemming from the Integrated Mobility Plan, this checklist was created to support the planning and design process and should be considered before any major street recapitalization. It is intended to apply to projects with significant impacts to streets, such as full street rehabilitation, or significant excavation for water, wastewater or storm mains. It is not intended to apply to smaller projects, such as individual lateral cuts or projects which leave existing curbs intact such as pavement overlay or micro-surfacing.

A fillable PDF version of this checklist can be found at
https://www.halifax.ca/transportation/streets-sidewalks/municipal-design-guidelines-red-book

Project Location
Street Name: From: To:
Cross streets affected by construction:
Length of street affected by construction:

STEP 1: Identify Context

*What is the street's role as a **place**? Refer to existing and proposed:*

- Land use/ type of district (residential, commercial, institutional, historic, cultural, mixed use, industrial)
- Is the street pedestrian-oriented? (buildings set back from street +/-6m or less; no off-street parking within building setback); or
- Is it vehicle-oriented? (larger setbacks, off-street parking between street and building)

Example:

Hollis Street is a mixed use, pedestrian-oriented, one-way urban minor collector passing through two heritage districts; and is identified as a full-time truck route, part of the AAA bike network; with two bus routes and stops every 300m or so.

*What is the street's role as a **link?** Consider all transportation modes, and existing/ proposed*:

- Presence of bus stops, bus routes, pedestrian, and bicycling facilities
- Ways the pedestrian, bicycling, transit, and vehicle facilities connect to existing networks
- Trip generators and mode share in the area for walking, bicycling, transit, and vehicles
- Types of vehicles travelling on this street
- Street classification

The following resources will help identify the context:

- Land Use/ Pedestrian Orientation
    - Area Municipal Planning Strategy (MPS);
    - Site visit (extent and gaps in sidewalk network, crossing opportunities, pedestrian wear paths, building setbacks);
    - Streetscaping maps (draft Red Book)
- Bicycle - IMP All Ages & Abilities Bicycle Network (IMP p92) and Candidate Bike Routes (Making Connections AT Plan)
- Transit – Transit Corridors Map (IMP p103); Rapid Transit Strategy (p20-23; p26); Halifax Transit Routes and Stops
- Vehicles – recent counts, collision history, lists of priority streets for traffic calming; road safety, etc.
- Trucks - Truck Routes Map (Open Data)
- Primary Emergency Response Map; evacuation route map

STEP 2: Set Objectives

Based on the intended street function determined in Step 1, project objectives should be set and prioritized (e.g. transit priority, traffic calming). The target Multi Modal Level of Service (MMLOS) should be set based on the desired outcomes.

STEP 3: Data Collection

Additional data collection will further inform the project and assist with evaluating its success once complete. Data collection may include:

- Multi Modal Level of Service (MMLOS)
- Curbside usage study (type of curbside use e.g. parking, accessible parking, loading, occupancy, turn-over)
- Street tree inventory and condition assessment
- Traffic counts:
    - Pedestrians
    - Bicyclists
    - Transit ridership and boardings / alighting at impacted stops
    - Buses
    - Trucks
    - Vehicles (include speed & volume)
- Photograph site (to document ‘before’ condition)

STEP 4: Design

Assemble

Based on the context and intended role of the street, determine required street design elements, from the HRM Complete Street Design Guidelines and other design guides as needed (e.g. NACTO, TAC, etc.) to achieve intended MMLOS and other project objectives.

Confirm basic horizontal and vertical design elements, intersection configurations, and active transportation facility types. Identify vertical and grading constraints, utility impacts and impacts to existing buildings and green infrastructure (limit impacts to heritage properties and mature trees where possible).

Depending on project scope, consult with municipal staff, utilities, stakeholders, councillor, and public as needed to identify concerns and coordinate projects.

Consider operational and maintenance requirements, as well as any necessary changes or new equipment needed to maintain to adequate service levels.

Refine

Consider adding pedestrian friendly design features in all projects in existing or proposed residential and pedestrian-oriented areas:

- Normalize irregular intersections (so streets meet at right angles to extent possible)
- Reduce corner radius (if existing has been set using an oversized design vehicle)
- Curb extensions at marked crosswalks (except on bicycle routes, generally when on-street parking present)
- Tactile Warning Surface Indicators (TWSI) at all marked and unmarked crossings
- Bus landing pads (and connecting them to nearby sidewalk or walkway)
- Traffic calming in school zones

Where required, propose design trade-offs based on constraints, modal priorities and feedback from consultation:

- Consider design elements with smaller footprints (variance approval may be required)
- Remove elements intended for lower priorities
- Change use of existing space (e.g. shift parking to nearby street)
- Acquire land, if needed
- Document decisions (include reasoning and mitigation proposed for any trade-offs)

Evaluate

Evaluate the design based on the desired MMLOS and project objectives.

Repeat

Designing a street is an iterative process. Complex street redesign projects will go through at least three major design phases: functional, preliminary, and detailed.

Final Check

Confirm and finalize the design with staff, stakeholders and public / Council (as appropriate).

STEP 5: Evaluation

Measuring quantitative and qualitative attributes of the constructed design will evaluate the project's success and provide valuable information for future projects.

- Repeat some or all pre-construction data collection undertaken, including photos
- Compare pre and post data to determine if project objectives were achieved
- Engage public for feedback (i.e. intercept survey; online survey)
- Document results and lessons learned