DESIGNING NEIGHBOURHOOD COLLECTOR STREETS

2019

The role of this document is to provide general design guidance specific to urban collectors in Ottawa. The pre-vetted concepts and design considerations and other guidance in this document will require detailed design investigations and, while they may inform, they do not constitute City standards or procedures.

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1.0 INTRODUCTION

This document illustrates the City of Ottawa's pre-vetted Neighbourhood Collector street[1] cross-section designs for urban areas[2] and supersedes the urban portion the *Road Planning and Design Guidelines*[3]. That document took a broad view in the planning of collector roads and provided direction for Neighbourhood Collector streets in urban and rural settings as well as for rural arterials. This document focuses on urban Neighbourhood Collector streets. Relevant policies (new or updated) informing street design have emerged since 2008:

- *Official Plan;*
- *Transportation Master Plan;*
- *Accessibility Design Standards;*
- *Complete Streets Framework;*
- *Building Better and Smarter Suburbs;*
- *Traffic Calming Design Guidelines; and*
- *Street Planning Manual for New Neighbourhoods.*

Other relevant guiding documents emerging since 2008 include:

- *TAC Geometric Design Guide for Canadian Roads, 2017;*
- *MTO Design Supplement for TAC GDGCR, 2017*
- *Ontario Traffic Manual - Book 18 – Cycling Facilities, 2013;*
- *Ontario Traffic Manual - Book 15 – Pedestrian Crossing Treatments, 2016; and*
- *NACTO Urban Street Design Guide, 2013.*

A "Complete Streets" focus is predominant in this policy guidance. There is an emphasis on accommodating users of all ages and abilities in a safe and predictable manner, contribute to environmental sustainability, be affordable, and support livable communities. Neighbourhood Collector streets influence the success of neighbourhoods, provide access to adjacent development, connect to higher and lower order transportation facilities, and form a vital part of the public realm.

Neighbourhood Collector streets play an important role in the multi-modal transportation network of people, goods, and services. They are also social places that bring local users together to interact on their daily travels.

[1] Neighbourhood Collector streets refer specifically to all streets designated as "Collectors" and "Major Collectors" in the City's Official Plan and Transportation Master Plan.

[2] Urban area as defined by the Official Plan and outlined in Schedule A

[3] 2008 version

The principles for Neighbourhood Collector Street design are:

Compact: The right-of-way width and distance between opposing building faces are minimized to help foster a sense of safety and community and allow the City to deliver compact neighbourhoods and cost-effective infrastructure.

Complete: Streets are accessible and accommodate for all modes and users of all ages and abilities.

Calm: Streets encourage traffic speeds in keeping with community context and road safety objectives.

Green: Streets provide space and conditions for healthy trees and opportunities to showcase low environmental impact design.

Serviceable: Streets include spaces for services and utilities in locations that are both manageable and protected.

Resilient: Streets that contribute to resilience to future climate conditions.

Maintainable: Streets have relative ease of maintenance and provide space for snow management.

2.1 CROSS-SECTION DESIGN

This section provides guidance on establishing an appropriate right-of-way (ROW) width and cross-section designs for Neighbourhood Collector streets. It applies to both the construction of new streets and the reconstruction of existing streets in urban settings.

2.1 Pre-vetted Design Options

To help in the preparation of collector street designs, the City has developed nine (9) "pre-vetted" cross-sections for Neighbourhood Collector streets (see Figures 2 through 10). Moreover, 26A is intended to be the City of Ottawa's "preferred" starting point for designers. The pre-vetted cross-sections were developed with key stakeholders involved in street design. In this way, competing interests among stakeholders were considered in the development of pre-vetted cross-sections and will help in streamlining the update of new City engineering design standards as well as the review and approval processes for road designs. Section 3 offers guidance in the case where the pre-vetted cross-sections may not be completely applicable to a situation.

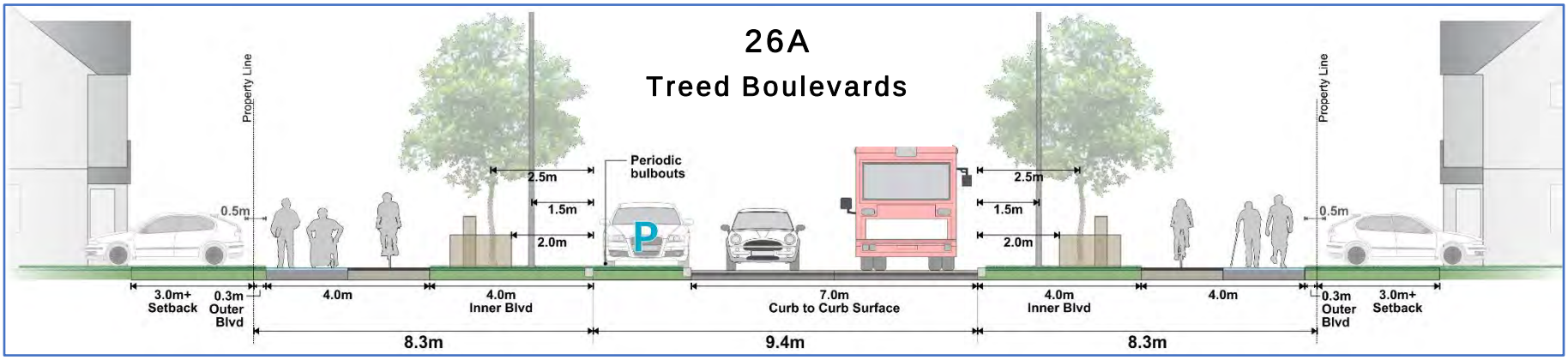
2.2 Customized Design Options

The design considerations in Section 3 of this document provides guidance for proponents who wish to pursue custom designs. Additional design criteria and references are provided in Appendix A and Appendix B. Customized design options will require individual approval.

Option	26A	26B	26C	26D	24A	24B	24C	22A	22B
ROW	26m	26m	26m	26m	24m	24m	24m	22m	22m
Rows of trees in ROW	2	0-2[A]	2	2	1	0-2[A]	2	2	2
Active Trans. Facilities Width [B]	▲	▲	▲	▲	▲	▲	▼	▲	N/A
Segregated Cycling	✓	✓	✓	✓	✓	✓	✓	✓	✗
Transit Service Frequency [C]	High	High	High	Low	High	Low	Low	High	None
Compatible with LID Features [D]	✓	✗	✓	✓	✓	✗	✓	✓	✓
Transformers in ROW (sides)	2	2	2	1	1	2	0	0	2
Private Land Utility Easement [E]	N/A	Required	N/A	N/A	N/A	Required	N/A	N/A	N/A
Driveway Parking [F]	0m	2.3m	0.5m	0m	0m	2.0m	0m	0m	0m
On street parking (sides)	1	1	0	2	1	1	2	1	1
Pavement Width	9.4m	9.4m	8.0m	11.0m	9.4m	9.0m	11m	9.4m	9.0m
Maintenance Class [G]	3/4	4	3/4	3/4	4	4	3/4	3	4

A. Subject to *Tree Planting in Sensitive Marine Clay Soils* Guidelines.
B. ▲ indicates options that provide desirable width ▼ indicates options that do not.
C. "High" and "low" transit frequency are as determined by OC Transpo.
D. Not including bulb-outs. All options with on-street parking are compatible with LID measures in bulb-outs.
E. Grounding grid of transformer encroaches onto private property, requiring an easement.
F. The amount of functional driveway parking length provided within the ROW. A "functional" driveway should have a minimum length of 6m.
G. Class 3 has higher winter maintenance standards than class 4. The best suited class(es) for each cross section are shown. Major Neighbourhood Collector streets are generally class 3, and other Neighbourhood Collector streets are generally class 4.

Figure 1 Summary of Pre-Vetted Cross-Section Designs



Defining Features

- 33% of width (more with bulb-outs) is green, including large trees
- Tree-protected sidewalks and cycle tracks at the right-of-way edge
- Wide boulevards with space for large trees, bus stops, utilities, and snow storage on both sides
- Compatible in areas with sensitive marine clay soils

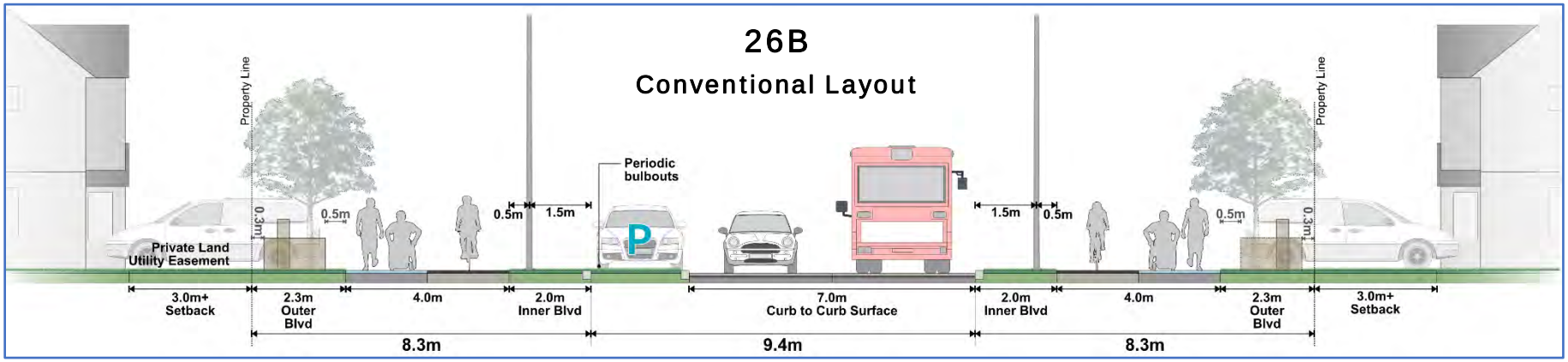
- Surface-mount hydroelectric transformers and grounding grid located within the right-of-way
- Sidewalks and cycle tracks narrow locally to provide 1.0m clearance from transformer

- Supports high frequency frequent transit service
- Can be maintained to 'Class 3' City standard
- One-sided street parking alternating from side to side
- Private driveway parking provided outside the right-of-way

Applicability (all apply)

- Compatible with the widest range of land uses
- Works for properties with direct driveway access
- The starting point for design in new communities and reconstructed corridors

Figure 2 Pre-Vetted Cross-Section 26A



Defining Features

- 33% of width (more with bulb-outs) is green
- Potential trees along both sides of the street close to buildings, with additional opportunities at bulb-outs (where soil volumes allow)
- Sidewalks and cycle tracks offset 2m from street curb
- Boulevard providing space for snow storage and utilities

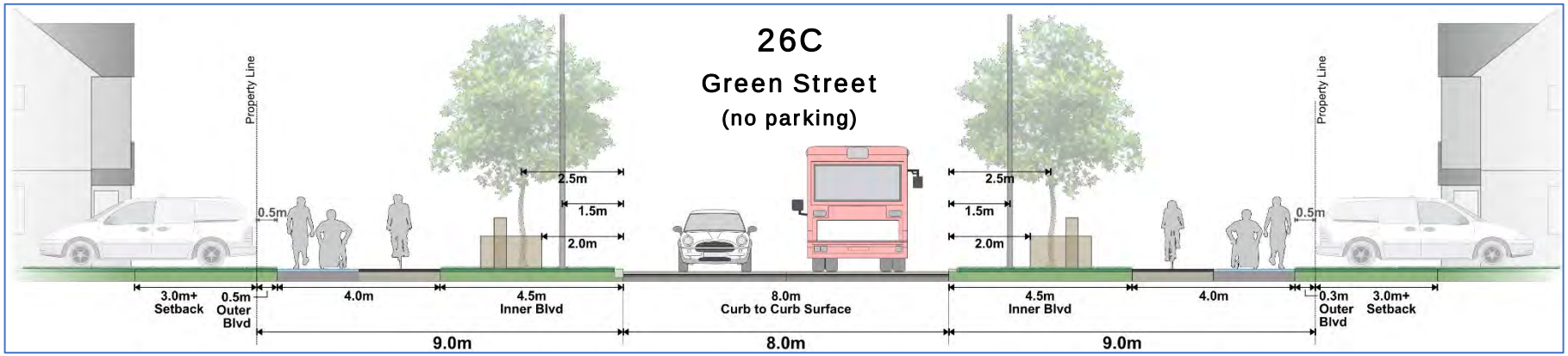
- Sidewalks and cycle tracks narrow locally to provide 1.0m clearance from transformer
- Surface-mount hydroelectric transformer located within the right-of-way but grounding grid on private land under easement

- Supports high frequency transit service
- One-sided street parking alternating from side to side
- Driveway parking can be partially within the right-of-way

Applicability (all apply)

- Compatible with a wide range of land uses
- Where an approval for hydroelectric transformer grounding grid to be on private land is granted
- Where soil conditions enable trees close to buildings

Figure 3 Pre-Vetted Cross-Section 26B



Defining Features

- 42% of width is green, including large trees
- Tree-protected sidewalks and cycle tracks near the right-of-way edge
- Wide boulevards with space for large trees, bus stops, utilities and snow storage
- Compatible with areas with sensitive marine clay soils

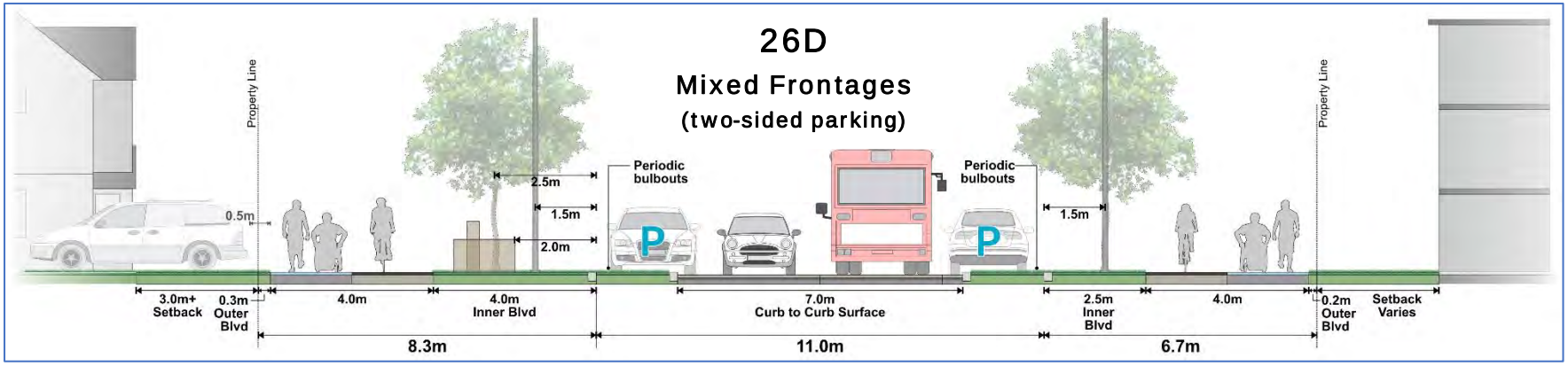
- Surface-mount hydroelectric transformer and grounding grid located within the right-of-way

- Limited application on priority emergency response routes
- Supports high frequency transit service
- No street parking
- Driveway parking provided primarily outside the right-of-way

Applicability (all apply)

- Where there is an emphasis on street greening
- Where parking in the ROW is not necessary
- Limited applicability on emergency response routes, for short segments only.

Figure 4 Pre-Vetted Cross-Section 26C



Defining Features

- 29% of width (more with bulb-outs) is green, including large trees
- Tree-protected sidewalks and cycle tracks near the right-of-way edge
- Wide boulevard on one side with space for large trees, bus stops, utilities and snow storage
- Boulevard on other side with compressed space for trees, bus stops and snow storage
- Compatible with areas with sensitive marine clay soils

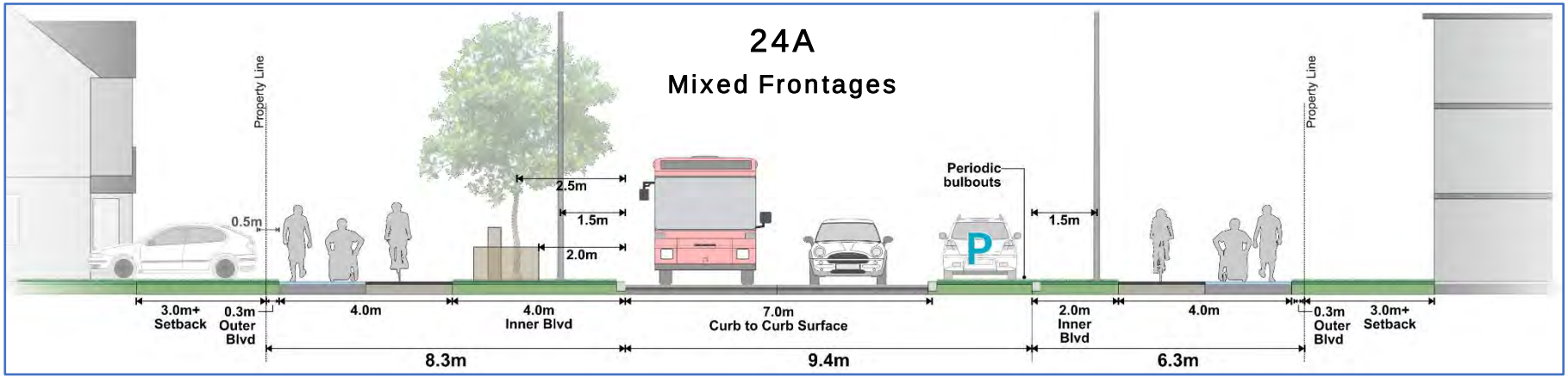
- Surface-mount hydroelectric transformer and grounding grid located within the right-of-way on one side only
- Sidewalks and cycle tracks narrow locally to provide 1.0m clearance from transformer

- Two-sided street parking (with potential seasonal restrictions on one side)
- Driveway parking provided outside the right-of-way
- Narrow travel lanes may supports low frequency transit service

Applicability (all apply)

- Where land use on one side do not require surface-mount transformers in the right-of-way (e.g. parks, schools, mixed use, stacked townhomes, apartments)
- Where on-street parking on both sides of the street is a priority

Figure 5 Pre-Vetted Cross-Section 26D



Defining Features

- 27% of width (more with bulb-outs) is green with large trees on one side
- Sidewalks and cycle tracks at the right-of-way edge (tree-protected on one side)
- Wide boulevard with space for large trees, bus stops, utilities and snow storage on one side of street
- Compatible with areas with sensitive marine clay soils

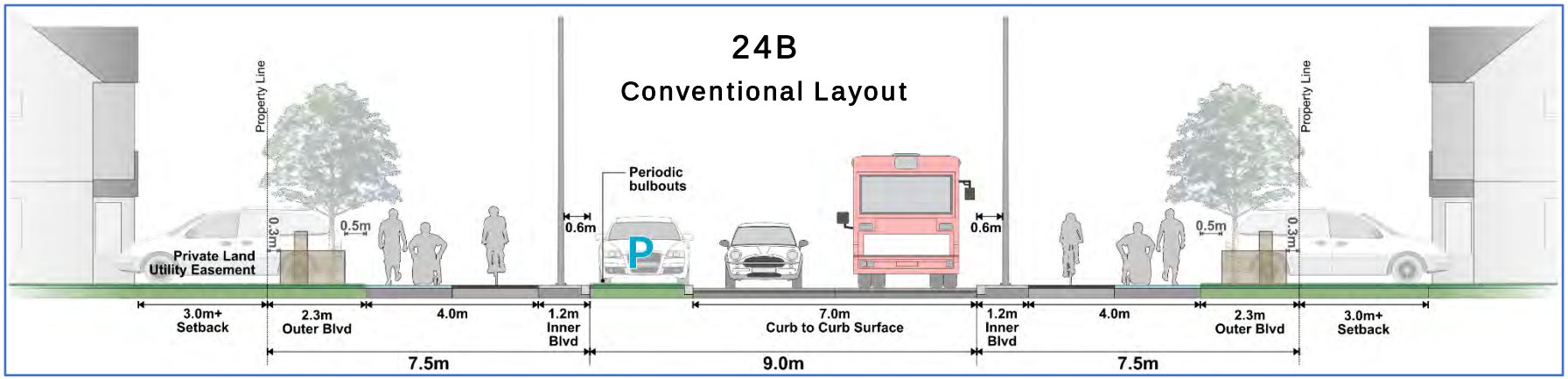
- Sidewalks and cycle tracks narrow locally to provide 1.0m clearance from transformer
- Surface-mount hydroelectric transformer and grounding grid located within the right-of-way but on one side only

- Supports high frequency transit service
- One-sided street parking alternating from side to side
- Driveway parking provided outside the right-of-way
- Opportunities at periodic bulb-outs for trees on one side of the street (where soil volumes allow)

Applicability (all apply)

- Where a 24m ROW has been pre-approved ***and*** widening to 26m is not feasible
- Where land use on one side does not require surface-mount transformers in the right-of-way (e.g. parks, schools, mixed use, stacked townhomes, apartments)

Figure 6 Pre-Vetted Cross-Section 24A



Defining Features

- 19% of width (or more with bulb-outs) is green
- Sidewalks and cycle tracks near the street curb line
- Potential trees along both sides of the street close to buildings, with additional opportunities at periodic bulb-outs (where soil volumes allow)
- Narrow hard surfaced boulevard along the street curb line

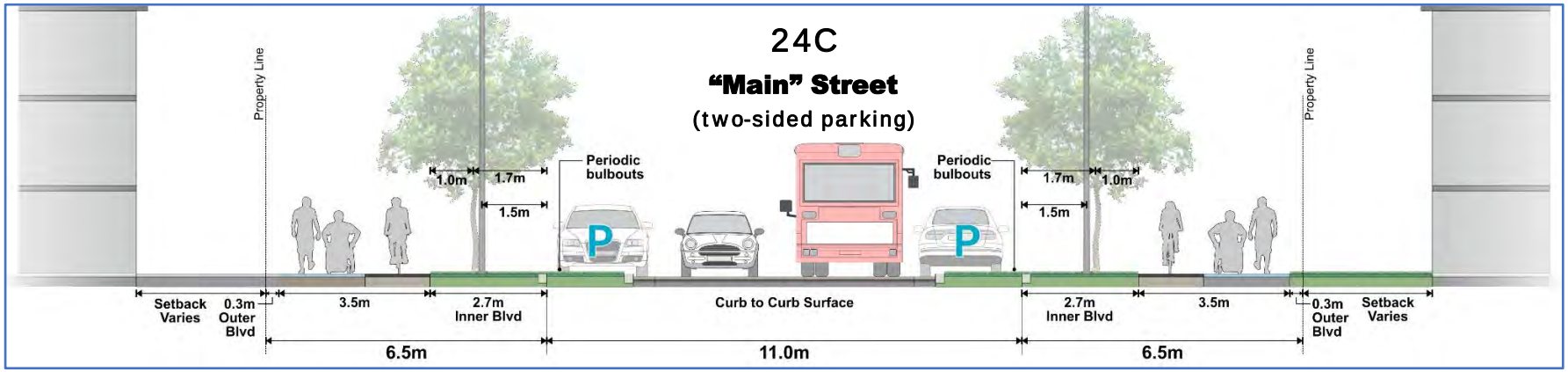
- Sidewalks and cycle tracks narrow locally to provide 1.0m clearance from transformer
- Surface-mount hydroelectric transformer located within the right-of-way but grounding grid on private land under easement

- Not ideal for transit service
- One-sided street parking alternating from side to side
- Driveway parking provided partially within the right-of-way
- Seasonal parking restrictions and boulevard space to allow for winter maintenance

Applicability (all apply)

- Where a 24m ROW has been pre-approved ***and*** widening to 26m is not feasible
- Where an approval is granted for hydroelectric transformer grounding grid to be on private land
- Where soil conditions allow trees to be planted in proximity to buildings

Figure 7 Pre-Vetted Cross-Section 24B



Defining Features

- 25% of width (more with bulb-outs) is green, including trees
- Tree and parking-protected sidewalks and cycle tracks at the right-of-way edge
- Boulevards with compressed space for trees, bus stops, utilities and snow storage
- Compatible with areas with sensitive marine clay soils

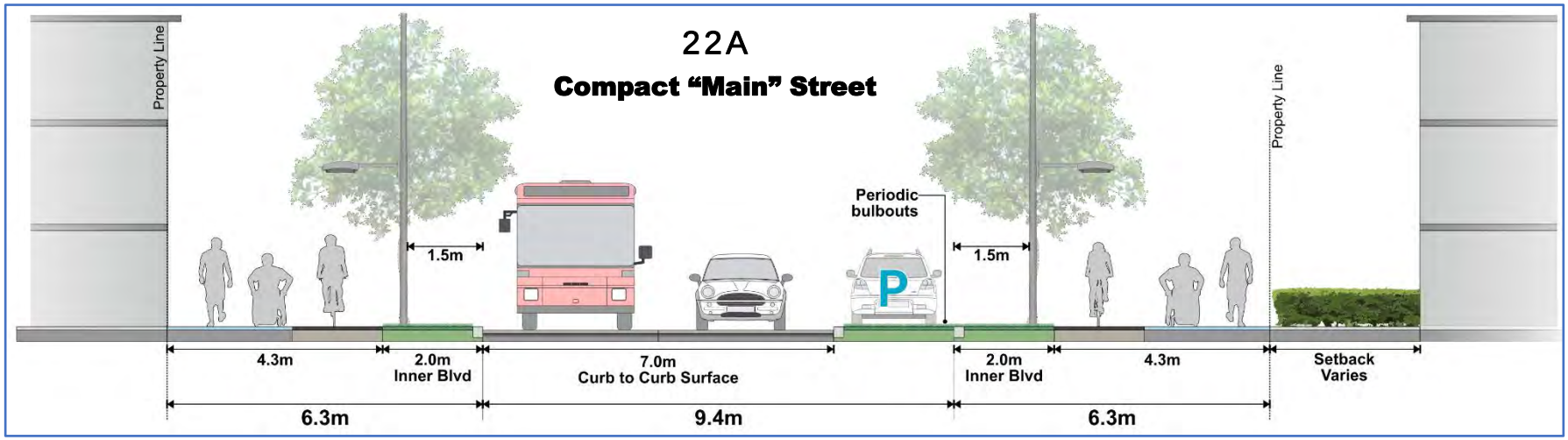
- Surface-mount hydroelectric transformers not provided in the right-of-way

- Active transportation facilities at compromised but acceptable widths
- Narrow travel lanes may support low frequency transit service
- Street parking on both sides
- Driveway parking provided outside the right-of-way

Applicability (all apply)

- Where a 24m ROW has been pre-approved ***and*** widening to 26m is not feasible
- Higher density/mixed use areas
- Where street parking on both sides of the street is a priority
- Where surface-mount hydroelectric infrastructure is not needed within the right-of-way

Figure 8 Pre-Vetted Cross-Section 24C



Defining Features

- 18% of width (more with bulb-outs) is green, including trees
- Tree-protected sidewalks and cycle tracks near the right-of-way edge
- Boulevards with compressed space for trees, bus stops, utilities and snow storage
- Trees may require special measures such as tree guards for protection and soil cells to provide enough soil volume
- Can be compatible with areas with sensitive marine clay soils
- Sidewalks at the right-of-way edge

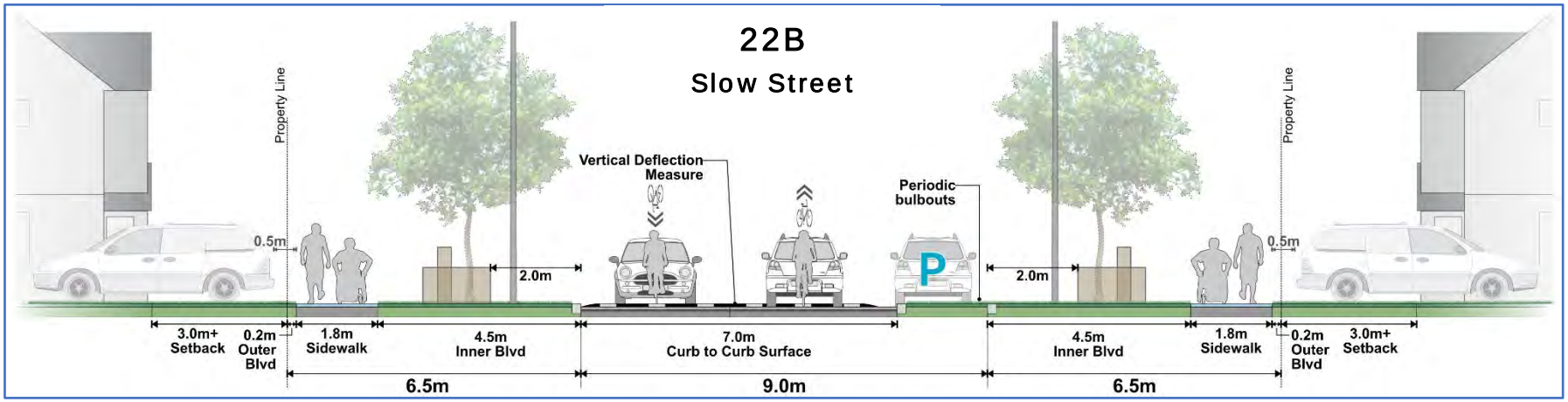
- Surface-mount hydroelectric transformers not provided in the right-of-way

- Supports high frequency transit service
- One-sided street parking (can alternate from side to side)

Applicability (all apply)

- Where a 22m ROW has been pre-approved ***and*** widening to 24m or 26m is not feasible
- Higher density/mixed use areas
- Where bus service and/or higher traffic volumes are expected
- Where special tree planting measures can be provided
- Where surface-mount hydroelectric infrastructure is not needed within the right-of-way

Figure 9 Pre-Vetted Cross-Section 22A



Defining Features

- 43% of width (more with bulb-outs) is green, including large trees
- Tree-protected sidewalks near the right-of-way edge
- Wide boulevard with space for large trees, utilities and snow storage on both sides of street
- Standard sidewalk near right-of-way edge
- On-road cycling in shared slow-speed travel lanes
- Compatible with areas with sensitive marine clay soils

- Surface mount hydroelectric transformer and grounding grid located within the right-of-way on both sides

- Frequent vertical and horizontal traffic calming features
- Not ideal for transit service
- Not appropriate for high traffic volumes or high speeds
- One-sided street parking alternating from side to side
- Driveway parking provided outside the right-of-way

Applicability (all apply)

- Where a 22m ROW has been pre-approved ***and*** widening to 24m or 26m is not feasible
- Where the street is designed for low vehicular speeds (vertical deflection traffic calming measures are included on average every 100m, posted 30km/h)
- Where the street is designed for low vehicular volumes (maximum street length of 500m)
- When connecting local streets to other collectors
- Where transit service is provided on nearby corridors to the satisfaction of OC Transpo
- Works for streets that require all surface-mount utilities to be in the right-of-way

Figure 10 Pre-Vetted Cross-Section 22B

3.0 DESIGN CONSIDERATIONS

Successful and "complete" Neighbourhood Collector street design results when balance is achieved with the apportionment of space and arrangement of components. The importance in finding balance is amplified when designing compact and affordable streets that enable buildings to be placed as close to the ROW as possible. In the spirit of the Neighbourhood Collector street design principles set out in Section 1.0 and considering input from agency stakeholders, several key design considerations that are essential in the development of Neighbourhood Collector street designs are identified. The considerations are grouped in the following subsections:

1. Adjacent land uses;
2. ROW width;
3. Road edge;
4. Roadway;
5. Services and utilities;
6. Low impact design features;
7. Maintenance; and
8. Intersections.

3.1 Adjacent Land Uses

The context of adjacent land uses and how they interact with the ROW affect the City's ability to achieve policy objectives.

Building Separation

The objective is to minimize the distance between buildings across the street from one another or the distance to the road in the interest of a more compact community. In addition, having reduced building separation can provide greater opportunity for social interaction and offer a greater sense of safety which supports community building. It also encourages low vehicle speeds through creating visual "friction".

The measure of building separation is equal to the distance between a building face on one side of a street to the building face on the opposite side. Using a reduced ROW width does not necessarily result in reduced building separation. Accommodating driveway parking with recessed garages instead of increasing the setback of the building's main front wall from the ROW keeps the apparent building separation to a minimum while still providing the required clearance to park between the garage and the sidewalk.

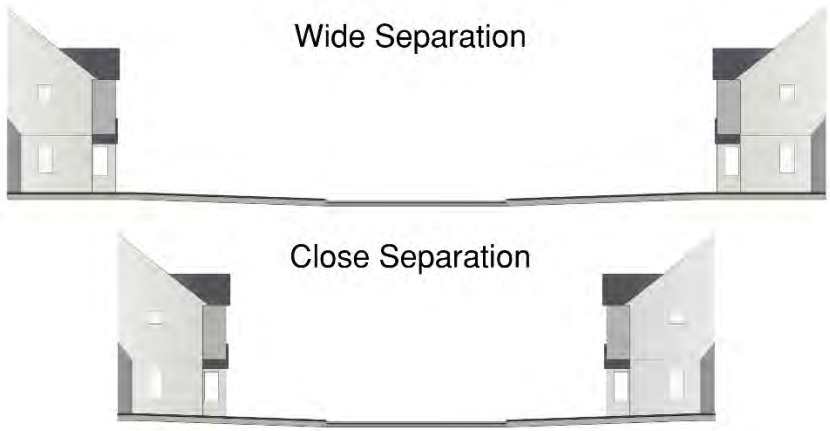


Figure 11 Close separation is preferable over wide separation

Driveway Parking

When introducing private driveway parking, the building/garage setback needs to be planned in lockstep with the street cross-section, and in particular, the municipal sidewalk alignment. This is to ensure that driveways will be of adequate length. The City of Ottawa *Traffic and Parking By-Law* allows parking on private driveways to encroach onto the municipal ROW provided that no portion of a parked vehicle may be closer than 0.5m to a sidewalk.

These design decisions need to be made early in the planning process, ideally at the Community Design Plan stage. The result will inform the depth of lots to be provided along Neighbourhood Collector streets, the arrangement of elements in the ROW, and the design of dwelling units – particularly the relationship between the building façade and garage.

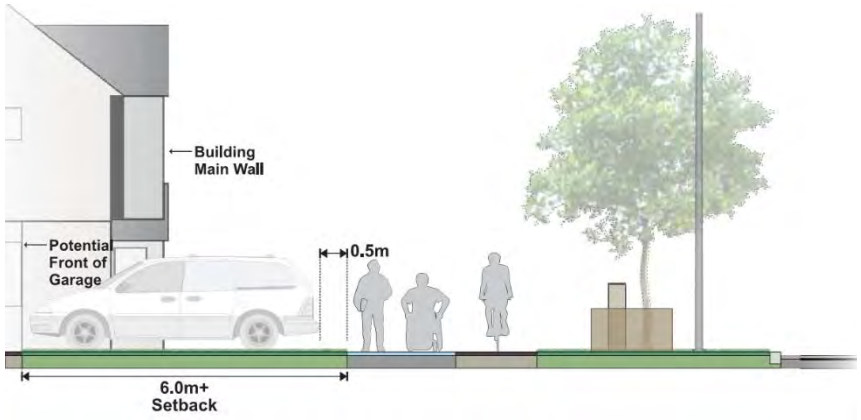


Figure 12 Driveway parking cannot be closer than 0.5m to sidewalks, cycle tracks, or curb

Driveway parking must accommodate at least one car to be parked legally. A good benchmark is that the garage (when provided) needs to be set back a minimum 6.0m from the sidewalk or cycle track, whichever is nearer. If there is a concern or special requirements for extremely long vehicles to park legally in the driveway, the setback would need to be increased accordingly. In areas where reduced building setback is desired, such as 3.0m from the street lot line, driveway parking can be accommodated with garages that are further set back from the main wall of the building. This treatment is recognized in the *City of Ottawa Zoning By-law* (No. 2008-250), in some zones.

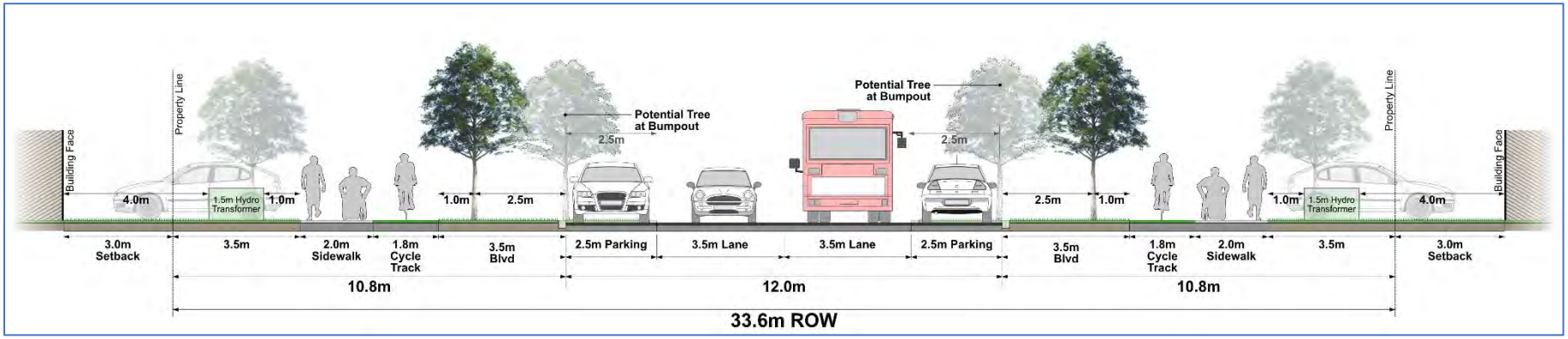


Figure 13 Demonstration of Wide, Unrationalized Right-of-Way Design

3.2 ROW Width

To deliver Neighbourhood Collector streets that meet the design principles above, the objective is to minimize ROW width without compromising functionality. Neighbourhood Collector streets need to serve compact land use forms and minimize the need for further ROW widening when reconstructing existing streets. This requires designers to minimize the width occupied by street design elements.

Assessing trade-offs is an essential part of balanced street design. Figure 13 illustrates preferred widths for many of the cross-section elements, when considered in isolation. However, this demonstrates that, without rationalization of the competing interests for space, the ROW would be much too wide and land-consuming. It also would result in buildings too far separated across the street to achieve a successful, integrated, and socially cohesive neighbourhood. As such, rationalization is required to create a tightly woven relationship among street elements.

Moving forward, the following ROW widths will apply:

26m ROW

A 26m ROW is considered the City of Ottawa "preferred" width when planning for Neighbourhood Collector streets in new neighbourhoods or establishing ROW protection policies. In general, it allows elements to fit together with reasonable balance of competing interests for space and serves the greatest diversity of adjacent land uses.

24m ROW

Although it may be possible to fit all elements into a 24m ROW, a greater degree of compromise may be required than with 26m. There will be less opportunities for street tree planting, and those trees will generally be smaller. Furthermore, the number of adjacent land use scenarios that fit with a 24m ROW will be less.

22m ROW

Significant rationalization is required to successfully implement a complete street within a 22m ROW. It is unlikely 22m ROWs can accommodate all elements with basic functionality. In such corridors, trade-offs will likely be more acute and scenarios for use limited.

Cross-Section Flexibility

Different cross-section designs can work together (see Figure 14) to address changing adjacent land use context along a street. More specifically, different cross-section designs can be applied along the same right-of way width and different ROW widths can be used along a corridor as well. The land use and the road function in the community sets the context.

Figure 14 Various cross-section designs can be used along a corridor to respond to the land use context and the transportation functions (not to scale)

3.3 Road Edge

Accessibility

The City of Ottawa *Accessibility Design Standards* (COADS) are mandatory for all new construction and redevelopment of existing spaces and facilities, owned, leased or operated by the City of Ottawa. These standards build on the requirements of *Ontario's Integrated Accessibility Standards* (O. Reg. 191/11), pursuant to the *Accessibility for Ontarians With Disabilities Act* (AODA).

Requirements of the AODA and COADS generally cover topics such as sidewalk clear width, rest areas, TWSIs, delineation, transit stops, maximum grades, curb ramp details, etc.

Active Transportation

Active Transportation facilities (including sidewalks, cycle tracks, and multi-use pathways) along Neighbourhood Collector streets are intended to accommodate users of all ages, types, and abilities.

2.0m wide sidewalks is preferred to accommodate pedestrians and users of assisted mobility devices. Minimum sidewalk width of 1.8m in constrained situations is defined by the clearance required to allow two persons using wheelchairs or mobility devices to pass each other. This can be found in the City of Ottawa *Accessibility Design Standard (COADS).* Consider increased sidewalk width for streets expected or intended to have high pedestrian activity.

2.0m cycle tracks will accommodate cycling and other similar modes. Provision of unidirectional cycle tracks on each side of the road is preferred. However, bidirectional facilities can be evaluated on a case-by-case basis. A minimum cycle track width of 1.5m can be

used in constrained situations. This is defined by the operating envelope of cyclists as specified in Book 18 of the *Ontario Traffic Manual (OTM)* and Chapter 5 of the *TAC Geometric Design Guide for Canadian Roads*. Offsets between cycle tracks and parked cars must be a minimum of 0.7m to provide a "dooring buffer", and a minimum 0.5m offset between cycle tracks and other fixed objects.

Sidewalks can be bundled together with a cycle tracks for easier winter maintenance rather than having the two facilities separated (see Figure 15). With the side-by-side format, colour contrast and tactile delineation between the cycle track and sidewalk may be required to meet accessibility requirements (See Accessibility Design Standards).

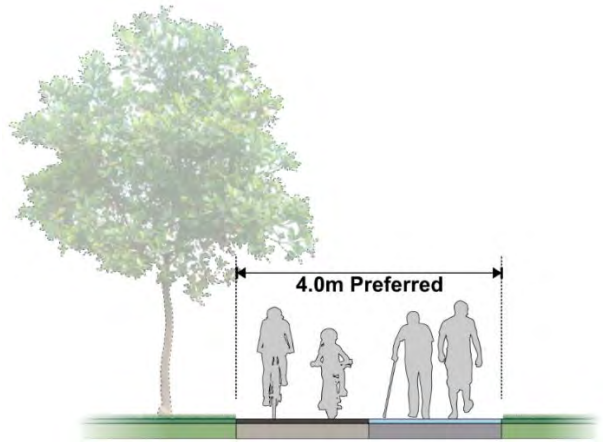


Figure 15 Sidewalk and cycle track shown in a bundled, side-by-side arrangement

Cycle tracks are appropriate on new and reconstructed roads in Ottawa as they provide physical protection from vehicular traffic. However, designers can consider on-road facilities so long as appropriate conditions are met[4].

Refer to the City of Ottawa's *Pedestrian & Cycling Design Toolbox* when designing active transportation facilities.

Multi-Use Pathways (MUPs) are another in-corridor facility option where pedestrians and cyclists share the same travel surface. MUPs along Neighbourhood Collector streets can be successful in appropriate contexts. Long, uninterrupted segments of street may be good candidates for MUPs.

Provide opportunities for rest areas along active transportation facilities in accordance with the COADS.

Shading of active transportation facilities through the use of street trees makes them more comfortable and attractive to use. This is expected to become increasingly important in future warmer climate conditions.

Street Trees

Street trees are an essential element in complete street corridors. Adequate space and growing conditions are necessary for trees to flourish. Planting locations for street trees must be carefully

[4] The appropriate cycling facility to be used is based on consideration of vehicular operating speeds (not posted speeds), traffic volumes, function of street, vehicle mix, user groups and street parking. The City's *Cycling Facility Selection Decision Support Tool & User Guide* can be used to determine the appropriate facility. Book 18 of the *Ontario Traffic Manual* (OTM) and Chapter 5 of the *TAC Geometric Design Guide for Canadian Roads* provide further guidance.

considered to ensure successful growing conditions, maximize benefit to street users, and avoid damage to surrounding features.

A 2.5m offset (see Figure 16) between curb face and tree trunks allows for winter maintenance and helps to mitigate negative effects of salt spray. Similarly, a 2.0m offset is needed between trees and active transportation facilities. These clearances can be reduced as low as the practical lower limit of 1.5m and 1.0m respectively, subject to City of Ottawa Development Review staff approval (in consultation with Forestry Services). The offset between curb face and tree trunk is particularly important on Neighbourhood Collector streets, as these may become serviced by double-decker buses. Regardless of clearance, it is very important to ensure trees are provided with sufficient soil volume and quality to grow and flourish.

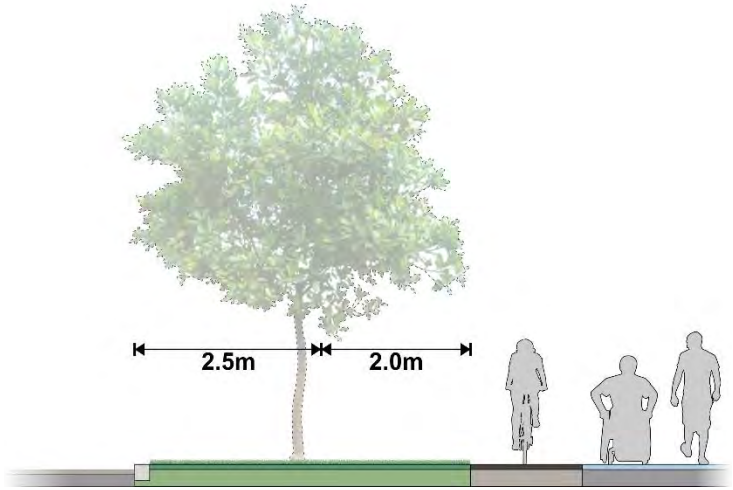


Figure 16 Offset trees from the roadway and active transportation facilities to promote growth and avoid impacts of road maintenance activities.

There are additional opportunities for tree plantings in bulb-outs, which is particularly helpful for cross-sections with inner boulevards that are too narrow to accommodate trees. In locations such as town centre areas, Transit-Oriented Developments and along Traditional Main Streets and areas of intensive mixed-use development, there is also the possibility of using soil cells and tree guards.

At the time of installation, a 1.0m minimum clearance between tree root balls and below-grade utility infrastructure is required Applicable tree planting and utility guidelines provide further details.

There are many areas in Ottawa with sensitive marine clay soils. Trees can contribute to the contraction of these soils as groundwater is drawn from them, causing a potential for differential settlement and risk of damage to adjacent building foundations. In these areas, care must be taken when selecting tree species and separation distances from building foundations. The City of Ottawa's *Tree Planting in Sensitive Marine Clay Soils – 2017 Guidelines* provide further details.

Bus Stops

Bus stops are an important feature of Neighbourhood Collector streets. They can be placed in boulevards or on bulb-outs. When constructed on bulb-outs, they double as traffic calming features. Bus stops that feature shelters or benches can also double as rest areas. Bus stops must be accessible and must facilitate safe interaction of pedestrians and cyclists. OC Transpo's *Bus Stops and Bike Lanes – Interaction Zone Design Guidelines* provide further details.

3.4 Roadway

Curbside Spaces / On-Street Parking

Plan curbside spaces to maximize benefits and limit negative impacts. The space can be used for:

- On-street parking which provides short-term visitor parking, loading, and delivery opportunities (the use, and dimensions of this space is defined in *the Ottawa Traffic and Parking By-Law);*
- Other curbside uses, including bicycle parking, rest areas and restaurant patios; and
- Bulb-outs to provide a traffic calming effect at locations that bookend parking areas, at all intersections, at mid-block pedestrian crossings and long mid-block stretches of uninterrupted parking (>100m), and to accommodate other elements such as trees, bioswales, street furniture and services pedestals, etc.

For on-street parking, designers must be aware of the following:

- Areas where on-street parking utilization is low may enable higher than desirable vehicle operating speeds without the provision of additional horizontal elements such as bulb-outs; and
- Driveways, fire hydrants, and bus stops impact parking and curbside space supply. Refer to the City of Ottawa's *parking By-law* for specific offsets required from these and other elements.

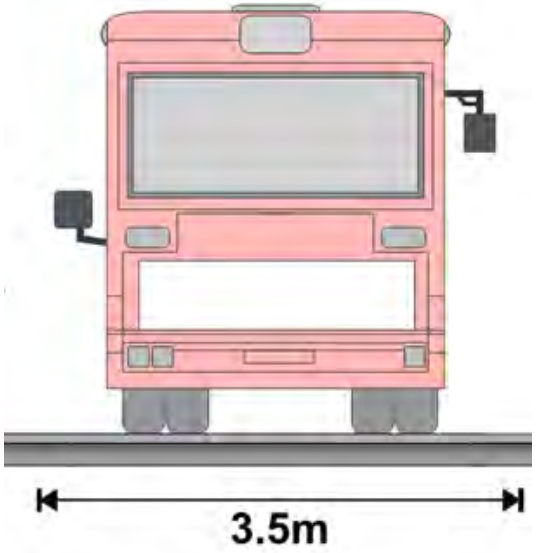


Figure 17 The operating envelope of Ottawa's buses is 3.5m

Curb-to-Curb Width

Keep curb-to-curb distance to a minimum to assist in managing vehicle operating speeds and provide the necessary space for other ROW elements. It is notable that the operating width of an OC Transpo bus is 3.5m (see Figure 17).

Design Neighbourhood Collector streets to accommodate OC Transpo buses and Emergency response vehicles. On two-way streets, a minimum curb-to-curb width of 8.0m is preferred when street parking is not present (except at pinch points). When street parking is present, provide additional curb-to-curb width accordingly.

Temporary transit detours are required occasionally and as such, all Neighbourhood Collector streets are expected to have transit service at some point in their lifespan.

Vehicle Speed and Traffic Management

Pursue speed and traffic management in all Neighbourhood Collector street designs to encourage appropriate driver behaviour. The City of Ottawa's *Traffic Calming Design Guidelines*, and the *Street Planning Manual for New Neighbourhoods* can provide guidance.

In general, designs that avoid excessive lane widths and include pinch-points, vertical deflection measures, lateral shifts, textured surfaces, and have high on-street parking occupancy exhibit lower speeds than those that do not.

Achieving vehicle speed and traffic management objectives can also be maximized through coordination with other design elements (e.g. bus stop locations, planned crossings, streetscaping, etc.).

3.5 Services and Utilities

Services and Utilities within the ROW

Provide space for municipal services and private utility infrastructure within the ROW. For high density development, certain elements of private utility infrastructure can be located on private property. However, street-oriented land uses such as single detached, semi-detached, and row dwellings, usually require surface mount pedestals for utility infrastructure within the ROW. Regardless, private property utility easements may be required.

Furthermore, infrastructure and utility providers may identify trunk service installation and may have special requirements such as chambers that may need to be in the right-of-way or on an easement.

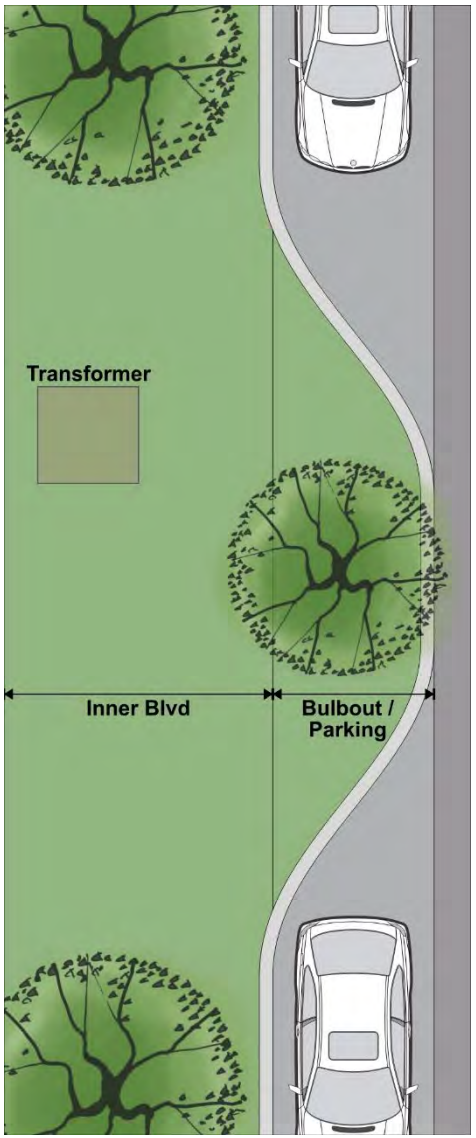


Figure 18 Bulb-outs can provide additional tree planting opportunities

Surface Mount Services and Utilities

Plan for the location of surface-mount utility infrastructure from the earliest stages of neighbourhood planning and design, ideally at the Community Design Plan stage. Electrical and communication services are typically buried in new subdivisions, but this is not always the case, nor is it required more generally. Furthermore, buried service lines still require surface-mount utility pedestals and hydroelectric transformers so it is important to allocate surface space for these features.

Surface-mount electrical transformer placements are a key design consideration for Neighbourhood Collector streets given their size, frequency and clearance requirements. They are the largest surface-mount feature and have wide clearance requirements. As such, they generally govern the placement of surface mount utilities and are typically an anchor in the overall design. One transformer can serve approximately 10-12 dwellings. For townhomes, every unit in a given block must be served by the same transformer. Transformers are provided on the same side of the street as the dwellings they are serving. For designs where transformers can only be accommodated on one side of the street within the ROW, land uses on the other side must be of types that feature transformers on private property such as planned multi-unit developments or commercial, mixed use, or institutional spaces.

The following minimum clearances (see Figure 19) are required around electrical transformers to allow for safe operations of hydroelectric service:

- 1.0m from sidewalks, cycle tracks, and driveways;
- 2.0m from the roadway edge

Furthermore, building foundations are set back 3.0m or greater from the property line where transformers are placed within the ROW. There are additional clearance requirements from trees and other features. Refer to the latest Hydro Ottawa standards for further details. Where necessary, to provide sufficient clearances, use bulb-outs to extend the boulevard space, or narrow cycle tracks and sidewalks (minimum 1.5m each) when passing surface mounted hydroelectric transformers.

Other utilities such as telecommunications and natural gas also require surface mount pedestals. All surface mount pedestals are to be installed in accordance with the City of Ottawa's *Guidelines for Utility Pedestals Within the Road Right-Of-Way*.

Place surface mount utilities away from larger intersections to allow for space for such features as auxiliary lanes, bend-outs for pedestrian and cycling crossings, and bus stops.

Below-Grade Services and Utilities

Neighbourhood Collector streets also host a number of below-grade municipal services and private utilities. Each have their own requirements with respect to placement and clearance requirements. These requirements are often based on safety considerations and the varying life-cycle needs to repair or renew the infrastructure.

To keep street ROW widths to a minimum while allowing for the inclusion of other elements, utility companies and the City of Ottawa have collaborated on joint utility trench designs. Please refer to the latest City of Ottawa Standard Detail Drawings as they are updated, the *Ottawa Joint Utility Trench Guidelines* and respective utilities' standards for further details.

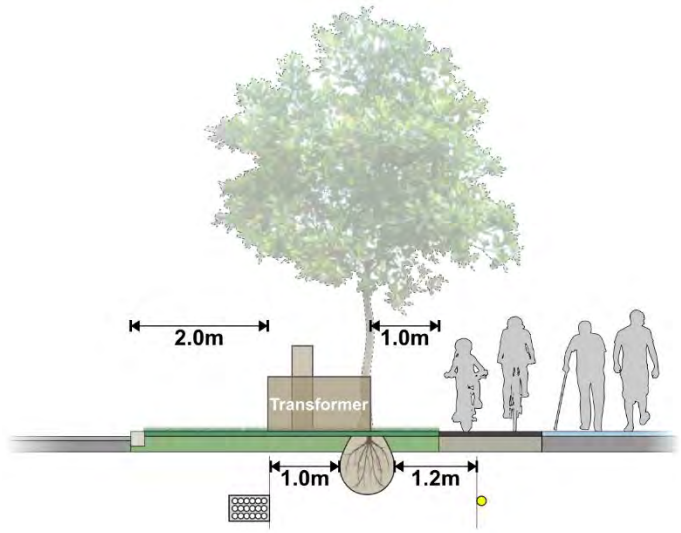


Figure 19 Surface-mount hydroelectric transformers need separation from roadways, parking, cycle-tracks and sidewalks, and tree root balls must have separation when planted (minimum of 1.0m from duct banks and 1.2m from gas main)

Enbridge gas requirements:

- 0.6m minimum clearance from hydrants, lights, and root barriers
- 0.6m minimum clearance from surface features such as benches, transit shelters and street signs
- 1.2m minimum clearance from root balls
- 0.3m minimum clearance from property line
- 0.9m minimum clearance from curb
- 0.9m minimum depth of cover above gas main
- 0.6m minimum depth of cover above service laterals
- 0.3m minimum vertical clearance above hydroelectric duct at crossings
- Refer to Enbridge's *Third Party Requirements in the Vicinity of Natural Gas Facilities* for further details

Hydro Ottawa requirements:

- 1.0m minimum depth of cover for concrete encased hydroelectric ducts (where used)

Joint Utility Trench (JUT) requirements:

- 0.8m minimum depth of cover
- 0.6m preferred (0.3m minimum) horizontal clearance from structures outside the trench, both above and underground
- For 3-party JUT, provide at least 0.6m between the exclusive gas main and the edge of the 3-party trench to provide sufficient clearance to be able to pass over laterals
- For 4-party JUT, gas servicing should be placed closest to the property line given difficulty to cross over the other utilities in the JUT
- 0.15m vertical clearance for service laterals allowed for gas main in JUT

Aerial Services and Utilities

While not common in new developments, aerial hydroelectric and communication servicing is still considered the default option. Where these services are buried, it is done at the cost of the proponent.

When aerial servicing is used, there are additional constraints to be considered. There are restrictions with respect to how close trees can be planted to the aerial line. This is depicted in Figure 20 below, however proponents are encouraged to refer to Hydro Ottawa's latest guidelines. When electrical distribution is overhead, apply the

electric utility's overhead restricted zone clearance requirements. This includes a 5m clear radius from the nearest electric service, and a 2m clear drop zone from the nearest service, for safety and access reasons. This may result in required building setbacks patterns along streets in established areas. Consider this when making zoning decision on minimum front-yard setbacks.

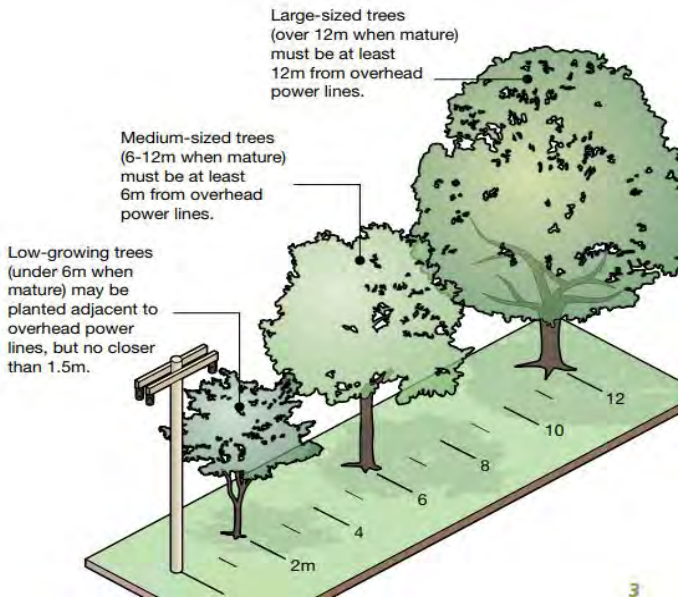


Figure 20 Tree planting restrictions near aerial utilities

When evaluating the costs and benefits of burying existing overhead utilities along corridors planned for rehabilitation, consider the lost development potential and streetscape implications of staggered building setbacks that may result from the application of the electric utility's overhead restricted zone clearance requirements.

Furthermore, if overhead utilities are provided they should be aligned to minimize impact of trees.

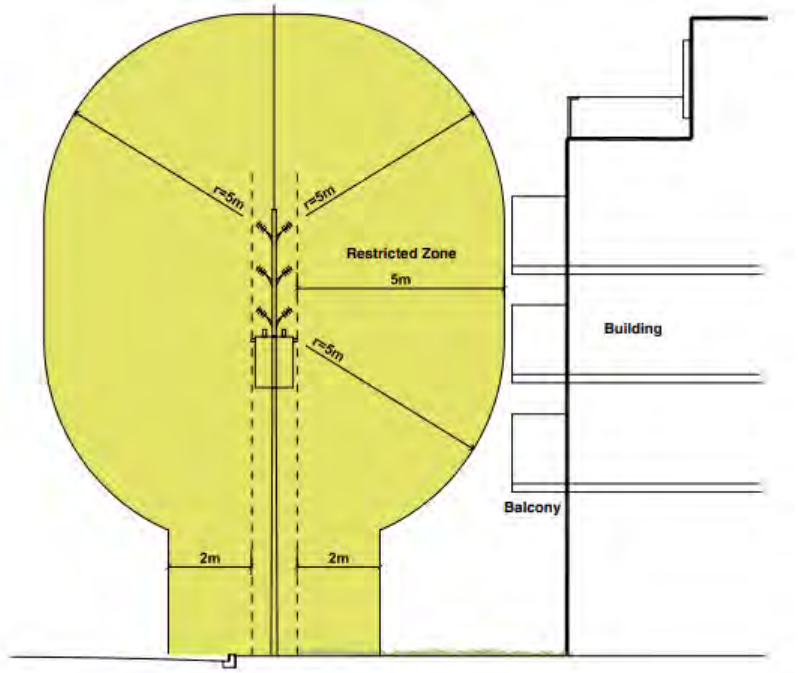


Figure 21 Building restrictions near aerial utilities

Curves in the aerial line require guys and anchoring. Span guys may be needed to avoid conflict with the active transportation facilities or roadway. While not ideal, private property easements may also be needed for anchoring.

3.6 Low Impact Design Features

Explore opportunities to integrate Low Impact Design (LID) features. This includes features such as bioswales or rain gardens. Street designs with wide boulevards along the roadway edge, and/or with mid-block bump-outs (see Figure 22), provide the best opportunities for LID features. Drainage requirements, winter maintenance, and saltwater effluent, are important design considerations. Consider future changing climate conditions. The City's associated stormwater management policies and best practices can provide further direction.

Figure 22 Bulb-outs can provide added space for bio-swales

3.7 Maintenance

Winter operations

In Ottawa, planning for snow management along municipal streets is important. Street design are required to allow for snow plowing, storage, and removal operations (see Figure 23). A minimum 2.0m width of unused curbside space and boulevard is required on each side of the road for this purpose (with minimal vertical obstructions). City of Ottawa maintenance standards ensure that a minimum 3.0m width of each vehicle lane and 1.5m width of sidewalk is clear of snow (and 1.5m width of cycle track, where winter maintained). Where on-street parking is permitted in the winter, that space may not be counted towards snow storage. However, seasonal parking restrictions can create opportunities for snow storage.

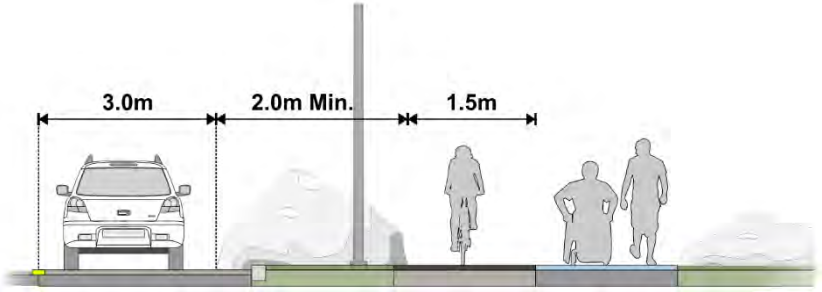


Figure 23 Sufficient space is necessary for snow management

Align vertical features such as trees, light standards, hydrants, transformers, utility pedestals, and benches in the boulevard for ease of snow clearing, snow removal, and grass maintenance.

Boulevard treatments

Grassed boulevards require sufficient soil quality and depth for viable growth. Unit pavers or other hard surface treatments can be used when the boulevard space is too narrow for viable turf grass. The minimum viable width for grass in Ottawa streets is generally considered to be 1.5 m, with a desirable width of 2.0 m. It is important to consider the context when selecting a treatment as well as maintenance and life-cycle costs of each.

3.8 Intersections

There are a number of different intersection control types that can be used on Neighbourhood Collector streets. They are generally as follows:

- Minor leg stop control
- All-way stop control
- Signalized
- Roundabout
- Partially signalized (IPS)
- Signalized mid-block active transportation crossing
- Pedestrian crossover (PXO)

Minor leg stop control is generally only suitable for intersections of Neighbourhood Collector streets with local streets. Use other intersection types at higher traffic intersections, such as those between two Neighbourhood Collector streets. These include all-way stop control, signalized, and roundabout.

All-way stop control is the most cost effective to implement, however it's only suitable for lower traffic volumes and when applicable warrants are met.

Roundabouts provide a good balance of performance, implementation cost and long-term operational costs. Roundabouts also generally give the best fuel efficiency for vehicles. As long as traffic patterns are suitable and sufficient ROW exists, roundabouts are the best option for higher traffic volume intersections.

Only consider traffic signals where other options are not viable. They are the costliest to implement and operate, and only yield better performance than roundabouts under specific traffic patterns.

Regardless of intersection type, protected features must be provided for active transportation users. Refer to Figure 24 for a depiction of a typical protected intersection layout.

Intersections between active transportation links and Neighbourhood Collector streets are also important. These can come in the form of partially signalized intersections (IPS), signalized mid-block crossings, and pedestrian crossovers (PXO).

Partially signalized intersections and signalized active transportation crossings provide opportunities for active transportation users to cross roadways. However, like with intersections, these are both costly to implement and costly to maintain. Partially signalized intersections are suitable where an active transportation corridor follows a local road, and mid-block signalized crossings are suitable where an active transportation corridor runs independent of other facilities.

Pedestrian crossovers (PXOs) are suitable at either intersections or mid-block locations. They give high level of service to pedestrians, as they do not have to wait for the light to change. There are four (4) types of pedestrian crossovers in Ontario[5]. Type 'A' has overhead lit signage and is generally only used on arterial roads. Types 'B' and 'C' feature signage and solar-battery powered rectangular rapid flashing beacons (RRFBs). These are the types most likely to be used on Neighbourhood Collector streets. Type 'D' only features signage and

[5] Refer to Ontario Traffic Manual Book 15 – Pedestrian Crossing for more information PXO's

is suitable for local roads and the lowest volume Neighbourhood Collector Streets.

Accessible and Protected Intersection Designs

A demonstration of a contemporary "protected" intersection is illustrated in Figure 24. Key features include:

- Tactile delineators and tactile walking surface indicators (TWSIs) that contribute to accessibility;
- Appropriate space for pedestrian storage areas between the cycle track and roadway curb;
- Dedicated pedestrian crossings and cycling cross-rides;
- Curb extensions at intersection throats to minimize crossing distances;
- Appropriate "bend-out" of the cycle track cross-rides at intersections to provide visibility (2m minimum, and 5m preferred);
- Bus stops on the far-side of the intersection, located with the bus flag 20m away from the point of curb tangency; and
- Vehicle turning lanes, where warranted.

Roundabouts

While roundabouts generally offer excellent levels of service to vehicles, if care is not taken during their design, they can have greatly reduced levels of service for active transportation users. It is essential that safe and efficient crossings across all legs are provided for active transportation users. Refer to City of Ottawa roundabout design guidance (under development) for further details.

While the demonstration in Figure 24 below shows a signalized intersection, the features listed above also apply to stop controlled intersections. The need for exclusive left-turn lanes is determined by the volume of left-turn traffic, advancing and opposing volumes, as well as safety considerations. A turn volume of 100 veh/h is considered a typical "rule-of-thumb" indicator of need for a single exclusive left-turn lane, however designers must consider competing demands as well as safety warrants per *OTM Book 12 – Traffic Signals* to assist with the decision to include turn lanes in a design. At signalized locations, factor the findings of an operational assessment into the decision. Associated storage lengths will be calibrated to the traffic forecasts but are typically 30m long as a minimum.

Figure 24 A protected intersection provides separation and clarity of space for all users

4.0 DOCUMENT SUPPORT AND ADMINISTRATION

4.1 Stakeholder input

This document was developed in consultation with numerous stakeholders, including the development industry, utility providers, and City of Ottawa departments. This included detailing the most up-to-date requirements and preferred conditions for all stakeholders who use Neighbourhood Collector street ROWs to deploy services or achieve policy objectives.

4.2 Council Approval and Updating

[This section is to be updated following approval by Planning Committee and Council.]

4.3 Implementation

This manual provides guidance on the planning and design of Neighbourhood Collector streets in all urban contexts. The guidance can be integrated into the City's various implementing tools, as outlined below.

Community Design Plans and Secondary Plans

The City approves Community Design Plans (CDPs) as the planning tool to guide the overall master planning of new communities on large tracts of land. Often, these plans are also approved as Secondary Plans. As CDPs and Secondary Plans are fulsome in scope and include the planning of supporting infrastructure, this is the ideal time to establish the street network and the corresponding ROW to be protected. The relationship of building/garage setbacks, driveway parking lengths, Neighbourhood Collector street active transportation locations, and a plan for above-grade and below-grade services and utilities must also be addressed at this master planning stage.[6]

In the case of CDPs and Secondary Plans approved prior to the issuance of this document, the pre-vetted cross sections can be applied where possible. In cases where this isn't possible, develop custom designs using the principles outlined in section 3 above.

ROW Protection Policy

The *Official Plan* establishes the City's policy for protection of ROW widths along all street segments. This policy enables the City to acquire ROW widenings under the provisions of the *Planning Act*. The City may consider updating these policies with the understanding that a 26m ROW is the target width for

[6] City of Ottawa Street Planning Manual for New Neighbourhoods (under development) provides important guidance and considerations at this stage in neighbourhood and street framework planning and design.

Neighbourhood Collector streets. In addition, special corner ROW widening triangles that protect views and enable protected intersection designs can be established through ROW protection policy.

Subsequent Engineering Design Standard Cross-Sections

The pre-vetted Neighbourhood Collector street cross-sections illustrated in Section 2.0 each provide spaces for above-grade and below-grade municipal services including water, sanitary sewer, storm sewers, street lighting and traffic plant, as well as private utilities including hydroelectric, telecommunications, fibre, and gas. However, conflicts between elements may exist and the available space diminishes as the ROW width decreases. The intent is that this document will inform a follow-on process where the horizontal and vertical location of all services and utilities are confirmed and a set of corresponding City of Ottawa “standard” engineering cross-sections are approved. These standard cross-sections would be included in the City’s Standard Tender Documents for Unit Price Contracts and can also be integrated into the City’s standard conditions for subdivision approval.

APPENDIX A: Design Criteria for Cross-Sectional and Intersection Elements on Neighbourhood Collector Streets

PART A: Cross-Sectional Components

Element	Acceptable Value or Range	Target	Explanatory Notes
Sidewalk Width	1.8m to 2.0m	2.0m	The minimum width of 1.8m is defined by the clearance required for two persons using wheelchairs or mobility devices to pass. The sidewalk width can be reduced to 1.5m at constrained locations provided that passing areas are provided every 30 m. Driveways are considered acceptable passing areas if they are hard surfaced and of appropriate grade. Refer to the *City of Ottawa Accessible Design Standards* for further details. The minimum width of 1.8m is also consistent with the minimum hard surface width required for snow clearing operations.
Cycle Track Width	1.5m to 2.0m	2.0m	This is consistent with the *Ottawa Cycling Plan*, *TAC GDGCR Chapter 5* and *OTM Book 18*. Note that a minimum hard surface width of 1.8m is required to allow for snow clearing operations (if the cycle track is not located adjacent to the sidewalk).
Tactile Delineation Width between Sidewalk and Cycle Track when Abutting	TBD	TBD	This element's purpose is to allow visually impaired users to distinguish the interface between pedestrian facilities and cycling facilities. Note that the current 0.2m wide detail is currently under review at the time of writing of this document and is subject to change. Due to the tactile profile, it can be uncomfortable for mobility device users to ride on. As such, provide a sidewalk width of at least 1.8m plus the width of the tactile delineation where possible.
Cycle Track Dooring Zone Buffer Width	0.6m to 1.0m	1.0m	This is consistent with the *Ottawa Cycling Plan*, *TAC GDGCR Chapter 5* and *OTM Book 18*.
Vehicle Lane Width	3.5m	3.5m	3.5m is required to accommodate OC Transpo bus fleet, including mirror overhangs. Excessive lane width can increase vehicle travel speeds and is discouraged.
Vehicle Lane Width (Turn Lanes)	3.0m to 3.25m	3.25m	Generally 0.25m narrower that the adjacent through lane.
Pavement Width, Emergency Vehicle Access (Minimum)	8.0m	N/A	For roads without on street parking or adjacent hard surface, an 8.0m minimum curb-to-curb width is required for emergency vehicle access. Note that this criterion only applies for continuous segments. For bulb-outs and periodic pinch points, minimum lane widths apply.

PART A: Cross-Sectional Components

Element	Acceptable Value or Range	Target	Explanatory Notes
Pavement Width, Bus Service (Minimum)	9.0m (seasonally restricted parking one side) 11.0m (parking two sides)	9.4m (parking one side) 11.8m (parking two sides)	It is desirable to provide a total width that respects minimum lane and parking widths. For reduced widths, seasonal parking restrictions may be required.
On-Street Parking Width	2.2m to 2.6m	2.4m	Excessively wide on-street parking areas can lead to increased travel speeds in the adjacent lane. A minimum width of 2.4m is required for streets with high frequency bus service (as determined by OC Transpo).
Road Edge Green Boulevard Width (Minimum, Without Trees)	1.5m to 2.0m	2.0m	A 1.5m road edge boulevard is the absolute minimum for snow storage, streetlighting and the survivability of grass. 2.0m is preferred.
Road Edge Green Boulevard Width (Minimum, With Trees)	2.5m to 4.5m	4.5m	The minimum width of 2.5m is defined by the minimum offsets from the roadway and the cycletrack to trees. At the 2.5m width, growing conditions for trees are less than ideal. Expect reduced survival and reduced growth. A width of 4.0m to 4.5m is strongly preferred.
Separation of Tree from Roadway (Minimum)	1.5m	2.5m	This provides space for snow removal operations and reduces the effect of salt spray.
Separation of Tree from Cycle Track or Sidewalk (Minimum)	1.0m	2.0m	This mitigates potential for root damage to the sidewalk/cycle track structure.
Separation of Hydroelectric Transformer from Road (Minimum)	2.0m	N/A	This provides space for snow removal operations and reduces the effect of salt spray.
Separation of Hydroelectric Transformer from Sidewalk or Cycle Track (Minimum)	1.0m	N/A	This is the minimum acceptable clearance for snow clearing operations.

Part B: Intersection Components

Element	Acceptable Value or Range	Target	Explanatory Notes
Crosswalk Width	3.0m +	3.0m	The minimum crosswalk width used in Ottawa is 3.0m. If the pedestrian facility is wider than 3.0m, widen the crosswalk to match.
Cross-ride Width	1.5m to 2.0m	1.5m to 2.0m	Match the width of the associated cycle track. Refer to *OTM Book 18* for further details.
Pedestrian Waiting Area Between Curb and Cycle Track	2.7m +	3.0m	Sufficient area must be provided for pedestrians to wait for the walk signal. Areas with high pedestrian volumes will require greater storage area.
Cross-ride (Offset) Bend-out Width	3.7m to 6.0m	5.0m	Provide sufficient offset for right turning vehicles to get clearer view of crossing cyclists. Ideally, provide sufficient space for a single right turning vehicle to stop for a cyclist without obstructing through traffic. The minimum value is defined by the pedestrian waiting area plus a 1.0m offset as per City of Ottawa Traffic Signals Design & Coordination Unit policy. In constrained situations, it may be necessary to bend the cycle track in instead to bring cyclists directly adjacent to the road.

APPENDIX B: Reference Documents

Document Title	Revision Date[1]	Source
Accessibility Design Standards	2012	https://ottawa.ca/en/city-hall/accessibility-services/accessibility-design-standards-features
Building Better and Smarter Suburbs	2015	https://ottawa.ca/en/city-hall/planning-and-development/community-plans-and-design-guidelines/design-and-planning/completed-guidelines/building-better-and-smarter-suburbs-bbss
Bus Stops and Bike Lanes – Interaction Zone Design Guidelines (OC Transpo)	2019	*Anticipated to be published in 2019*
City of Ottawa Traffic and Parking By-law (No. 2017-301)	2017	https://ottawa.ca/en/traffic-and-parking-law-no-2017-301
City of Ottawa Zoning By-law (No. 2008-250)	2008	https://ottawa.ca/en/zoning-law-no-2008-250
Complete Streets Framework		https://ottawa.ca/en/city-hall/planning-and-development/community-plans-and-design-guidelines/design-and-planning/completed-guidelines/complete-streets-ottawa
Guidelines for Utility Pedestals Within the Road Right-Of-Way		Available upon request from the City of Ottawa
Guide to preparing studies and plans	2019	https://ottawa.ca/en/city-hall/planning-and-development/information-developers/development-application-review-process/development-application-submission/guide-preparing-studies-and-plans
Guide to preparing studies and plans – Composite Utility Plans	2019	https://ottawa.ca/en/city-hall/planning-and-development/information-developers/development-application-review-process/development-application-submission/guide-preparing-studies-and-plans#composite-utility-plan
Joint Utility Trench Guidelines		Available upon request from the City of Ottawa
MTO Design Supplement for TAC GDGCR	2017	https://www.library.mto.gov.on.ca/SydneyPLUS/Sydney/Portal/default.aspx?component=AAAAIY&record=59cabe78-8aaf-4347-95ab-d6c066099015
NACTO Urban Street Design Guide, 2013	2013	https://nacto.org/urban-street-design-guide-2013/
Official Plan	2003	https://ottawa.ca/en/city-hall/planning-and-development/official-plan-and-master-plans/official-plan

Ontario Integrated Accessibility Standards (O. Reg. 191/11)	2016	https://www.ontario.ca/laws/regulation/110191#BK91
Ontario Traffic Manual - Book 12 – Traffic Signals	2012	https://www.library.mto.gov.on.ca/SydneyPLUS/Sydney/Portal/default.aspx?component=AAAAIY&record=59cabe78-8aaf-4347-95ab-d6c066099015
Ontario Traffic Manual - Book 15 – Pedestrian Crossing Treatments	2016	https://www.library.mto.gov.on.ca/SydneyPLUS/Sydney/Portal/default.aspx?component=AAAAIY&record=fa5caef1-9963-4786-b3c9-4b5e50e70321
Ontario Traffic Manual - Book 18 – Cycling Facilities	2013	https://otc.org/research/otm-book-18/
Ottawa Cycling Plan	2013	https://ottawa.ca/en/city-hall/planning-development-and-construction/official-plan-and-master-plans#ottawa-cycling-plan
Pedestrian & Cycling Design Toolbox	2019	Available upon request from the City of Ottawa
Road Corridor Planning & Design Guidelines	2008	https://ottawa.ca/en/road-corridor-planning-design-guidelines
Standard Tender Documents for Unit Price Contracts	2019	On request via email standardssection@ottawa.ca
Street Planning Manual for New Neighbourhoods	2019	*Anticipated to be published in 2019*
TAC Geometric Design Guide for Canadian Roads	2017	https://www.tac-atc.ca/en/publications-and-resources/geometric-design-guide-canadian-roads
Third Party Requirements in the Vicinity of Natural Gas Facilities	2018	https://www.enbridgegas.com/~/media/Extranet-Pages/Safety/Before-you-dig/Third-Party-Requirements-in-the-Vicinity-of-Natural-Gas-Facilities
Traffic Calming Design Guidelines	2019	https://ottawa.ca/en/traffic-calming-design-guidelines
Transportation Master Plan	2013	https://ottawa.ca/en/city-hall/planning-and-development/official-plan-and-master-plans/transportation-master-plan
Tree Planting in Sensitive Marine Clay Soils	2017	https://ottawa.ca/en/city-hall/planning-and-development/community-plans-and-design-guidelines/design-and-planning/completed-guidelines/tree-planting-sensitive-marine-clay-soils-2017-guidelines
Urban Forest Management Plan	2017	https://ottawa.ca/en/residents/water-and-environment/trees-and-community-forests/ottawas-urban-forest-management-plan

[1] Revision date as of the writing of this document, provided for context only. Readers shall use the most recent version available unless directed otherwise by City of Ottawa staff.

APPENDIX C: Demonstration of Pre-vetted Design Options

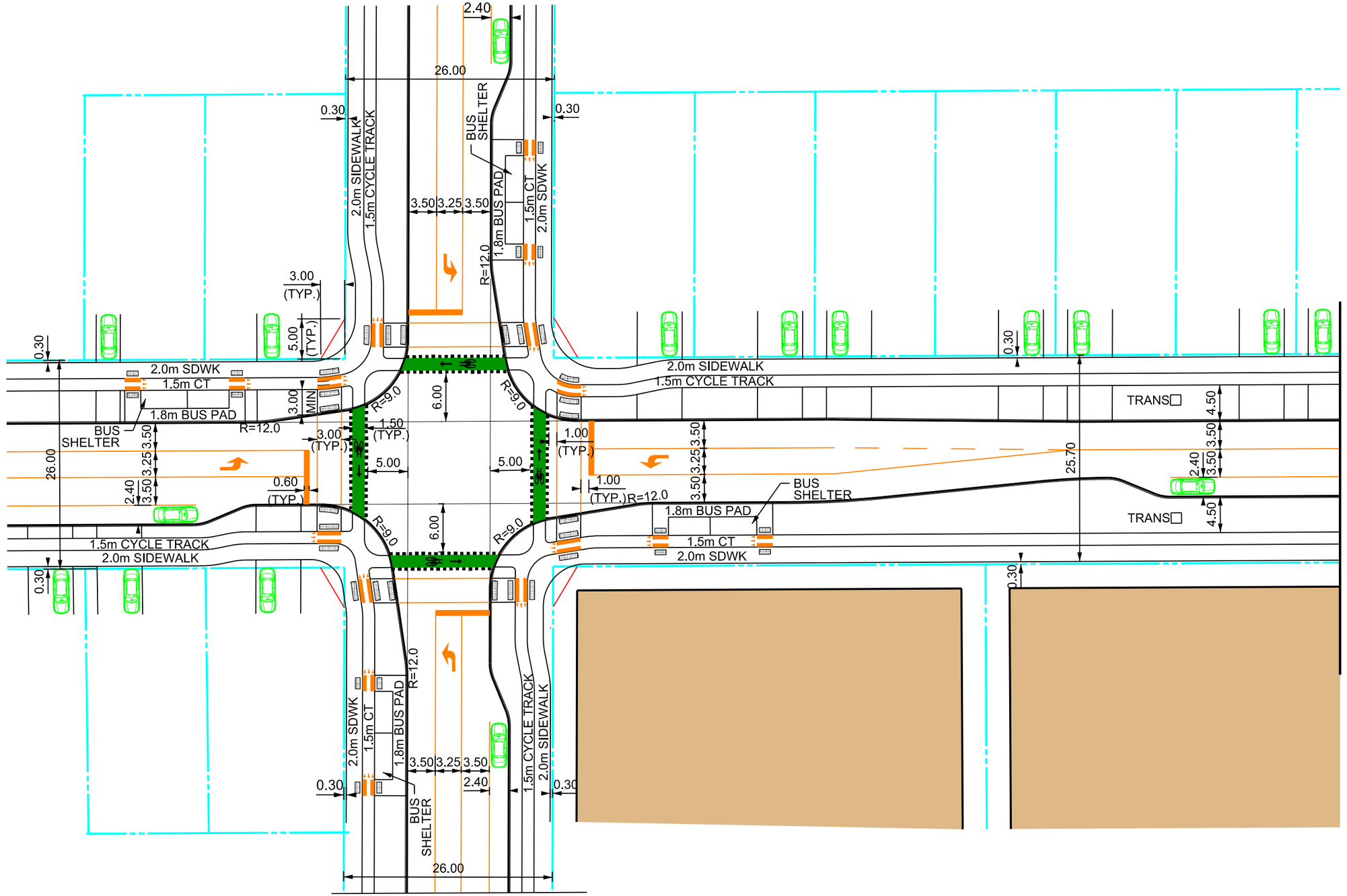
Working draft copies of demonstration drawings for the "pre-vetted" cross-section concepts illustrated in Section 2.1 are included in the following pages. These drawings were developed in order to help explore potential functionality of the pre-vetted concepts and were done in consultation with the project Technical Advisory Group and key stakeholders.

List of demonstration drawings:

- **26A – Four drawings including one demonstration plan view along with three cross-section drawings (one that shows interactions at each of hydroelectric transformers, trees and bulb-outs)**
- **26B – One cross-section drawing illustrating interaction at hydroelectric transformers**
- **26C – One cross-section drawing illustrating interaction at hydroelectric transformers/trees**
- **26D – One cross-section drawing illustrating interaction at hydroelectric transformers**
- **24A – One cross-section drawing illustrating interaction at hydroelectric transformers**
- **24B – One cross-section drawing illustrating interaction at hydroelectric transformers**
- **24C – One cross-section drawing illustrating interaction at street lights**
- **22A - One cross-section drawing illustrating interaction at street lights**
- **22B - One cross-section drawing illustrating interaction at hydroelectric transformers**

The following should be noted:

- The pre-vetted cross-section concepts, nor the supporting demonstration drawings, cover poled servicing.
- 26m and 24m cross-sections with adjacent, side-by-side, sidewalks and cycle tracks have total widths of 4m, but "pinch" to provide 1m lateral clearance from hydroelectric transformers, as necessary.
- The demonstration drawings are not standards. They are intended to provide interim assistance in the preparation of street designs using the pre-vetted cross-sections until such time that the engineering design standards for collector roads are updated. For standards, users may refer to the City's Standard Tender Documents



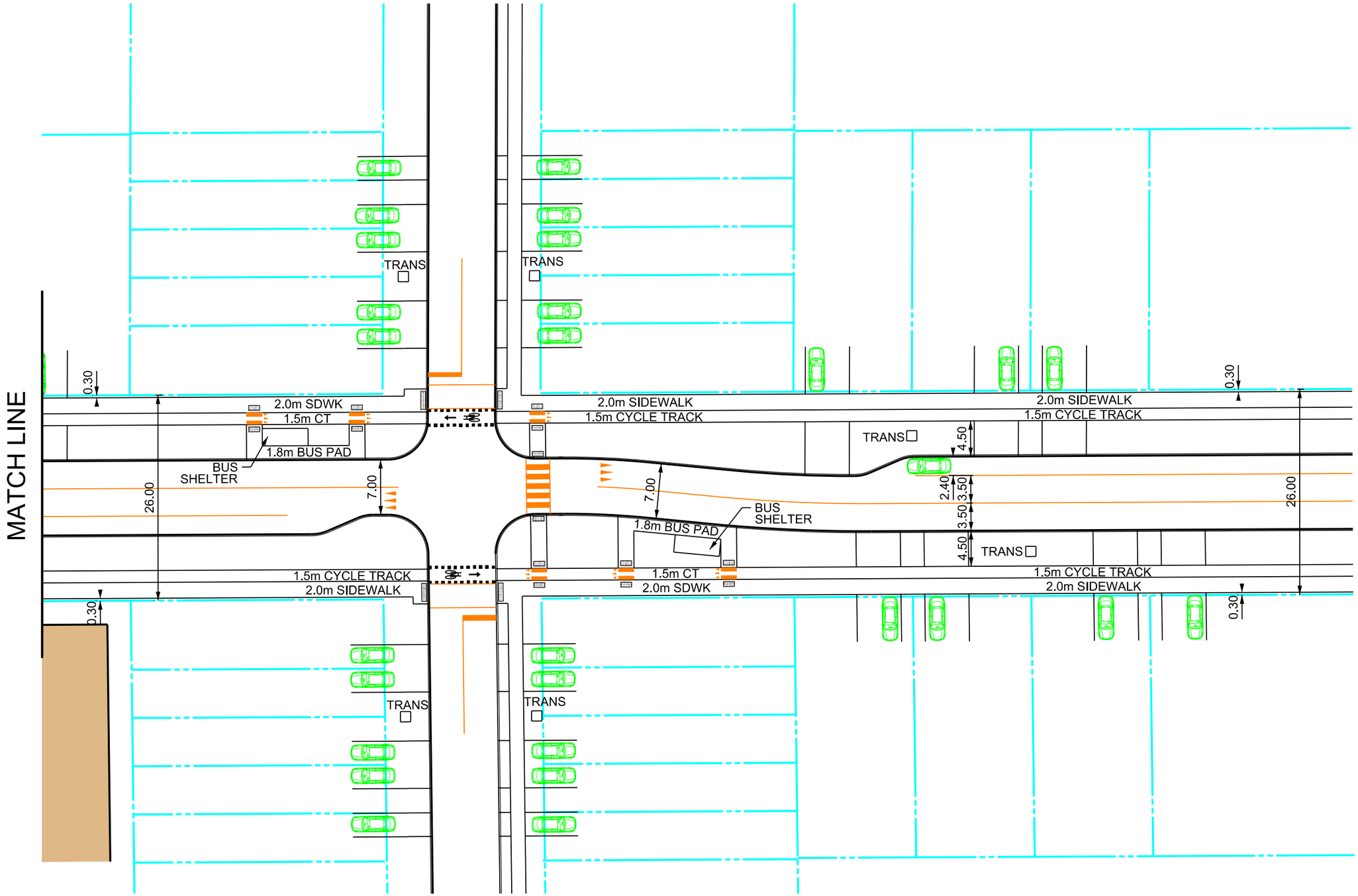
DEMONSTRATION PLAN ONLY

COLLECTOR "26A"
DEMONSTRATION
PLAN VIEW

Scale: HORIZONTAL
0m 2.5 5 10

Rev. No. 0

Dwg. No. 1 of 2



DEMONSTRATION PLAN ONLY

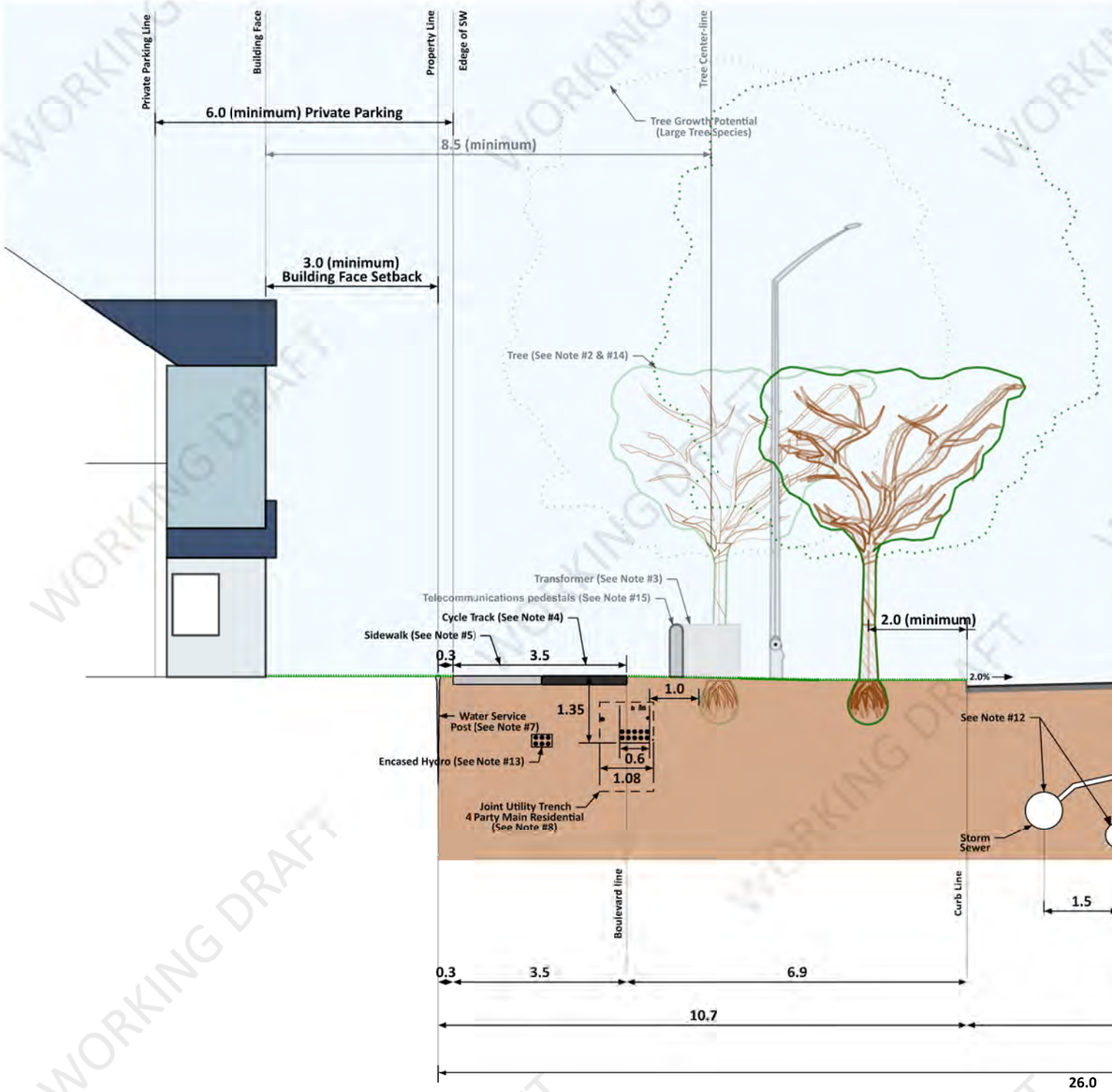
COLLECTOR "26A"
DEMONSTRATION
PLAN VIEW

Scale: HORIZONTAL
0m 2.5 5 10

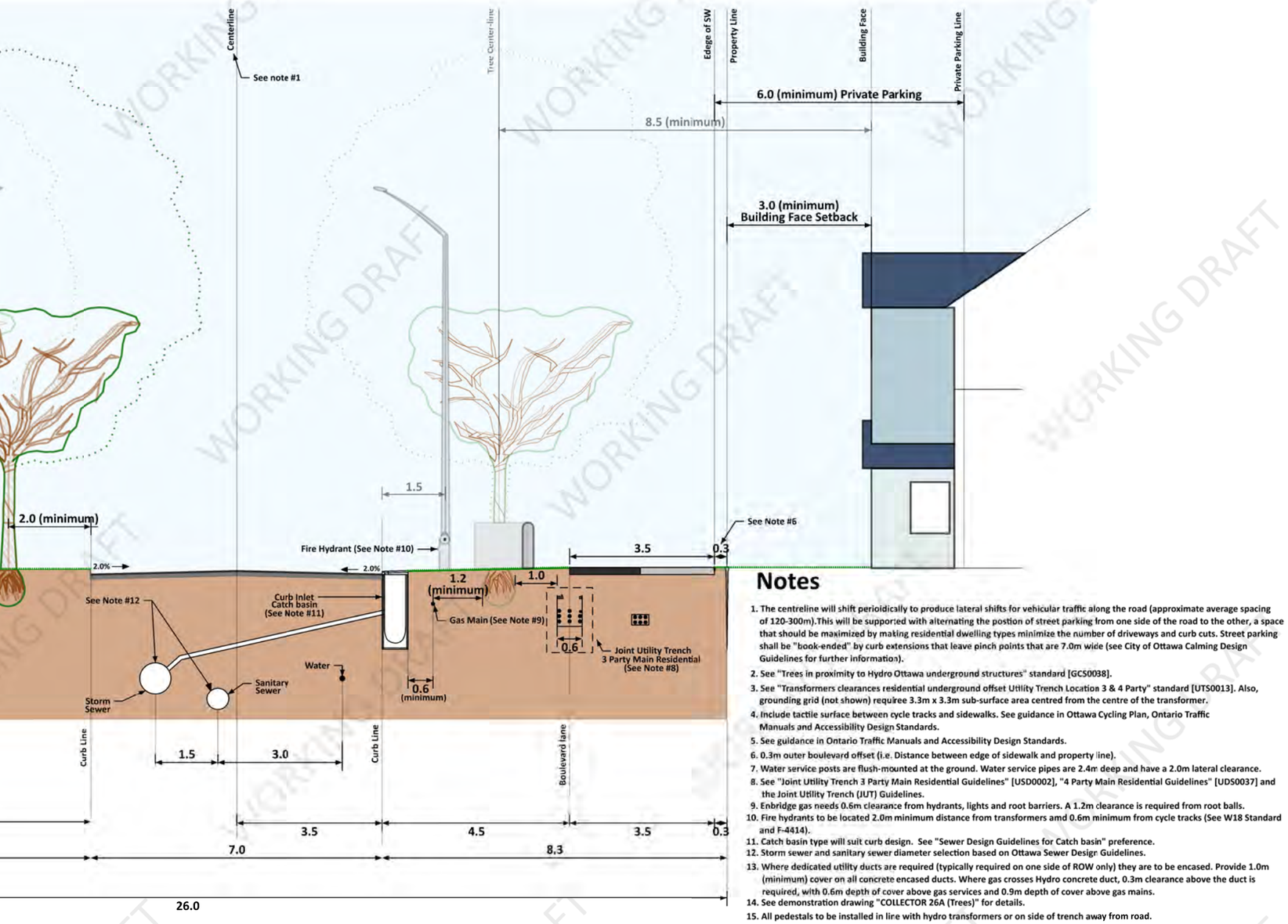
Rev. No. 0

Dwg. No. 2 of 2

Option A



Option B



Notes

1. The centreline will shift perioidically to produce lateral shifts for vehicular traffic along the road (approximate average spacing of 120-300m).This will be supported with alternating the postion of street parking from one side of the road to the other, a space that should be maximized by making residential dwelling types minimize the number of driveways and curb cuts. Street parking shall be "book-ended" by curb extensions that leave pinch points that are 7.0m wide (see City of Ottawa Calming Design Guidelines for further information).
2. See "Trees in proximity to Hydro Ottawa underground structures" standard [GCS0038].
3. See "Transformers clearances residential underground offset Utility Trench Location 3 & 4 Party" standard [UTS0013]. Also, grounding grid (not shown) requiree 3.3m x 3.3m sub-surface area centred from the centre of the transformer.
4. Include tactile surface between cycle tracks and sidewalks. See guidance in Ottawa Cycling Plan, Ontario Traffic Manuals and Accessibility Design Standards.
5. See guidance in Ontario Traffic Manuals and Accessibility Design Standards.
6. 0.3m outer boulevard offset (i.e. Distance between edge of sidewalk and property line).
7. Water service posts are flush-mounted at the ground. Water service pipes are 2.4m deep and have a 2.0m lateral clearance.
8. See "Joint Utility Trench 3 Party Main Residential Guidelines" [USD0002], "4 Party Main Residential Guidelines" [UDS0037] and the Joint Utility Trench (JUT) Guidelines.
9. Enbridge gas needs 0.6m clearance from hydrants, lights and root barriers. A 1.2m clearance is required from root balls.
10. Fire hydrants to be located 2.0m minimum distance from transformers amd 0.6m minimum from cycle tracks (See W18 Standard and F-4414).
11. Catch basin type will suit curb design. See "Sewer Design Guidelines for Catch basin" preference.
12. Storm sewer and sanitary sewer diameter selection based on Ottawa Sewer Desigr Guidelines.
13. Where dedicated utility ducts are required (typically required on one side of ROW only) they are to be encased. Provide 1.0m (minimum) cover on all concrete encased ducts. Where gas crosses Hydro concrete duct, 0.3m clearance above the duct is required, with 0.6m depth of cover above gas services and 0.9m depth of cover above gas mains.
14. See demonstration drawing "COLLECTOR 26A (Trees)" for details.
15. All pedestals to be installed in lire with hydro transformers or on side of trench away from road.

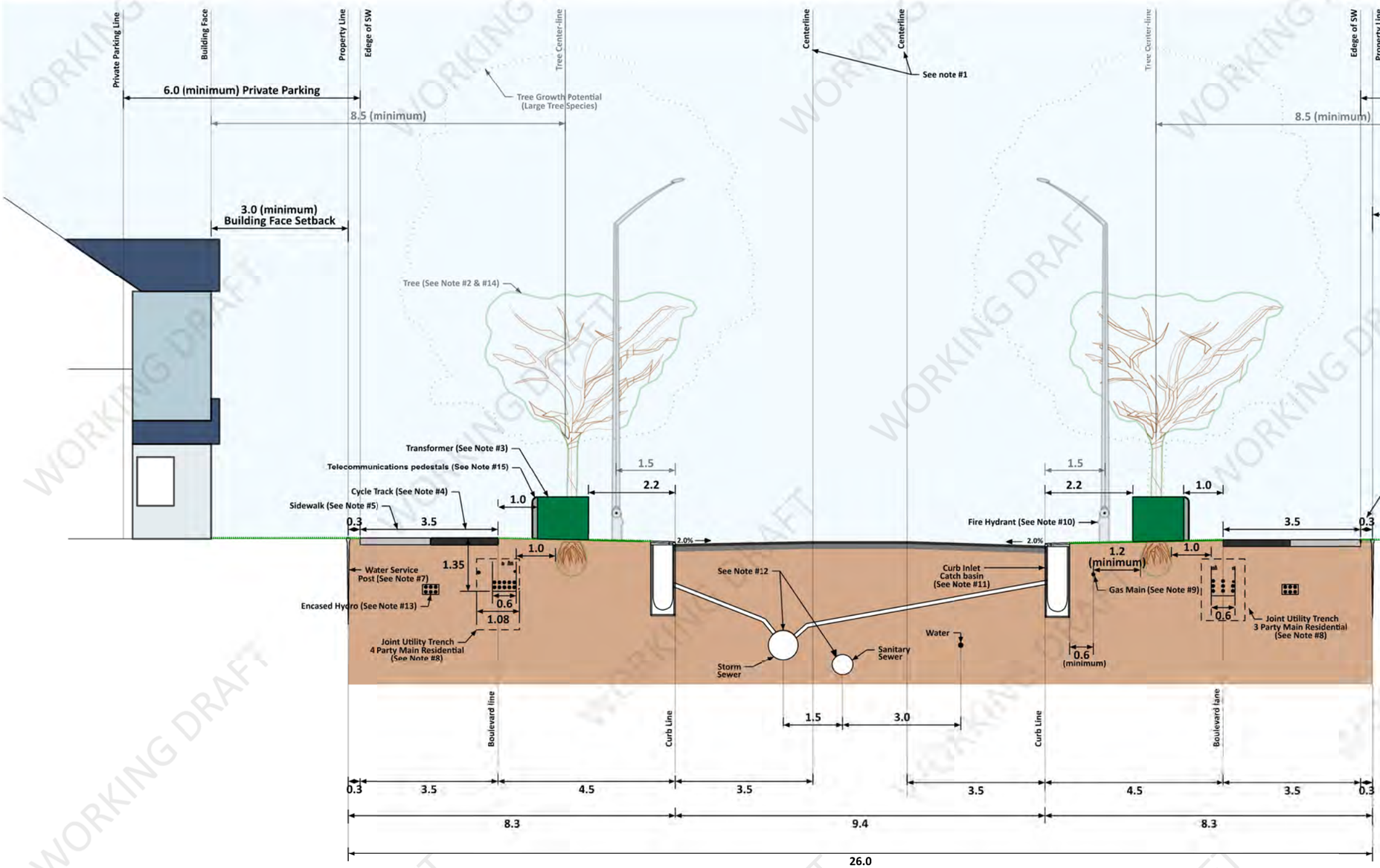
DEMONSTRATION SECTION ONLY

COLLECTOR ''26A'' (Bulb-out)
26.0m ROAD ALLOWANCE at bulb-out
*****WORKING DRAFT*****

Option A - 4 Party Joint Utility Trench
Option B - 3 Party Joint Utility Trench

August 21, 2019

Option A



Option B

Notes

1. The centreline will shift perioidically to produce lateral shifts for vehicular traffic along the road (approximate average spacing of 120-300m).This will be supported with alternating the postion of street parking from one side of the road to the other, a space that should be maximized by making residential dwelling types minimize the number of driveways and curb cuts. Street parking shall be "book-ended" by curb extensions that leave pinch points that are 7.0m wide (see City of Ottawa Calming Design Guidelines for further information).
2. See "Trees in proximity to Hydro Ottawa underground structures" standard [GCS0038].
3. See "Transformers clearances residential underground offset Utility Trench Location 3 & 4 Party" standard [UTS0013]. Also, grounding grid (not shown) requiree 3.3m x 3.3m sub-surface area centred from the centre of the transformer.
4. Include tactile surface between cycle tracks and sidewalks. See guidance in Ottawa Cycling Plan, Ontario Traffic Manuals and Accessibility Design Standards.
5. See guidance in Ontario Traffic Manuals and Accessibility Design Standards.
6. 0.3m outer boulevard offset (i.e. Distance between edge of sidewalk and property line).
7. Water service posts are flush-mounted at the ground. Water service pipes are 2.4m deep and have a 2.0m lateral clearance.
8. See "Joint Utility Trench 3 Party Main Residential Guidelines" [USD0002], "4 Party Main Residential Guidelines" [UDS0037] and the Joint Utility Trench (JUT) Guidelines.
9. Enbridge gas needs 0.6m clearance from hydrants, lights and root barriers. A 1.2m clearance is required from root balls.
10. Fire hydrants to be located 2.0m minimum distance from transformers amd 0.6m minimum from cycle tracks (See W18 Standard and F-4414).
11. Catch basin type will suit curb design. See "Sewer Design Guidelines for Catch basin" preference.
12. Storm sewer and sanitary sewer diameter selection based on Ottawa Sewer Desigr Guidelines.
13. Where dedicated utility ducts are required (typically required on one side of ROW only) they are to be encased. Provide 1.0m (minimum) cover on all concrete encased ducts. Where gas crosses Hydro concrete duct, 0.3m clearance above the duct is required, with 0.6m depth of cover above gas services and 0.9m depth of cover above gas mains.
14. See demonstration drawing "COLLECTOR 26A (Trees)" for details.
15. All pedestals to be installed in lire with hydro transformers or on side of trench away from road.

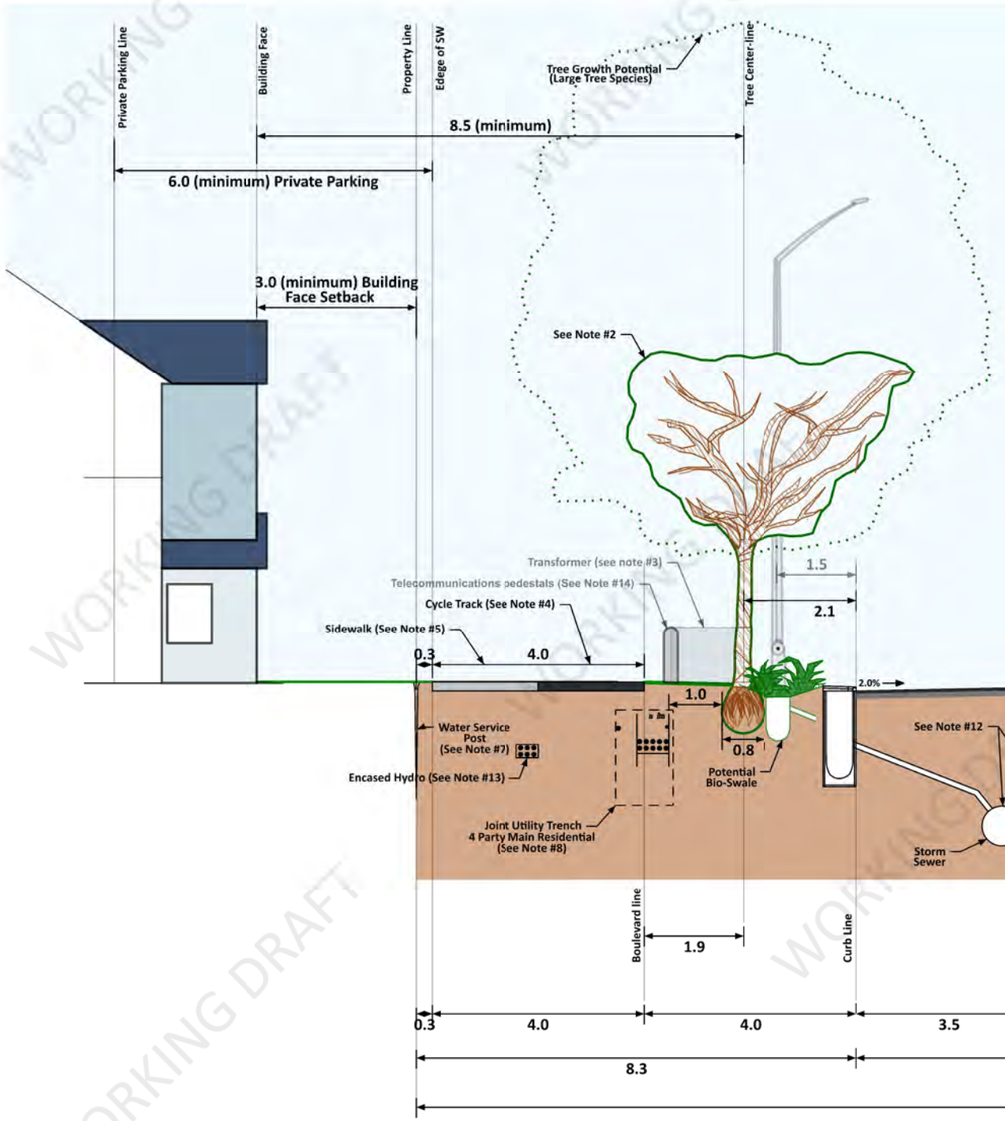
DEMONSTRATION SECTION ONLY

COLLECTOR ''26A'' (Transformer)
26.0m ROAD ALLOWANCE at transformer
*****WORKING DRAFT*****

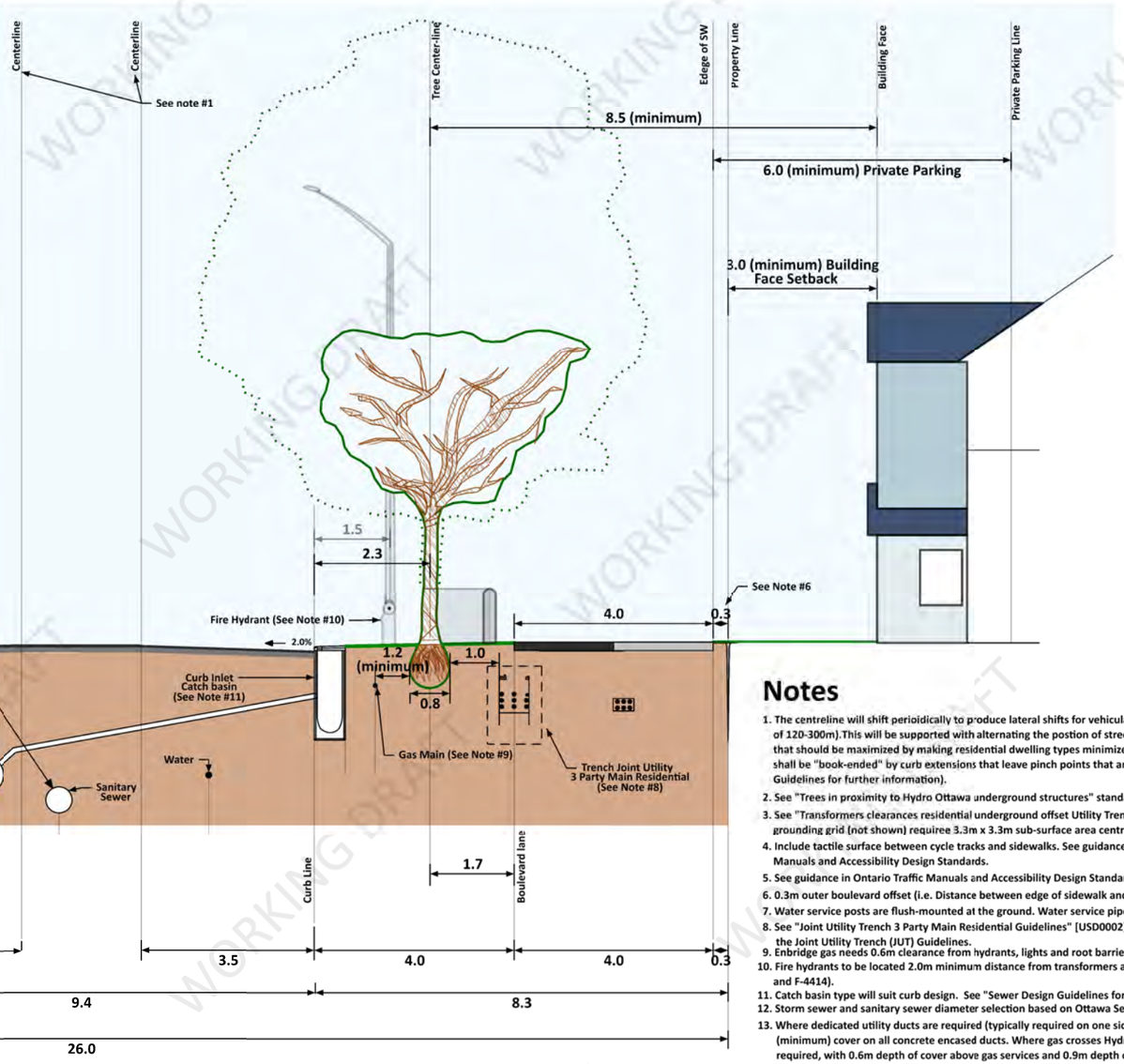
Option A - 4 Party Joint Utility Trench
Option B - 3 Party Joint Utility Trench

August 21, 2019

Option A



Option B



Notes

1. The centreline will shift periodically to produce lateral shifts for vehicular traffic along the road (approximate average spacing of 120-300m).This will be supported with alternating the postion of street parking from one side of the road to the other, a space that should be maximized by making residential dwelling types minimize the number of driveways and curb cuts. Street parking shall be "book-ended" by curb extensions that leave pinch points that are 7.0m wide (see City of Ottawa Calming Design Guidelines for further information).
2. See "Trees in proximity to Hydro Ottawa underground structures" standard [GCS0038].
3. See "Transformers clearances residential underground offset Utility Trench Location 3 & 4 Party" standard [UTS0013]. Also, grounding grid (not shown) requiree 3.3m x 3.3m sub-surface area centred from the centre of the transformer.
4. Include tactile surface between cycle tracks and sidewalks. See guidance in Ottawa Cycling Plan, Ontario Traffic Manuals and Accessibility Design Standards.
5. See guidance in Ontario Traffic Manuals and Accessibility Design Standards.
6. 0.3m outer boulevard offset (i.e. Distance between edge of sidewalk and property line).
7. Water service posts are flush-mounted at the ground. Water service pipes are 2.4m deep and have a 2.0m lateral clearance.
8. See "Joint Utility Trench 3 Party Main Residential Guidelines" [USD0002], "4 Party Main Residential Guidelines" [UDS0037] and the Joint Utility Trench (JUT) Guidelines.
9. Enbridge gas needs 0.6m clearance from hydrants, lights and root barriers. A 1.2m clearance is required from root balls.
10. Fire hydrants to be located 2.0m minimum distance from transformers amd 0.6m minimum from cycle tracks (See W18 Standard and F-4414).
11. Catch basin type will suit curb design. See "Sewer Design Guidelines for Catch basin" preference.
12. Storm sewer and sanitary sewer diameter selection based on Ottawa Sewer Design Guidelines.
13. Where dedicated utility ducts are required (typically required on one side of ROW only) they are to be encased. Provide 1.0m (minimum) cover on all concrete encased ducts. Where gas crosses Hydro concrete duct, 0.3m clearance above the duct is required, with 0.6m depth of cover above gas services and 0.9m depth of cover above gas mains.
14. All pedestals to be installed in line with hydro transformers or on side of trench away from road.

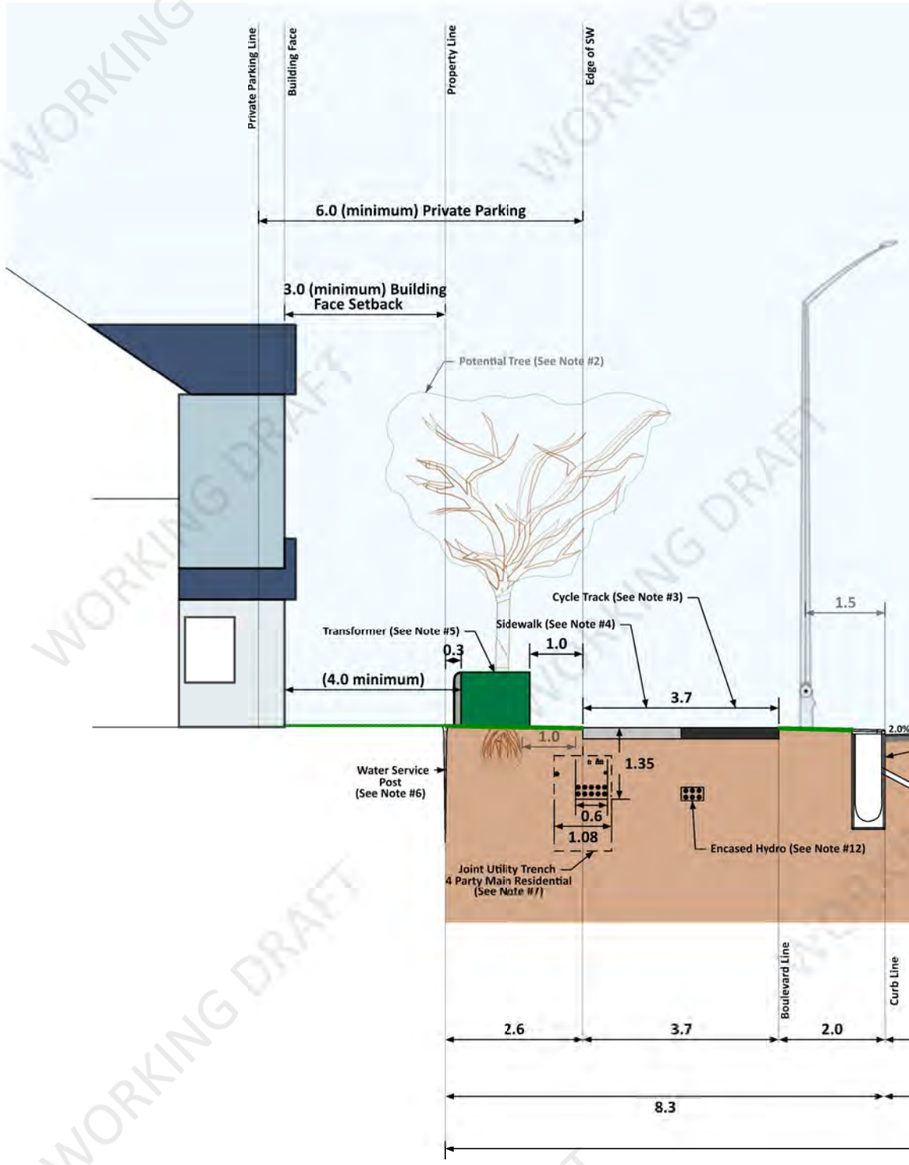
DEMONSTRATION SECTION ONLY

COLLECTOR ''26A'' (Trees)
26.0m ROAD ALLOWANCE at trees
*****WORKING DRAFT*****

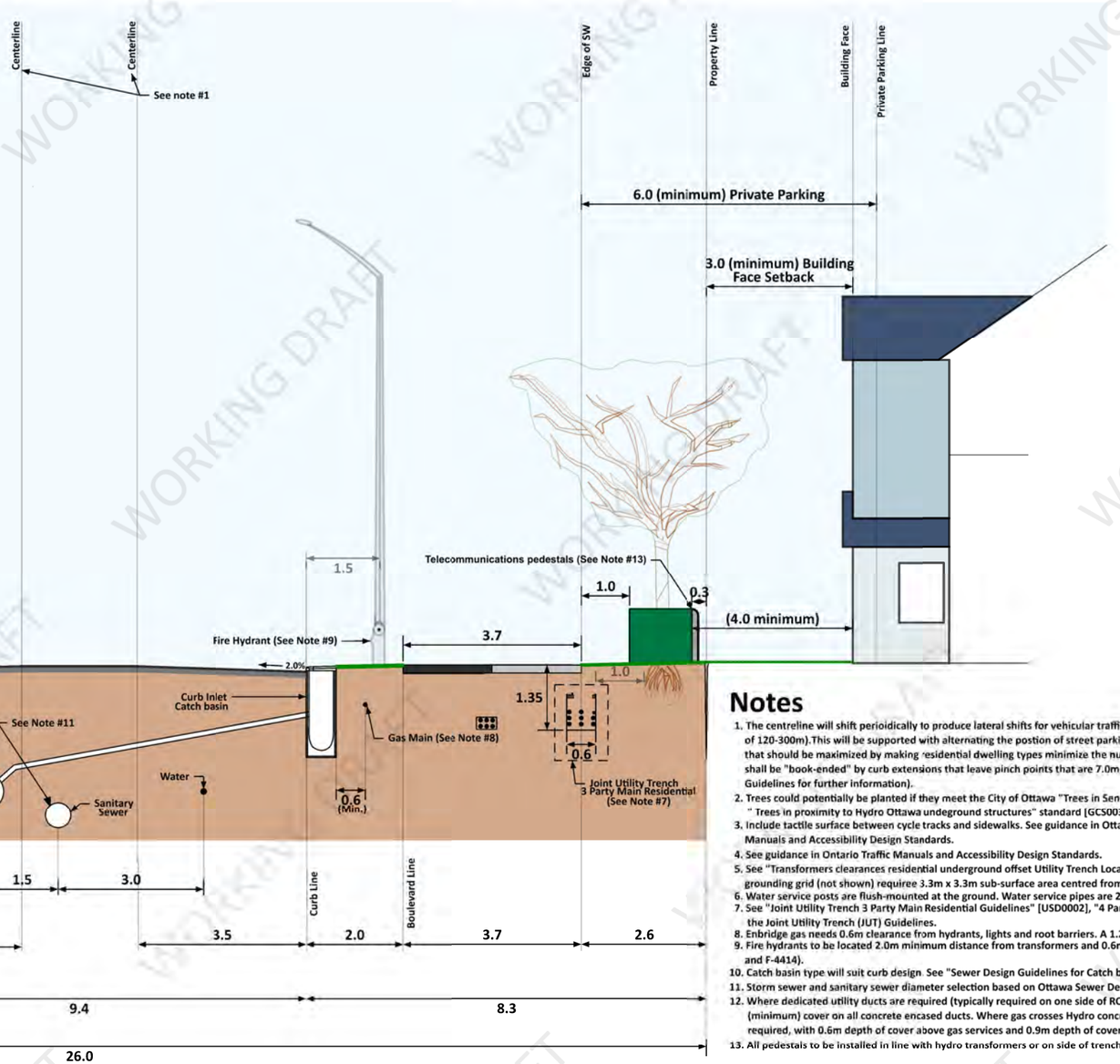
Option A - 4 Party Joint Utility Trench
Option B - 3 Party Joint Utility Trench

August 21, 2019

Option A



Option B



Notes

1. The centreline will shift perioidically to produce lateral shifts for vehicular traffic along the road (approximate average spacing of 120-300m).This will be supported with alternating the postion of street parking from one side of the road to the other, a space that should be maximized by making residential dwelling types minimize the number of driveways and curb cuts. Street parking shall be "book-ended" by curb extensions that leave pinch points that are 7.0m wide (see City of Ottawa Calming Design Guidelines for further information).
2. Trees could potentially be planted if they meet the City of Ottawa "Trees in Sensitive Marine Clay Soils Guideline provisions and " Trees in proximity to Hydro Ottawa undeground structures" standard [GCS0038].
3. Include tactile surface between cycle tracks and sidewalks. See guidance in Ottawa Cycling Plan, Ontario Traffic Manuals and Accessibility Design Standards.
4. See guidance in Ontario Traffic Manuals and Accessibility Design Standards.
5. See "Transformers clearances residential underground offset Utility Trench Location 3 & 4 Party" standard [UTS0013]. Also, grounding grid (not shown) requiree 3.3m x 3.3m sub-surface area centred from the centre of the transformer.
6. Water service posts are flush-mounted at the ground. Water service pipes are 2.4m deep and have a 2.0m lateral clearance.
7. See "Joint Utility Trench 3 Party Main Residential Guidelines" [USD0002], "4 Party Main Residential Guidelines" [UDS0037] and the Joint Utility Trench (JUT) Guidelines.
8. Enbridge gas needs 0.6m clearance from hydrants, lights and root barriers. A 1.2m clearance is required from root balls.
9. Fire hydrants to be located 2.0m minimum distance from transformers and 0.6m minimum from cycle tracks (See W18 Standard and F-4414).
10. Catch basin type will suit curb design. See "Sewer Design Guidelines for Catch basin" preference.
11. Storm sewer and sanitary sewer diameter selection based on Ottawa Sewer Design Guidelines.
12. Where dedicated utility ducts are required (typically required on one side of ROW only) they are to be encased. Provide 1.0m (minimum) cover on all concrete encased ducts. Where gas crosses Hydro concrete duct, 0.3m clearance above the duct is required, with 0.6m depth of cover above gas services and 0.9m depth of cover above gas mains.
13. All pedestals to be installed in line with hydro transformers or on side of trench away from road.

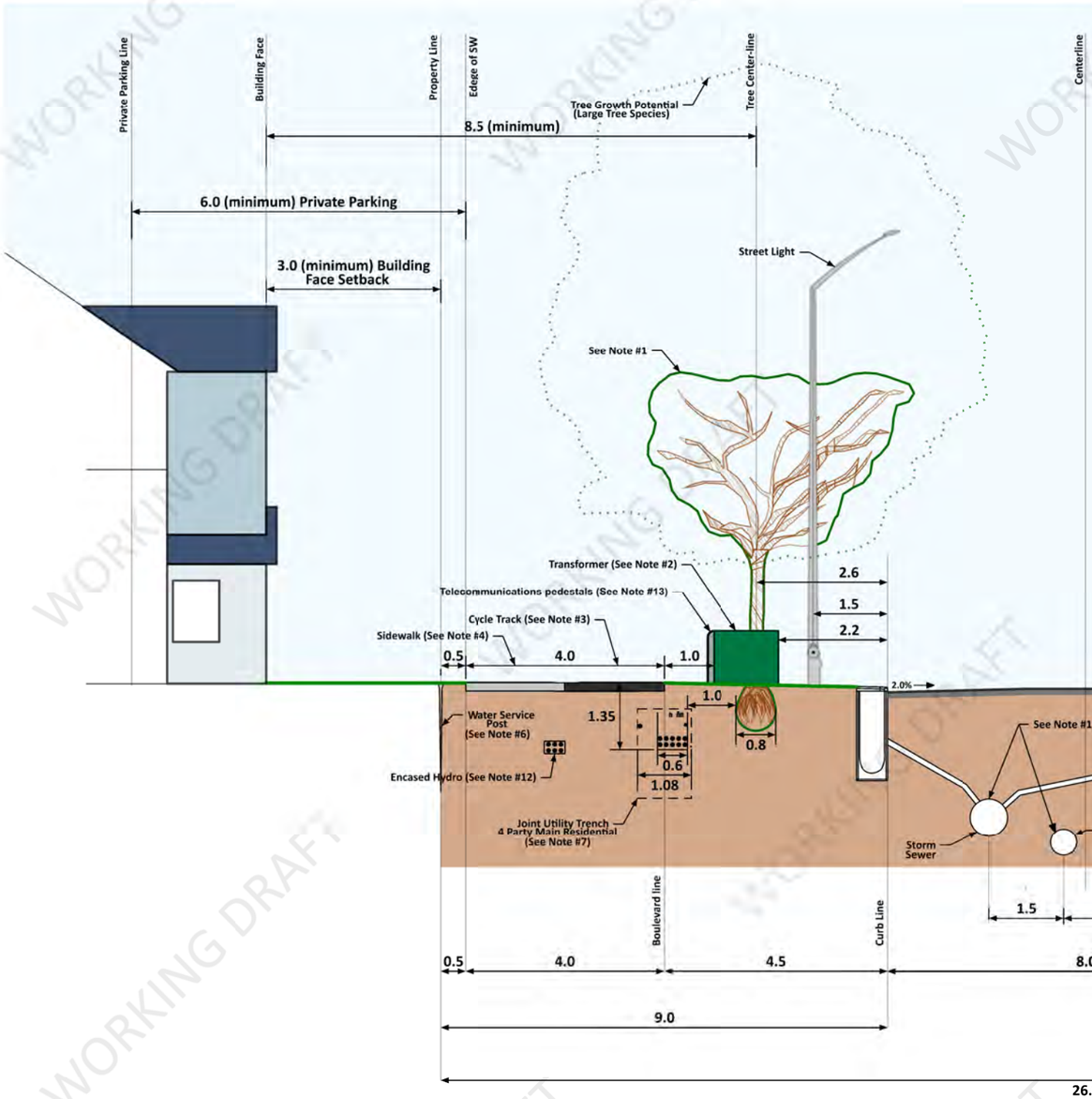
DEMONSTRATION SECTION ONLY

COLLECTOR ''26B'' (Transfromer)
26.0m ROAD ALLOWANCE at transformer
*****WORKING DRAFT*****

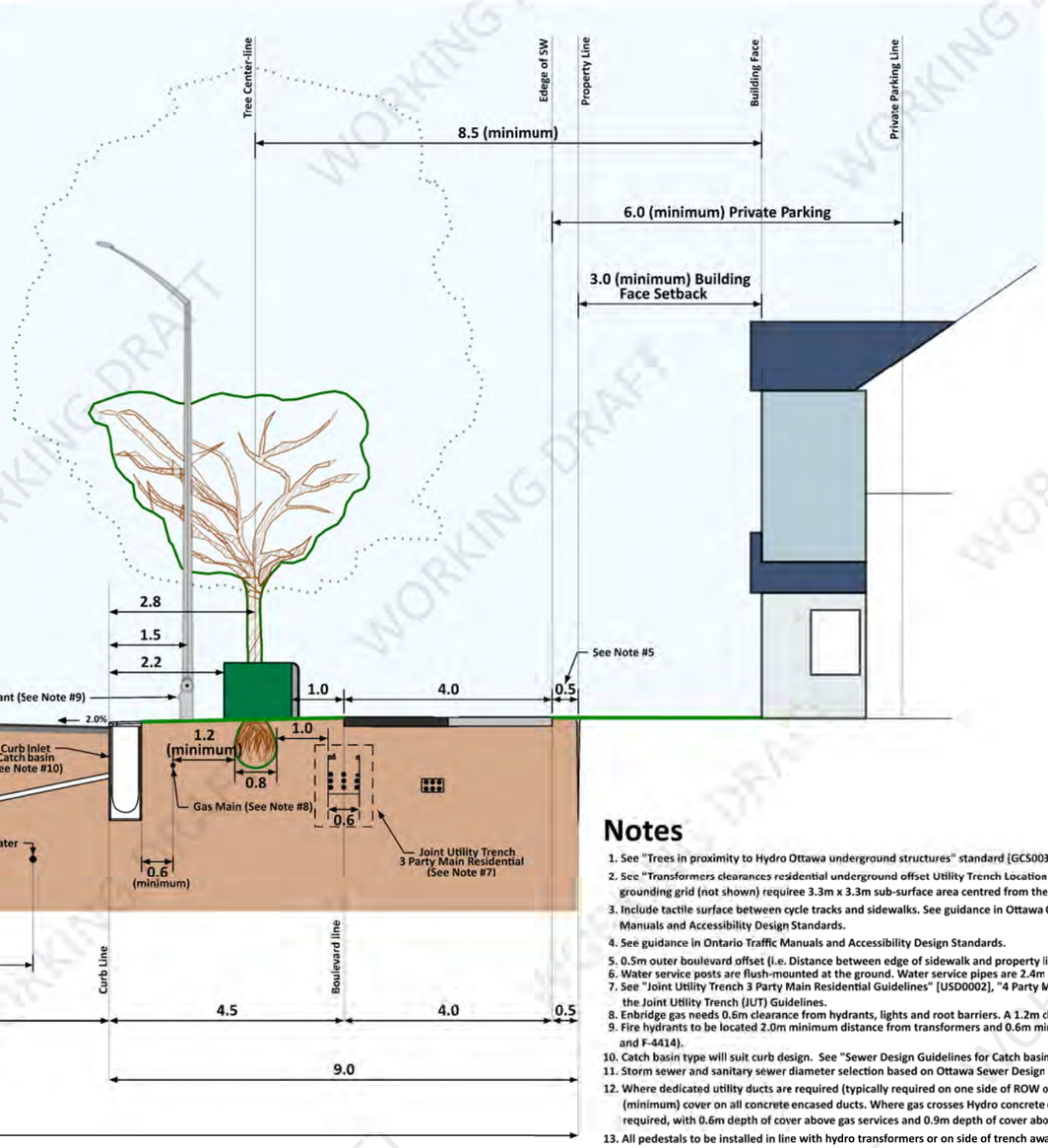
Option A - 4 Party Joint Utility Trench
Option B - 3 Party Joint Utility Trench

August 21, 2019

Option A



Option B



Notes

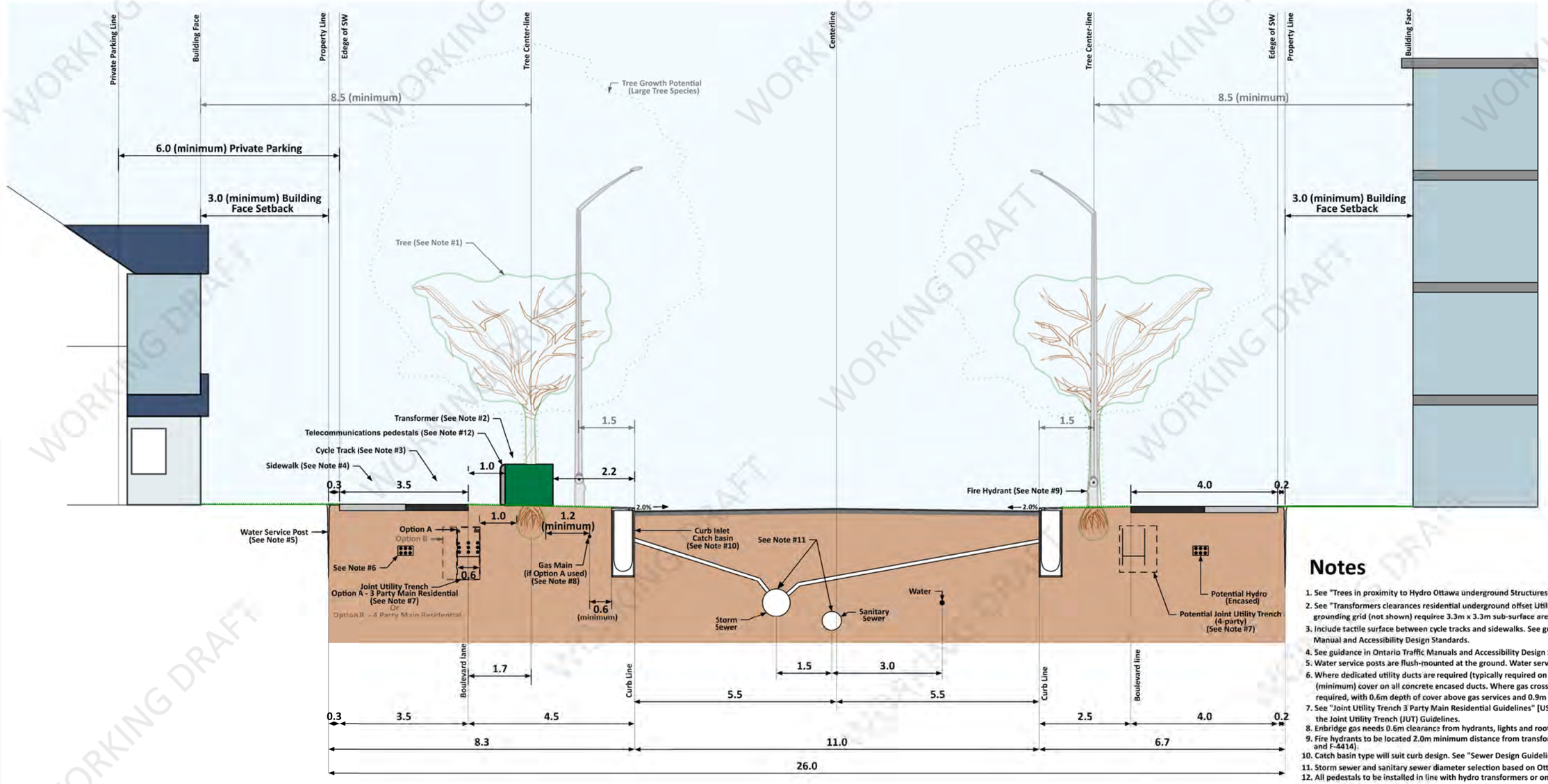
1. See "Trees in proximity to Hydro Ottawa underground structures" standard [GCS0038].
2. See "Transformers clearances residential underground offset Utility Trench Location 3 & 4 Party" standard [UTS0013]. Also, grounding grid (not shown) requiree 3.3m x 3.3m sub-surface area centred from the centre of the transformer.
3. Include tactile surface between cycle tracks and sidewalks. See guidance in Ottawa Cycling Plan, Ontario Traffic Manuals and Accessibility Design Standards.
4. See guidance in Ontario Traffic Manuals and Accessibility Design Standards.
5. 0.5m outer boulevard offset (i.e. Distance between edge of sidewalk and property line).
6. Water service posts are flush-mounted at the ground. Water service pipes are 2.4m deep and have a 2.0m lateral clearance.
7. See "Joint Utility Trench 3 Party Main Residential Guidelines" [USD0002], "4 Party Main Residential Guidelines" [UDS0037] and the Joint Utility Trench (JUT) Guidelines.
8. Enbridge gas needs 0.6m clearance from hydrants, lights and root barriers. A 1.2m clearance is required from root balls.
9. Fire hydrants to be located 2.0m minimum distance from transformers and 0.6m minimum from cycle tracks (See W18 Standard and F-4414).
10. Catch basin type will suit curb design. See "Sewer Design Guidelines for Catch basin" preference.
11. Storm sewer and sanitary sewer diameter selection based on Ottawa Sewer Design Guidelines.
12. Where dedicated utility ducts are required (typically required on one side of ROW only) they are to be encased. Provide 1.0m (minimum) cover on all concrete encased ducts. Where gas crosses Hydro concrete duct, 0.3m clearance above the duct is required, with 0.6m depth of cover above gas services and 0.9m depth of cover above gas mains.
13. All pedestals to be installed in line with hydro transformers or on side of trench away from road.

DEMONSTRATION SECTION ONLY

COLLECTOR ''26C''
26.0m ROAD ALLOWANCE
*****WORKING DRAFT*****

Option A - 4 Party Joint Utility Trench
Option B - 3 Party Joint Utility Trench

August 21, 2019



Notes

1. See "Trees in proximity to Hydro Ottawa underground Structures" standard [GCS0038].
2. See "Transformers clearances residential underground offset Utility Trench Location 3 & 4 Party" standard [UTS0013]. Also, grounding grid (not shown) requires 3.3m x 3.3m sub-surface area centered from the center of the transformers.
3. Include tactile surface between cycle tracks and sidewalks. See guidance in Ottawa Cycling Plan, Ontario Traffic Manual and Accessibility Design Standards.
4. See guidance in Ontario Traffic Manuals and Accessibility Design Standards.
5. Water service posts are flush-mounted at the ground. Water service pipes are 2.4m deep and have a 2.0m lateral clearance.
6. Where dedicated utility ducts are required (typically required on one side of ROW only) they are to be encased. Provide 1.0m (minimum) cover on all concrete encased ducts. Where gas crosses Hydro concrete duct, 0.3m clearance above the duct is required, with 0.6m depth of cover above gas services and 0.9m depth of cover above gas mains.
7. See "Joint Utility Trench 3 Party Main Residential Guidelines" [USD0002], "4 Party Main Residential Guidelines" [UDS0037] and the Joint Utility Trench (JUT) Guidelines.
8. Enbridge gas needs 0.6m clearance from hydrants, lights and root barriers. A 1.2m clearance is required from root balls.
9. Fire hydrants to be located 2.0m minimum distance from transformers and 0.6m minimum from cycle tracks (See W18 Standard and F-4414).
10. Catch basin type will suit curb design. See "Sewer Design Guidelines for Catch basin" preference.
11. Storm sewer and sanitary sewer diameter selection based on Ottawa Sewer Design Guidelines.
12. All pedestals to be installed in line with hydro transformers or on side of trench away from road.

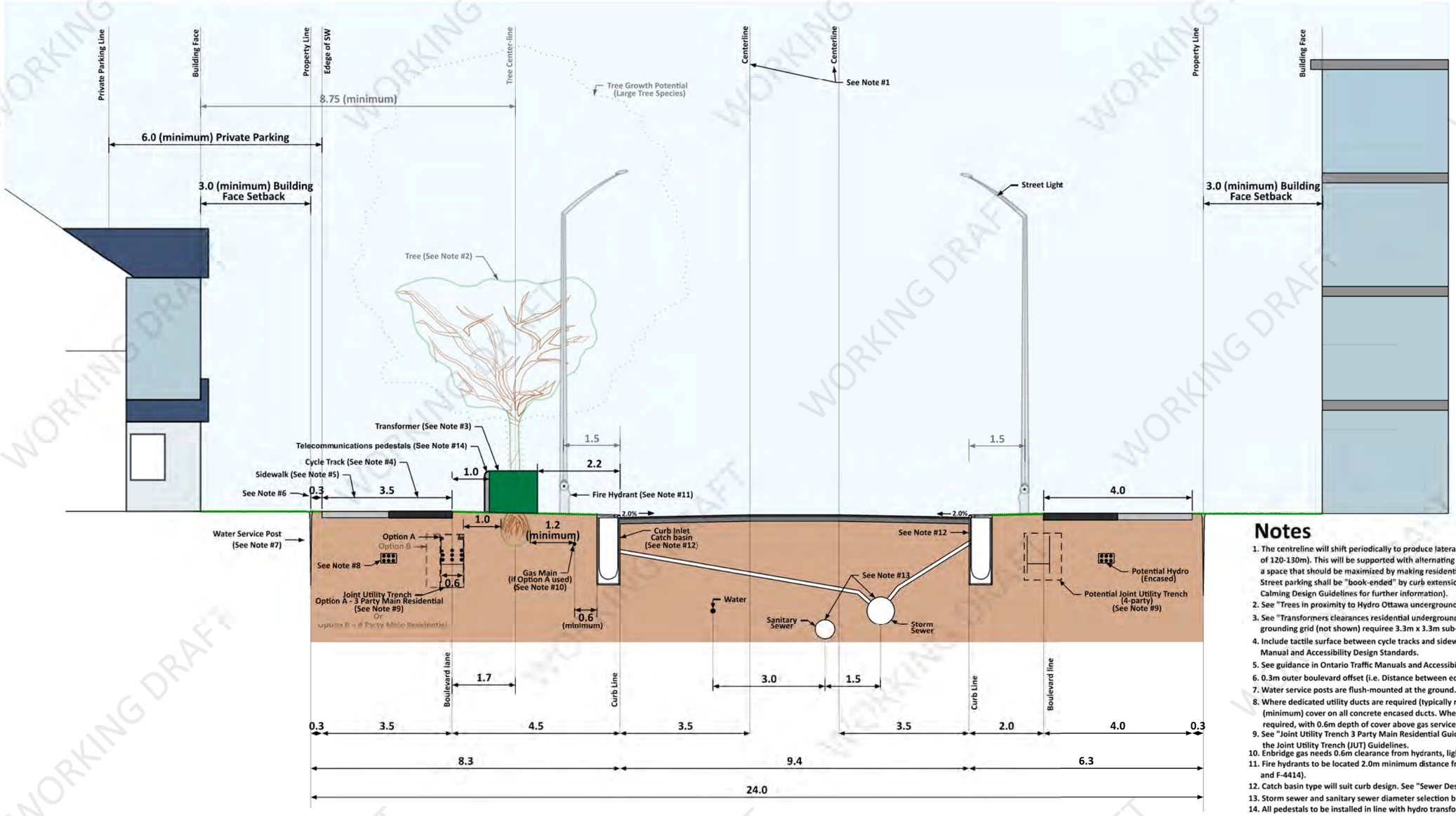
DEMONSTRATION SECTION ONLY

COLLECTOR '' 26D '' (Transformer)

24.0m ROAD ALLOWANCE at transformer

*****WORKING DRAFT*****

August 21, 2019



Notes

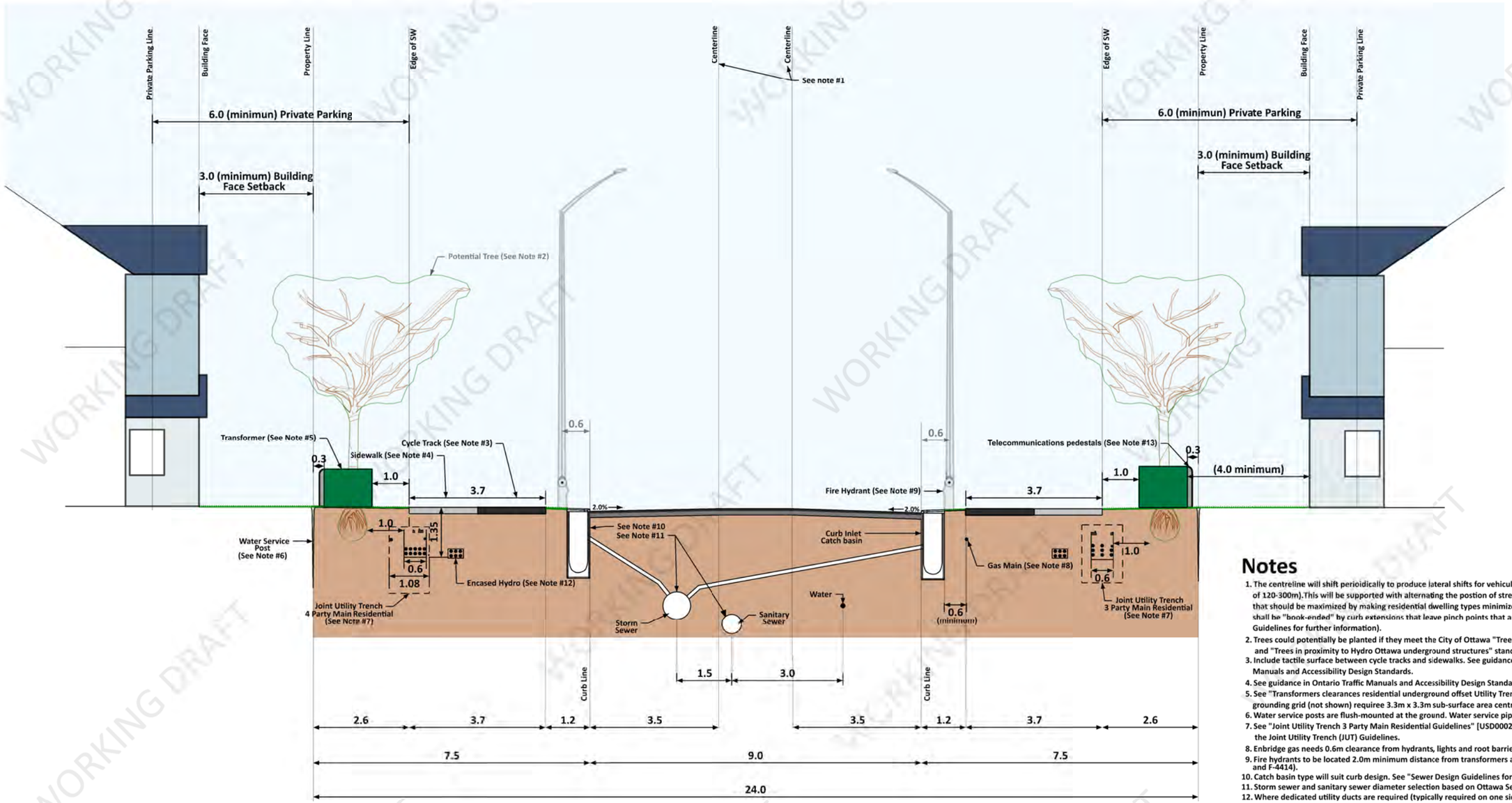
1. The centreline will shift periodically to produce lateral shifts for vehicular traffic along the road (approximate average spacing of 120-130m). This will be supported with alternating the position of street parking from one side of the road to the other, a space that should be maximized by making residential dwelling types minimize the number of driveways and curb cuts. Street parking shall be "book-ended" by curb extensions that leave pinch points that are 7.0m wide (see City of Ottawa Calming Design Guidelines for further information).
2. See "Trees in proximity to Hydro Ottawa underground Structures" standard [GCS0038].
3. See "Transformers clearances residential underground offset Utility Trench Location 3 & 4 Party" standard [UTS0013]. Also, grounding grid (not shown) requiree 3.3m x 3.3m sub-surface area centered from the center of the transformers.
4. Include tactile surface between cycle tracks and sidewalks. See guidance in Ottawa Cycling Plan, Ontario Traffic Manual and Accessibility Design Standards.
5. See guidance in Ontario Traffic Manuals and Accessibility Design Standards.
6. 0.3m outer boulevard offset (i.e. Distance between edge of sidewalk and property line).
7. Water service posts are flush-mounted at the ground. Water service pipes are 2.4m deep and have a 2.0m lateral clearance.
8. Where dedicated utility ducts are required (typically required on one side of ROW only) they are to be encased. Provide 1.0m (minimum) cover on all concrete encased ducts. Where gas crosses Hydro concrete duct, 0.3m clearance above the duct is required, with 0.6m depth of cover above gas services and 0.9m depth of cover above gas mains.
9. See "Joint Utility Trench 3 Party Main Residential Guidelines" [USD0002], "4 Party Main Residential Guidelines" [UDS0037] and the Joint Utility Trench (JUT) Guidelines.
10. Enbridge gas needs 0.6m clearance from hydrants, lights and root barriers. A 1.2m clearance is required from root balls.
11. Fire hydrants to be located 2.0m minimum distance from transformers and 0.6m minimum from cycle tracks (See W18 Standard and F-4414).
12. Catch basin type will suit curb design. See "Sewer Design Guidelines for Catch basin" preference.
13. Storm sewer and sanitary sewer diameter selection based on Ottawa Sewer Design Guidelines.
14. All pedestals to be installed in line with hydro transformers or on side of trench away from road.

DEMONSTRATION SECTION ONLY

COLLECTOR '' 24A '' (Transformer)
24.0m ROAD ALLOWANCE at transformer
*****WORKING DRAFT*****

August 21, 2019

Option A



Option B

Notes

1. The centreline will shift periodically to produce lateral shifts for vehicular traffic along the road (approximate average spacing of 120-300m).This will be supported with alternating the postion of street parking from one side of the road to the other, a space that should be maximized by making residential dwelling types minimize the number of driveways and curb cuts. Street parking shall be "hook-ended" by curb extensions that leave pinch points that are 7.0m wide (see City of Ottawa Calming Design Guidelines for further information).
2. Trees could potentially be planted if they meet the City of Ottawa "Trees in Sensitive Marine Clay Soils Guidelines" provisions and "Trees in proximity to Hydro Ottawa underground structures" standard [GCS0038].
3. Include tactile surface between cycle tracks and sidewalks. See guidance in Ottawa Cycling Plan, Ontario Traffic Manuals and Accessibility Design Standards.
4. See guidance in Ontario Traffic Manuals and Accessibility Design Standards.
5. See "Transformers clearances residential underground offset Utility Trench Location 3 & 4 Party" standard [UTS0013]. Also, grounding grid (not shown) requiree 3.3m x 3.3m sub-surface area centred from the centre of the transformers.
6. Water service posts are flush-mounted at the ground. Water service pipes are 2.4m deep and have a 2.0m lateral clearance.
7. See "Joint Utility Trench 3 Party Main Residential Guidelines" [USD0002], "4 Party Main Residential Guidelines" [UDS0037] and the Joint Utility Trench (JUT) Guidelines.
8. Enbridge gas needs 0.6m clearance from hydrants, lights and root barriers. A 1.2m clearance is required from root balls.
9. Fire hydrants to be located 2.0m minimum distance from transformers and 0.6m minimum from cycle tracks (See W18 Standard and F-4414).
10. Catch basin type will suit curb design. See "Sewer Design Guidelines for Catch basin" preference.
11. Storm sewer and sanitary sewer diameter selection based on Ottawa Sewer Design Guidelines.
12. Where dedicated utility ducts are required (typically required on one side of ROW only) they are to be encased. Provide 1.0m (minimum) cover on all concrete encased ducts. Where gas crosses Hydro concrete duct, 0.3m clearance above the duct is required, with 0.6m depth of cover above gas services and 0.9m depth of cover above gas mains.
13. All pedestals to be installed in line with hydro transformers or on side of trench away from road.

DEMONSTRATION SECTION ONLY

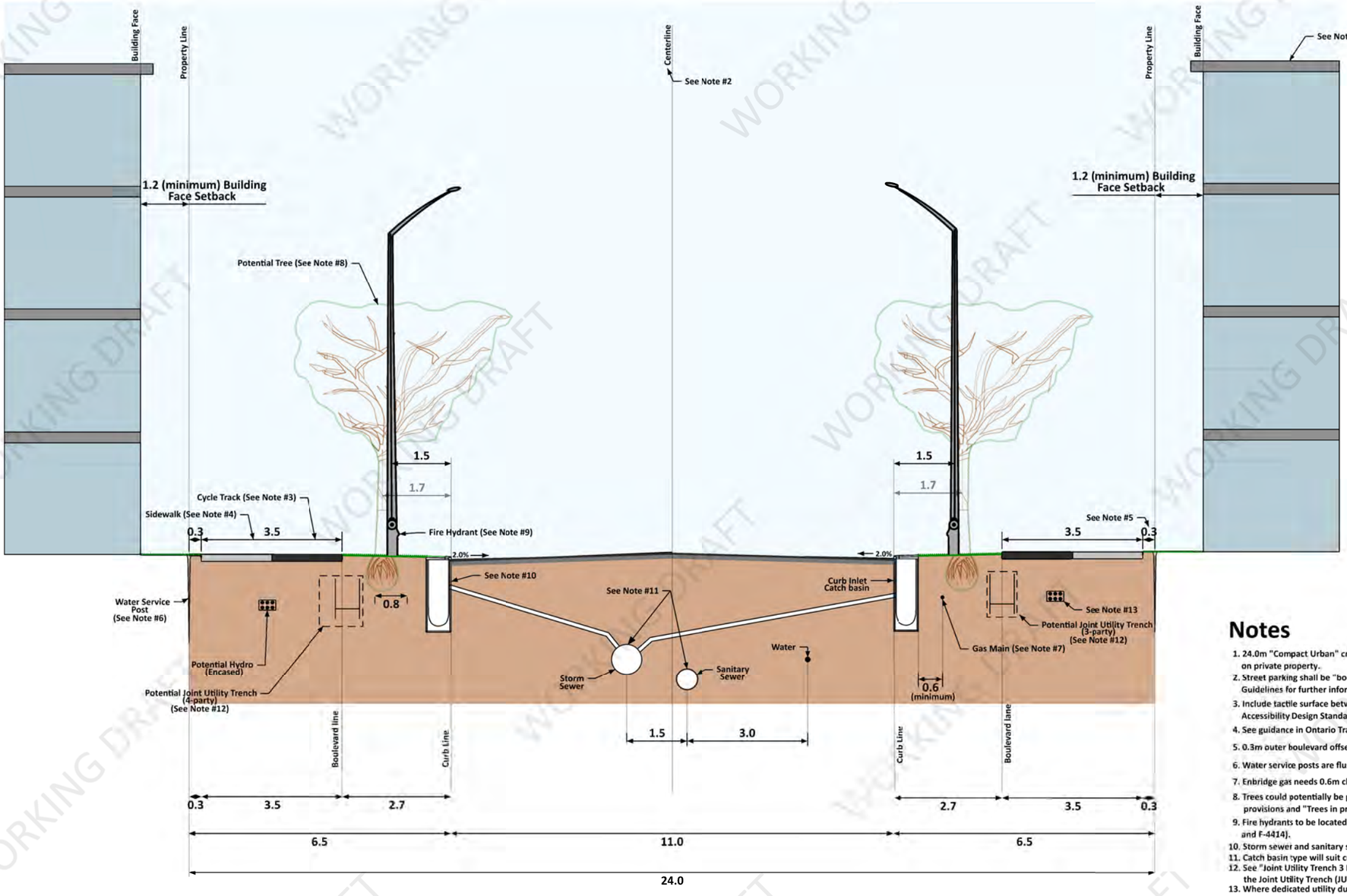
COLLECTOR '' 24B '' (Transformer)
24.0m ROAD ALLOWANCE at transformer
*****WORKING DRAFT*****

Option A - 4 Party Joint Utility Trench
Option B - 3 Party Joint Utility Trench

August 21, 2019

Option A

Option B



Notes

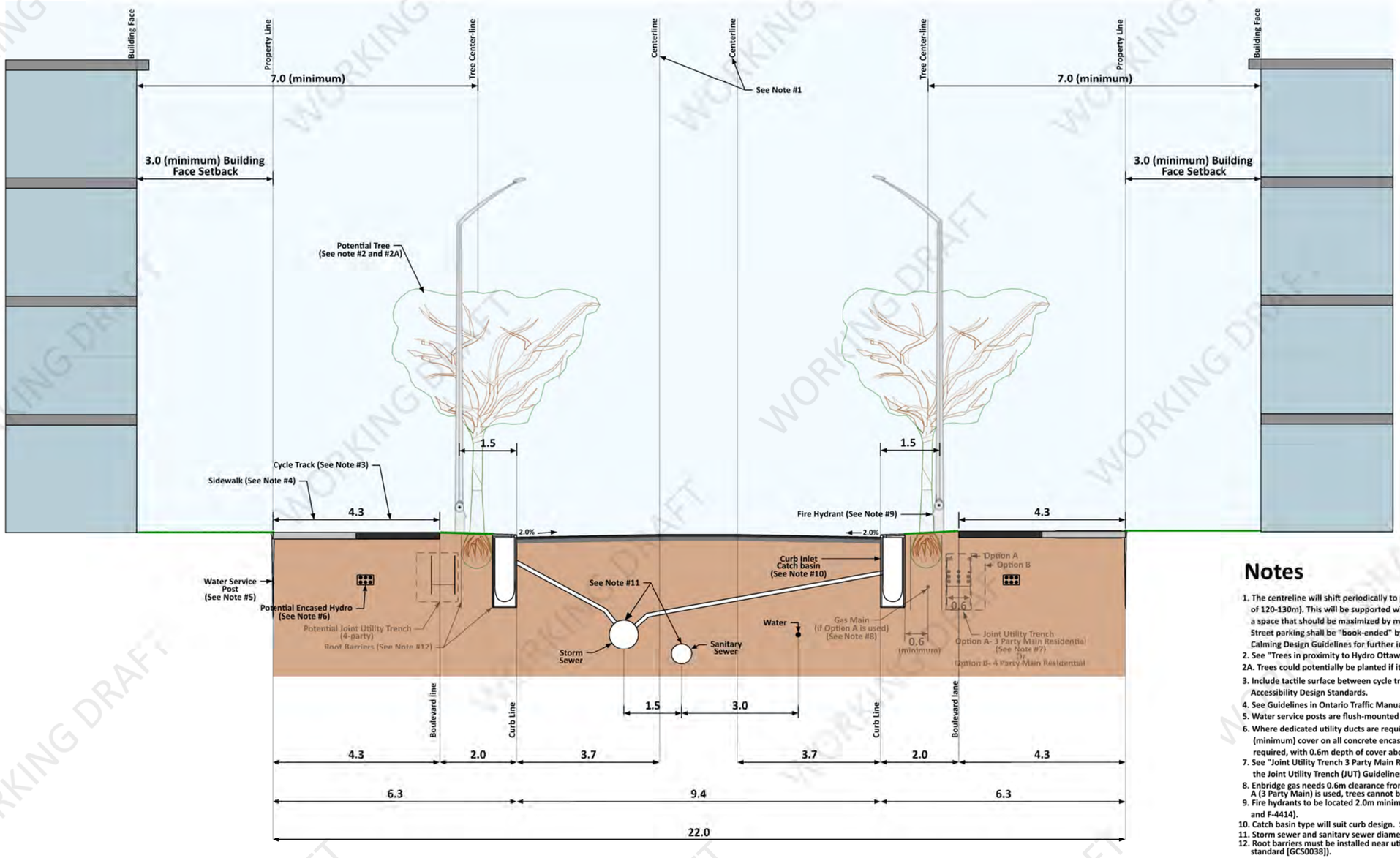
1. 24.0m "Compact Urban" cross-section only suitable with medium-to- high density development wher electrical transformers are located on private property.
2. Street parking shall be "book-ended" by curb extensions that leave pinch points that are 7.0m wide (see City of Ottawa Calming Design Guidelines for further information).
3. Include tactile surface between cycle tracks and sidewalks. See guidance in Ottawa Cycling Plan, Ontario Traffic Manuals and Accessibility Design Standards.
4. See guidance in Ontario Traffic Manuals and Accessibility Design Standards.
5. 0.3m outer boulevard offset (i.e. Distance between edge of sidewalk and property line).
6. Water service posts are flush-mounted at the ground. Water service pipes are 2.4m deep and have a 2.0m lateral clearance.
7. Enbridge gas needs 0.6m clearance from hydrants, lights and root barriers. A 1.2m clearance is required from root balls.
8. Trees could potentially be planted in the 2.7m boulevard if they meet the City of Ottawa "Trees in Sensitive Marine Clay Soils Guidelines" provisions and "Trees in proximity to Hydro Ottawa underground structures" standard [GCS0038].
9. Fire hydrants to be located 2.0m minimum distance from transformers and 0.6m minimum from cycle tracks (See W18 Standard and F-4414).
10. Storm sewer and sanitary sewer diameter selection based on Ottawa Sewer Design Guidelines.
11. Catch basin type will suit curb design. See "Sewer Design Guidelines for catch basin" preference.
12. See "Joint Utility Trench 3 Party Main Residential Guidelines" [USD0002], "4 Party Main Residential Guidelines" [UDS0037] and the Joint Utility Trench (JUT) Guidelines.
13. Where dedicated utility ducts are required (typically required on one side of ROW only) they are to be encased. Provide 1.0m (minimum) cover on all concrete encased ducts. Where gas crosses Hydro concrete duct, 0.3m clearance above the duct is required, with 0.6m depth of cover above gas services and 0.9m depth of cover above gas mains.

DEMONSTRATION SECTION ONLY

COLLECTOR '' 24C ''
24.0m ROAD ALLOWANCE
*****WORKING DRAFT*****

Option A - 4 Party Joint Utility Trench
Option B - 3 Party Joint Utility Trench

August 21, 2019



DEMONSTRATION SECTION ONLY

COLLECTOR '' 22A''

22.0m ROAD ALLOWANCE

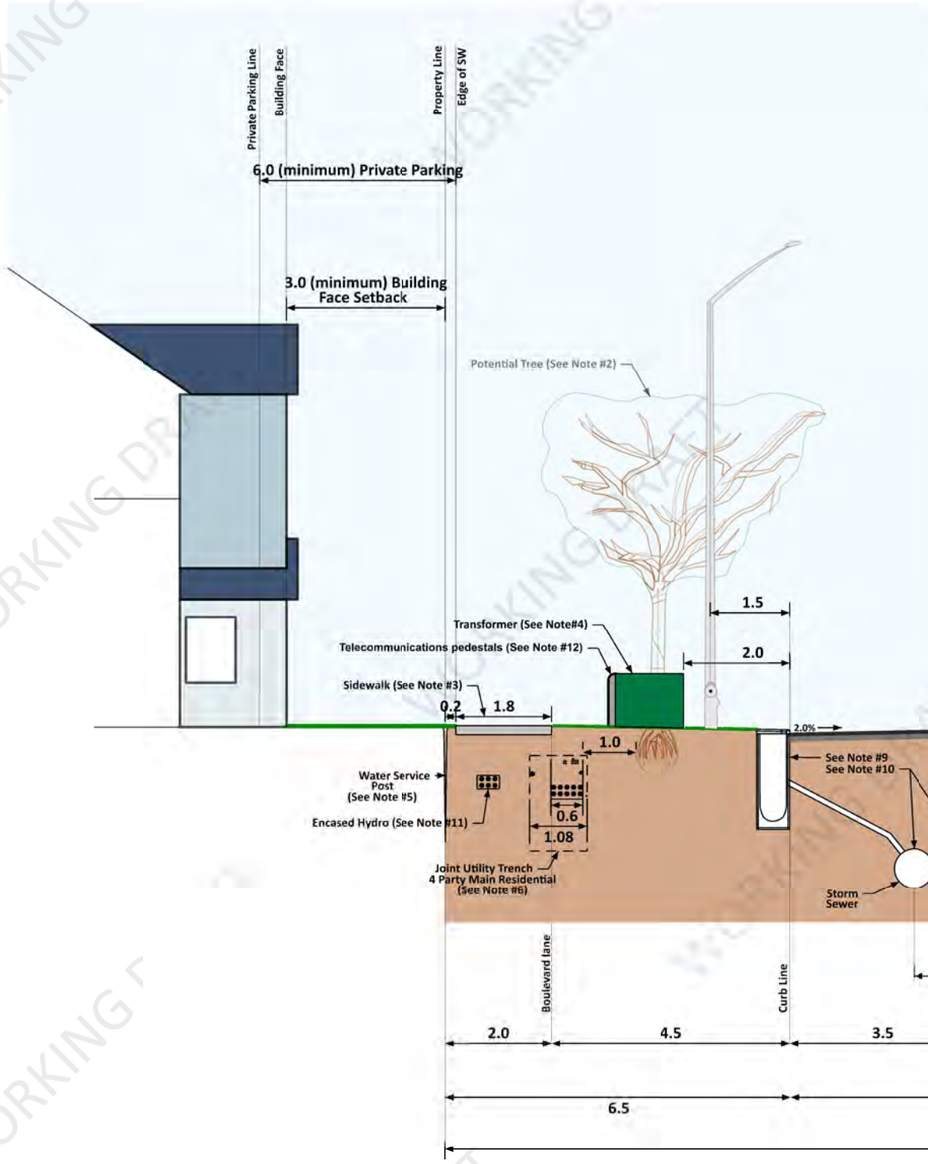
*****WORKING DRAFT*****

Notes

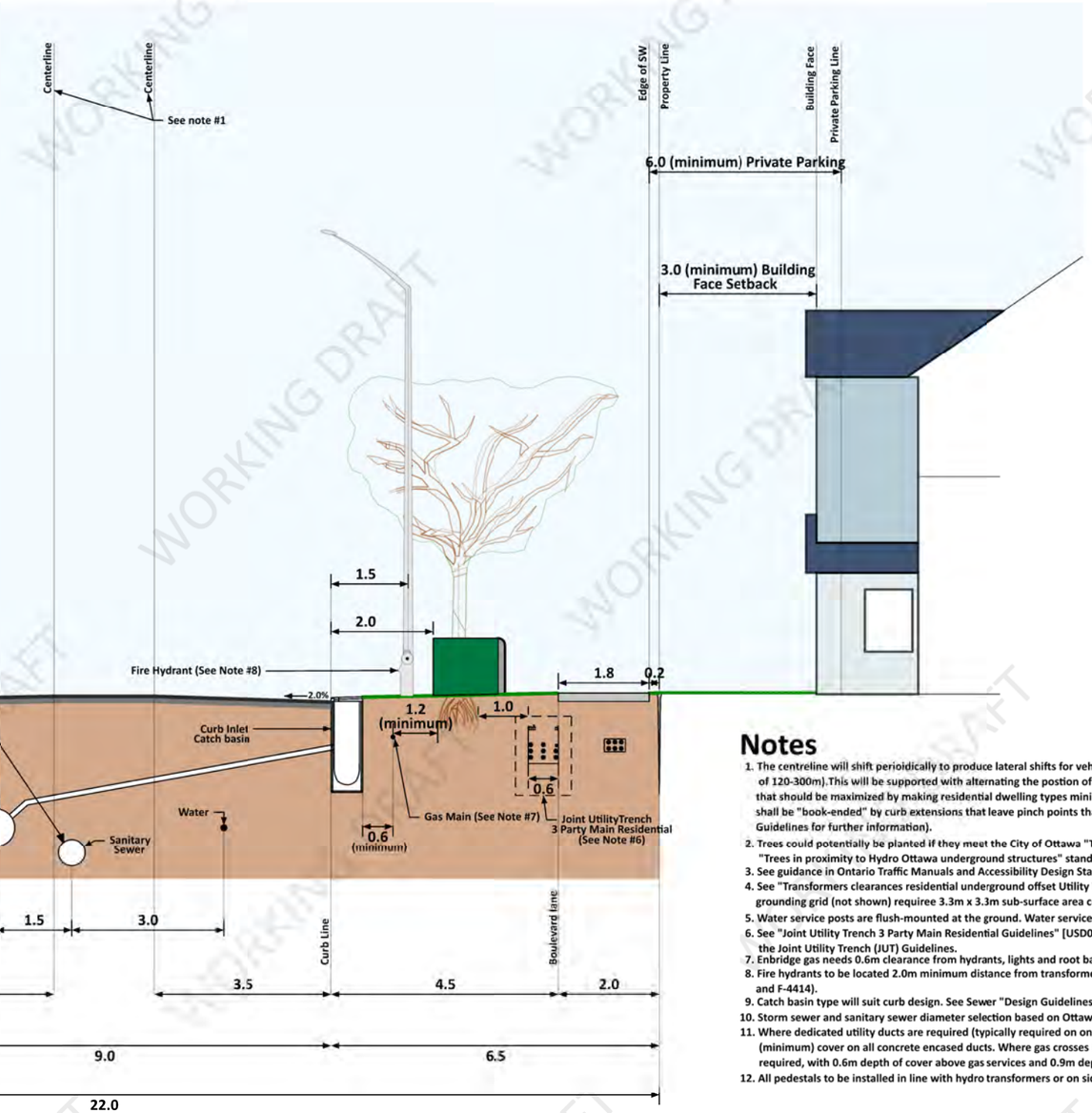
1. The centreline will shift periodically to produce lateral shifts for vehicular traffic along the road (approximate average spacing of 120-130m). This will be supported with alternating the position of street parking from one side of the road to the other, a space that should be maximized by making residential dwelling types minimize the number of driveways and curb cuts. Street parking shall be "book-ended" by curb extensions that leave pinch points that are 7.0m wide (see City of Ottawa Calming Design Guidelines for further information).
2. See "Trees in proximity to Hydro Ottawa underground structures" standard [GCS0038].
2A. Trees could potentially be planted if it meets the City of Ottawa "Trees in Sensitive Marine Clay Soils Guideline" provisions.
3. Include tactile surface between cycle tracks and sidewalks. See guidance in Ottawa Cycling Plan, Ontario Traffic Manuals and Accessibility Design Standards.
4. See Guidelines in Ontario Traffic Manuals and Accessibility Design Standards.
5. Water service posts are flush-mounted at the ground. Water service pipes are 2.4m deep and have a 2.0m lateral clearance.
6. Where dedicated utility ducts are required (typically required on one side of ROW only) they are to be encased. Provide 1.0m (minimum) cover on all concrete encased ducts. Where gas crosses Hydro concrete duct, 0.3m clearance above the duct is required, with 0.6m depth of cover above gas services and 0.9m depth of cover above gas mains.
7. See "Joint Utility Trench 3 Party Main Residential Guidelines" [USD0002], "4 Party Main Residential Guidelines" [UDS0037] and the Joint Utility Trench (JUT) Guidelines.
8. Enbridge gas needs 0.6m clearance from hydrants, lights and root barriers. A 1.2m clearance is required from root balls. If option A (3 Party Main) is used, trees cannot be planted in the boulevard above the gas main.
9. Fire hydrants to be located 2.0m minimum distance from transformers and 0.6m minimum from cycle tracks (See W18 Standard and F-4414).
10. Catch basin type will suit curb design. See "Sewer Design Guidelines for Catch basin" preference.
11. Storm sewer and sanitary sewer diameter selection based on Ottawa Sewer Design Guidelines.
12. Root barriers must be installed near utilite trenches (See "Trees in proximity to Hydro Ottawa underground structures" standard [GCS0038]).

August 21, 2019

Option A



Option B



Notes

1. The centreline will shift perioidically to produce lateral shifts for vehicular traffic along the road (approximate average spacing of 120-300m).This will be supported with alternating the postion of street parking from one side of the road to the other, a space that should be maximized by making residential dwelling types minimize the number of driveways and curb cuts. Street parking shall be "book-ended" by curb extensions that leave pinch points that are 7.0m wide (see City of Ottawa Calming Design Guidelines for further information).
2. Trees could potentially be planted if they meet the City of Ottawa "Trees in Sensitive Marine Clay Soils Guideline provisions and "Trees in proximity to Hydro Ottawa underground structures" standard [GCS0038].
3. See guidance in Ontario Traffic Manuals and Accessibility Design Standards.
4. See "Transformers clearances residential underground offset Utility Trench Location 3 & 4 Party" standard [UTS0013]. Also, grounding grid (not shown) requiree 3.3m x 3.3m sub-surface area centred to centre of the transformer.
5. Water service posts are flush-mounted at the ground. Water service pipes are 2.4m deep and have a 2.0m lateral clearance.
6. See "Joint Utility Trench 3 Party Main Residential Guidelines" [USD0002], "4 Party Main Residential Guidelines" [UDS0037] and the Joint Utility Trench (JUT) Guidelines.
7. Enbridge gas needs 0.6m clearance from hydrants, lights and root barriers. A 1.2m clearance is required from root balls.
8. Fire hydrants to be located 2.0m minimum distance from transformers and 0.6m minimum from cycle tracks (See W18 Standard and F-4414).
9. Catch basin type will suit curb design. See Sewer "Design Guidelines for Catch basin" preference.
10. Storm sewer and sanitary sewer diameter selection based on Ottawa Sewer Design Guidelines.
11. Where dedicated utility ducts are required (typically required on one side of ROW only) they are to be encased. Provide 1.0m (minimum) cover on all concrete encased ducts. Where gas crosses Hydro concrete duct, 0.3m clearance above the duct is required, with 0.6m depth of cover above gas services and 0.9m depth of cover above gas mains.
12. All pedestals to be installed in line with hydro transformers or on side of trench away from road.

DEMONSTRATION SECTION ONLY

COLLECTOR '' 22B ''

22.0m ROAD ALLOWANCE

*****WORKING DRAFT*****

Option A - 4 Party Joint Utility Trench

Option B - 3 Party Joint Utility Trench

August 21, 2019