TAC Environmental Achievement Award

DESIGNING NEIGHBOURHOOD COLLECTOR STREETS

2019

Submission by:

Justin Swan, P.Eng., M.Sc.
Senior Project Engineer
Transportation Planning
City of Ottawa

CONTENT

BACKGROUND

Ottawa's residents are increasingly demanding streets with healthy tree canopies that are comfortable for walking, cycling, and taking public transit no matter what their age or level of ability. With over 6,000 km of existing streets, the traditional approach to transform them through retrofit projects takes significant time, cost and inconvenience compared to getting the design right at the outset. Meanwhile, the Ottawa continues to grow at a rate of approximately 15,000 people annually[1], adding thousands of new trips to the transportation network and placing additional pressure on the existing system.

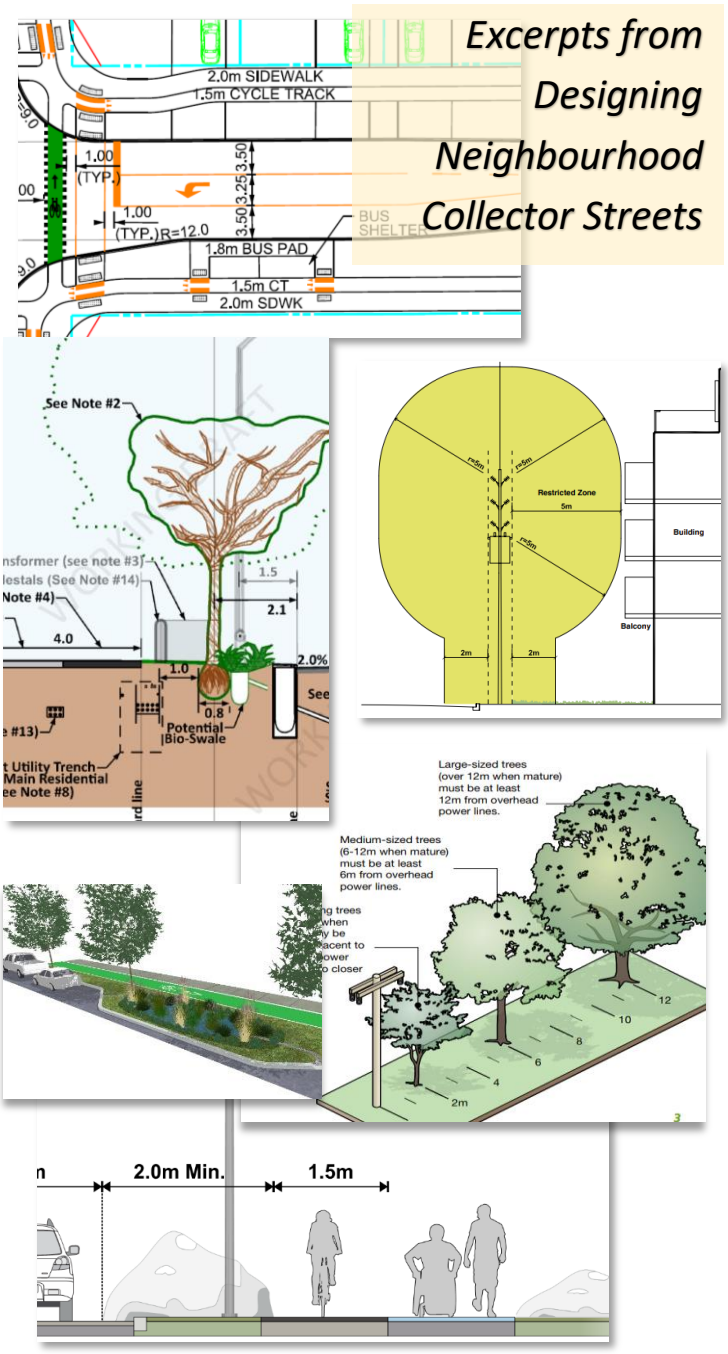
This "green" street vision is reflected in the City of Ottawa's higher-level policy documents such as the Official Plan and Transportation Master Plan. Greening city streets has a significant impact on the quality of life for citizens, impacting the health and safety or our population, the ability to provide equitable access to education, employment, recreation and community, and the quality of the natural environment. Many streets do not support this green vision in their current form. Furthermore, there are a significant number of new streets being planned through development of new neighourhoods. The majority of these streets built in new areas have typically been constructed without integrated speed management design, safe cycling facilities, consistent space for large tree species, and don't meet operational requirements for transit, emergency response, winter maintenance, or utility servicing. However, guidance on how to resolve these challenges and materialize solutions into reality has been limited, often resulting in reversions to 'watered down' or more traditional street designs before reaching implementation.

Until now, build-out of progressive street designs have been limited to occasional achievements on isolated streets where resources, technical perspectives and political support have aligned. To address this, and help achieve broader scaling, the City's Transportation Planning group developed two street design guidance documents in partnership with key stakeholders to ensure the implementation of progressive street designs are part of the basic design framework on any project, by any proponent.

This paper discusses the second of these two foundational sets of guidelines approved in 2019 which summarizes a significant update to urban road design in the Designing Neighbourhood Collector Streets document.

[1] Growth Projections for the New Official Plan: Methods and Assumptions for Population, Housing and Employment 2018 to 2046. Appendix 1 – Population Projection Scenario Summaries. Medium Scenario Population Projection.

PROJECT INTRODUCTION



Up to and following the second World War, cities continued to grapple with significant public health issues exacerbated by poor air quality and sanitation. Before the war, given local transportation options were limited to primarily streetcars, foot, and bicycle, new residential communities were compactly built near city cores along streetcar lines – not completely insulated from these public health issues. With the emergence of affordable private car ownership and high levels of post-war middle-class housing demand, new residential neighbourhoods moved to more car-centric layouts which allowed for larger lots in quiet, low-density enclaves further away from the core. High levels of resulting vehicular traffic and the desire to maintain quiet local streets away from major streets led to an emerging network hierarchy that would limit non-local traffic on local streets through an intermediary: "collector" streets.

Today, Ottawa's collector streets, like in many cities, form a substantial component of the city's overall transportation network. However, land use policies have reverted to emulate pre-war concepts of more compact neighbourhoods built around transit and this has evolved expectations of what collector streets should be. The Designing Neighbourhood Collector Streets document shows how practitioners how to meet these expectations. The document not only illustrates the concepts needed to meet our Complete Streets policies, but more importantly helps resolve many underlying engineering challenges that have stifled more rapid progress on in the recent past. This includes addressing accessibility, climate resiliency, compact right-of-way, utility arrangement, speed management, active transportation, winter maintenance, emergency response, transit provision, and tree canopying as part of new collector street designs. The document provides a set of pre-vetted street designs as well as considerations for customized designs which guide the layouts for new collector streets and those being re-built as part of renewal exercises.

ENVIRONMENTAL PROTECTION AND ENHANCEMENT

This project addressed key challenges that will result in the following benefits from an environmental protection and enhancement perspective:

Provision of tree lines of large tree species within the public Right-of-Way – The preferred collector street design, along with many of the nine pre-vetted designs approved through this project, allow for the inclusion of consistent lines of large tree species within the public right-of-way. This is a significant accomplishment. While Ottawa's newer suburban development has been in alignment with policies targeting more compact growth, it has resulted in a drop in available space for trees. Furthermore, competition for space within public street rights-of-way has left adding softer measures like street trees as an afterthought. The results have been that trees in many new communities are often small-to-medium sized ornamental trees planted in the occasional locations where space permits once roadway design, utility infrastructure, driveways, accessibility requirements and development setbacks have been established. Many have tried to address this by planting trees in street rights-of-way even when conditions were not ideal which has resulted in low survival rates (e.g. locations where sufficient soil volumes and buffering from winter maintenance operations are not possible).

The new preferred design, and many of the pre-vetted designs, prioritized trees by anchoring them as the first design feature, providing the necessary soil volumes and clearances, then designing the rest of the elements around them. Beyond the benefits, the significance is more pronounced when considering the many challenges that had to be addressed:

- ***Soil volumes*** – Large tree species are considered those which reach heights and diameters of 15m or more (approximately the height of a 4 to 5-storey building). To provide opportunities for large tree species to thrive, a minimum of 4m wide spaces of 6m in length and 1.5m depth (or greater) needed to be provided – a significant challenge when also attempting to meet the host of other demands discussed below.
- ***Compact development and sensitive marine clay soils*** – In areas with sensitive marine clay soils, trees planted close to buildings can, over time, reduce the structural integrity of the ground supporting the adjacent buildings and contribute to problematic differential settlement. To avoid this problem, trees need to be planted more than 7m away from building foundations in sensitive clay soil areas which represent a significant proportion of the new development lands in Ottawa.
- ***Operational cost control*** – To limit or eliminate potential operational cost increases for winter maintenance and forestry lifecycle activities, a few design provisions need to be addressed. For the occasional snow removal activities necessary in areas with heavy snow like Ottawa, at least 2m of clear adjacent space to the road surface and 1m of clear adjacent space from sidewalks, raised cycle tracks, or segregated cycling facilities were needed. Meeting these requirements reduces the need for using specialized equipment or additional resources. It also eliminates the need for using structural soil products and tree guards which both have on-going operational costs associated with them.
- ***Utility clearances and operations*** – The most ideal conditions for underground utility placements are in locations where they are covered with soft surface such as turf grass and within the public rights-of-way. Due to limited space, utility groups such as Hydro Ottawa have often needed to rely on easements to accommodate their operations which can be problematic.

This, along with other considerations, has resulted in some requirements being relaxed in the past (e.g. clearance requirements) which has resulted in problems like root encroachment into underground utility infrastructure. When planting trees, the most important consideration is to provide a minimum 1m horizontal clearance between the root ball edge and the edge of the joint utility trench and to do so in a way that doesn't push utility infrastructure into scenarios where they need easements on private property.

Designing Neighbourhood Collector Streets resolves challenges to find consistent space for large tree species

- ***Compact urban development, public right-of-way widths, and other demands*** – Dense land development is a policy pillar for creating environments economically feasible for high-frequency transit, make walking and cycling viable modes of transportation, and thus reduce dependence on private cars and limit the high costs of low-density land-use layouts. Currently, street rights-of-way occupy a considerable proportion of the total land area in cities and Ottawa is no exception. As such, it is imperative that street right-of-way widths are kept to a minimum to help achieve these goals. In fact, to ensure limited impacts to already approved sub-divisions, staff were directed to keep right-of-way widths at existing levels or reduce them further.

Not only were the above challenges met with the preferred design, but value was maximized by placing sidewalks and raised cycle tracks beside tree lines for shading, weather-screening, and using the trees as a vertical buffer from road traffic to create an environment where walking and cycling is an attractive prospect for people of all ages and abilities. This helps the city increase its sustainable transportation modes and reduce car dependence. There are other design features that help improve attractiveness of walking and cycling including 7m full crossing distances at intersections (10m where turn lanes are included), large 4m wide by 15m long transit stop pads for comfort and accessibility purposes, deliberate space for eco-friendly stormwater management features (i.e. engineered bioswales), and reduced heating requirements from tree shading in summer months.

INNOVATION

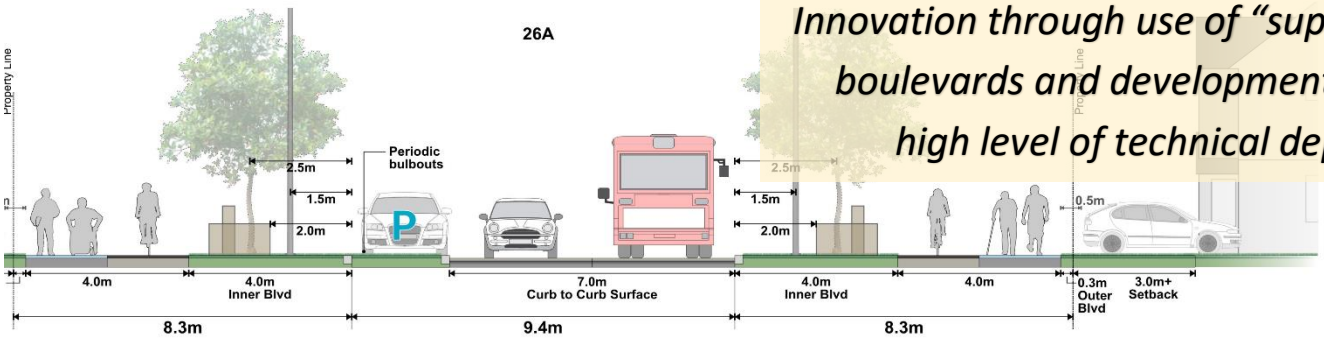
The primary innovation in the guidelines comes from the level of technical depth extracted from extensive stakeholder consultation. Typical street design guidelines establish the horizontal contexts of surficial element and the rationale behind them. For example, they establish the width of sidewalks, where they are placed in relation to other surficial elements and why. The Designing Neighbourhood Collector Streets document looks at the vertical and time context as well which is typically not considered until individual project detailed design exercises. So, continuing with the case of sidewalks, they are not only looked at in relation to their horizontal context, but from a vertical perspective (e.g. where do they fall in relation to utility trench depth) and from a time perspective (e.g. will their horizontal and vertical context be sufficient for routine winter maintenance and utility servicing activities).

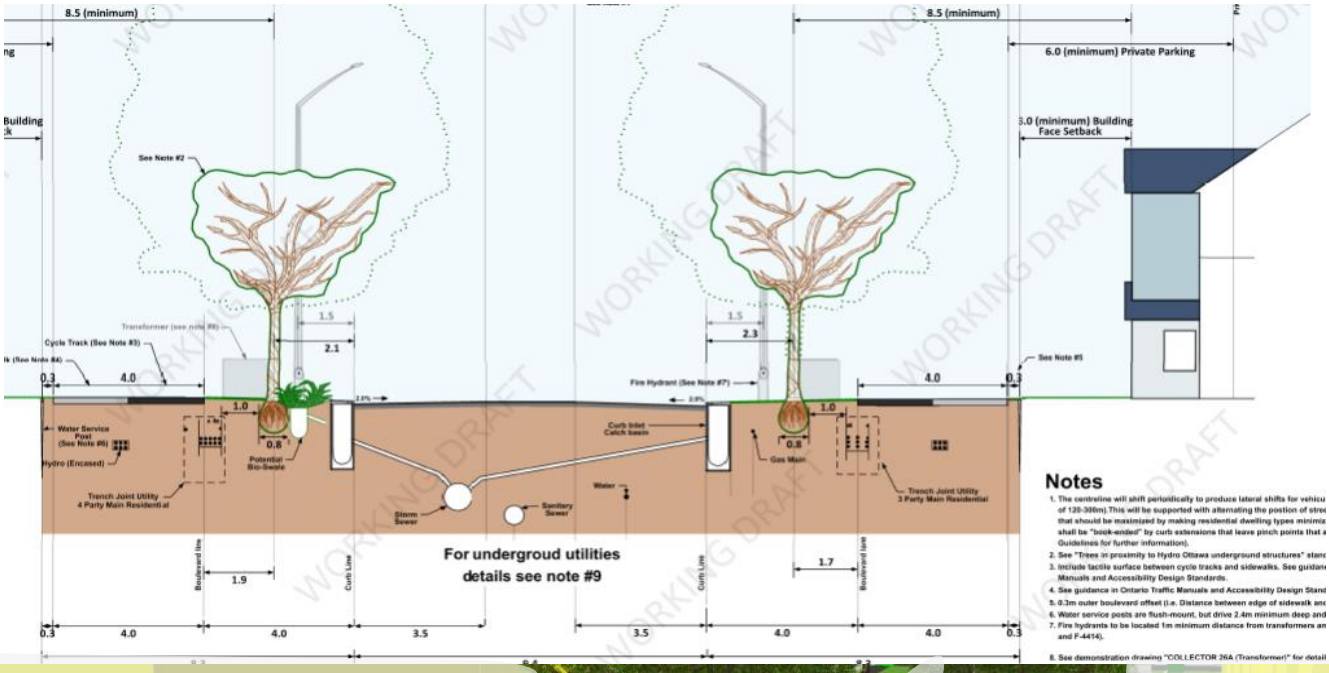
From a design perspective, the project team innovated through the creation of the "super" boulevard concept. Wider boulevard spaces were provided in many of the pre-vetted designs despite being constrained to existing right-of-way widths. This may seem counter-intuitive, but the benefit of widening the boulevard space allowed the project team to maximize its use to address a number of demands at the same time instead of requiring additional cross-section space for each individual demand. The wider boulevards provide for the following:

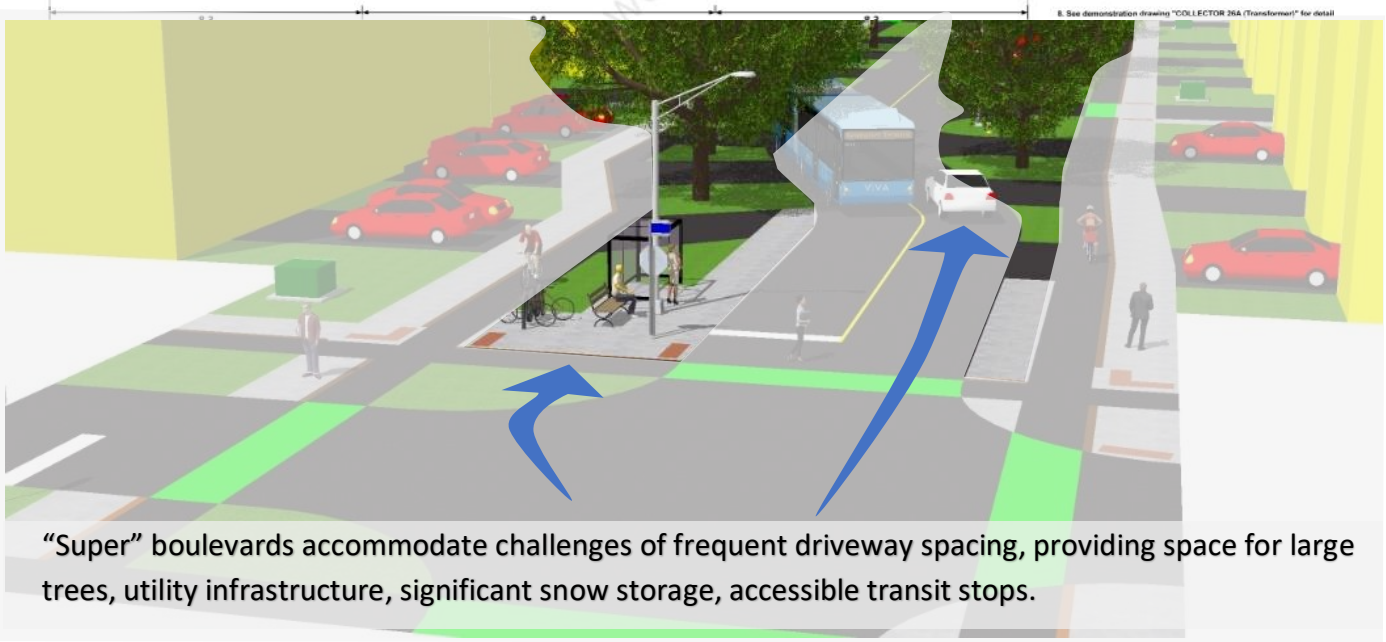
- ***Large tree species*** – The boulevard allows for sufficient soil volumes to be achieved even with a high density of adjacent private driveways.
- ***Standardized accessible bus stops*** – The boulevard allows for enough space to provide accessible bus stops within the boulevards without requiring movement of other elements in the street design.
- Integrated speed management - Placing large tree species in the boulevard as close to the roadway surface as possible is one element of the overall integrated speed management elements in the design.
- ***Long-term snow storage*** – The wide boulevards allow the city's winter maintenance planners more flexibility with removal activities given the significant additional storage from the previous narrower boulevards.
- ***Hydro-electric transformers*** – There is sufficient space within the boulevard to both allow for the placement of local distribution hydro-electric transformers, but also provide appropriate lateral clearance from road and sidewalk winter maintenance activities to meet safety requirements and finally to allow for ease of regular utility servicing tasks.
- ***Eco-friendly storm-water management*** – The boulevards provide enough space for the integration of bio-retention measures (e.g. bioswales) at the outset or in the future.
- ***Sidewalk and cycle track shading*** – The large trees within the boulevard will shade the immediately adjacent sidewalk and cycle tracks.

The use of the "super" boulevard concept allowed the project team to save significant space by packaging the many elements described above into them instead of finding their own exclusive space.

Innovation through use of "super" boulevards and development of high level of technical depth







"Super" boulevards accommodate challenges of frequent driveway spacing, providing space for large trees, utility infrastructure, significant snow storage, accessible transit stops.

FINANCIAL ASPECTS

This project will result in the following benefits from a financial perspective:

On-going operational cost savings – Keeping sidewalks and cycle tracks adjacent to one another and providing 4 to 4.5m wide boulevards separating them from the roadway surface helps control winter maintenance and tree lifecycle care costs. Firstly, keeping the sidewalk and cycle-tracks side-by-side and with adjacent boulevard space allows for fewer plowing passes than under scenarios where the two are separated and / or one of those elements is placed immediately adjacent to the roadway surface. The boulevard, which is twice as wide as the previous standard, allows for significant added snow storage and thus reduces the need for snow removal activities as well. This boulevard space also allows for vertical elements like signs to be placed slightly further away from the road than under the previous standard which helps with snow removal efficiency. Finally, large tree species can also thrive without the need for investments in tree guards and structural soil products which require regular maintenance.

Pre-vetted Designs Optimized for Maintenance Efficiency

Reduced costs from limiting collision severity potential - It's not uncommon for new collector streets to open and within a few days receive legitimate complaints of speeding traffic. Given the implications of higher travel speeds and the increased severity of potential collisions that may occur as a result, the City of Ottawa spends a significant amount of money addressing legitimized traffic calming requests through its Neighbourhood Traffic Calming Program. Many of the streets in queue for retrofits are those that have been built recently. To address this, the new collector designs include built-in speed management features through lateral shifting of the vehicle travel lanes, intersection pinch-points, street parking alternating from side to side, and a reduced road surface width from the previous standards. These features not only serve to keep societal costs down by reducing the potential severity of collisions that do occur, but also mitigates the need for traffic calming retrofit investments after the fact which often come at a significant cost relative to including speed management features in the initial design.

Reduced private heating costs – The significance of adding space for large species tree lines extends beyond providing the benefits discussed above. They also help reduce private heating costs in summer months by providing substantial shading of adjacent buildings – particularly for low-rise apartments, townhomes, and single units.

APPLICABILITY IN OTHER CANADIAN COMMUNITIES

The guidelines have a significant amount of transferable value to other communities given it addresses many unresolved competing interests that are common in communities across Canada. Winter maintenance, utility operational, emergency response, and transit service practices vary across the country, but a significant proportion of municipalities have similarities in their operations for these groups.

For example, routine salting, clearing, and removal activities that make use of motorized plows, blowers, and other ubiquitous equipment are common in many communities across Canada. In addition, many jurisdictions must meet provincial road maintenance quality standards. The design details in the document were developed in consultation with the City's Road Operations and Maintenance department to understand the key operational constraints and opportunities such as scenarios at what points vertical deflection or pinch-points widths become problematic. Furthermore, these consultations were useful in building a mutual understanding of objectives and the need to integrate consensus-driven design guidance into the document. Similarly, emergency response performance is measured based on metrics such as response time – a focused metric when considering the broader overall goal of making communities safer. Historically, narrower street pavement widths and integrated speed management have been opposed by Fire Services due to its effect of potentially increasing response times. The project team spent significant time, over the course of a number of years, educating the Fire and Paramedic Services teams on the common public safety goals with respect to integrated speed management features and how they contribute to reducing collision severity, improving safety for all road users, and thus aiming to reduce the need for response activities in the first place.

In summary, the consultation approach used for developing the Designing Neighbourhood Collector Streets document can be applied in any jurisdiction. It consisted of two key elements:

1. developing mutual understanding of goals, operating constraints and opportunities, and conflicting and common interests; and
2. empowering stakeholder groups to develop design guidance solutions from a lead position.

The development of these guidelines formally had taken place over the past 2 years. However, the issues discussed and resolved in the document have been on-going for decades. In this regard, the document is a key milestone in the progression of resolving long-standing issues but has also added value by acting as a launching point for further works that have been initiated since and offering off-the-shelf design solutions that can will be applied to new streets and renewals moving forward.