

TO:	CHAIR AND MEMBERS CIVIC WORKS COMMITTEE MEETING ON APRIL 2, 2019
FROM:	KELLY SCHERR, P. ENG, MBA, FEC MANAGING DIRECTOR, ENVIRONMENTAL & ENGINEERING SERVICES AND CITY ENGINEER
SUBJECT:	BOSTWICK ROAD REALIGNMENT ENVIRONMENTAL STUDY REPORT

RECOMMENDATION

That, on the recommendation of the Managing Director, Environmental & Engineering Services and City Engineer, the following actions **BE TAKEN** with respect to the Bostwick Road Realignment Municipal Class Environmental Assessment:

- (a) The Bostwick Road Realignment Environmental Study Report **BE ACCEPTED**;
- (b) A Notice of Study Completion for the project **BE FILED** with the Municipal Clerk;
and,
- (c) The Environmental Study Report **BE PLACED** on the public record for a 30 day review period.

PREVIOUS REPORTS PERTINENT TO THIS MATTER
--

- Environment and Transportation Committee - August, 2005 - Bradley Avenue Extension, White Oak Road to Bostwick Road Environmental Study Report
- Planning and Environmental Committee – October 15, 2012 - The Southwest Area Secondary Plan Report
- Strategic Priorities and Policy Committee – June 23, 2014 – Approval of 2014 Development Charges By-Law and DC Background Study
- Civic Works Committee — March 8, 2016 — Bostwick Road Environmental Assessment Appointment of Consulting Engineer
- Civic Works Committee – January 10, 2017 – Southdale Road Environmental Assessment Appointment of Consulting Engineer

2015-2019 STRATEGIC PLAN

The following report supports the Strategic Plan through the strategic focus area of *Building a Sustainable City* by implementing and enhancing safe and convenient mobility choices for transit, automobile users, pedestrians, and cyclists through the improvement of roadways.

DISCUSSION

Purpose

This report provides Committee and Council with an overview of the Municipal Class Environmental Assessment (EA) for the Bostwick Road Realignment from 400 m north of Pack Road / Bradley Avenue Extension to Wharncliffe Road West and seeks approval to finalize the study. The EA also includes a section of the Bradley Avenue extension from Pack Road to Wonderland Road South. The completed Environmental Study Report (ESR) documents the EA and decision-making process for the Bostwick Road Realignment Class EA.

Background

Bostwick Road is identified as a north/south arterial road in the current Official Plan. The need to complete the EA study was identified in the South West Area Plan (SWAP) to identify the proposed realignment and associated long-term property requirements for the coordination of developments within the City's southwest area. As part of SWAP, medium density residential designation was allocated along Bostwick Road and at three quadrants of the intersection of Bostwick Road and Bradley Avenue extension.

Southwest Area Plan (SWAP 2014)

Municipal Council adopted the Southwest Area Secondary Plan (SWAP) which guides urban growth in the Southwest London study area. SWAP identified the Bostwick Residential Neighbourhood, which is intended to "provide for residential development with the highest intensity of all of the Residential Neighbourhood Areas in the Southwest Planning Area, to support activities in the Wonderland Boulevard Neighbourhood". The SWAP indicated a mix of low, medium, and high density residential uses distributed throughout the neighbourhood, and a multi-use path along the Thornicroft Drain allowing pedestrian and cyclist movement generally north-south. The Thornicroft Drain corridor forms a linear area of Open Space land use which is crossed by collector roads in order to create connectivity with the Wonderland Corridor to the east.

The design of Bostwick Road will mainly accommodate traffic flowing south of Southdale Road, intersecting future Bradley Avenue extension and the proposed Kilbourne Road to the south, and collecting traffic volumes from adjacent developments in a safe and efficient manner.

Bradley Avenue Extension Environmental Assessment

The EA for the Bradley Avenue Extension from White Oak Road to Bostwick Road, was completed in 2005 to address the deficiency in roadway capacity south of the Thames River in the east-west direction. The EA recommended two different alignments be considered through the Bostwick Road intersection, however no preferred alignment was selected when the subject EA was completed.

Project Description

The Bostwick Road Realignment Class EA Study was carried out in accordance with Schedule 'C' of the Municipal Class Environmental Assessment (Class EA) document (October 2000, amended 2007, 2011, and 2015). The Class EA process is approved under the Ontario Environmental Assessment Act and outlines the process whereby municipalities can comply with the requirements of the Ontario Environmental Assessment Act.

The limits for the EA Study generally includes the section of Bostwick Road from just north of Pack Road / Bradley Avenue extension to Wharncliffe Road in the south, a section covering the proposed extension of Bradley Avenue from Wonderland Road South to just west of Bostwick Road, and Kilbourne Road extension connecting to Bostwick Road through the south property line of the existing Forest City Community Church (FCCC). The study limits extend approximately two km from north to south and are within a predominantly agricultural area. The study area is within the urban growth boundary covered by the City of London's SWAP. The limits of the concurrent Southdale Road West EA include the Bostwick Road intersection and extend south down Bostwick Road to abut the study area for this study. The study area for the project is shown on Figure 1 below.

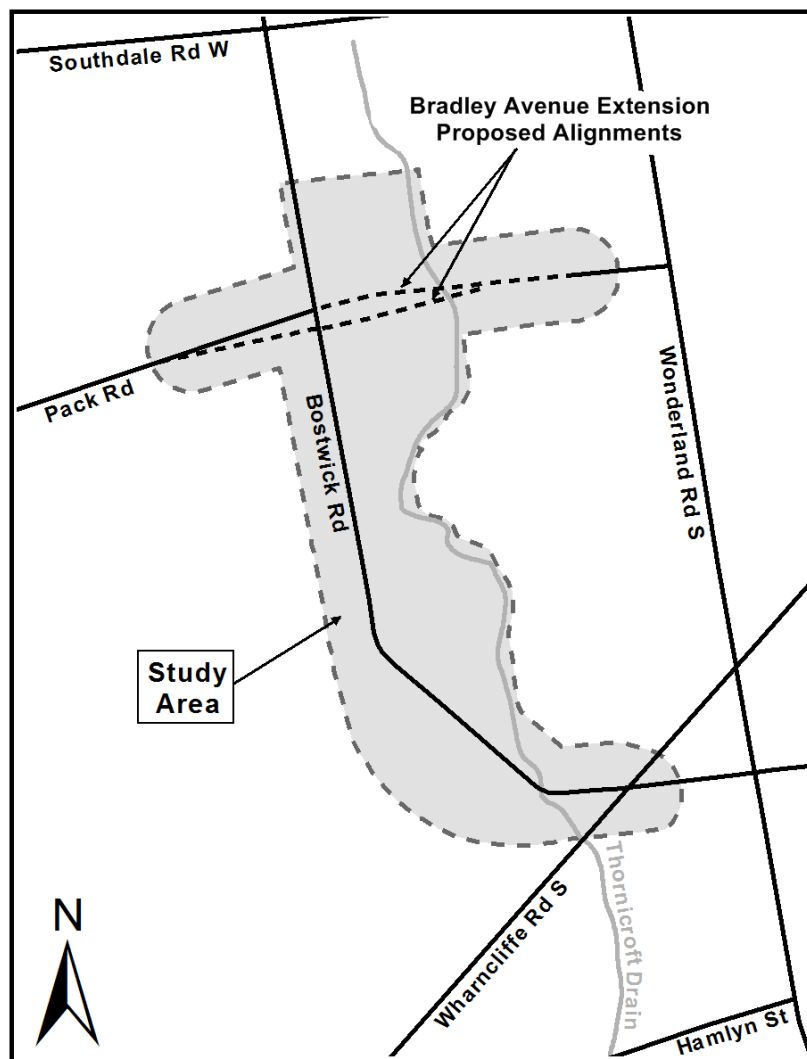


Figure 1: EA Study Area

ENVIRONMENTAL ASSESSMENT SUMMARY

The Environmental Study Report (ESR) documents the process followed to determine the recommended undertaking and the environmentally significant aspects of the planning, design and construction of the proposed Bostwick Road realignment, Bradley Avenue extension, and Kilbourne Road extension. It describes: the problem being addressed, the existing social, natural and cultural environmental considerations, planning and design alternatives that were considered and a description of the recommended alternative. The proposed new alignment of Bostwick Road will allow for improved operations and maintenance as well as better meet the mobility, future growth, and accessibility needs of all transportation users. A copy of the Executive

Summary for the ESR is contained in Appendix A.

Planning and Analysis of Alternatives

Phase 1 of the Municipal Class EA (MCEA) process involved the identification of the problem and opportunity statement. It was determined that improvements are needed in this corridor to address existing and future road/traffic operational deficiencies, transit system efficiencies, road safety, and long-term vision of a street design that improves active transportation.

Phase 2 of the MCEA process involved identifying alternative solutions (planning alternatives) to address the problem/opportunity statement.

The following six alternative solutions were developed for improvements to Bostwick Road:

1. Do Nothing
2. Limit Development
3. Improve Alternative Routes
4. Roadway Intersection/Operational Improvements
5. Provide Additional Lanes
6. Accommodate Other Modes

Alternative solutions for Bradley Avenue were taken from the Bradley Avenue Extension EA completed in 2005. In addition to these alternatives another option was also evaluated. They include:

1. Do Nothing
2. Bradley Avenue EA Option X – extend to the north
3. Bradley Avenue EA Option Y – extend to the south
4. Bradley Avenue Option Z – extend further to the south than Option Y

Through the evaluation of these alternatives against a set of criteria that broadly represents the environment (technical, cultural, socio-economic, natural, costs), a combination of Alternatives 4, 5, and 6 were recommended for Bostwick Road and Alternatives 2, 3 and 4 for Bradley Avenue were recommended to be carried forward to Phase 3 of the EA study.

Design Alternatives

Phase 3 of the MCEA process involved the development and evaluation of alternative design concepts. The main outcome in this phase of the study was developing road cross-sections and layout concepts for the recommended planning solution. Identification of the land requirements for this project was a key outcome to identify appropriate mitigation measures such as minimizing cultural, socio-economic and environmental impacts. Four design concepts that comprise alignment and intersection treatments (A, B, C, & D) were proposed for Bostwick Road and three design concepts (X, Y, & Z) were proposed for Bradley Avenue.

Recommended Alternatives

Bostwick Road

The existing Bostwick Road alignment does not meet current geometric design standards and does not address drainage deficiencies. In addition, it is not consistent with the objectives of the London Plan and the Southwest Area Plan (SWAP). Based on the evaluation of the alternatives, it was determined that the proposed alignment of Option C best met the technical requirements, needs and planning policies for the area

while also limiting environmental impacts. Option C provides the maximum available setback from residential properties while also limiting encroachment into adjacent natural areas. North of the future Kilbourne Road intersection, the alignment remains the same as existing, until Pack Road, where the alignment is shifted to the west to minimize encroachment into woodland natural heritage features. At the southern portion (south of the proposed Kilbourne Road extension) the road jogs slightly to the south of the existing alignment through planned residential development area and connects with the existing Wharncliffe Road intersection. Roundabouts are recommended along Bostwick Road at Bradley Avenue extension and the future Kilbourne Road extension intersections. The preferred design for the Bostwick Road realignment is shown on Figure 2.

Bradley Avenue

Based on the evaluation of the alternatives, it was determined that the proposed alignment of Option Y best met the technical requirements while also limiting impacts to other areas. This option requires shifting the current Pack Road alignment to the south to connect with Bostwick Road and Bradley Avenue. The preferred design for Bradley Avenue alignment is shown on Figure 3.

Potential interim and ultimate cross-section configurations of the proposed Bostwick Road and Bradley Avenue alignments are shown on Figures 4 & 5. It should be noted that the EA study recommends the construction of the ultimate four-lane configuration as one project since the majority of the estimated cost for both roads occurs during the interim phase. However, property availability may also influence implementation.

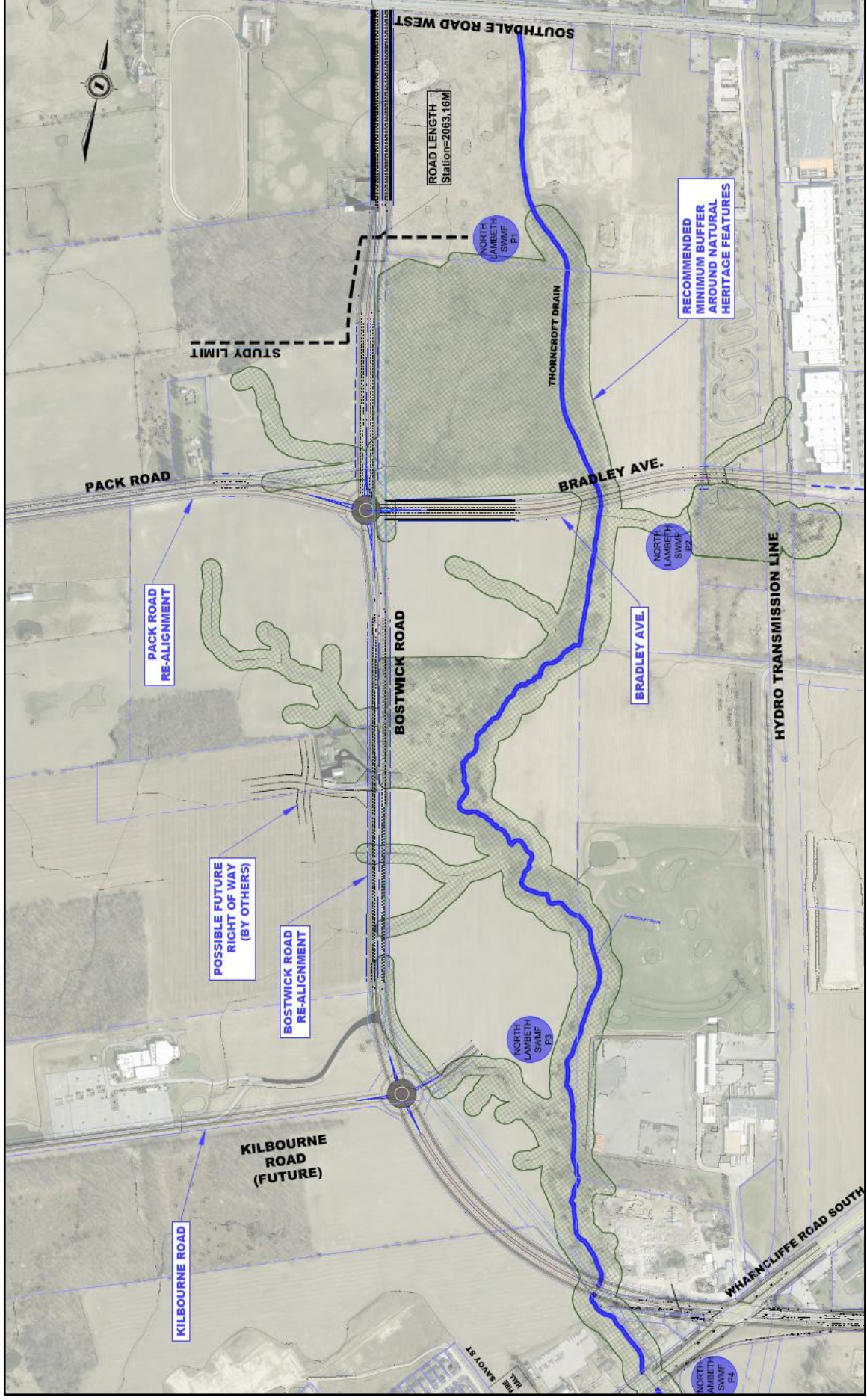


Figure 2: Bostwick Road Realignment Preferred Option

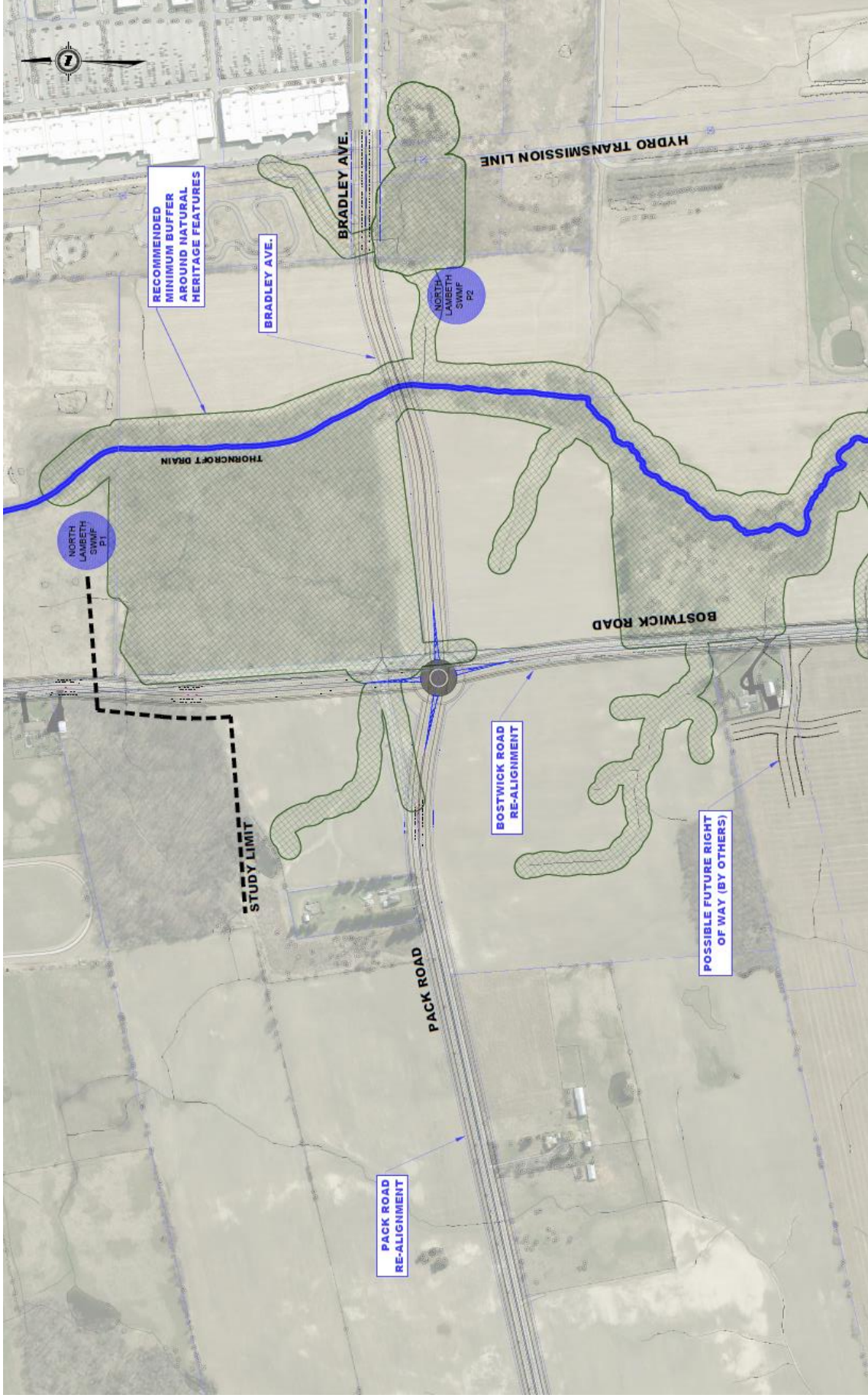


Figure 3: Bradley Avenue Preferred Option

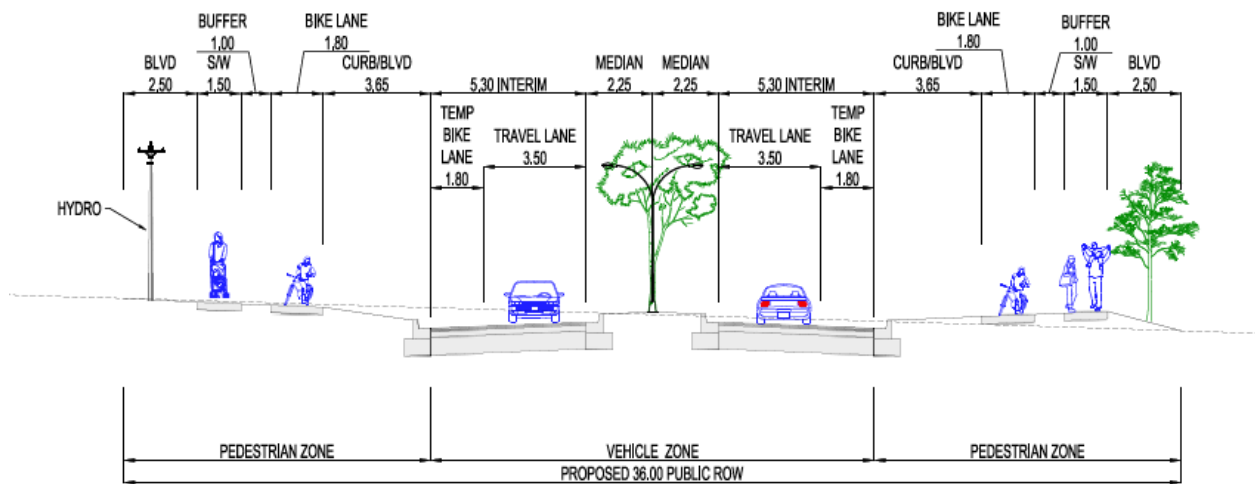


Figure 4: Preferred Bostwick Road & Bradley Avenue Cross Section - Interim Configuration

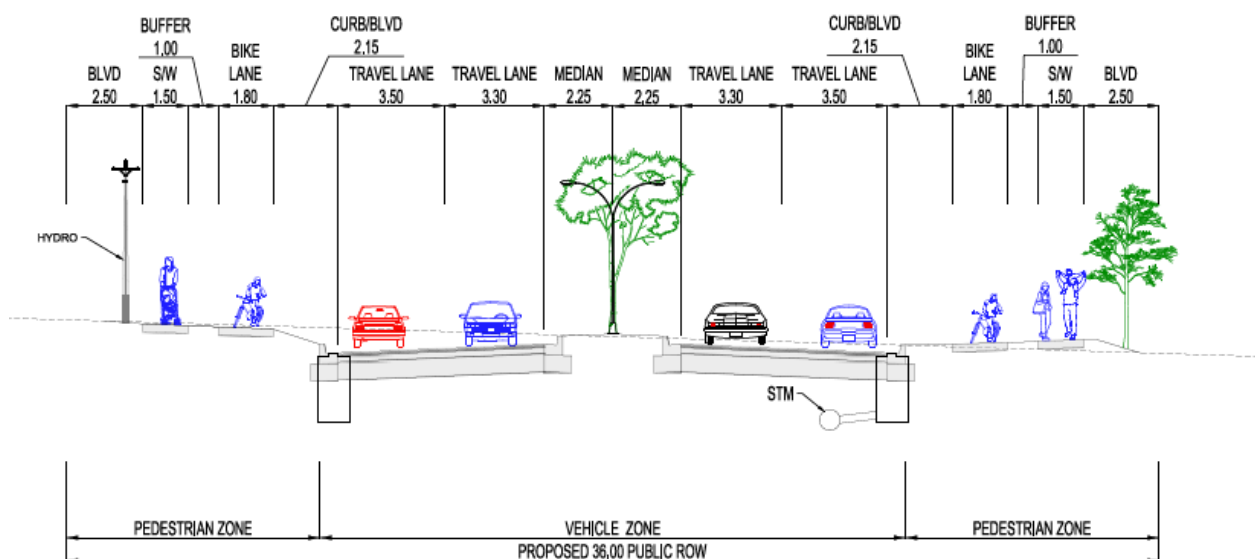


Figure 5: Preferred Bostwick Road & Bradley Avenue Cross Section - Ultimate Configuration

Property Impacts

In order to construct Bostwick Road, Bradley Avenue and Kilbourne Road in accordance with the preferred plans for realignment and road widening, the City will acquire property (either through negotiations with property owners or dedication through development). Where possible, efforts were made during the study to minimize the amount of property required.

CONSULTATION

Public and Agency Consultation

Consultation was a key component of this Class EA study in order to provide an opportunity for stakeholder groups and the public to gain an understanding of the study process and provide feedback. The consultation plan was organized around key study

milestones, including the two Public Information Centres (PICs), stakeholder engagement and participation of technical review/regulatory agencies. The key stakeholders included residents, interested public, agencies, First Nations communities and those who may be affected by the project. Property owners brought forward suggestions that were developed into alternatives and reviewed under the process. The key consultation milestones include:

Notice of Commencement	May 17 and 24, 2016
Public Information Centre No. 1	October 13, 2016
Public Information Centre No. 2	June 14, 2017
Notice of Completion	Upon Council acceptance of the ESR

Agencies and stakeholders were notified at study milestones and during specific phases of the study which required an information update pertaining to them. In addition to formal public events, the project team conducted in-person meeting with stakeholders and agencies.

Prior to writing this report, a property owner raised a concern with respect to the Environmental Impact Study (EIS) report, specifically in regards to the natural environment buffers required as part of the preferred road alignment. The study team met with the land owner representatives and agreed to add clarifications to a few sections in the EIS and ESR reports in order to address their concerns. The study team clarified that while these buffers may be utilized by the developers of the lands described in the EIS, they may also be reviewed and potentially refined during subsequent EISs undertaken as a part of future developments.

The study team explained that in order to evaluate potential impacts of the alignment alternatives, it was necessary to complete a field assessment and review/document the condition of significant vegetation patches identified in the SWAP. The EIS study area needed to be large enough to encompass a full spectrum of potential alignment alternatives and verify the preferred alternative of the EA would not jeopardize significant features within the adjacent significant vegetation patch. The recommended buffer widths identified in the EIS are consistent with the City's Official Plan policies and council approved guidelines (e.g., Environmental Management Guidelines) and have provided the framework needed to complete the assessment of road alignment alternatives.

Consultation with First Nations

Consultation with First Nations is a mandatory component of the Municipal Class EA process and is required as a result of the Crown's Duty to Consult. At the beginning of the study, a comprehensive list developed by the project team included the Ministry of Aboriginal Affairs, Aboriginal Affairs and Northern Development Canada, Association of Iroquois & Allied Indians, Union of Ontario Indians and the London District Chiefs Council. Notification was also provided to: Bkejwanong Walpole Island First Nation, Six Nations of the Grand River Territory, Aamjiwaang First Nation, Delaware Nation – Morovian of the Thames, Chippewas of the Thames First Nation, Caldwell First Nation, Munsee-Delaware Nation, Oneida Nation of the Thames, Mississaugas of New Credit First Nation, and the Kettle and Stony Point First Nation.

IMPLEMENTATION

Construction Staging

The improvements planned in this ESR are long term in nature. The implementation timing will be managed to facilitate the surrounding development coordinated through the annual Growth Management Implementation Strategy (GMIS) process. The approach to implementation can be adaptable because the Bostwick Road project trigger is primarily development more than road capacity. The phasing options are described below and will be reviewed in the future as the implementation approaches. Factors will include traffic operations and costing.

Potential Interim Configuration

In a two-stage implementation scenario, Bostwick Road could initially be constructed as a two-lane road. The initial phase would be a two-lane roadway with an urban cross section and ultimately widened to four lanes. In the interim, Bostwick Road would have 2 x 3.5 m through lanes, a 1.8 m temporary bike lane (5.3m between curbs) and a 4.5 m centre raised median to provide access control.

Ultimate Configuration

The ultimate configuration could be achieved as a second phase following a two-lane improvement or immediately as a single phase project. In its ultimate configuration, the typical four-lane cross section developed for Bostwick Road includes 2 x 3.3 m through lanes, 2 x 3.5 m curb through lanes, a 4.5 m centre raised median, 2.15 m buffered off-road bicycle lanes, and 1.5 m sidewalks separated from the roadway curb via 2.15 m vegetated boulevards along both sides.

The concept is similar for Bradley Avenue. However, the scope of the Bradley Avenue corridor considered in this EA is localized and the project staging will be dictated by the broader corridor project. The details of the roundabout staging will be determined in the design phase.

The preliminary costing of the two approaches is illustrated in the following table.

Cost Comparison Analysis for Bostwick Road & Bradley Avenue

Road	Two-Stage Construction			Single Phase Construction
	Phase 1	Phase 2	Total	
Bostwick Road	\$16,977,000	\$2,213,000	\$19,190,000	\$18,128,400
Bradley Avenue	\$7,063,000	\$1,267,500	\$8,330,500	\$7,899,750

Based on the financial analysis illustrated above, the preliminary recommendation is to construct Bostwick Road and Bradley Avenue to the ultimate four-lane configuration as one single phase project since the majority of the estimated cost for both roads occurs during the interim phase if these roads are constructed in two phases.

The property acquisition will be coordinated through the development of associated land parcels. It is recommended that the full property requirements be acquired during the interim construction stages. Acquiring the full property requirements will provide the City with the flexibility in constructing for the interim conditions.

Cost Estimates

Preliminary Detailed Costing of One-Stage Approach

The cost estimates to construct Bostwick Road and Bradley Avenue in their ultimate configurations under one project each are \$18,128,400 and \$7,899,750 respectively. The breakdown of the cost estimate with anticipated implementation timing based on the draft 2019 Transportation Development Charges Background Study (DCBS) currently in development is shown below. These cost estimates will inform the DCBS process. Coordinated lifecycle renewal of sewers and watermains that are funded separately are identified individually. Figures are in 2018 dollars.

Cost Estimate for Bostwick Road Four Lane Construction as One Project Potential Implementation Timing 2026

Item	Estimated Cost (\$)
Road Widening Cost Estimates	
Roadworks and Earthworks	3,700,000
Storm Sewers	3,300,000
Traffic Signals and Illumination	850,000
Miscellaneous	650,000
Utility Relocation (10%)	988,000
Sub-total	9,488,000
Engineering and Consulting (15%)	1,423,200
Contingency (15%)	1,423,200
Property Acquisition*	4,000,000
Total Preliminary Cost Estimate	16,334,400
Lifecycle Renewal Cost Estimate	
Sanitary Sewers	690,000
Watermain	690,000
Sub-total	1,380,000
Engineering and Consulting (15%)	207,000
Contingency (20%)	207,000
Total Preliminary Cost Estimate	1,794,000

**Cost Estimate for Bradley Avenue
Four Lane Construction as One Project
Potential Implementation Timing 2028**

Item	Estimated Cost (\$)
Road Widening Cost Estimates	
Roadworks and Earthworks	2,350,000
Storm Sewers	800,000
Traffic Signals and Illumination	500,000
Miscellaneous	375,000
Utility Relocation (10%)	482,500
Sub-total	4,507,500
Engineering and Consulting (15%)	676,125
Contingency (20%)	676,125
Property Acquisition*	1,000,000
Total Preliminary Cost Estimate	6,859,750
Lifecycle Renewal Cost Estimate	
Sanitary Sewers	400,000
Watermain	400,000
Sub-total	800,000
Engineering and Consulting (15%)	120,000
Contingency (20%)	120,000
Total Preliminary Cost Estimate	1,040,000

CONCLUSION

Improvements to the Bostwick Road alignment are necessary to fulfill its necessary function in the transportation network as the area develops and the number of road users grow. The realignment of Bostwick Road was identified in SWAP. An outstanding localized alignment issue for the Bradley Avenue Extension also required finalization. The new Bradley Avenue will provide more east-west capacity in the southwest and reduce pressure on Southdale Road. A Municipal Class Environmental Assessment (EA) was undertaken to confirm the detailed alignments to enable potential future land designation changes to proceed in coordination with the required road realignment. The ESR is ready for final public review.

Four Bostwick Road and three Bradley Avenue alternative design concepts were developed and evaluated based on factors such as, but not limited to: surrounding planned land use, impact on areas of archaeological potential, built heritage resources, vegetation, property and municipal services and utilities as well as opportunities for streetscaping and active transportation. Based on these factors, Option C was selected as the preferred design for Bostwick Road and Option Y was selected as the preferred design for Bradley Avenue.

The implementation timing of these improvements will be managed to facilitate the surrounding development coordinated through the annual Growth Management Implementation Strategy (GMIS) process. The approach to the Bostwick Road realignment can be adaptable because the project trigger is primarily development and is tentatively identified for 2026 implementation. The portion of the Bradley Avenue extension considered in this study is part of a larger project and is planned for 2028 implementation.

Consultation was a key component of this study. The Class EA was prepared with input from external agencies, utilities, emergency service providers, property owners in proximity to the study and First Nations.

Pending Council approval, a Notice of Study Completion will be filed, and the ESR will be placed on public record for a 30-day review period. Stakeholders and the public are encouraged to provide input and comments regarding the study during this time period. Should the public and stakeholders feel that the EA process has not been adequately addressed, they may request a Part II Order from the Minister of the Environment, Conservation and Parks within the 30-day review period per MOECP instructions on the ministry website.

Acknowledgements

This report was prepared with the assistance of Maged Elmadhoon, M.Eng., P.Eng. Traffic and Transportation Engineer and Josh Ackworth, C.E.T., Technologist II of the Transportation Planning & Design Division.

SUBMITTED BY:	RECOMMENDED BY:
DOUG MACRAE, P.ENG., MPA DIRECTOR, ROADS AND TRANSPORTATION	KELLY SCHERR, P.ENG., MBA, FEC MANAGING DIRECTOR, ENVIRONMENTAL AND ENGINEERING SERVICES & CITY ENGINEER

Attachment: Appendix A – Environmental Study Report Executive Summary

cc. Henry Huotari, P.Eng, Parsons

Executive Summary

Study Background

The City of London retained Parsons Inc. to complete a Schedule 'C' Municipal Class Environmental Assessment (Class EA) for Bostwick Road from just north of Pack Road / Bradley Avenue extension to Wharncliffe Road South. The purpose of this study is to determine the existing and future transportation needs for the Bostwick Road corridor, specifically addressing the alignment of Bostwick Road and to finalize the alignment of the future Bradley Avenue Extension. Study justification was identified in The London Plan, the City's Transportation Master Plan (Smart Moves), and the Southwest Area Plan (SWAP). The study addresses the safety, capacity, and operational improvements on Bostwick Road.

As per Phase 1 of the Municipal Class EA process, a problem/opportunity statement is needed. This statement outlines the need and justification for the overall project and establishes the general parameters, or scope, of the study. Based on a review of the existing and future conditions of the study area, which includes a review of existing planning policies, traffic conditions, the transportation network, the natural environment, cultural resources, and servicing needs, the following problem/opportunity statement was developed for this project:

As a result of the planned residential and commercial growth forecasted in the City of London's Smart Moves - the London 2030 Transportation Master Plan, South West Area Plan (2014) and Official Plan, lands adjacent to Bostwick Road are projected to experience a significant amount of residential, commercial and institutional development in the near future. To maintain the City's acceptable level of transportation service and to accommodate future developable lands in the southwest area of the City of London, it is critical to assess the Bostwick Road corridor for future traffic demands, accessibility through the corridor, and to improve the roadway geometrics. In developing a functional, safe and visually attractive corridor that is suitable for all road users, the following have been identified as needing to be evaluated:

- Roadway and intersection capacity and geometric modifications;
- Extension of Bradley Avenue to connect with Bostwick Road/Pack Road;
- Potential realignment of the south end of Bostwick Road;
- Accommodation for pedestrians and cyclists by way of improving active transportation facilities; and,
- Roadway drainage and stormwater management.

Municipal Class Environmental Assessment Process

The Municipal Class EA (Municipal Engineers Association October 2000, as amended in 2007, 2011 and 2015) is the guiding process that the subject municipality, the City of London, is required to complete for public works projects as indicated under the *Ontario Environmental Assessment Act* (EAA). The Municipal Class EA applies to municipal infrastructure projects including roads, water and wastewater. Projects are classified according to the scope of work and the anticipated work for this project would be classified as:

Schedule C: Defined as a project that includes major expansions or new facilities that have the potential to have significant impact on the environment and are therefore subject to the full Municipal Class Environmental Assessment process; preparation of an Environmental Study Report is required for this type of study.

Schedule 'C' projects require that all 5 phases of the Municipal Class EA planning process are completed. The first four phases will be completed as a part of this study; the fifth phase will be initiated following completion of the study. The 5 phases are summarized as follows:

- Phase 1 – Identify the Problem and Opportunity Statement
- Phase 2 – Identify and Evaluate Alternative Solutions
- Phase 3 – Identify Alternative Design Concepts for Preferred Solution
- Phase 4 – Prepare Design Plans & Environmental Study Report
- Phase 5 – Implement Recommended Solution

Existing Conditions

Several technical studies were undertaken to determine the baseline conditions of the study area. The key findings are included below:

Local Planning Policies

The City's Mobility Transportation Master Plan (TMP), SmartMoves, identifies the need for mobility improvements for all modes of transportation to address the projected growth in the City of London. Specific to the study area, the TMP identifies the extension of Bradley Avenue from Wonderland Road South to Bostwick Road, providing four through-lanes, on a 10 to 15-year timeframe, as a desired improvement. The realignment of Bostwick Road is identified in the Official Plan; however, it is not specifically included in the TMP.

The City of London’s current Official Plan dates to 1991, however “The London Plan” is the latest update to the Official Plan, of which sections of the new Official Plan are currently still under review. The City’s Official Plan dictates the types of roads throughout the City, thereby indicating the purpose/key use of the roadway. Both Bostwick Road and Pack Road / Bradley Avenue are identified as Civic Boulevards / Arterials.

The Southwest Area Secondary Plan (SWAP) is an area-specific Secondary Plan that guides urban growth in the Southwest London study area. Municipal Council has adopted the SWAP and the Official Plan Amendment to realign the existing Bostwick Road. In addition to the realignment of Bostwick Road, the SWAP also identifies the Bostwick Residential Neighbourhood, which is intended to “provide for residential development with the highest intensity of all of the Residential Neighbourhood Areas in the Southwest Planning Area, to support activities in the Wonderland Boulevard Neighbourhood”. The SWAP indicates a mix of low, medium, and high density residential uses distributed throughout the neighbourhood, and a multi-use path allowing pedestrian and cyclist movement generally north-south (Figure 1). The Thornicroft Drain corridor forms a linear area of Open Space land use which is crossed by collector roads in order to create connectivity with the Wonderland Corridor to the east.

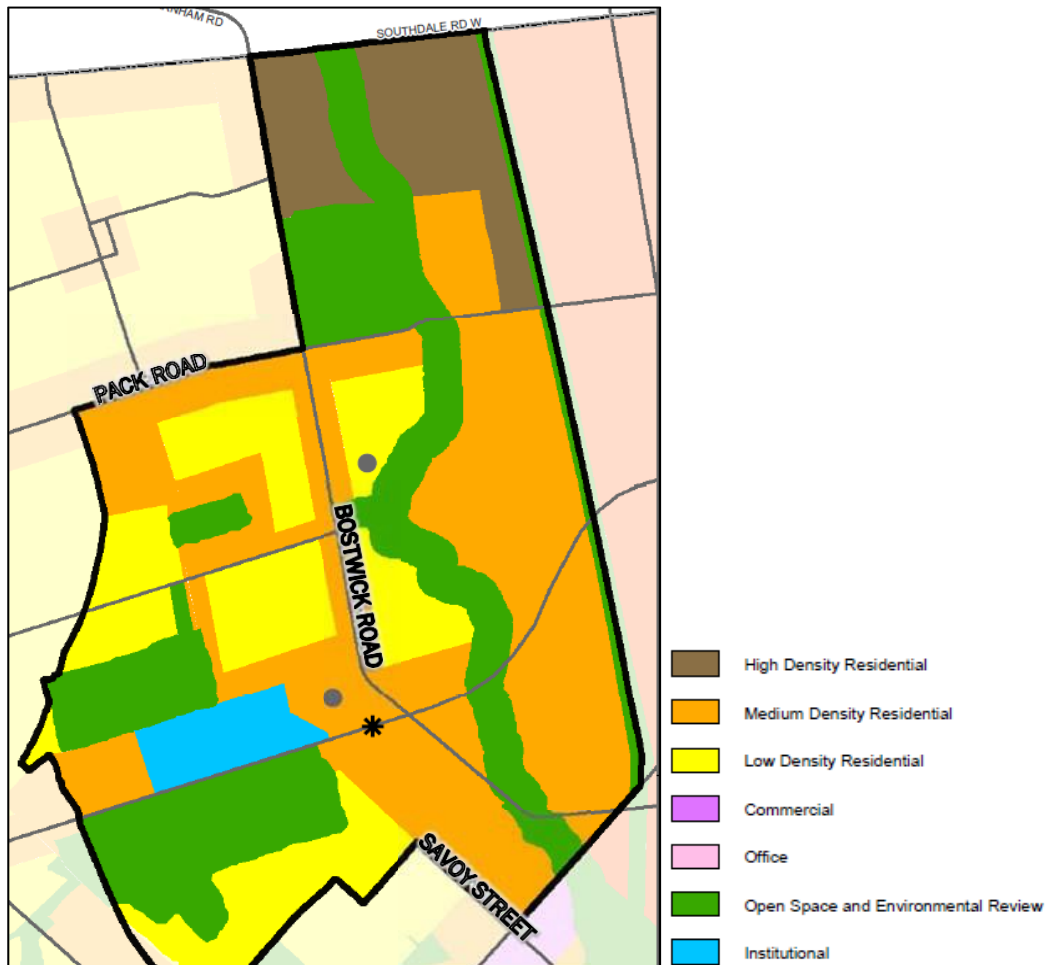


Figure 1: SWAP, Bostwick Residential Neighbourhood Land Use

Active Transportation

The 2016 Cycling Master Plan identifies a preferred cycling network throughout the city that includes a proposed separated-facility route along the entirety of Bostwick Road as well as a “desired connection” which links Kilbourne Road to the west side of the Thornicroft Drain.

The SWAP indicates a planned multi-use path/trail that, within the vicinity of the study area, begins to the east of the Wharcliffe Road South intersection and follows Thornicroft Drain north beyond the project limits. This planned trail is shown to cross both Bostwick Road near the future Kilbourne Road intersection and the proposed eastern terminus of the Bradley Avenue extension.

Environmental Assessment Studies

The Bradley Avenue Extension Environmental Assessment was completed in 2005 from White Oak Road to Bostwick Road to address the deficiency in east-west roadway capacity south of the Thames River. The EA recommended two different alignments be considered through the Bostwick Road intersection, which are to be confirmed as part of this study.

Traffic

A traffic analysis was undertaken for the corridor in light of the proposed developments and land uses for the adjacent area, as well as future roads. Corridor lane capacity analysis for the future (2035) 'Do Nothing' traffic conditions was undertaken. Based on the results of the analysis, Bostwick Road from Pack Road to Wharncliffe Road is projected to operate above capacity under this scenario. This section of Bostwick Road will require additional through lanes both in the northbound and southbound directions to accommodate the future forecasted (2035) traffic volumes.

Intersection capacity analyses under a 'Do Nothing' traffic scenario was also completed for the signalized and unsignalized intersections using the future (2035) traffic volumes established. Critical movements and significant delays were forecasted for the unsignalized intersections of Bostwick Road with Pack Road and Kilbourne Road, however traffic signal control is not warranted for these intersections. In consultation with the City, roundabout options for both intersections were considered based on their ability to alleviate delay issues and provide other benefits (evaluated further in this study). The signalized intersection of Bostwick Road and Wharncliffe Road is projected to contain several critical movements (i.e. movements that will operate over capacity). This intersection would benefit from the additional northeast through lane as well as an additional westbound through lane and westbound double left turn lane, though these should be confirmed in detail design.

A traffic analysis was also completed for the future (2035) traffic volumes with additional through lanes, which indicated there will be no capacity issues along the Bostwick Road corridor.

Natural Environment

The major significant environmental features includes the Thornicroft Drain, the major aquatic feature flowing north-south east of Bostwick Road, and several significant woodlots as shown in Figure 2. Given the current rural nature of the study area, several Species at Risk were encountered, or determined to reside or exist, within the study area.



Figure 2: Key Environmental Features in the Study Area

Alternative Solutions

Based on Phase 2 of the Municipal Class EA process, alternative solutions, which are ways to address the study objectives and opportunities (i.e. problem/opportunity statement), should be identified and described, including the “Do Nothing” alternative, which is typically included to represent the status quo. Six alternative solutions were developed for improvements to Bostwick Road:

Alternative Solution		Description
1.	Do Nothing	Maintain existing roadway network and provide no major changes to Bostwick Road (this alternative was selected as a baseline for comparison of alternative solutions).
2	Limit Development	Restrict development in the surrounding area to projects already underway in order to limit growth.
3	Improve Alternative Routes	Expand or maximize capacity on adjacent roads where justified (e.g. Southdale Road, Wonderland Road, Wharncliffe Road).
4	Roadway Intersection / Operational Improvements	Undertake roadway intersection / operational improvements and geometrics for future roadway connections (traffic signals, turn lanes, etc.)
5	Provide Additional Lanes	Widen Bostwick Road through additional lanes to increase traffic capacity and accommodate future growth in the southwest.
6	Accommodate other Modes	Improve existing facilities to encourage active transportation (walking, cycling, etc.) and improve Bostwick Road to accommodate future transit services.

Through the evaluation of these alternatives against a set of criteria that broadly represents the environment (technical, cultural, socio-economic, natural, costs), a combination of Alternatives 4, 5, and 6 were recommended for Bostwick Road. Alternative solutions for Bradley Avenue were taken from the Bradley Avenue Extension EA completed in 2005. In discussion with developers, a third option based off of Option Y was developed. Thus, Option Y is renamed Option Y1, and the reworked option is called Option Y2. They include:

Alternative Solutions		Description
1	Do Nothing	Do not extend Bradley Avenue from Wonderland Road to Bostwick Road.
2	Bradley Avenue EA, Option X	Extend Bradley Avenue through a wooded area located northeast of the proposed Bradley Avenue and Bostwick Road intersection (Bradley Ave EA Option X). This option would connect with Pack Road and Bostwick Road at its current location.
3	Bradley Avenue EA, Option Y1	Extend Bradley Avenue south of the wooded area, thereby avoiding it, but requiring property south of the current alignment, which is now identified as a medium density residential area as identified in SWAP (Bradley Ave EA Option Y). This option would require shifting the current alignment of Pack Road to the south to connect with Bostwick Road.
4	Option Y2	Extends Bradley Avenue further south of the wooded lot than Option Y1 and avoids encroaching on the adjacent woodlot while also creating a parcel of developable land. This would shift the current intersection with Pack Road further south and require greater realignment of Pack Road.

Through evaluation of these alternatives against a set of criteria that broadly represents the environment (technical, cultural, socio-economic, natural, costs), Options X, Y1, and Y2 were recommended to be carried forward to Phase 3 of the EA study.

Alternative Design Concepts

Subsequently, as per requirements of Phase 3 of the Municipal Class EA, alternative design concepts were developed based on the alternative solutions for the alignment and improvements to Bostwick Road, the alignment of Bradley Avenue Extension, the alignment of Kilbourne Road, and intersection controls.

The following design concepts were proposed for Bostwick Road:

- Option A: generally maintains the current Bostwick Road alignment from the north end of the corridor to the future Kilbourne Road and Bostwick Road connection. South of the future Kilbourne Road, Bostwick Road shifts significantly to the southwest through a planned residential development area. Option A maintains the intersection of Bostwick Road and Wharncliffe Road.
- Option B: realigns the corridor to the west to avoid encroaching onto natural heritage features. Maintains existing road alignment at the north and south ends of the corridor.
- Option C: realigns the corridor to the west at Pack Road to avoid encroaching onto natural heritage features. South of the future Kilbourne Road connection, the alignment jogs slightly to the south through planned residential development areas and connects to the existing intersection at Wharncliffe Road.

- Option D: realigns the corridor to the west at Pack Road to avoid encroaching onto natural heritage features. South of the future Kilbourne Road connection, the alignment jogs to the south through planned residential development areas and connects with Savoy Street. A new signalized intersection will be required at Wharncliffe Road/Savoy Street. The west leg of Wharncliffe Road would be closed as a cul-de-sac where Bostwick Road currently connects.

Based on the evaluation of the alternatives, it was determined that the ultimate proposed alignment of Option C (Figure 3) best met the technical requirements, needs and planning policies for the area while also limiting environmental impacts. Option C provides the maximum available setback from residential properties while also limiting encroachment into adjacent natural areas. North of the future Kilbourne Road intersection, the alignment remains the same, until Pack Road, where the alignment is realigned to the west to minimize encroachment into natural heritage features. At the southern portion (south of the proposed Kilbourne Road) the road jogs slightly to the south of the existing alignment through planned residential development area and connects with the existing Wharncliffe Road intersection.

Active transportation improvements for Bostwick Road would be provided via continuous sidewalks and off-road bike lanes. Roadway drainage will be accommodated and modified accordingly depending on either the rural or urban cross section to be used and how development progresses. Some commercial property is required at the Bostwick / Wharncliffe intersection.

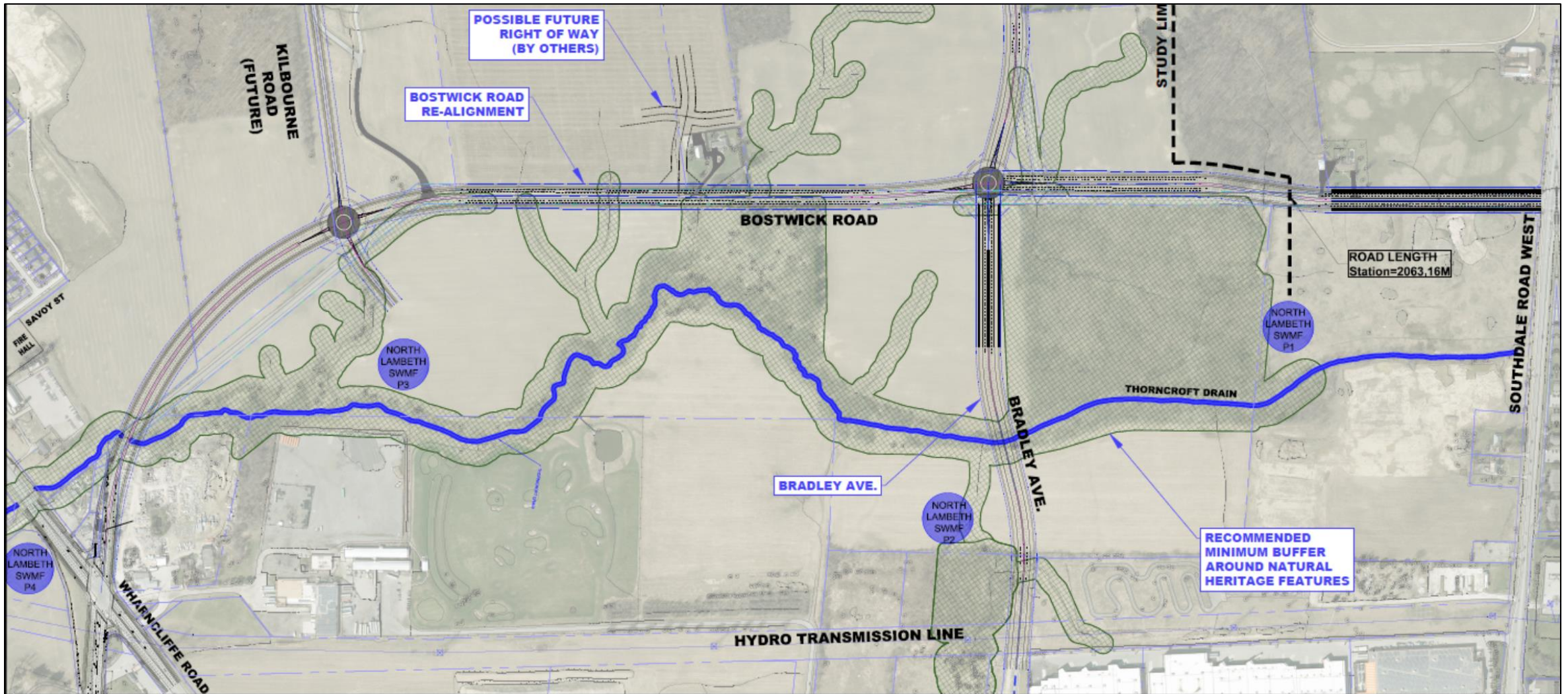


Figure 3: Ultimate Preferred Design Concept Option C for Bostwick Road

The Bradley Avenue extension options that were carried forward include Option X, Y1, and Y2, which were developed previously in the Bradley Avenue Extension EA and in discussion with developers.

- Option X: extends Bradley Avenue through a wooded area northeast of the proposed intersection and would connect with Pack Road at Bostwick Road at its existing location.
- Option Y1: extends Bradley Avenue through a planned residential area south of the wooded lot and avoids encroaching on the adjacent woodlot. This would shift the current intersection with Pack Road to the south.
- Option Y2: extends Bradley Avenue further south of the wooded lot than Option Y1 and avoids encroaching on the adjacent woodlot while also creating a parcel of developable land. This would shift the current intersection with Pack Road further south and require greater realignment of Pack Road.

Based on the evaluation of the alternatives, it was determined that the ultimate proposed alignment of Option Y1 (Figure 4) best met the technical requirements while also limiting impacts to other areas. Option Y1 extends to the south of Patch 10064, avoiding a significant woodlot containing rare species, and allows for possible street connections, both of which are consistent with local planning policies. This option requires shifting the current Pack Road alignment slightly to the south to connect with Bostwick Road and Bradley Avenue, though significantly less than Option Y2. Bradley Avenue will operate with two through lanes to accommodate vehicular traffic in the interim, with an ultimate four lane configuration in the future.

Active transportation improvements will be provided via continuous sidewalks and paved shoulders for interim conditions only. Roadway drainage will be accommodated and modified accordingly depending on either the rural or urban cross section to be used and how development progresses. It is recommended that the City investigate rezoning of the lands to the south of the Bradley Avenue extension to mitigate the loss of adjacent medium density developable area that will result from implementing the preferred Option.

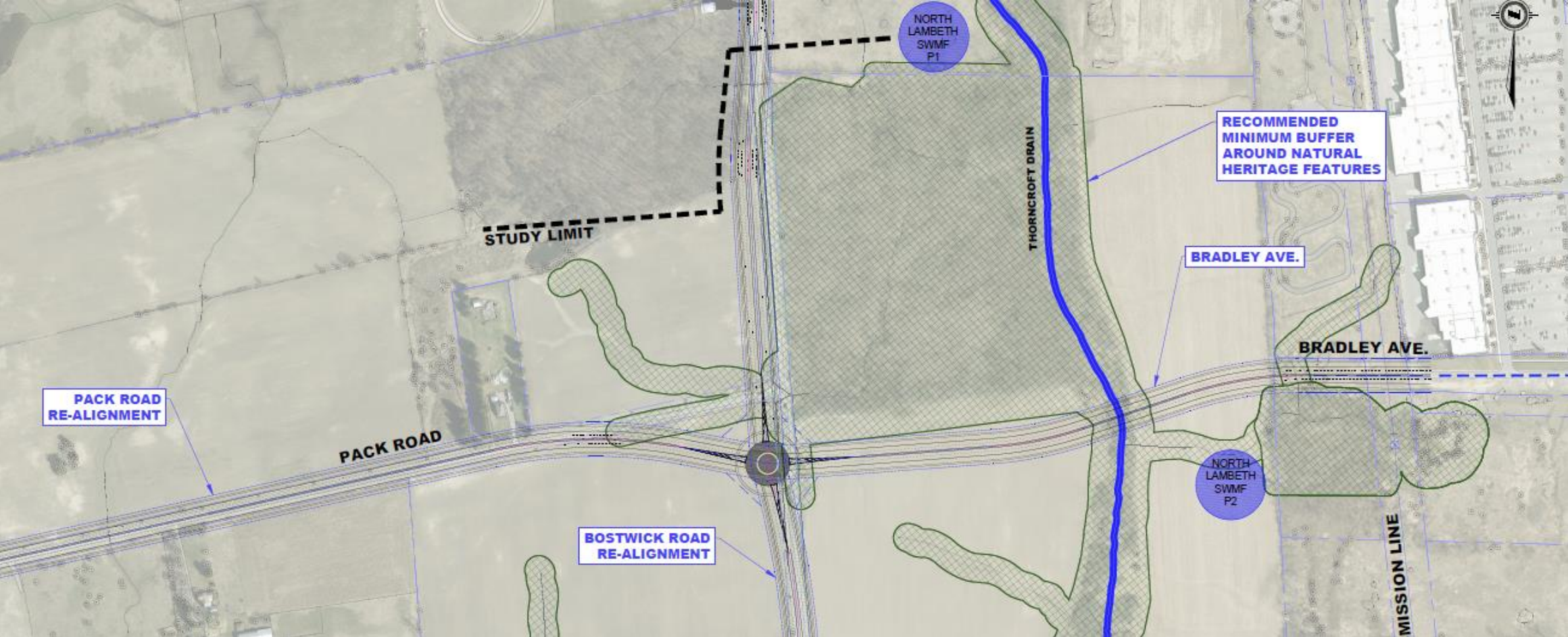


Figure 4: Ultimate Preferred Design Concept Option Y1 for Bradley Avenue Extension

PARSONS

Two alternative design concepts were developed for the new intersection that will be created on Bostwick Road with the extension of Kilbourne Road from the west:

- Option 1: the Kilbourne Road extension connecting to Bostwick Road to the north of the existing Forest City Community Church (FCCC) south property line to avoid impacts to the adjacent wooded area to the south.
- Option 2: the Kilbourne Road extension connecting to Bostwick Road to the south of the existing Forest City Community Church (FCCC) south property line to avoid impacts to the FCCC property.

Based on the evaluation of the alternative alignments for a future Kilbourne Road connection with Bostwick Road, it was determined that the proposed alignment of Option 1 best met the technical requirements while also limiting impacts to the adjacent woodlot to the south. Implementing this option will require approximately 21.5m of property frontage from the FCCC property (actual property requirements to be confirmed during the detailed design phase of the study) and coordination with the FCCC to identify alternative access requirements.

The study also evaluated whether roundabouts or traffic signals were preferable for this area. Based on the evaluation of the intersection control options (roundabout or traffic signals) for the intersections of Bostwick Road with Pack Road/Bradley Avenue and Kilbourne Road, roundabouts were identified as the preferred configurations for both locations. Roundabouts were determined to outperform signal control in the following key categories: user safety, traffic operations, emissions, and maintenance costs. Of particular importance for the Bostwick corridor, roundabouts would provide more flexibility in the design of key intersection approaches. This flexibility of being able to modify the approach alignments provides an added advantage in being able to reduce impacts to adjacent environmentally significant areas.

Consultation

As public input is a vital part of the Class EA process, the study included a number of contact points with the public, Indigenous communities, technical agencies, and stakeholder interest groups. The key consultation milestones include:

Consultation Event	Date
Notice of Commencement	May 17 and 24, 2016
Public Information Centre No. 1	October 13, 2016
Public Information Centre No. 2	June 14, 2017
Notice of Completion	Anticipated April 2019

Public outreach and advertisements of these milestone events included local newspapers, direct mailing and email. Individual meetings with agencies, stakeholders, and property owners were held throughout the study. Indigenous communities were also contacted at key milestones.

Recommended Design

Cross Sections and Construction Staging

The cross sections for the Bostwick Road and Bradley Avenue corridors were developed to meet both technical requirements of the study and planning objectives established in the Southwest Area Plan (SWAP 2014), The London Plan (Official Plan), 2030 Transportation Master Plan – SmartMoves and City of London Cycling Master Plan (London ON Bikes). The cross sections in particular were designed according to the City’s Complete Streets Manual, which seeks to create a safe environment for all road users and also to improve the comfort of travel and access throughout the right-of-way.

Bostwick Road

Bostwick Road could be implemented in either one stage or two stages (interim and ultimate). If construction is planned for two (2) stages, Bostwick will be constructed initially as a two-lane (interim) urban cross section and ultimately widened to four lanes. In the interim (2026), Bostwick Road is to be reconstructed to 2 x 3.5m through lanes, 2 x 1.8m temporary on-road bike lanes, and a 4.5m centre raised median to provide access control (Figure 5). 1.5m sidewalks along both sides set back from the roadway curb will also be provided. Interim construction phasing will allow for the installation of sidewalks, street lighting, municipal services, and utilities in the ultimate location as well as appropriate maintenance of traffic during construction and flexibility in timing and construction of the proposed roundabouts. The centre median would serve as a safety buffer between opposing lanes, however temporary breaks in the median will be provided to allow emergency vehicles the ability to turn around under the interim condition. The interim right-of-way of Bostwick Road will span 36.0m to protect for the ultimate configuration.

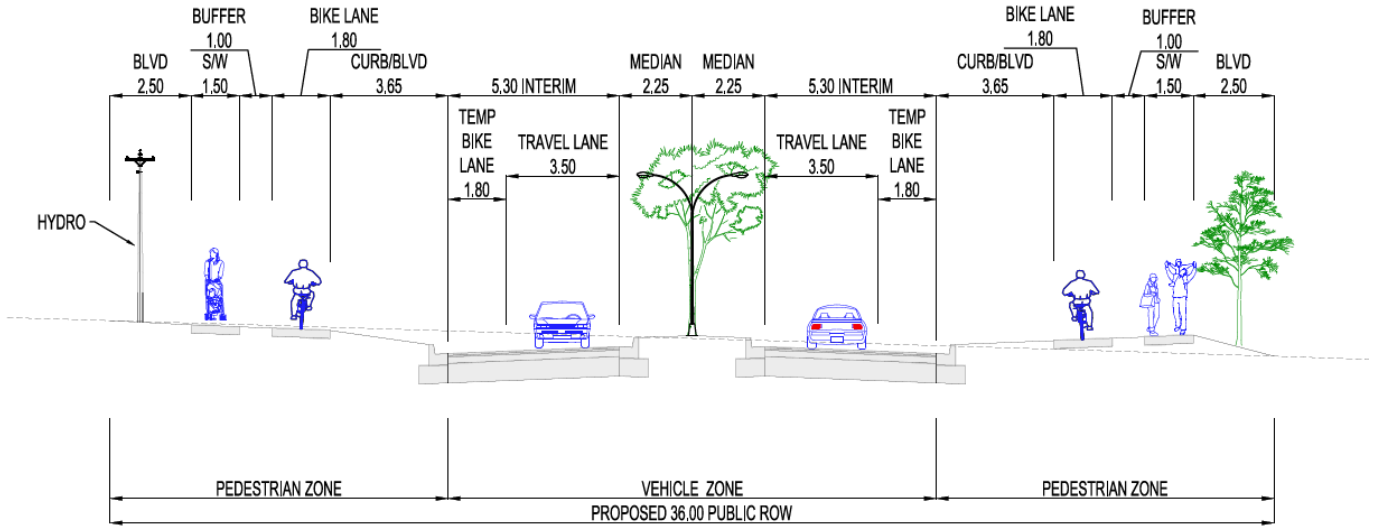


Figure 5: Bostwick Road, Interim Configuration (Stage 1)

In its ultimate configuration the typical cross section developed for Bostwick Road includes 2 x 3.3m through lanes, 2 x 3.5m curb lanes, a 4.5m centre raised median, 1.8m buffered off-road bike lanes, and 1.5m sidewalks separated from the roadway curb via a 1.7m vegetated boulevards on both sides (Figure 6). If Bostwick Road is to be implemented in one stage, this ultimate configuration would be constructed.

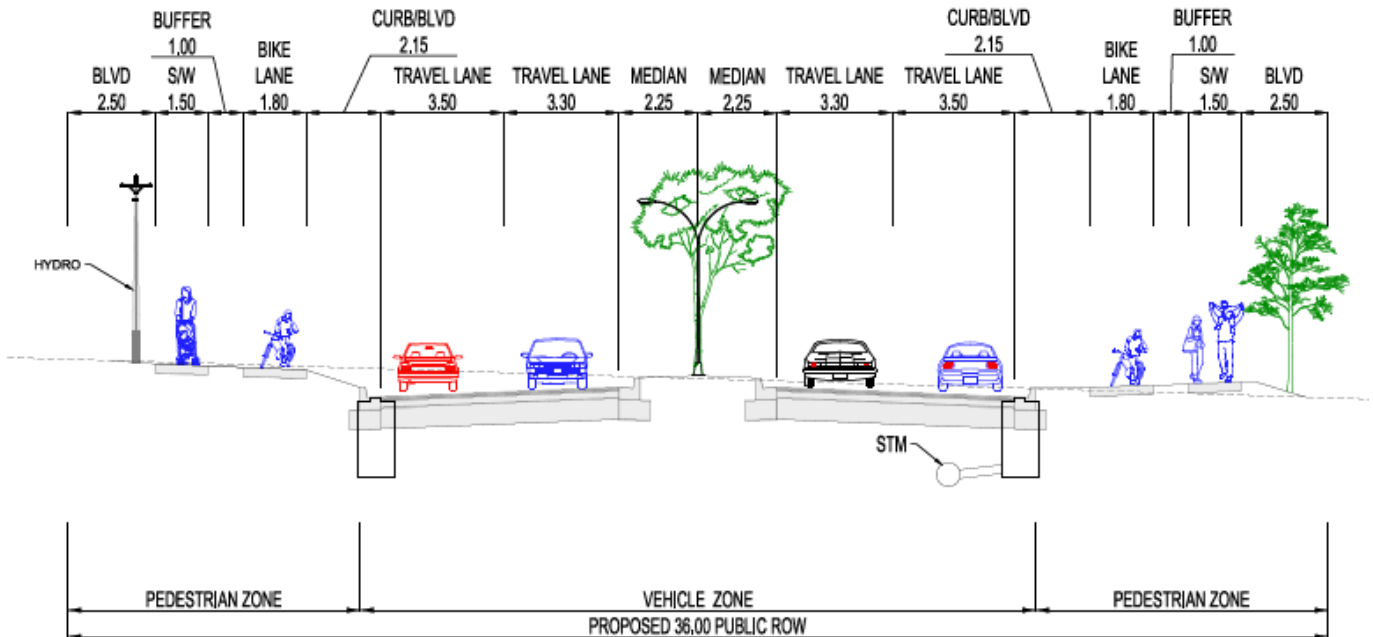


Figure 6: Bostwick Road, Ultimate Configuration (Stage 2)

Bradley Avenue

While the Bradley Avenue EA recommended its own cross section options, the preferred design concepts were revised according to the City’s Complete Streets Manual. Major differences include lane widths, and the location of bike lanes. Bradley Avenue could be implemented in either one stage or two stages (interim and ultimate). If construction is planned for two (2) stages, Bradley Avenue will be constructed as a two-lane roadway (interim) and ultimately to four lanes. In the interim (Stage 1), the Bradley Avenue extension is to be constructed with an urban cross section to accommodate stormwater drainage and includes 2 x 3.5m through lanes, 2 x 1.8m temporary on-road bike lane, and a centre raised median to provide access control and 1.5m sidewalks and 1.8m buffered off-road bike lanes on both sides (Figure 7).

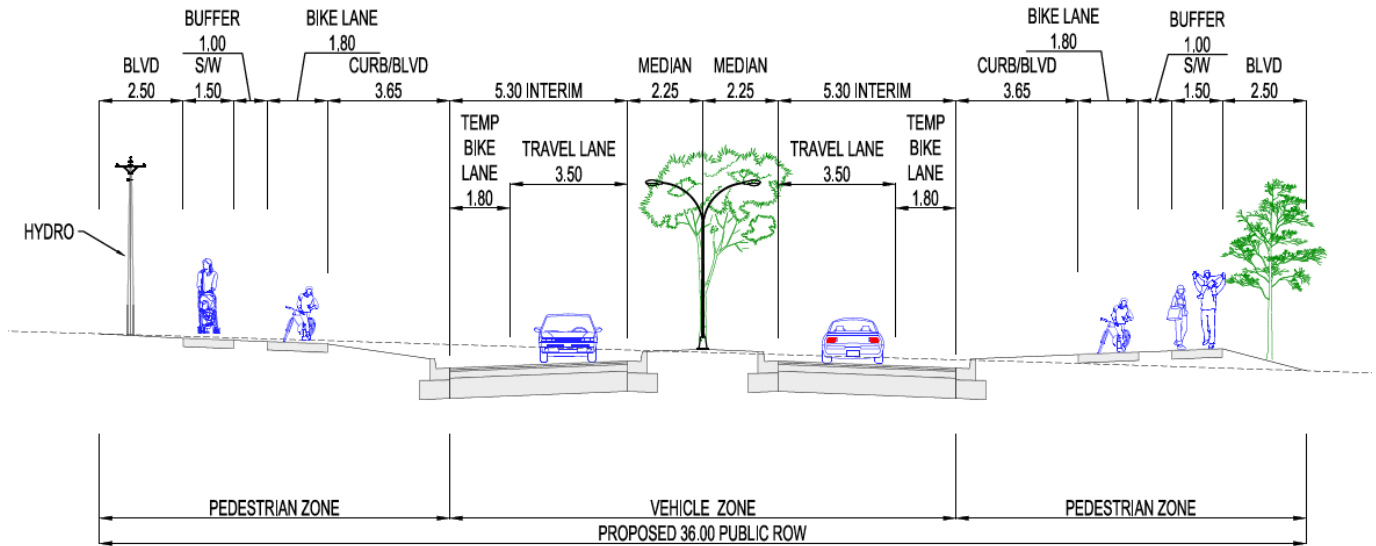


Figure 7: Bradley Avenue, Interim Configuration (Stage 1)

In Stage 2, Bradley Avenue is to be reconstructed to 2 x 3.3m through lanes, 2 x 3.5m curb lanes, and a 4.5m raised median with storm sewers and curb and gutter to accommodate stormwater drainage (Figure 8). Pedestrians would be accommodated via 1.5m sidewalks. Cyclists would be accommodated via 1.8m buffered off-road bike lanes. If Bradley Avenue is to be implemented in one stage, this ultimate configuration would be constructed.

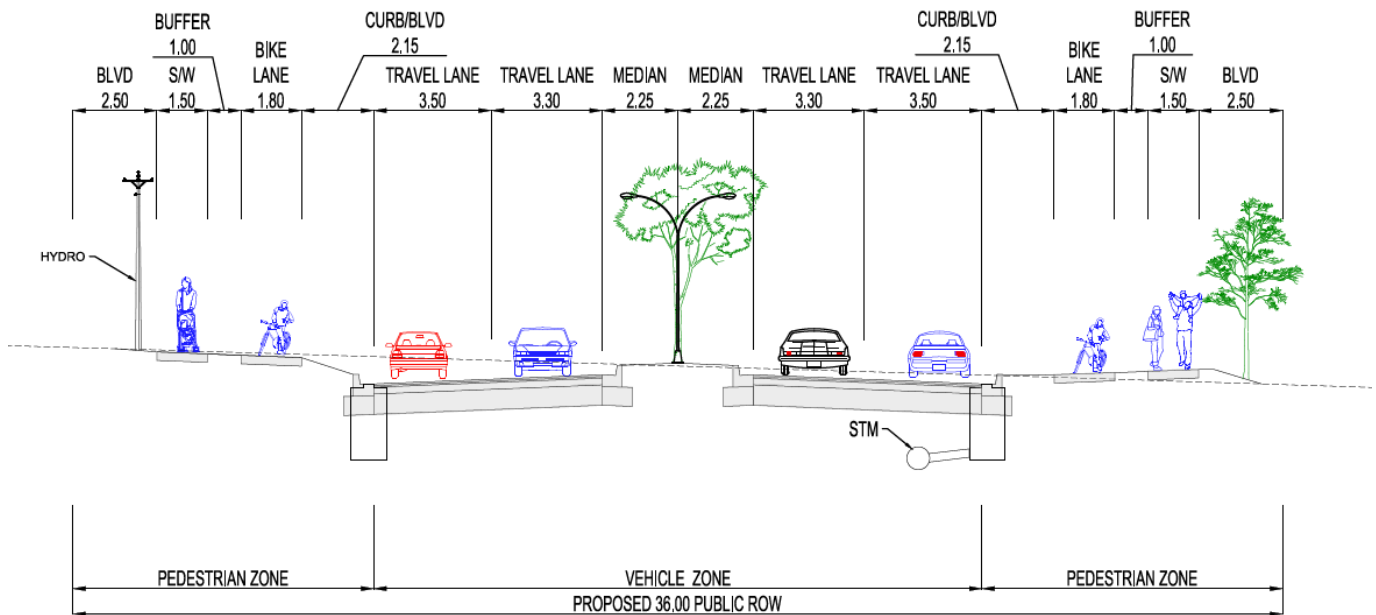


Figure 8: Bradley Avenue, Ultimate Configuration (Stage 2)

Kilbourne Road

The future Kilbourne Road is planned as a primary collector (Neighbourhood Connector as per The London Plan) and will be implemented in conjunction with adjacent area land development. Kilbourne Road is to be constructed with 2 x 3.0m through lane and 1.5m sidewalks on both sides, set back from the roadway via vegetated boulevards of varying widths.

Intersection Controls

Within the study area, the Bostwick Road corridor includes two existing intersections (Pack Road / Future Bradley Avenue extension and Wharncliffe Road South / Exeter Road) and three future intersections as identified in the Southwest Area Secondary Plan (SWAP) study. The future intersections include two secondary collectors (neighbourhood connectors) located approximately 500m south and north of the current Pack Road intersection, and the future Kilbourne Road extension further south. The following summarizes the proposed controls at each intersection:

Intersection	Intersection Control Options
Pack Road / Future Bradley Avenue extension	Roundabout
Neighbourhood Connector (north of Pack Rd)	Stop controlled right/in and right-out movement only
Neighbourhood Connector (south of Pack Rd)	Stop controlled right/in and right-out movement only
Kilbourne Road extension	Roundabout
Wharncliffe Road South / Exeter Road	Existing signal controlled, intersection modifications including additional lanes

Drainage and Storm Water Management

Previous reports have recommended proposed stormwater management facility (SWMF) locations and sizes for the future drainage areas within the project. Ultimately, Bostwick Road drainage will be directed to one of these communal SWMFs; four SWMF ponds are applicable to this study: North Lambeth SWMF P1, North Lambert SWMF P2, North Lambeth SWMF P3, and North Lambeth SWMF P4.

New outlets will be required to convey drainage to the future SWMFs adjacent to Thornicroft Drain. While the preliminary SWMF sizing for Ponds P1, P2, P3 and P4 have been completed, the exact location of the outlet connections cannot be determined until the SWMFs are located. In general, roadway drainage will be conveyed to SWMFs P1, P3 and P4 via a sufficiently sized swale or pipe. At this stage, the design of the connecting structure between the roadway and SWMF has not been considered as the future development plan is not fully developed or approved. This will need to be determined in subsequent design phases for this project.

To alleviate roadway runoff that will result as an increase in impervious areas, LID measures were considered and evaluated to ensure the best approach to water quality and quantity management. The pervious pipe system was ultimately recommended and consists of a rectangular trench filled with clean stone and a filter sand layer at the bottom, thereby providing some water quality measure. During detailed design, a hydraulic model is required to ensure the distance between the sewer system and the perforated pipe is sufficient and that the extra rainfall can be conveyed by the sewer system. Therefore, the LID system attenuates roadway runoff volume significantly while providing water quality and quantity measures.

Property Impacts

The City must acquire property (either through negotiations with property owners or dedication through development) in order to construct Bostwick Road, Bradley Avenue and Kilbourne Road in accordance with the preferred plans for realignment and road widening. Where possible, efforts were made during the study to minimize the amount of property required. This will be further refined during Detailed Design, once the total amount of property required has been confirmed. At this point, it is estimated that approximately 11.8 Ha will be required to reconstruct the noted roadways to their ultimate cross sections.

Of note, the proposed realignment of the Bostwick Road corridor will also result in surplus lands previously owned by the City that can be sold to adjacent property owners. It may be an option to relocate the North Lambeth SWMF P3 to these surplus lands to avoid additional property needs.

A summary of the preliminary ultimate property requirements and offsetting surplus property resulting from the proposed recommendations are illustrated in Figure 9.

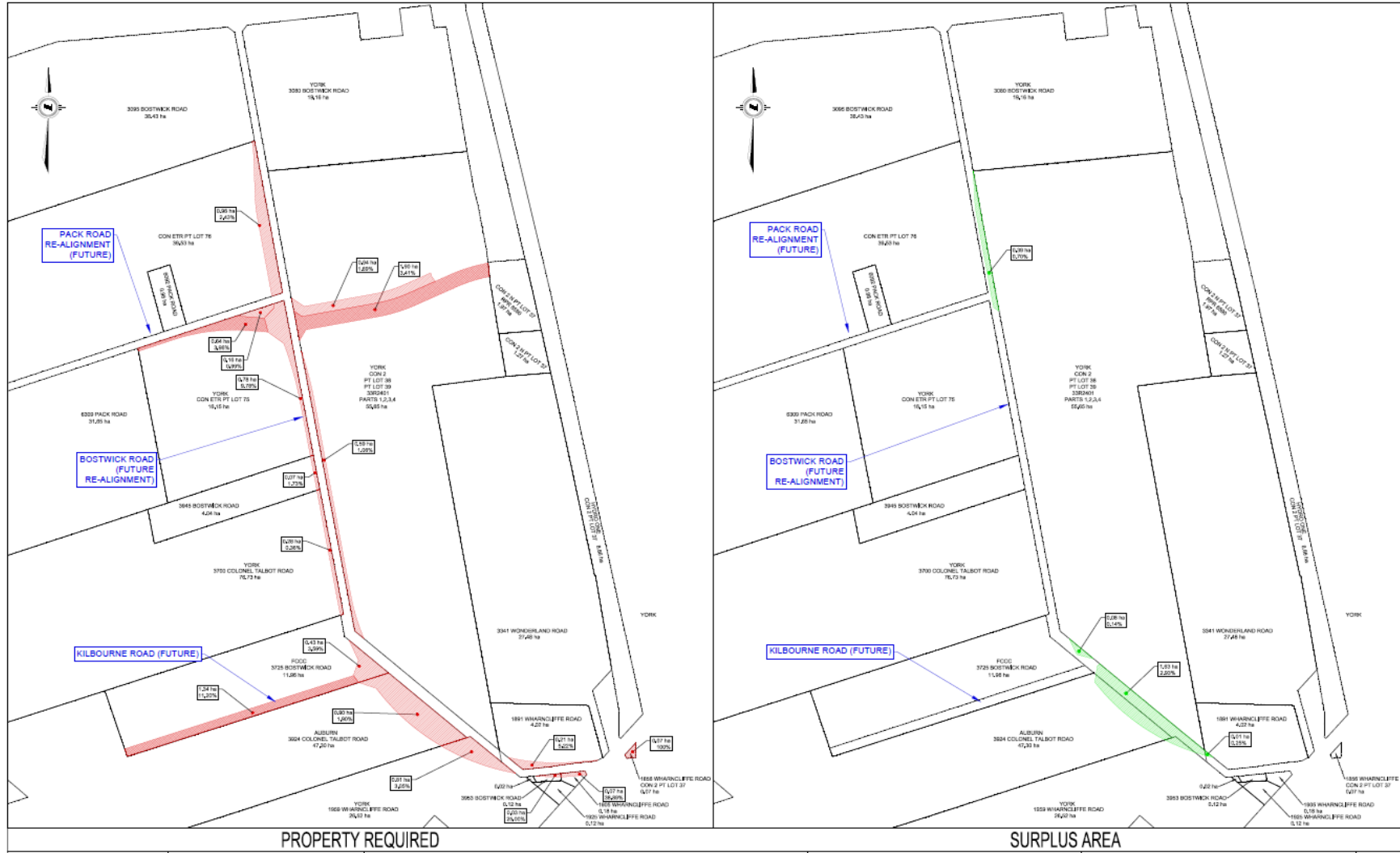


Figure 9: Preliminary Property Requirements and Surplus Lands

PARSONS

Preliminary Construction Cost Estimate

Cost estimates were completed for a two-stage and a one-stage construction approach. Based on the financial analyses for the various implementation scenarios, it is recommended to construct Bostwick Road and Bradley Avenue to the ultimate four-lane configuration as one project each (i.e., one-stage approach) since the majority of the estimated cost for both roads occurs during the interim phase if these roads are constructed in two phases.

For a one stage construction approach, the cost estimates to construct Bostwick Road and Bradley Avenue in their ultimate configurations under one project each are \$18,128,400 and \$7,899,750, respectively. The breakdown of the cost estimate is shown below.

Bostwick Road – Ultimate Construction as One Project (2026)

Item	Estimated Cost (\$)
Road Widening Cost Estimates	
Roadworks and Earthworks	3,700,000
Storm Sewers	3,300,000
Traffic Signals and Illumination	850,000
Miscellaneous	650,000
Utility Relocation (10%)	988,000
Sub-total	9,488,000
Engineering and Consulting (15%)	1,423,200
Contingency (15%)	1,423,200
Property Acquisition*	4,000,000
Total Preliminary Cost Estimate	16,334,400
Lifecycle Renewal Cost Estimate	
Sanitary Sewers	690,000
Watermain	690,000
Sub-total	1,380,000
Engineering and Consulting (15%)	207,000
Contingency (20%)	207,000
Total Preliminary Cost Estimate	1,794,000

Bradley Avenue – Ultimate Construction as One Project (2028)

Item	Estimated Cost (\$)
Road Widening Cost Estimates	
Roadworks and Earthworks	2,350,000
Storm Sewers	800,000
Traffic Signals and Illumination	500,000
Miscellaneous	375,000
Utility Relocation (10%)	482,500
Sub-total	4,507,500
Engineering and Consulting (15%)	676,125
Contingency (20%)	676,125
Property Acquisition*	1,000,000
Total Preliminary Cost Estimate	6,859,750
Lifecycle Renewal Cost Estimate	
Sanitary Sewers	400,000
Watermain	400,000
Sub-total	800,000
Engineering and Consulting (15%)	120,000
Contingency (20%)	120,000
Total Preliminary Cost Estimate	1,040,000

Environmental Impacts and Mitigation

Impacts to the natural, socio-economic and cultural environments were considered through the evaluation process and mitigation measures were developed to address potential impacts.

Transportation

Temporary construction-related impacts to traffic flow on Bostwick Road and emergency services routes. A construction staging plan / traffic management plan will be developed to minimize impacts to traffic and EMS providers will continue to be contacted in future phases, particularly prior to construction.

Property

Property is needed to accommodate for realignment, widening and proposed improvements either via negotiations with property owners or through land dedication through development. It is estimated that approximately 11.8 Ha will be required to construct the roadways to their ultimate cross section. The realignment of Bostwick Road will result in surplus lands that can be sold to adjacent property owners or used for LID measures. Some land may also be used to relocate the North Lambeth SWMF Pond 3 to avoid additional property needs.

Bradley Avenue passes across a Hydro One corridor on the east end of the study area. The City will need to coordinate with Hydro One on the transfer of land to the City for the road right of way.

Access to property may also be temporarily restricted during construction. Notice will be given to those affected and efforts will be made to reduce the length of time that access is impacted.

Noise and Air Quality

No noise and air impacts are expected in the long term. Temporary impacts are likely to occur during construction and specific mitigation measures should be included into the construction contract.

Natural Environment

The alignment of Bostwick Road avoids most key environmental features and thus the chances of rare species impacts will be minimized. Nonetheless, impacts to vegetation will be confirmed in detail design and a compensation plan should be prepared. Wildlife movement and connectivity may become restricted once the alignments are constructed, thus the new culverts over Thornicroft Drain should be sized to allow for wildlife movement along the banks and the continuity of riparian habitat.

The study and design incorporate environmental buffers to protect sensitive ecological areas and designated lands. The buffer requirements are consistent with the City's policy and council approved guidelines (e.g., Environmental Management Guidelines). While these buffers were developed as a requirement of the EA, these buffers are not binding and may be reviewed and potentially refined during subsequent EISs undertaken as part of future developments.

Cultural Heritage / Archaeology

There may be some potential impacts to the driveways or accesses of properties of cultural heritage value. A Cultural Heritage Assessment will need to be completed in detail design to confirm the impacts and appropriate mitigation measures.

A Stage 2 Archaeological Assessment (AA) will be completed in detail design, when the City owns the land impacted by the realignment.

Future Commitments

Additional works that are required to be completed during the detail design phase of the project, prior to construction, are identified below.

Transportation/Technical Requirements

- Develop a traffic management plan to maintain vehicular access during construction.
- Confirm intersection configuration at Wharncliffe Road and Bostwick Road, particularly the need for double westbound left turn lanes.
- Undertake a roundabout operational analysis to verify performance and geometry for design parameters including fastest path, deflections, entry angle, speed differentials, sight distances etc.
- Confirm location and depths of utilities for impacts and relocation requirements. Consult with utility agencies regarding their regulations and requirements should additional approvals be required (e.g. Hydro One, Infrastructure Ontario).
- Coordinate with Hydro One on the transfer of land for the road right of way and also the completion of the MOI Class EA process.
- Liaise with London Transit Commission to ensure accommodation of future transit service on Bostwick Road and Bradley Avenue.

Drainage/Stormwater Management

- Finalize proposed stormwater outlet locations and servicing, particularly regarding work around Wharnclyffe Road and the crossing of Bostwick Road over the Thornicroft Drain.
- Undertake the necessary property acquisitions for the proposed stormwater management facilities (SWMF) in conjunction with proposed development plans or with any City initiated SWM project within the project area.
- Consider relocation of the North Lambeth SWMF P3 to optimize use of surplus lands.
- Complete the environmental assessment and design of the proposed SWMFs.
- Create a dual drainage hydraulic model including LID systems to confirm the connections between the sewer system and perforated pipe, backwater effects and distance between the leads of sewer system and perforated pipe.
- Detailed design of the trunk storm sewers should be coordinated with the SWMF design.
- Confirm proposed culvert sizes for the crossing of Thornicroft Drain and resulting 250-year flood levels. Confirm outlets, trunk storm sewer, LID and OGS design and location based on SWMFs.
- Confirm/adjust elevation of Bostwick Road to accommodate the confirmed 250-year flood levels to prevent overtopping the road.
- Ensure that adequate drainage for 3645 Bostwick Road be included as part of the detailed design for any reconstruction of Bostwick Road. Should the reconstruction of Bostwick Road be delayed, it is recommended that the City alleviate this situation on an interim, maintenance basis.

Socio-Economic Requirements

- Complete detailed property requirements and begin negotiations with affected property owners to purchase property required to implement the preferred design.
- Develop a landscaping plan for Bostwick Road and Bradley Avenue that includes aesthetic features such as roadside trees and vegetative plantings.
- Investigate the potential rezoning of the land use adjacent to the Bradley Avenue corridor to compensate for the loss of developable land.

Natural Environment Requirements

- Clearly define the vegetation removal areas and conduct a floral inventory in those areas to confirm the absence of Butternut and quantify the species being removed.
- Prepare a tree preservation plan to ensure the health of retained vegetation.
- Prepare a post-construction restoration/landscaping plan to compensate for removed vegetation and enhance buffer areas using native species.
- Consider including wildlife crossing features into Thornicroft Drain culvert design.
- Ensure that construction impact mitigation measures as described in the EIS are incorporated into construction contract documents.
- Prepare a detailed post-construction monitoring plan.

Cultural Heritage Requirements

- Complete a Cultural Heritage Evaluation/Impact Assessment.
- Complete a Stage 2 Archaeological Assessment.

Permits and Approvals

The applicable permits and approvals for this study include:

Regulatory Agency	Legislation	Permit/Approval	Comments
Provincial Government			
Ministry of the Environment, Conservation and Parks	Ontario Environmental Assessment Act	Schedule 'C' Class EA (Municipal Engineer's Association Class EA)	Satisfactory completion of EA requirements is a prerequisite for obtaining most other approvals. Will be required for the design of the proposed SWMFs.
	Ontario Water Resources Act	Permit to Take Water	Required if >50,000 L/d of surface or groundwater taken, includes temporary dewatering during construction
	Environmental Protection Act	Environmental Compliance Approval	Required prior to construction to ensure that the proposed works comply with MECP guidelines for the design of sanitary sewage systems, storm sewer systems and/or water systems
Ministry of Natural Resources and Forestry	Fish and Wildlife Conservation Act	License to Collect Fish for Scientific Purposes	Any area of streambed that will be accessed by industrial equipment will be isolated from the open waterbody, and any fish confined within the sequestered area will be rescued and relocated by a qualified biologist, under a License to Collect Fish for Scientific Purposes issued by the MNRF. This fish salvage will be completed prior to dewatering in order to prevent suffocation and mechanical harm.

Upper Thames River Conservation Authority	Development, Interference with Wetlands and Alterations to Shorelines and Watercourses regulation	Permit under ON. Reg. 157/06	Applies to areas along Thornicroft Drain and one of its tributaries near the northern project limits. Under this regulation, any development, site alteration, construction, or placement of fill within the regulated area requires a permit from UTRCA, as does interference with a wetland or any alteration to an existing watercourse channel.
Ministry of Infrastructure	Ontario Environmental Assessment Act	Category "B" Class EA Process for Realty Activities Other Than Electricity Projects (Approved 2004, Amended September 11, 2008)	Lands managed by Hydro One, on behalf of Infrastructure Ontario, are located within the study area. The purchase of IO-managed lands or disposal of rights and responsibilities (e.g. easement) for IO-managed lands triggers the application of the MOI Class EA.
Local Governments			
City of London	Noise Control By-Law	Exemption	Required to allow construction works outside of normal hours (9 pm to 7 am) and on weekends.
	Tree Bylaw	Permit	Required to remove trees on town-owned property (i.e. within road right-of-way).