CARP ROAD WIDENING ENVIRONMENTAL ASSESSMENT STUDY
HWY 417 TO HAZELDEAN ROAD

ENVIRONMENTAL STUDY REPORT

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Overview

Carp Road is designated in the Official Plan (OP) as an Arterial Road. The City of Ottawa's Transportation Master Plan (TMP 2013) also identifies Carp Road as a spine route and part of the city wide Cycling Network . Although the OP identifies a right-of-way protection of 37.5 metres for Carp Road within the project limits (Figure Ex-1) to provide for a four-lane urban divided roadway, with cycling lanes, sidewalks, and green boulevards, the existing right-of-way along the corridor generally varies between 22 metres to 30 metres with the exception of a wider right-of-way north of Westbrook Road and near Hazeldean Road intersection.

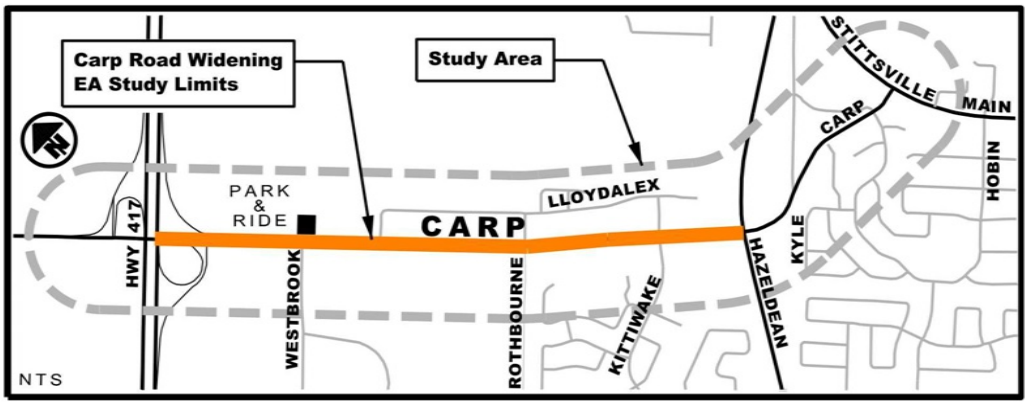


Figure Ex-1: Carp Road Study Area

The City's Transportation Master Plan (TMP) identifies widening of Carp Road from two to four lanes between Highway 417 and Hazeldean Road (approximately two kilometres long), as a Phase 2 (2020-2025) project. This Environmental Assessment (EA) study is completed in accordance with the Municipal Class EA Schedule "C" process to establish a recommended plan for the widening of Carp Road and to identify the right-of-way requirements to guide future developments along the corridor.

Project Need and Opportunities

The community of Stittsville is estimated to grow from its current population of 27,000 to an estimated 70,000 by the year 2031. As Carp Road offers the most direct route to Highway 417 for the communities of Stittsville, it has the potential to draw additional traffic along the corridor.

Based on the planned development in the Stittsville area, approximately 2,600 and 3,800 'new' two-way vehicle trips are projected on Carp Road during the weekday AM and PM peak hours, respectively. Given the projected peak hour volumes, widening of Carp Road from two lanes to four lanes is needed. Additionally, there are traffic movement and safety considerations that warrant the need to improve traffic operations on Carp Road that can be best addressed with a four-lane roadway. There is also an opportunity to provide infrastructure for active modes of transportation (pedestrian and cycling facilities) on Carp Road in accordance with the current policy direction of the City's OP and TMP. The widening also allows for improvements to the visual environment and functionality of Carp Road to provide a pleasant entrance to Stittsville.

Existing Conditions

Within the study area, Carp Road is primarily a two-lane rural road without sidewalks and bike lanes. The exception is the section from Kittiwake Drive to Hazeldean Road where the road widens with turning lanes and a merging lane, and includes a sidewalk and on-road bike lane on the west side, and a short section of sidewalk on the east side near the Hazeldean intersection. Recent traffic counts show peak hour volumes of 500 veh/h (non-peak direction) to 1,200 veh/h (peak direction

southbound), and annual average daily traffic (AADT) levels of up to 16,000 vehicles between Highway 417 and Hazeldean Road.

Between Westbrook Road and Hazeldean Road, the existing right-of-way varies from 22 metres to 30 metres. North of Westbrook Road it varies from 31 to 37 metres. Many of the lots fronting Carp Road within the project limits are small and relatively shallow with direct access to Carp Road. Many of these buildings are former residences that have been re-purposed for commercial and service uses, where access and parking are important to their functionality. As such, minimizing the impacts on private property was an important consideration in the development of the Recommended Plan.
As per the City's Official Plan, Carp Road between Highway 417 and Rothbourne Road is designated as Carp Road Corridor Rural Employment Area, allowing for a diverse range of employment and industrial opportunities in the area.

Alternative Solutions

The EA process identified the broadest possible range of potential solutions which were subjected to a screening process based on their ability to fulfill the needs and opportunities of this EA Study. Of these potential solutions, only three (3) alternative solutions were considered for further evaluation. These include 1) Do Nothing, 2) Two Lane Carp Road Renewal with new Parallel Road, and 3) Four Lane Carp Road Renewal. Following is a description of these alternatives:

Although transit activity within the corridor is very low, both road alternatives also allow for improved bus service along the corridor.

1) *Do Nothing* scenario served as a baseline for comparison.

2) *Two Lane Carp Road Renewal with New 1.8 kilometre Parallel Road:* This alternative involves renewing Carp Road as a two lane urban road together with the construction of a new 1.8-kilometre long parallel two-lane urban road to the east of Carp Road on vacant lands to function either as an Arterial Road or a Major Collector Road.

3) *Four Lane Road Renewal:* This alternative involves renewing Carp Road as a new four lane urban road, with two lanes in each direction, plus turn lanes where appropriate.

The major features of both solutions include:

- An urban cross-section;
- Sidewalks and cycling facilities;
- Streetscaping elements.
- Turning lanes at intersections and major entrances; and,
- Localized intersection/mid-block operational improvements.

The evaluation criteria to analyze and evaluate the suitability of each alterative solution comprised of five broad categories: transportation, social, natural, physical, and economic. The evaluation criteria were developed by the study team and discussed with study stakeholders during consultation group meetings.

The Four-Lane Road Renewal option was ranked highest overall, and was identified as the Preferred Solution.

Alternative Designs

Six alternatives designs were developed for the Preferred Solution (widening of Carp Road to four lanes) with variations on intersection treatment, cycling facility and means for lane separation. These included:

- Alternative Design #1: Signalized Intersections, On-road Cycling Facility, Central Two-Way Left Turn Lane;
- Alternative Design #2: Signalized Intersections, Off-road Cycling Facility, Central Two-Way Left Turn Lane;
- Alternative Design #3: Roundabouts, On-road Cycling Facility, Narrow Barrier Median;

- Alternative Design #4: Roundabouts, Off-road Cycling Facility, Narrow Barrier Median;
- Alternative Design #5: Roundabouts, On-road Cycling Facility, Wide Barrier Median; and
- Alternative Design #6: Roundabouts, Off-road Cycling Facility, Wide Barrier Median.

Common to each of the alternative designs were the following elements:

- A boulevard area to accommodate snow storage, landscaping and overhead utilities (i.e. street lights and utility poles);
- The signalization of the Hazeldean Road/Carp Road intersection;
- A constant vehicle lane arrangement and access restrictions within the MTO corridor management limits (north of Westbrook Road); and
- An additional southbound left turn lane at Hazeldean/Carp Roads intersection.

Evaluation Results

The evaluation criteria were grouped into three broad categories including Socio-Economic Environment, Transportation Environment and Biophysical Environment. An evaluation matrix was established in consultation with study stakeholders. Each of the six alternatives was evaluated based on how it performed in meeting each individual indicator. The results are documented in Section 5 of the ESR.

While the roundabout option has some advantages, its footprint is comparatively much larger than the signalized intersection option. This would mean a much greater impact on adjacent properties including the effects on the function of some lots, the potential impact on private on-site waste water systems at some locations, and a less direct crossing for cyclists. Furthermore, the cost of the roundabout option did not fit into the affordability envelope identified in the TMP for this project. Therefore, based on the evaluation results, public feedback, importance of multi-directional access to businesses along the corridor and consideration for project affordability, the study team recommended signalized intersections (alternative design #2) as the Preferred Design, thus providing the basis for developing the Recommended Plan for the project.

Summary of Study Recommendations

The Recommended Plan for widening of Carp Road (Highway 417 to Hazeldean Road) includes two vehicular lanes in each direction; a central two-way left turn lane at intermittent locations; and signalized intersections. Walking and cycling facilities are generally provided as a three-metre wide multi-use pathway on both sides of the road between Westbrook Road and Hazeldean Road. However, at about 120 metres south of Kittiwake Drive, the multi-use pathway on the west side converts into a sidewalk and an on-road cycling lane which connects to the existing cycle lane south of the Carp/Hazeldean Roads intersection. Furthermore, north of Westbrook Road, the multi- use pathway is provided on the west side only which converts into a sidewalk facility north of Highway 417 eastbound off-ramp. This connects to the existing west side only sidewalk on the Carp Road Bridge over the highway. On the east side, north of Westbrook Road, cycling is provided as a shared-use lane. The recommended design is consistent with the modifications undertaken by the Ministry of Transportation (MTO) in 2014 at the Highway 417/Carp Road interchange allowing for one northbound and two southbound lanes over the Carp Road overpass.

Project Staging

The EA study also recommends a two-phased implementation plan: an affordable plan which conforms to the project's budget envelope identified in the TMP, and an Ultimate Plan (post 2031) which includes additional measures such as double southbound through and eastbound left-turn lanes at the Carp/Hazeldean Roads intersection to meet long-term travel demand needs. It should be noted that in the interim, the Affordable Plan will provide adequate intersection performance at this location. The main features of the road widening are summarized in the recommended functional plan section of this report. The functional design drawings of the affordable plan and the ultimate plan are shown in Appendices E and F.

Property Requirements

The recommended affordable plan requires additional right-of-way from approximately 55 individual properties along the corridor. The property requirements are typically less than four-metre strips with larger requirements in the vicinity of intersections. The ultimate plan also requires minor land acquisition from one property on the west side of Carp Road in the south-west quadrant of Carp/Hazeldean Road intersection. The proposed property requirements are illustrated on the recommended plan drawings, attached in Appendices E and F.

Financial Implications

The estimate (Class C) to design and construct the Affordable Plan is $18 million in 2015 dollars. This estimate includes detailed design, property acquisition, construction, project management, as well as contingency allocations. The estimate (Class C) to design and implement the additional measures identified in the Ultimate Plan is $1.2 million, in 2015 dollars.

Public Consultation/Input

The study benefitted from the review and feedback of participants from approval agencies, and stakeholder groups within the study area, including community associations, property owners, businesses, and the Carp Road Business Improvement Area. There were five rounds of consultation group meetings, and four public open houses. Separate meetings were also arranged with individuals and small groups to discuss specific project details. A project website (www.ottawa.ca/carproad) was established to share information on the study's progress.

Issues that arose during consultation include: access to/from properties abutting the corridor; impact on properties; central two-way left turn lane versus median; signalized intersections versus roundabout design; cycling infrastructure; construction timing; noise; vibration; and environmental impacts of the facility. These issues were worked through during the course of the study, resulting in the recommended plan. Additionally, there were comments pertaining to the provision of sanitary services to this area. The road widening project presents an opportunity to coordinate the pipe installation at the same time; however, its funding will need to be identified separately through the Infrastructure Master Plan (IMP) budget.

Résumé

Le Plan officiel (PO) désigne le chemin Carp comme une artère à infrastructure cyclable intégrée. Bien que le PO établisse une protection d'emprise de 37,5 m pour la portion du chemin Carp visée par le projet afin qu'y soit aménagée une route urbaine àchaussées séparées de quatre voies comportant des voies réservées aux cyclistes, des trottoirs et des terre-pleins paysagés, la largeur de l'emprise actuelle varie entre 22 et 30 m (à l'exception d'une portion du couloir au nord du chemin Westbrook et à proximité de l'intersection du chemin Hazeldean, où l'emprise est plus large).

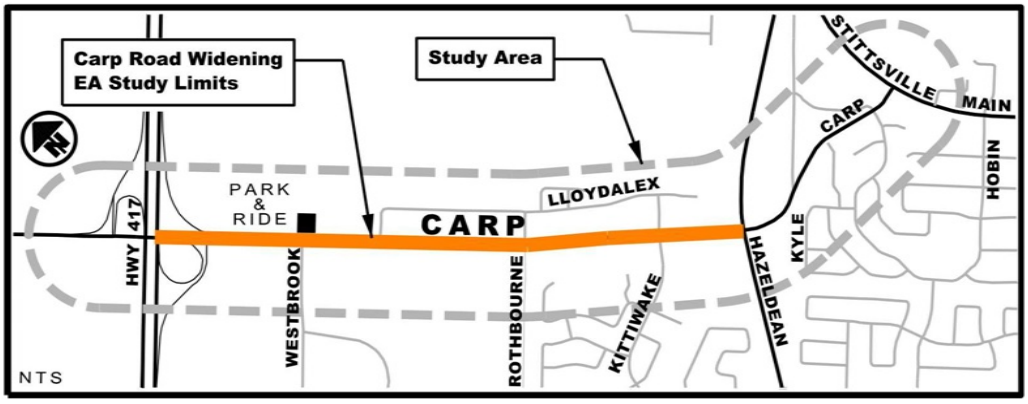


Figure Ex-1: le secteur visé par l'étude

Le *Plan directeur des transports* de la Ville (PDT) soulève le besoin d'élargir le chemin Carp (de deux à quatre voies) sur environ 2 km entre l'autoroute 417 et le chemin Hazeldean dans le cadre de la phase 2 (2020-2025). L'étude d'évaluation environnementale (EE) permettra d'établir un plan recommandé pour l'élargissement du chemin Carp et de déterminer les exigences en matière d'emprise afin de guider les futurs aménagements sur ce couloir.

Énoncé des besoins et possibilités du projet

D'après les estimations, la communauté de Stittsville devrait voir sa population passer de 27 000 habitants aujourd'hui à environ 70 000 habitants d'ici 2031. Offrant aux collectivités de Stittsville l'itinéraire le plus direct vers l'autoroute 417, le chemin Carp pourrait attirer davantage de véhicules le long du couloir.

Selon l'aménagement prévu dans le secteur de Stittsville, environ 2 600 à 3 800 nouveaux trajets de véhicules dans les deux sens sont projetés sur le chemin Carp aux heures de pointe du matin et de l'après-midi, respectivement. Si l'on s'en tient aux projections des heures de pointe, l'élargissement de deux à quatre voies du chemin Carp est nécessaire. En outre, certains problèmes liés à la circulation et à la sécurité, que seule une chaussée à quatre voies permettrait de régler, justifient la nécessité d'améliorer la circulation routière sur le chemin Carp. Il est également possible d'aménager des infrastructures pour les modes de transport actifs (installations piétonnières et cyclables) sur le chemin Carp, conformément à la direction politique du Plan officiel (PO) de la Ville et du PDT en vigueur. L'élargissement permet également d'améliorer l'esthétique et la fonctionnalité du chemin Carp pour doter Stittsville d'un point d'entrée agréable.

Conditions actuelles

Dans le secteur visé par l'étude, le chemin Carp constitue essentiellement une route rurale à deux voies, dépourvue de trottoirs et de voies cyclables, à l'exception de la section entre la promenade Kittiwake et le chemin Hazeldean, où la route, qui a été élargie grâce à des voies de virage et à une voie convergente, comprend un trottoir et une bande cyclable sur route du côté ouest, et une petite section de trottoir sur le côté est, près de l'intersection Hazeldean. Le dernier comptage des véhicules aux heures de pointe indique des volumes oscillant entre 500 véhicules/h (sens le moins sollicité à l'heure de

pointe) et 1 200 véhicules/h (en direction sud à l'heure de pointe), et un débit journalier moyen annuel pouvant atteindre 16 000 véhicules entre l'autoroute 417 et le chemin Hazeldean.

Les emprises en place varient entre 22 et 30 mètres entre le chemin Westbrook et le chemin Hazeldean, et entre 31 et 37 mètres, au nord du chemin Westbrook. Un grand nombre de lots donnant sur le chemin Carp et situés dans les limites du projet sont petits, relativement peu profonds et ont un accès direct au chemin Carp. La plupart des bâtiments sont d'anciennes résidences dont les utilisations ont été modifiées à des fins commerciales et de service et dont le fonctionnement est tributaire de l'accès et du stationnement. À ce titre, minimiser les répercussions sur les propriétés privées revêtait une grande importance dans l'élaboration du Plan recommandé.

Conformément au Plan officiel de la Ville, le chemin Carp entre l'autoroute 417 et le chemin Rothbourne est désigné Zone rurale d'emploi du corridor routier de Carp, et offre à ce titre un large éventail de possibilités d'emplois et de débouchés industriels dans le secteur.

Solutions de rechange

Le processus d'évaluation environnementale a permis de déterminer un vaste éventail de solutions possibles qui ont fait l'objet d'un processus de sélection en fonction de leur capacité à satisfaire aux besoins et aux possibilités de cette étude d'ÉE. Parmi ces solutions possibles, seules trois (3) ont été retenues aux fins d'une évaluation plus approfondie. Ces trois solutions sont : 1) ne rien faire, 2) la réfection du chemin Carp en deux voies avec un nouveau chemin parallèle, 3) la réfection du chemin Carp en quatre voies. Vous trouverez ci-dessous une description de ces trois solutions possibles.

Bien qu'il n'y ait pas beaucoup d'activité de transport en commun dans le couloir, ces deux solutions de remplacement permettent également d'améliorer le service d'autobus proposé le long du couloir.

1) Le scénario *Aucune intervention* sert également de comparaison de référence.

2) *La conservation des deux voies et l'aménagement d'une nouvelle route parallèle de 1,8 kilomètre :* Cette solution de rechange prévoit la réfection du chemin Carp sous forme de route urbaine à deux voies et la construction, sur des terrains vacants à l'est du chemin Carp, d'une nouvelle route parallèle à deux voies de 1,8 kilomètre de long qui pourrait remplir la fonction de grande artère ou de route collectrice principale.

3) *Réaménagement en route à quatre voies:* Cette solution de rechange prévoit le réaménagement du chemin Carp en une nouvelle route urbaine à quatre voies, dont deux dans chaque sens, ainsi que des voies de virage, au besoin.

Principales caractéristiques des deux solutions :

- une intersection urbaine;
- des trottoirs et installations cyclables;
- des éléments de paysage de rue;
- des voies de virage aux intersections et entrées principales;
- des améliorations de la circulation à certains intersections /à mi-chemin.

Les critères d'évaluation visant à analyser et à juger la viabilité de chaque solution de rechange comprenaient cinq grandes catégories : transport, social, naturel, physique et économique. Ils ont été élaborés par l'équipe chargée de l'étude et débattus avec les participants à l'étude au cours des réunions des groupes de consultation.

L'option du réaménagement en route à quatre voies a été la solution à privilégier le plus souvent mentionnée.

Autres concepts

Six autres concepts ont été proposés pour la solution privilégiée (élargissement à quatre voies du chemin Carp) avec des variations pour le traitement des intersections, les installations cyclables et les moyens de séparation des voies, telles que :

- Concept no 1 : Carrefours à feux, piste cyclable sur route, voie de virage à gauche aménagée sur la voie centrale à deux voies;
- Concept no 2 : Carrefours à feux, piste cyclable hors route, voie de virage à gauche aménagée sur la voie centrale à deux voies;
- Concept no 3 : Carrefours giratoires, piste cyclable sur route, terre-plein étroit;
- Concept no 4 : Carrefours giratoires, piste cyclable hors route, terre-plein étroit;
- Concept no 5 : Carrefours giratoires, piste cyclable sur route, large terre-plein;
- Concept no 6 : Carrefours giratoires, piste cyclable hors route, large terre-plein;

Éléments communs à tous les concepts de rechange :

- terre-pleins pour entreposer la neige, aménager des éléments paysagers et installer des structures de service aériennes (p.ex., éclairage de rue et poteaux de services publics);
- signalisation à l'intersection entre le chemin Hazeldean et le chemin Carp;
- même aménagement des voies de circulation automobile et restrictions dans les couloirs à accès limité gérés par le ministère des Transports (MTO) (au nord du chemin Westbrook);
- ajout d'une voie de virage à gauche en direction sud à l'intersection entre les chemins Hazeldean et Carp.

Résultats de l'évaluation

Les critères d'évaluation ont été regroupés en trois grandes catégories, soit les environnements socio-économiques, biophysiques et des transports. Une grille d'évaluation a été élaborée en collaboration avec les participants à l'étude. Les six concepts de rechange ont été évalués en fonction du rendement obtenu pour répondre aux exigences de chaque indicateur. Les résultats sont présentés dans la section 5 du Rapport sur l'étude environnementale.

Bien que les carrefours giratoires aient certains avantages, leur empreinte est beaucoup plus grande que celle des intersections signalisées. Ils auraient donc des effets considérablement plus importants sur les propriétés adjacentes (notamment sur la fonction de certains terrains), se répercuteraient éventuellement sur les réseaux d'égout privés à certains emplacements, et rendraient la traversée des cyclistes moins directe. De plus, les coûts des carrefours giratoires ne respectent pas le critère d'abordabilité pour ce projet, comme l'indique le PDT. Par conséquent, en fonction des résultats de l'évaluation, des rétroactions du public, de l'importance de l'accès multidirectionnel aux entreprises situées le long du couloir et de la viabilité financière du projet, l'équipe chargée de l'étude recommande les carrefours à feux (concept no 2) comme conception à privilégier, et fournit ainsi la base qui servira à élaborer le Plan recommandé pour le projet.

Résumé des recommandations de l'étude

Le plan recommandé pour l'élargissement du chemin Carp (entre l'autoroute 417 et le chemin Hazeldean*)* prévoit l'aménagement de deux voies dans chaque direction (nord et sud), d'une voie centrale de virage à gauche à deux sens à certains endroits, d'intersections signalisées, ainsi que d'un sentier polyvalent d'une largeur de 3 m pour les piétons et les cyclistes des deux côtés du tronçon entre le chemin Westbrook et le chemin Hazeldean, sauf à 120 m au sud de la promenade Kittiwake, où le sentier polyvalent du côté ouest se transformera en trottoir et en une voie cyclable reliée à la voie cyclable existante au sud de l'intersection des chemins Carp et Hazeldean. Au nord du chemin Westbrook, un sentier polyvalent sera aménagé du côté ouest seulement et se transformera en trottoir au nord de la bretelle de sortie de l'autoroute 417 en direction est. Il est à noter que le pont du chemin Carp traversant l'autoroute ne comporte actuellement qu'un trottoir du côté ouest. La conception recommandée intègre également les modifications entreprises par le ministère des

Transports (MTO) en 2014 à l'échangeur de l'autoroute 417 et du chemin Carp, qui permettent l'aménagement d'une voie en direction nord et de deux voies en direction sud au-dessus du passage supérieur du chemin Carp.

Étapes du projet

L'étude d'EE permet également de recommander un plan de mise en œuvre en deux étapes : un plan abordable, qui respecte l'enveloppe budgétaire du projet fixée dans le Plan directeur des transports, et un plan idéal, qui comprend des mesures additionnelles (comme l'aménagement de voies de circulation doubles en direction sud et de voies de virage à gauche en direction est à l'intersection des chemins Carp et Hazeldean) pour répondre à la demande en transport à long terme. Il faut souligner qu'entre-temps, la mise en œuvre du plan abordable permettra le fonctionnement adéquat de cette intersection. Les caractéristiques principales de l'élargissement du chemin sont résumées dans la section du présent rapport portant sur le plan de conception fonctionnelle recommandé. Les dessins de conception fonctionnelle du plan abordable et du plan idéal sont présentés en annexe E.

Exigences foncières

Le plan abordable recommandé exige d'acquérir une emprise supplémentaire d'environ 55 propriétés le long du couloir. Les exigences foncières sont habituellement des bandes de moins de quatre mètres qui doivent être élargies à proximité des intersections. Le plan idéal nécessite également l'acquisition d'une petite parcelle d'une propriété du côté ouest du chemin Carp, dans le quadrant sud-ouest de l'intersection des chemins Carp et Hazeldean. Les exigences foncières proposées sont illustrées sur les dessins du plan recommandé fournis en annexe E.

Répercussions financières

Les coûts de conception et de construction du plan abordable sont estimés (catégorie C) à 18 millions en dollars de 2015; l'estimation a été préparée conformément au processus d'examen de la mise en œuvre de projets et d'estimation des coûts de la Ville pour la réalisation des projets d'immobilisations. Les coûts de conception et de mise en œuvre des mesures additionnelles énoncées dans le plan idéal sont estimés (catégorie C) à 1,2 million en dollars de 2014.

Consultation publique et commentaires

L'étude a bénéficié de l'examen et des commentaires des participants d'organismes d'approbation et de groupes d'intervenants du secteur à l'étude, dont des associations communautaires, des propriétaires fonciers, des entreprises et la ZAC du couloir du chemin Carp. Cinq séries de réunions du groupe de consultation ont eu lieu, de même que quatre séances portes ouvertes. Des réunions ont aussi été organisées avec certaines personnes et de petits groupes pour discuter de points précis du projet. Un site Web sur le projet (ottawa.ca/chemincarp) *a* été créé pour renseigner les personnes concernées sur les progrès de l'étude.

Parmi les problèmes soulevés pendant la consultation, citons : l'accès aux propriétés adjacentes au couloir, les répercussions sur les propriétés, l'aménagement d'une voie centrale de virage à gauche dans les deux sens ou d'un terre-plein central, l'aménagement d'intersections signalisées ou de carrefours giratoires, l'infrastructure cycliste, le moment de la construction, le bruit, les vibrations ainsi que les répercussions environnementales du projet. Ces problèmes ont été réglés tout au long de l'étude, ce qui a permis de formuler le plan recommandé. Dans un autre ordre d'idées, des commentaires ont été émis sur la prestation de services sanitaires dans le secteur touché. Il s'agit d'une excellente occasion d'envisager l'installation simultanée des conduites; cependant, le financement d'un tel projet doit être obtenu séparément, à même le budget du Plan directeur de l'infrastructure.

List of Acronyms

µg/m3	micrograms per cubic meter
AADT	Average annual daily traffic
AAQC	Ambient Air Quality Criteria
ACG	Agency Consultation Group
BCG	Business Consultation Group
CDP	Community Design Plan
cm	Centimetre
CO	Carbon Monoxide
dBA	Decibel Unit
DBH	Diameter at Breast Height
dBV	Decibel Units
DR	Development Reserve Zone
EA	Environmental Assessment
ENCG	Environmental Noise Control Guidelines, City of Ottawa
ESR	Environmental Study Report
FSI	Floor Space Index
GWE	Gradient Wind Engineering (formerly GmE, Gradient Microclimate Engineering Inc.)
ha	Hectare
HC	Hydrocarbons
Hwy	Highway
IMP	Infrastructure Management Plan
IMP	Infrastructure Master Plan
in/s	Inch Per Second
ITE	Institute of Transportation Engineers
Km/hr	Kilometres per hour
KWCP	Kanata West Concept Plan
LEQ	Equivalent sound level
LoS	Level of Service
m	Metre
MCEA	Municipal Class Environmental Assessment
MEV	Million Entering Vehicles
mm	Millimetre
mm/s	Millimeters Per Second
MNR	Ministry of Natural Resources (Ontario)
MOE	Ministry of the Environment (now Ministry of the Environment and Climate Change)
MTO	Ministry of Transportation (Ontario)
MVCA	Mississippi Valley Conservation Authority
NHIC	Natural Heritage Information Centre
NOx	Oxides of Nitrogen
OLA	Outdoor Living Areas
OP	Official Plan
PAC	Public Advisory Committee

PCG	Public Consultation Group
pcu	passenger car units
PHF	Peak Hour Factor
PM	Particulate Matter
ppm	Parts Per Million
PPS	Provincial Policy Statement
RC	Rural Commercial Zone
RG	Rural General Industrial Zone
RMS	Root Square Mean
ROW	Right-of-Way
RU	Rural Countryside Zone
SAR	Species at Risk
SWMF	Stormwater Management Facility
SWMF	Stormwater Management Facility
TAC	Technical Advisory Committee
TIA	Traffic Impact Assessment
TMP	Transportation Master Plan
TRANS	Regional Transportation Model
TWLTL	Two-way Left-turn Lane
UNA	Urban Natural Area
UNAEES	Urban Natural Area Environmental Evaluation Study
v/c	Volume to Capacity Ratio
Veh/hr	Vehicle per Hour
VURLS	Vacant Urban Residential Land Survey
ZBL	Zoning By-law

1.0 Introduction

The City of Ottawa has completed an Environmental Assessment (EA) to study the proposed widening of Carp Road from Hazeldean Road to Highway (Hwy) 417 in accordance with the Municipal Class Environmental Assessment (EA) Schedule "C" process. This EA examines a range of alternatives, identify both construction and operational impacts on all aspects of the environment and brings forward a recommended plan detailing mitigation measures, costs and identification of the approvals required to proceed with its implementation. This environmental Study Report (ESR) documents the study activities and results.

1.1 Project Context

Carp Road is a major north-south arterial road in Ottawa travelling south from Fitzroy Harbour, passing through the village of Carp and crossing March Road, Hwy 417 and Hazeldean Road and ending at the intersection of Main Street in Stittsville. It is primarily a two-lane roadway with the exception of dual northbound lanes travelling through the Hazeldean Road intersection and dual southbound lanes between Kittiwake Drive and Hazeldean Road and at the Carp Road/Highway 417 bridge.

Rapid growth in the Stittsville area has increased traffic volumes on Carp Road, particularly between Hazeldean Road and Hwy 417, leading to congestion during the peak periods. New growth in the area includes development on vacant or underutilized lots abutting the corridor, expansion of the developing community east of Carp Road at Rothbourne Road and continued development in the A.G. Reed Industrial Area (at Westbrook Drive).

The City's Transportation Master Plan (TMP, 2013) identifies the widening of Carp Road from two to four lanes between Hwy 417 and Hazeldean Road as a Phase 2 project (2020-2025). While the widening is focused on the 2 km segment between Hwy 417/Carp Road Interchange and Hazeldean Road/Carp Road intersection which are the defined project limits in the Transportation Master Plan (TMP), the study area (Figure 1-1) includes:

- the section of Carp Road south of Hazeldean Road (to Stittsville Main Street) to ensure that downstream effects of the proposed widening are fully addressed and that recent growth in the area is taken into consideration; and
- integration with the Hwy 417 Interchange Ramps on the north and south sides of Hwy 417.

1.2 Environmental Assessment Process

This study has been carried out following the requirements of a Schedule 'C' project under the Municipal Class Environmental Assessment (October 2000, as amended in 2007 & 2011) document. The EA process consists of five phases (Figure 1-2):

- Phase 1: Problem or Opportunity
- Phase 2: Alternative Solutions
- Phase 3: Alternative Designs
- Phase 4: Environmental Study Report
- Phase 5: Implementation

The study is structured so that each phase builds on the previous one and provides greater clarity and support regarding the goals of the project. It is important to note that Phases 1 and 2 were completed through the City of Ottawa's Transportation Master Plan (2013) process. However, the terms of reference of this study include a re-confirmation of the preferred solution for the corridor, being the widening from two to four lanes.

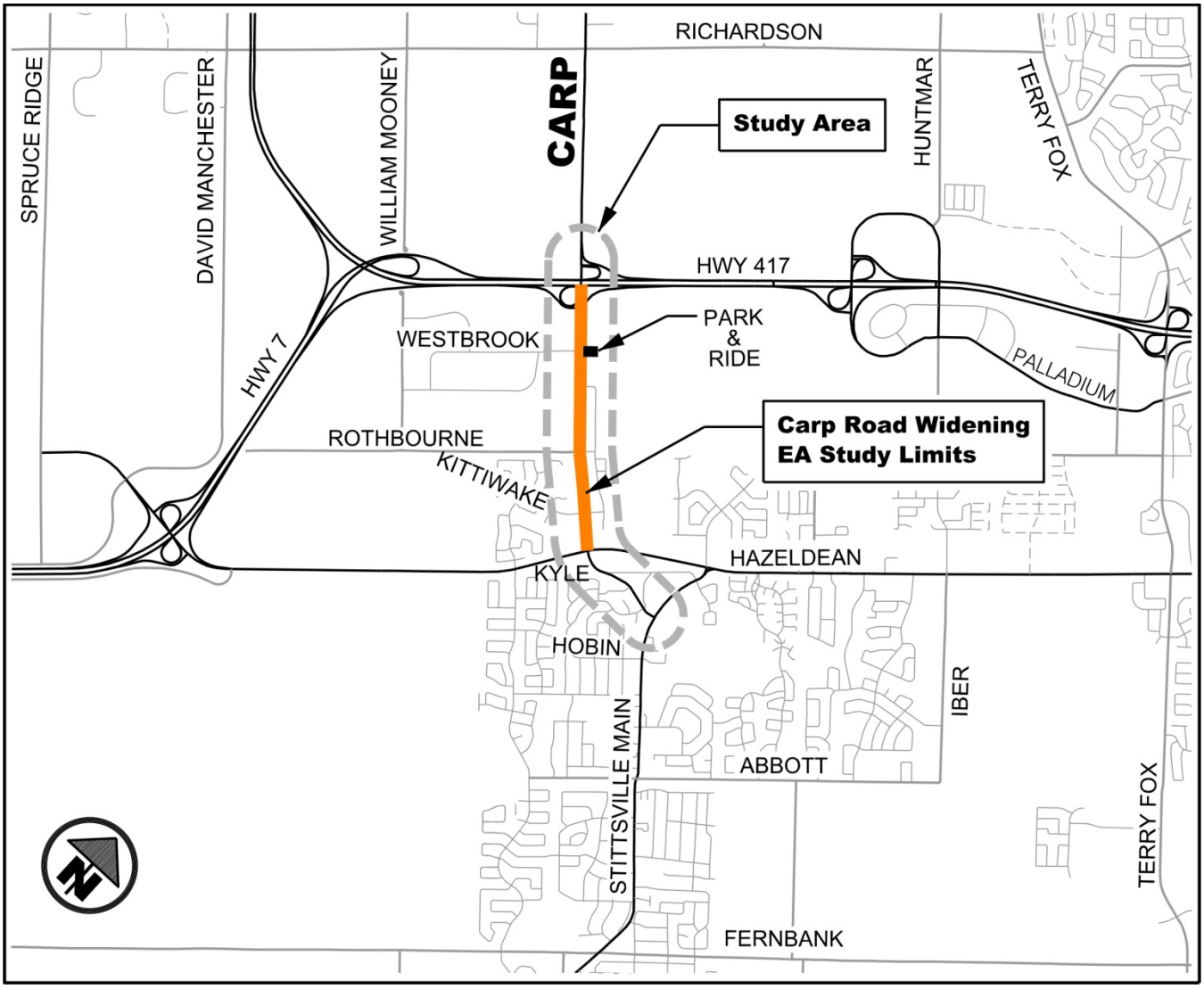


Figure 1-1: Study Area

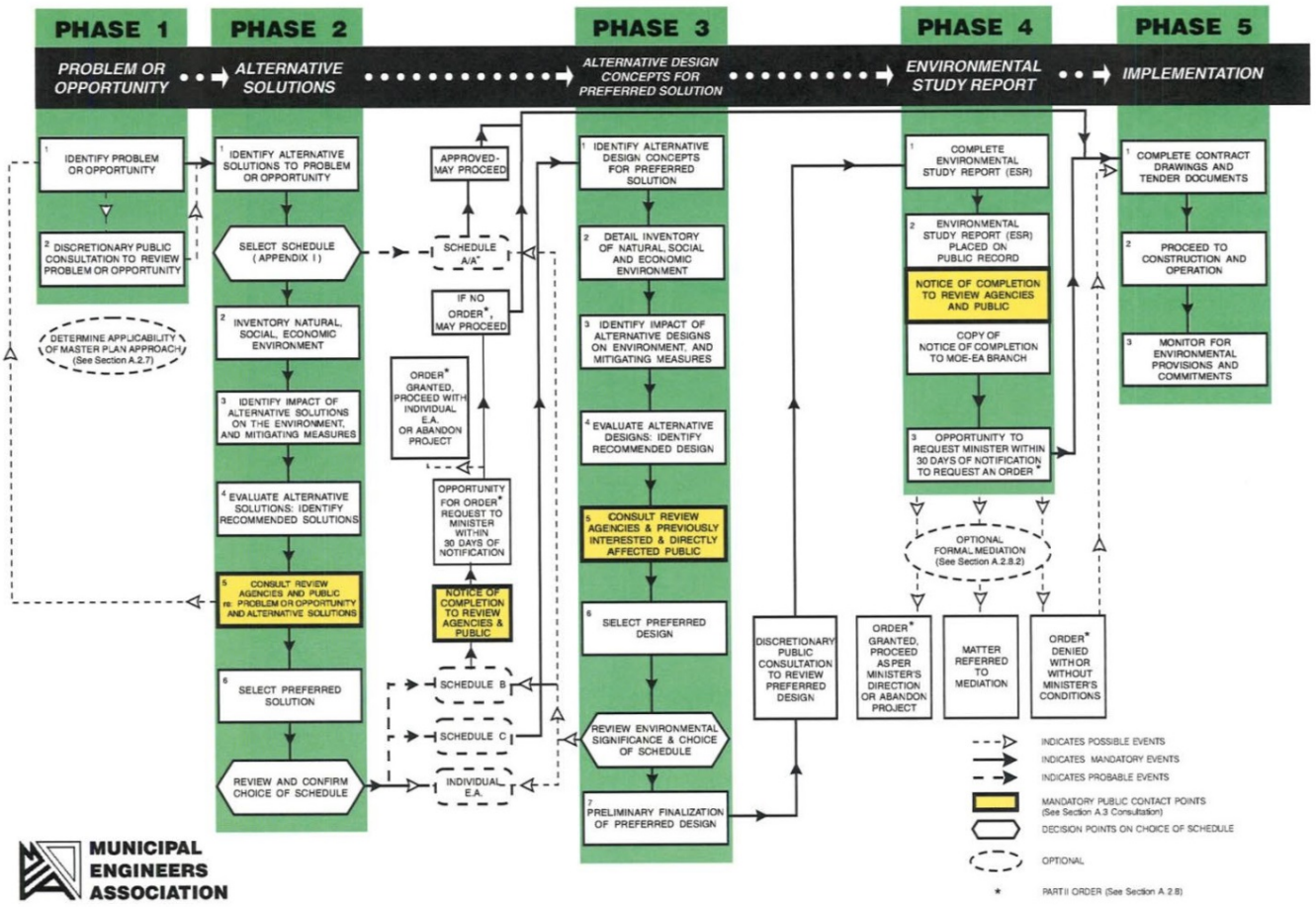


Figure 1-2: Environmental Assessment Process

1.3 Consultation

Public Consultation is an integral part of the EA process. Consultation and the exchange of information was undertaken throughout this assessment using a variety of methods including meetings with consultation groups and the general public, internet postings, newspaper advertisements, and mail outs. Scheduling of consultation opportunities corresponded to key project milestones. This section of the report provides an overview of the consultation processes, while more detailed accounts of the consultation activities are described throughout this report. A summary of all consultation activities is contained in Appendix A.

1.3.1 *Advisory Committees*

The project proceeded under the direction of the City of Ottawa and benefited from the direct involvement of:

- an Agency Consultation Group (ACG) consisting of representatives from the City of Ottawa, government agencies and approval authorities;
- a Business Consultation Group (BCG) consisting of representatives from area businesses and the Business Improvement Area (BIA); and
- a Public Consultation Group (PCG) consisting of representatives from Community Associations nearby the study area and special interest groups.

1.3.2 *Public Open Houses and Meetings*

Four open houses were held at key stages during the assessment process to obtain feedback from the general public on the information shared in these events. The open houses were organized to allow informal viewing of display panels about the project and the examination of resource material related to the various stages of the EA and included a presentation and Question and Answer period. All displays and maps were bilingual. Study team members were present at all open houses to answer questions and explain various aspects of the study as well as work done to-date.

1.3.3 *Web Site*

The City of Ottawa developed and maintained a project website with information about the proposed project and the EA process (www.Ottawa.ca/carproad). The information prepared for the Open Houses and for posting on project web site was formatted in a manner that fulfilled accessibility requirements related to graphics and other printed materials.

1.3.4 *First Nations Consultation*

Consultation with First Nations was achieved for this study by communications with their identified representatives through email correspondence. No first nation interests have been identified through the course of the study.

1.4 Report Organization

The purpose of this ESR is to document the environmental assessment process for the Carp Road Widening project within the study area as well the conclusions reached. The report consists of the following sections:

- Introduction
- Project Need and Opportunity
- Existing Environmental Conditions
- Alternative Solutions
- Alternative Designs
- Recommended Plan and Assessment
- Implementation and Approvals
- Summary and Conclusions

The Appendices contain the technical reports and technical documentation prepared throughout the course of the study. These reports and documentation contributed to the decision making process and in the development of recommendations that led to the selection and development of the Preferred Design and Recommended Plan for the corridor.

2.0 Project Need and Opportunity

2.1 Planned Function and Historic Need

Carp Road is designated in the Official Plan as an Arterial Road and an On-Road Cycling Route. It is also part of the City's truck route network. It is a vital north-south roadway linking the central and western portions of Stittsville (along Stittsville Main Street) to Hwy 417 and areas to the north including a large rural employment area, the Carp Airport, and the Village of Carp.

Except for the Hazeldean Road to Kittiwake Drive portion, Carp Road (within the project limits) is a 2-lane rural roadway, without pedestrian and cyclist facilities. Recent traffic counts demonstrate peak hour volumes of 500 veh/h (counter peak direction) to 1,200 veh/h (peak direction southbound), and annual average daily traffic (AADT) levels of up to 16,000 vehicles along the Carp Road Corridor, between Highway 417 and Hazeldean Road.

Cyclists and pedestrian volumes are considered negligible, and although there is a 115 space Rural Park and Ride facility located just south of Hwy 417 at the east leg of the Carp/Westbrook intersection, transit activity within the corridor is very modest. However, based on field observations, this Park and Ride is well utilized. North of Hazeldean Road, OC Transpo operates Route # 262 which is a weekday express route, and Route # 203 which is a once-a-week (Wednesday) rural shopper bus route. Bus stops are located at Hazeldean Road, Rothbourne Road, Lloydalex Crescent and Westbrook Road. In terms of transit, the EA for the West Transitway Connection identifies a Bus Rapid Transit (BRT) facility linking Hwy 417/Terry Fox to Fernbank Road that is expected to reduce the reliance of auto travel to/from Stittsville.

The TMP identifies the need for widening of Carp Road from 2 to 4 lanes (2020 – 2025), with the rationale of providing additional capacity for growth in the Stittsville area. The City's Official Plan (OP) identifies a right-of-way (ROW) protection policy of 37.5 m along Carp Road within the project limits. This width provides for a 4-lane urban divided roadway, plus bike lanes, sidewalks and green boulevards. The ROW policy also indicates a required minimum of 2.0 m wide sidewalks and on-road cycling lanes along Carp Road (within the Urban Area, south of Rothbourne Road).

The Carp Road Corridor Community Design Plan (CDP) was adopted by Council in June 2004. This document provides direction on land use/compatibility, visual appearance, environmental features, transportation, and servicing, in addition to the policies identified in the City's OP. It is important to note the Carp Road corridor within the CDP included the 9.0 km segment extending from Rothbourne Road in the south to March Road in the north. The portion of Carp Road, south of Rothbourne Road is not included in the CDP. From a transportation perspective, one of the key objectives of the CDP was to

> "*Ensure that Carp Road continues to function as a major arterial road that provides easy accessibility to Hwy 417 and the Carp Airport and businesses within the Corridor".*

Within the public consultation process completed for the CDP, accessibility to Hwy 417 was viewed as an important consideration to attract businesses to the Carp Road corridor. Workshop participants expressed the opinion that Carp Road needs to be upgraded (i.e. widened, turning lanes to deal with increased traffic volume and as well as trucks). Future development was anticipated to generate additional traffic within the corridor, and turning lanes into major developments were viewed as necessary measures to improve traffic movement and safety along Carp Road. The transportation analysis completed as part of the CDP indicated that peak hour volumes along Carp Road near the HWY 417 interchange area would be at or near capacity by the year 2021.

Based on the foregoing, in combination with existing heavy truck traffic in the area, the CDP concluded that protection for a 4-lane facility is warranted for Carp Road. On this basis, it was identified that a 37.5 m ROW would be required for the section of

Carp Road between the Village of Stittsville's Urban Boundary to Richardson Side Road (north of Hwy 417), even though this is part of the Rural Area in the OP. The OP was subsequently amended in this regard.

In addition, other relevant transportation policies emerging from the CDP include:

1. *Road modifications, turning lanes and intersection improvements (where warranted) will be identified by Transportation Impact Studies required by the Official Plan during the review of subdivisions, rezoning applications and site plans where there may be impact on the transportation network in the surrounding area.*
2. *Where operational deficiencies are identified through Traffic Studies, on a site specific or corridor basis, appropriate traffic analysis may be conducted to identify required operational improvements.*
3. *Carp Road:*
    a. *From "Richardson Side Road" to the "Urban Area Limit" the ROW will be protected for "37.5" metres*
    b. *From "Richardson Side Road" to "March Road" the ROW will be protected for 30.0 metres.*

2.2 Confirmation of Need

One of the key initial steps in the EA process for this project is to confirm the need for the project. In this instance, it is to reconfirm the need as identified in the TMP. Considerations include:

- the assumption that the City's projected 26% target for peak hour City-wide transit ridership is achieved and based on the OP's 2031 road and transit network being in place, the projected 2031 traffic volumes across the study area screenlines can be compared to the projected capacities of those screenlines to determine if there is a road network capacity deficiency through the area served by Carp Road;
- future development that would add transportation demand along the corridor;
- safety considerations; and
- operational performance of key intersections.

The following sub-sections, and the related background reports in the Appendices, elaborate upon the needs assessment process as part of this study.

To assess the needs related to Carp Road for year 2031, the following activities were undertaken:

- existing traffic conditions were analyzed at all study area screenlines and major intersections;
- population growth projections were confirmed and consideration was given to redevelopment potential within the corridor;
- the trip making parameters of the current City Official Plan and TMP were identified; and
- the City's transit ridership targets were reviewed and a sensitivity analysis was undertaken to identify the level of corridor transit ridership required to reduce the projected travel demand across study area screenlines to the level of the current arterial road capacity of these screenlines.

2.2.1 Existing Transportation Conditions

2.2.1.1 Transportation Master Plan

As noted above, the TMP identifies the need for the Carp Road widening from two to four lanes (2020 - 2025), with the rationale to provide capacity for identified growth in Stittsville. Moreover, since the last TMP update in 2008, a number of assumptions and existing/planned transportation conditions have changed. Most notably, the widening of Hazeldean Road between Hwy 7 and Terry Fox Drive was completed in 2012 (as part of the Federal Stimulus Program), which provides improved east-west capacity to alternative north-south routes (i.e. Huntmar Road, Terry Fox Drive, etc.) with interchange access to Hwy 417.

In the future, the planned re-alignment of Palladium Drive, widening of Huntmar Drive and Maple Grove Road, and the construction of the Stittsville Main Street Extension (a major collector through a residential area, also a Phase II project) and Robert Grant Avenue (formerly North-South Arterial) will all serve to provide additional north-south road capacity and Hwy 417 connectivity. It should also be noted that Maple Grove Road is not planned to connect to Carp Road at Rothbourne Road, according to the TMP.

In terms of transit, the EA for the West Transitway Connection (2012) identifies a BRT facility linking Hwy 417/Terry Fox to Fernbank Road that is expected to reduce reliance of auto travel to/from Stittsville.

The following figures depict the phasing of new area network capacity, as identified in the City's 2013 TMP.

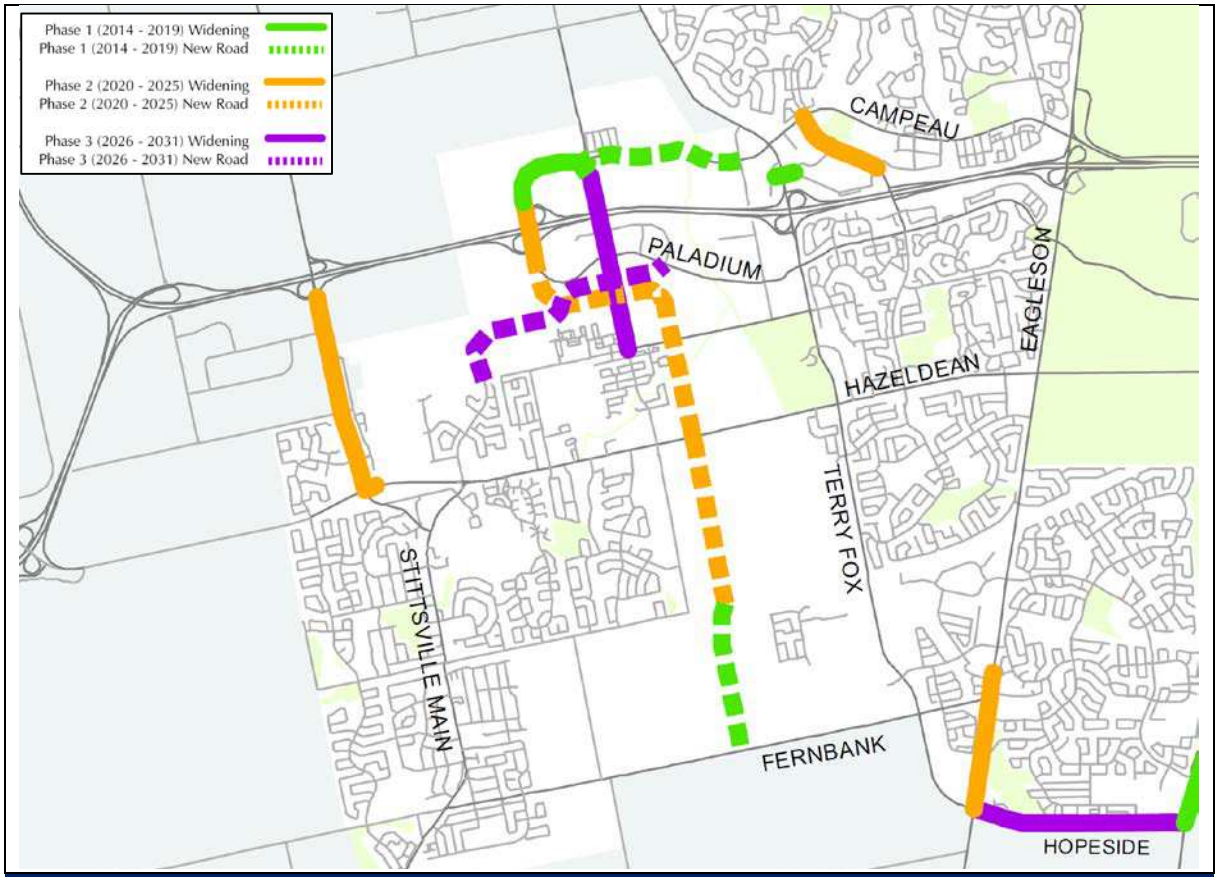


Figure 2-1: TMP Affordable Road Network

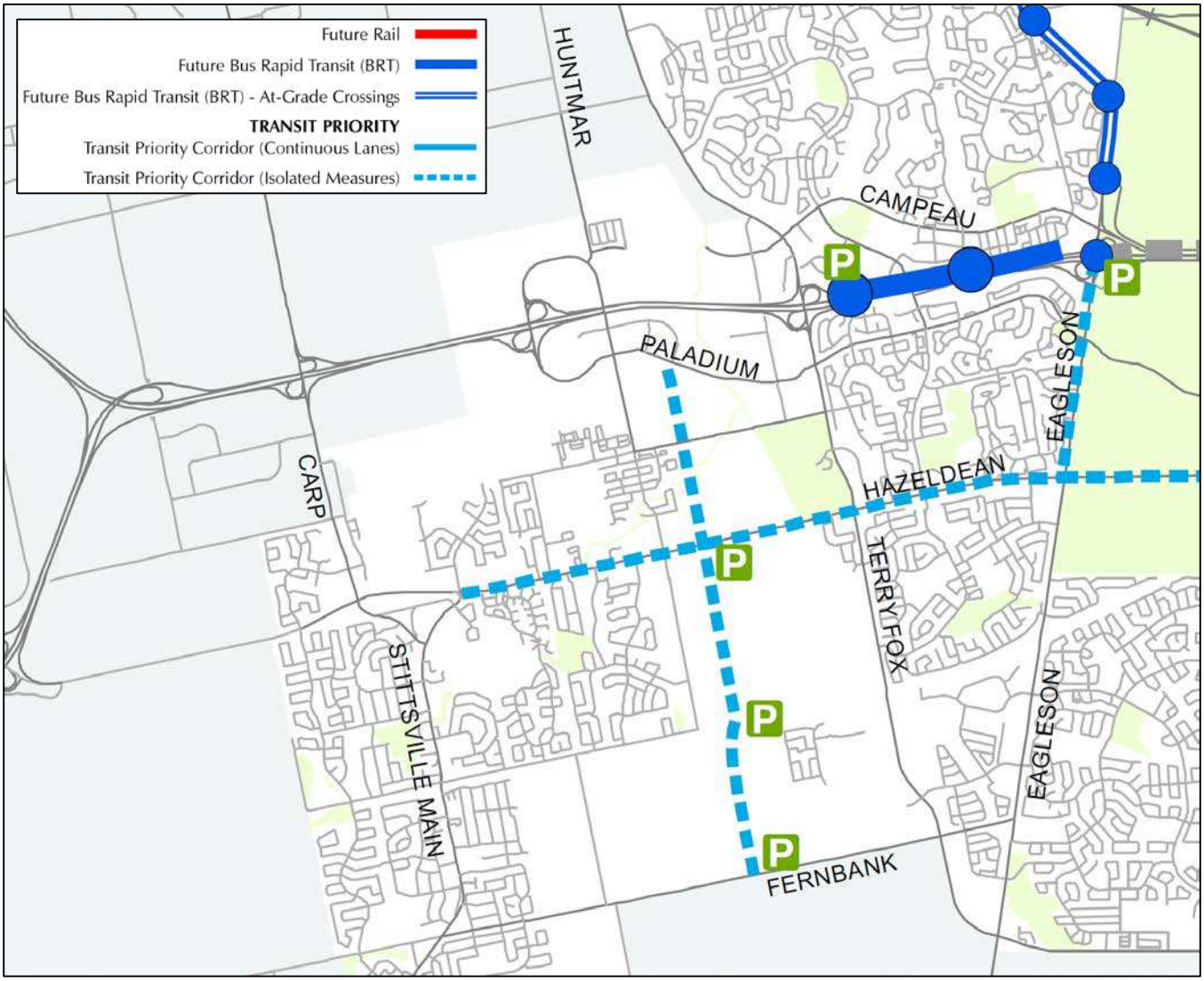


Figure 2-2: TMP Affordable Transit Network

2.2.1.2 Area Planning Studies

Kanata West Concept Plan/Fernbank CDP

Situated to the east of the Carp Road corridor, are two major planned development areas, namely Kanata West and Fernbank (Figure 2-3). These two areas were the subject of extensive planning studies that identified transportation networks that are reflected in the City's Transportation Master Plan (TMP).

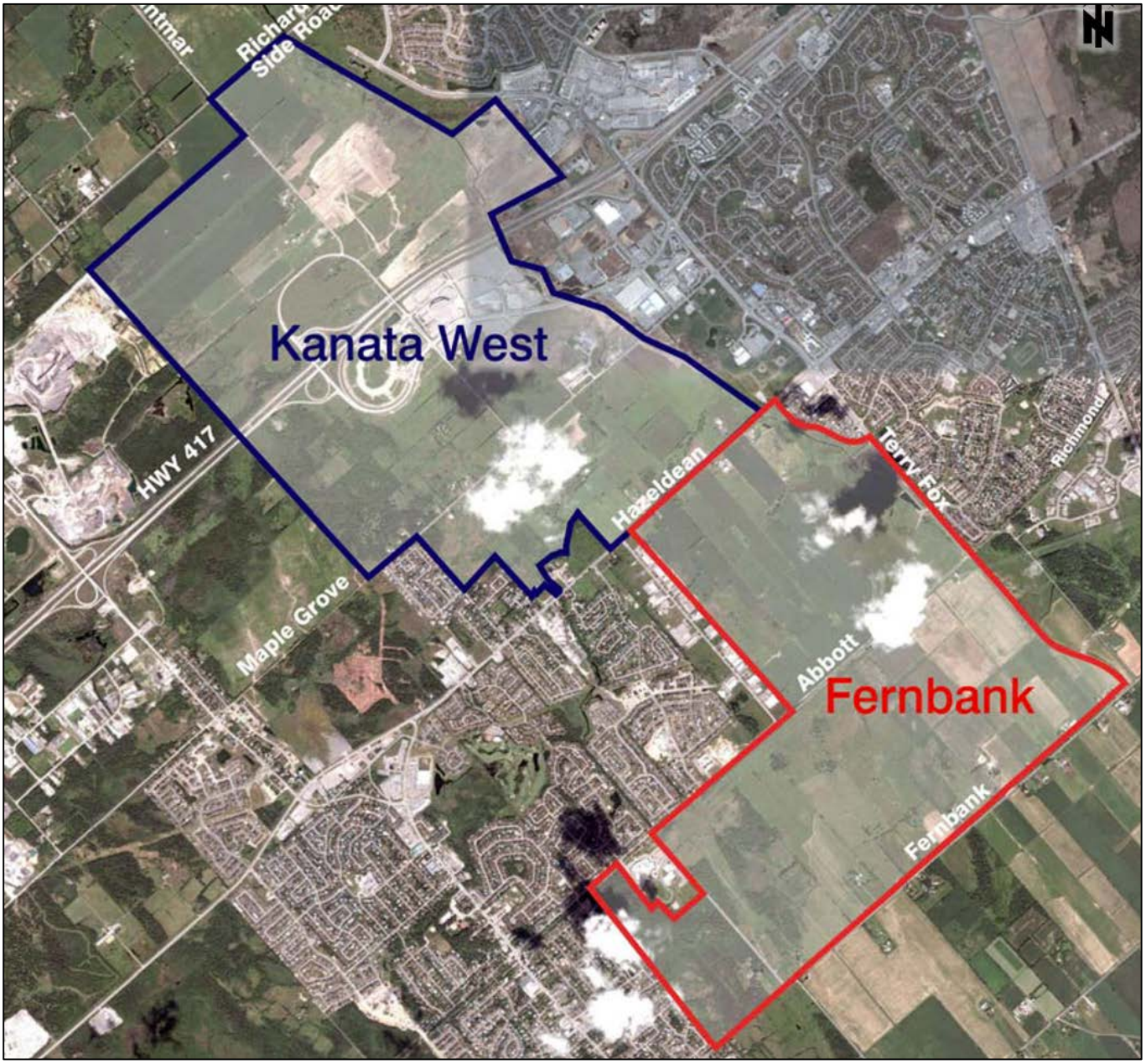


Figure 2-3: General Area Context (Kanata West and Fernbank)

In 2002, the City of Ottawa expanded the urban area to include the lands known as Kanata West. The ensuing planning process for Kanata West received input from many community groups and associations, and in March 2003, Ottawa City Council approved the general land use and development principles of the Kanata West Concept Plan (KWCP). The KWCP is a major component of urban growth in the western portion of the City. It is planned to include a population of approximately 17,000 persons in 6,300 households, 24,000 jobs and approximately 1 million square metres of commercial space. This scale of development, located between Stittsville and Kanata, is being planned as a mixed-use community. The approved plan includes the transportation network (Figure 2-4), environmental protection and servicing infrastructure required to support the identified land use plan. This includes a rapid transit corridor and a number of primary arterials, minor arterial roads, major collector roads, water, sewers, stormwater management and watercourse corridors.

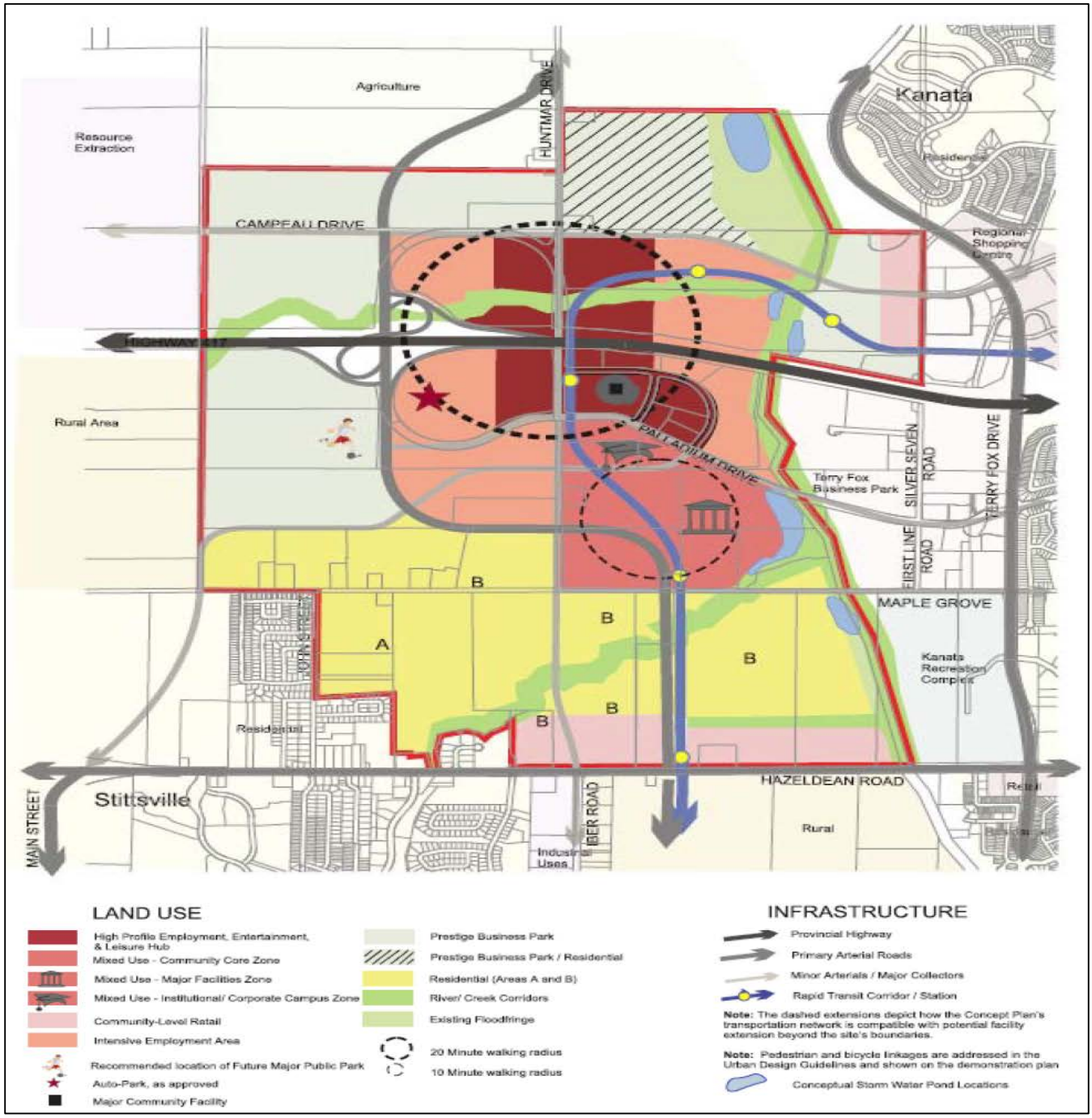


Figure 2-4: KWCP Transportation Network

The Fernbank Community is proposed to encompass approximately 674 hectares (1,665 acres) of land between the established communities of Stittsville, Kanata West and Kanata South, extending south from Hazeldean Road to Fernbank Road, within the West Urban Area of the City of Ottawa. The study area for the Fernbank Community extends to Hazeldean Road on the north, the Carp River and Terry Fox Drive on the east, Fernbank Road to the south and, the existing Urban Area of Stittsville in the west. Figure 2-5 illustrates the proposed elements of the transportation network associated with the plan. The major transportation conclusion of the Fernbank TMP is that the associated development will require the extension of both the rapid

transit corridor and the North-South Arterial (with an intended function as a bypass to Stittsville Main Street). The first two lanes of the North-South Arterial (between Hazeldean Road and Fernbank Road), combined with the widening of Hazeldean Road, were identified as early implementation requirements to accommodate these growing communities.

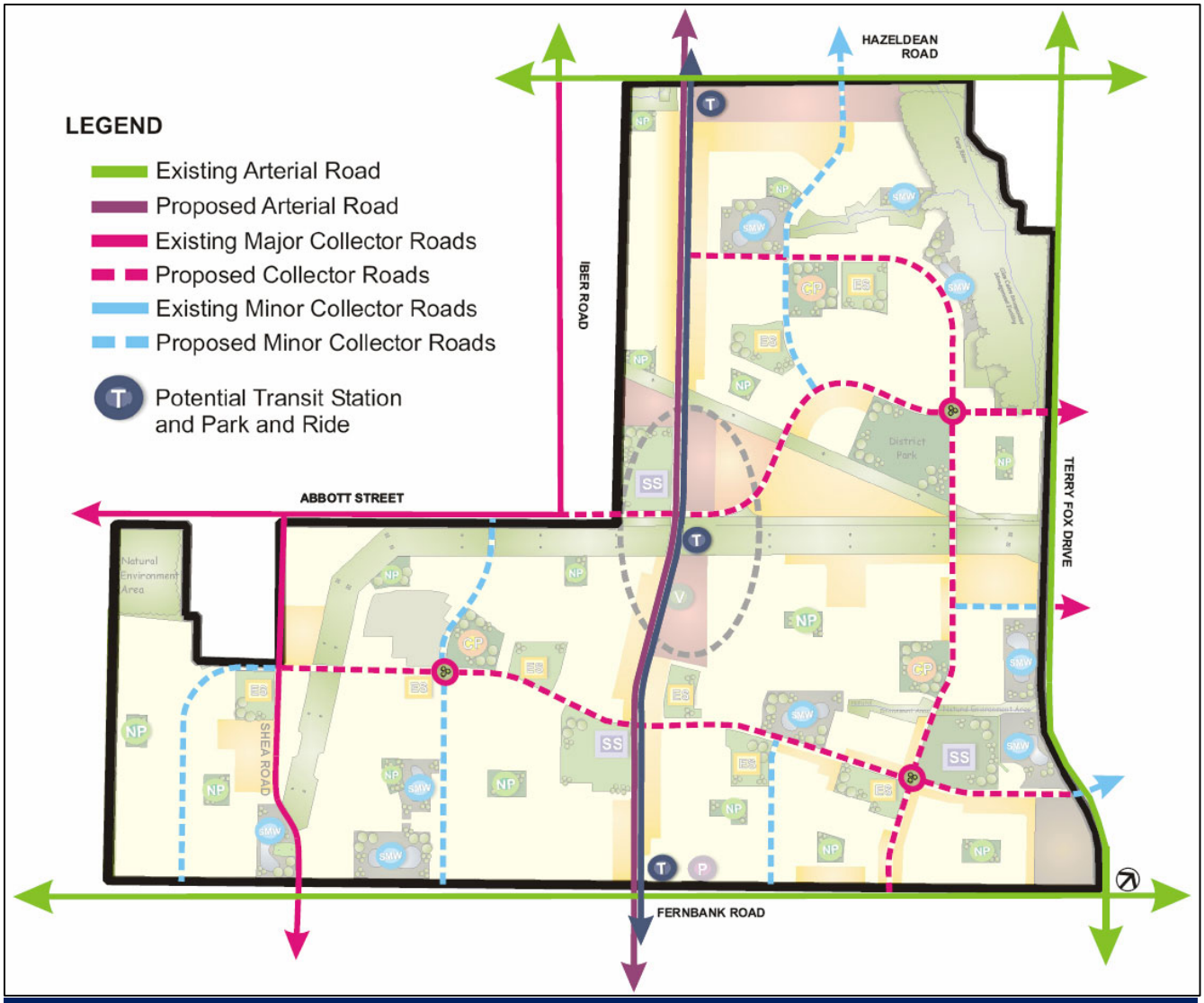


Figure 2-5: Fernbank CDP Transportation Network

2.2.1.3 Ministry of Transportation Modifications to Interchange with Hwy 417

Within the timeframe of the study, the Ministry of Transportation (MTO) widened Hwy 417 within the study area and includes modifications to the interchange with Carp Road which includes two southbound through lanes and a single northbound lane across the interchange. The westbound off-ramp was also modified to included dual westbound left-turn lanes. The two southbound lanes merge to one lane between the two ramp approaches to Carp Road. A sidewalk is provided only on the west side of the structure. Cyclists and vehicles will be required to share the travel lanes within the interchange area.

2.2.1.4 Area Transportation Impact Assessments

Stittsville Corners Retail Development (Carp/Hazeldean) TIA – Delcan

Delcan completed a Transportation Impact Assessment (TIA) in March 2007 for the Stittsville Corners Retail Development. The study projected that Carp Road would be operating close to the lane capacity of a 2-lane roadway at full build-out of the site, but also recognized that the provision of Stittsville Main Street, North-South Arterial and extension/widening of Huntmar will alter north-south travel patterns and likely reduce traffic on Carp Road. Furthermore, the study did not assume Hazeldean Road would be widened from Terry Fox Drive through Carp Road, which could attract traffic away from Carp Road.

Historical traffic counts at the Carp/Hazeldean intersection reveal that two-way volumes on the north leg of the intersection spiked in 2007 and returned to similar 2004 observed volumes for subsequent years 2008 and 2011.

Snow Dump Study TIA – Stantec

Stantec has recently completed a draft TIA for a proposed snow dump facility at 2125 Carp Road (site #24 on Figure 2-17) with access to/from Westbrook Road. The key findings indicate that dual eastbound left-turn lanes are required at the Carp/Westbrook intersection in order to accommodate the proposed site traffic and that the southbound through movement at this location is currently failing during peak hours and will continue to fail until the widening of Carp Road to 4-lanes.

2.2.1.5 Transportation Volumes on Carp Road

Recent traffic counts provided by the City of Ottawa demonstrate peak hour volumes of approximately 500 veh/h in the counter peak direction and up to approximately 1,200 veh/h in the peak direction. The Average Annual Daily Traffic (AADT) is noted as approximately 16,000 two-way vehicles along the Carp Road corridor, between Hwy 417 and Hazeldean Road.

Cyclist and pedestrian volumes are considered negligible within the corridor. With respect to transit activity, it is considered to be modest. Route # 203 is a rural shopper bus service which operates once-a-week (Wednesday) while Route # 262 is a weekday express service. Also, there is a highly-utilized Park & Ride facility (115 stalls) located at the Carp/Westbrook intersection.

Figures 2-6 to 2-12 depict existing peak hour traffic volumes, 8-hr through traffic volumes (broken down in 15 minute intervals) at intersections within the widening limits of the corridor, percent peak hour truck traffic, 8-hr cyclist/pedestrian volumes and existing OC Transpo bus service within the study area.

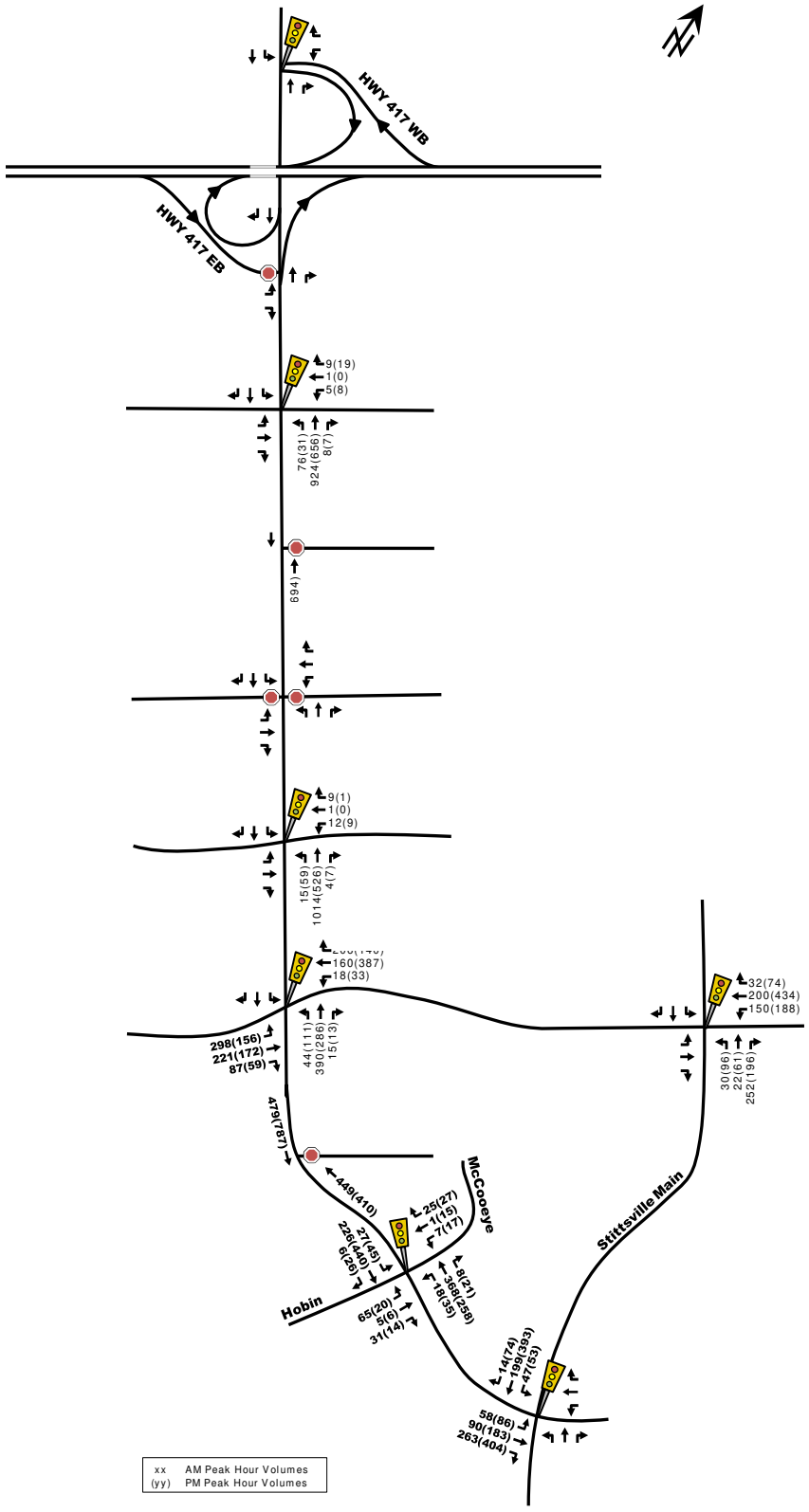


Figure 2-6: Existing Peak Hour Volumes

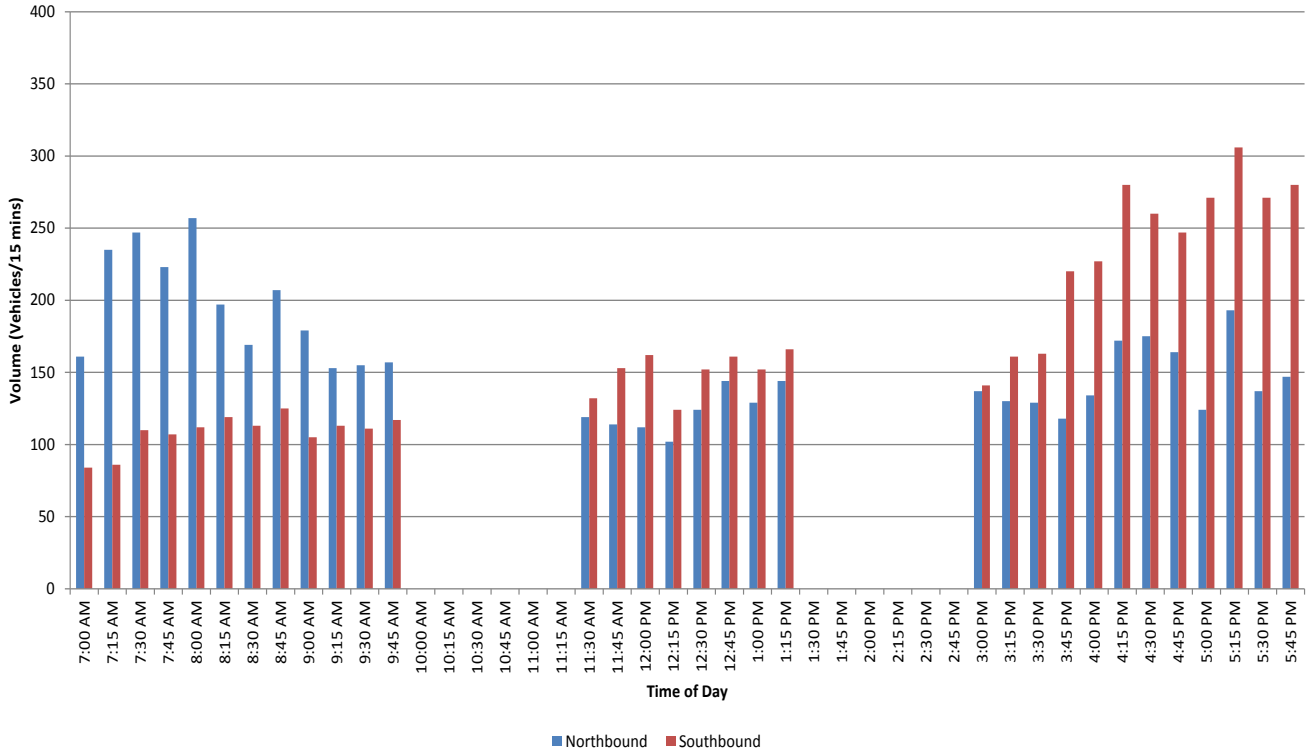


Figure 2-7: Existing 8-hr Through Volumes – Carp/Westbrook

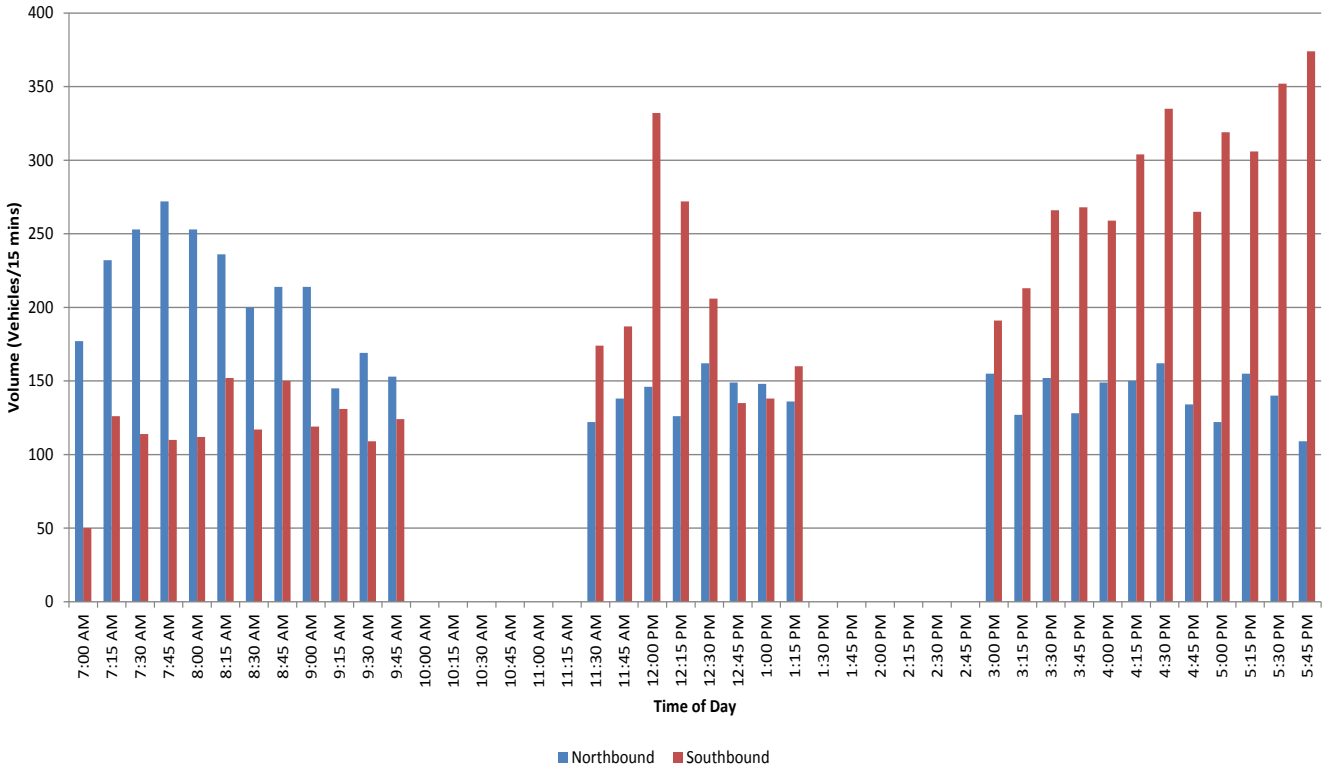


Figure 2-8: Existing Through Volumes – Carp/Kittiwake

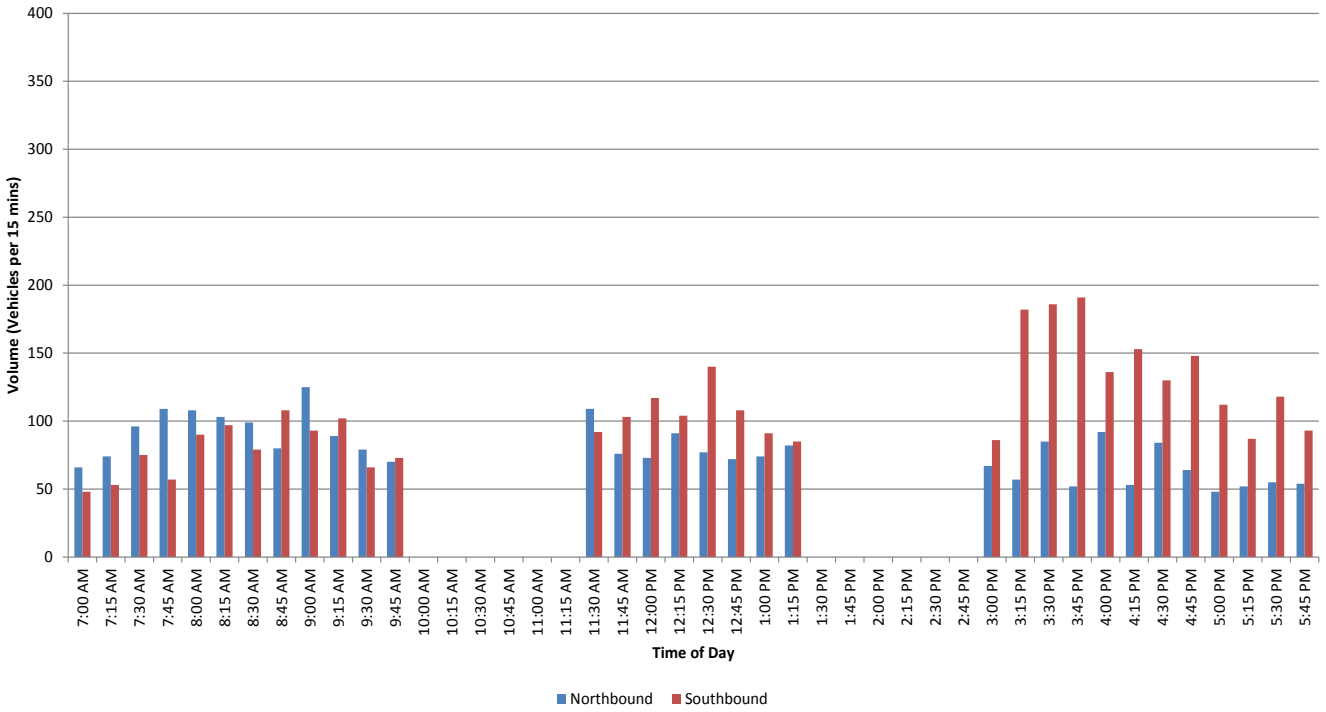


Figure 2-9: Existing 8-hr Through Volumes – Carp/Hazeldean

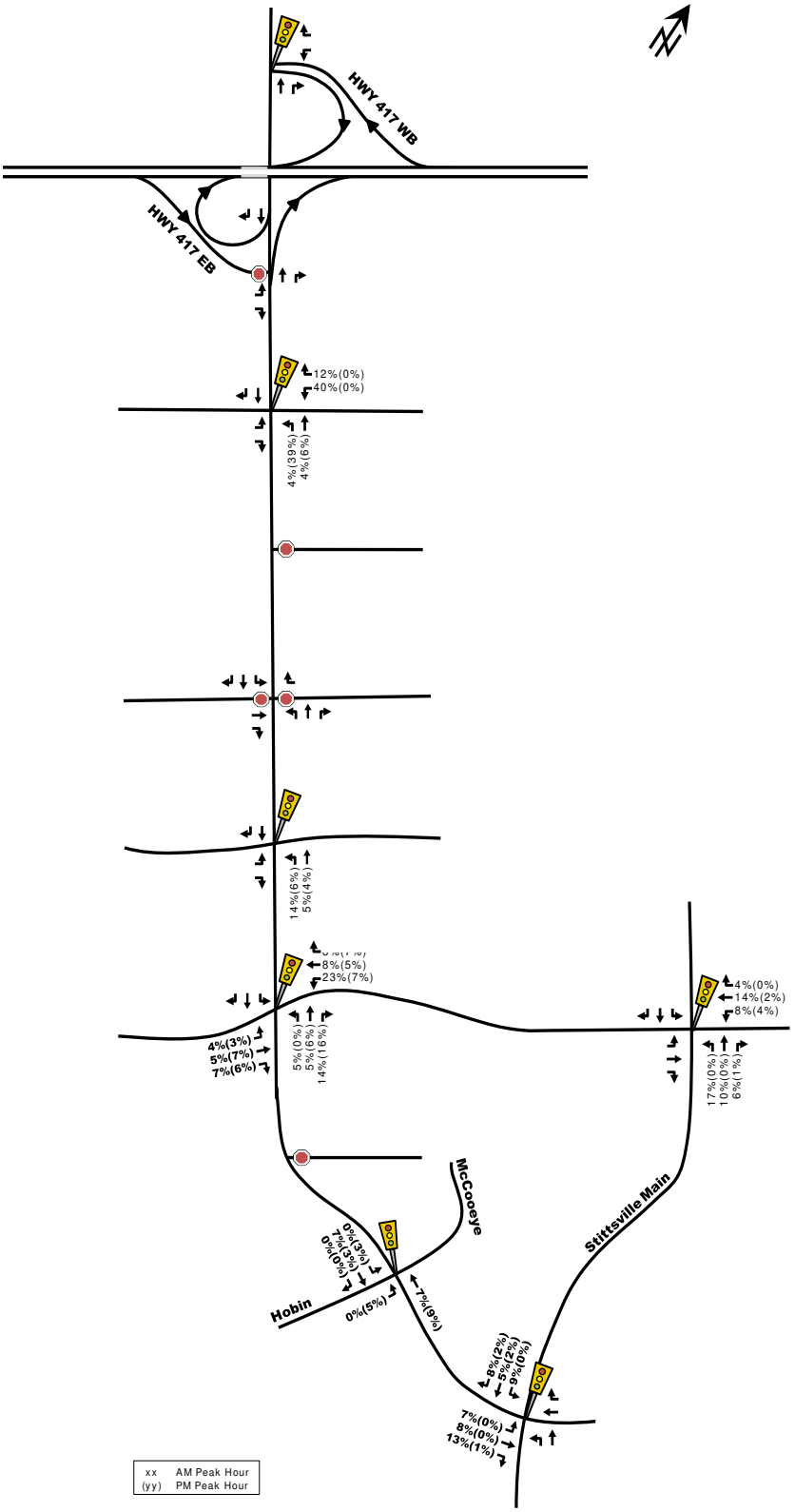


Figure 2-10: Percent Peak Hour Truck Traffic

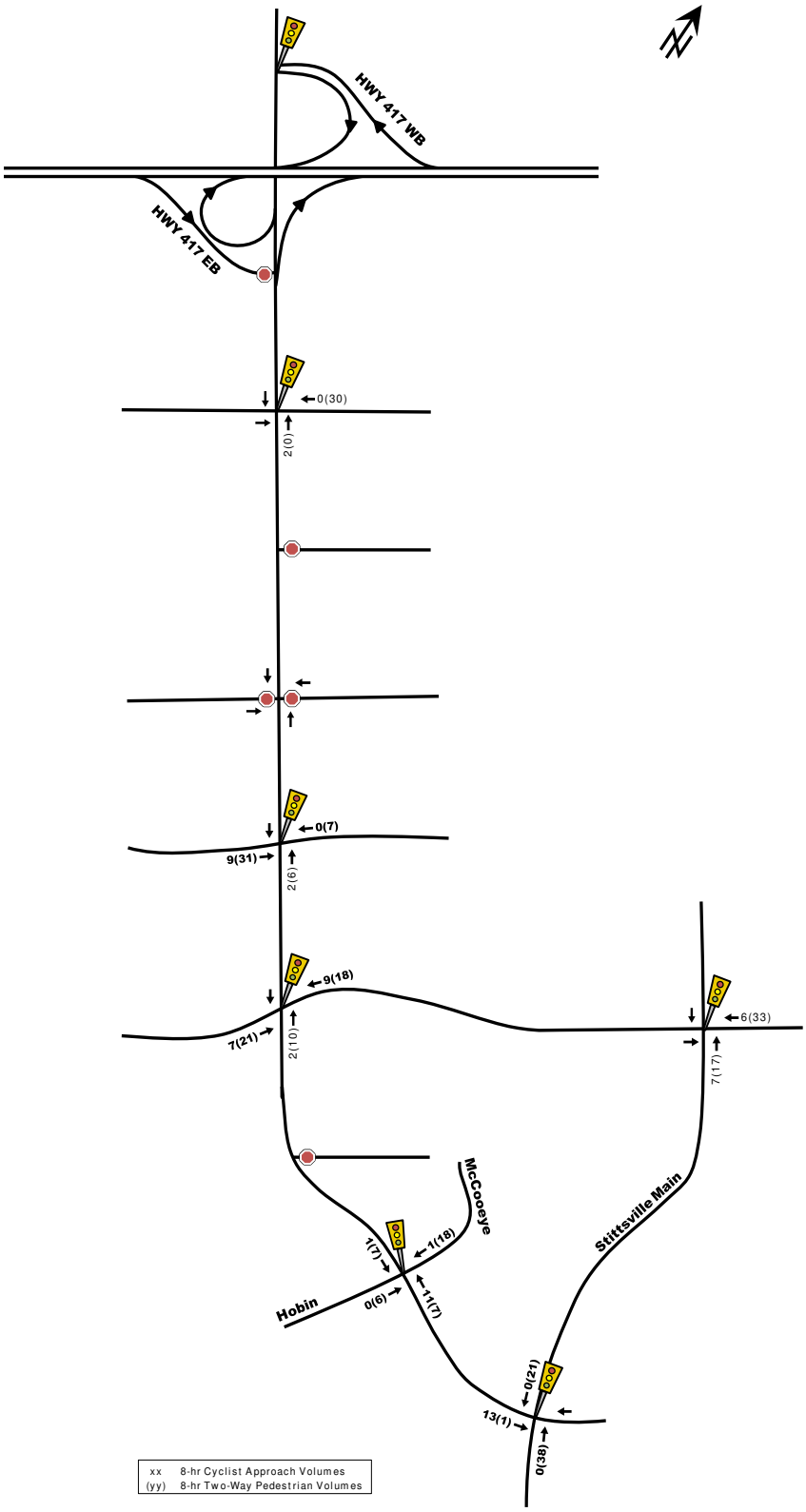


Figure 2-11: 8-hr Cyclist/Pedestrian Volumes

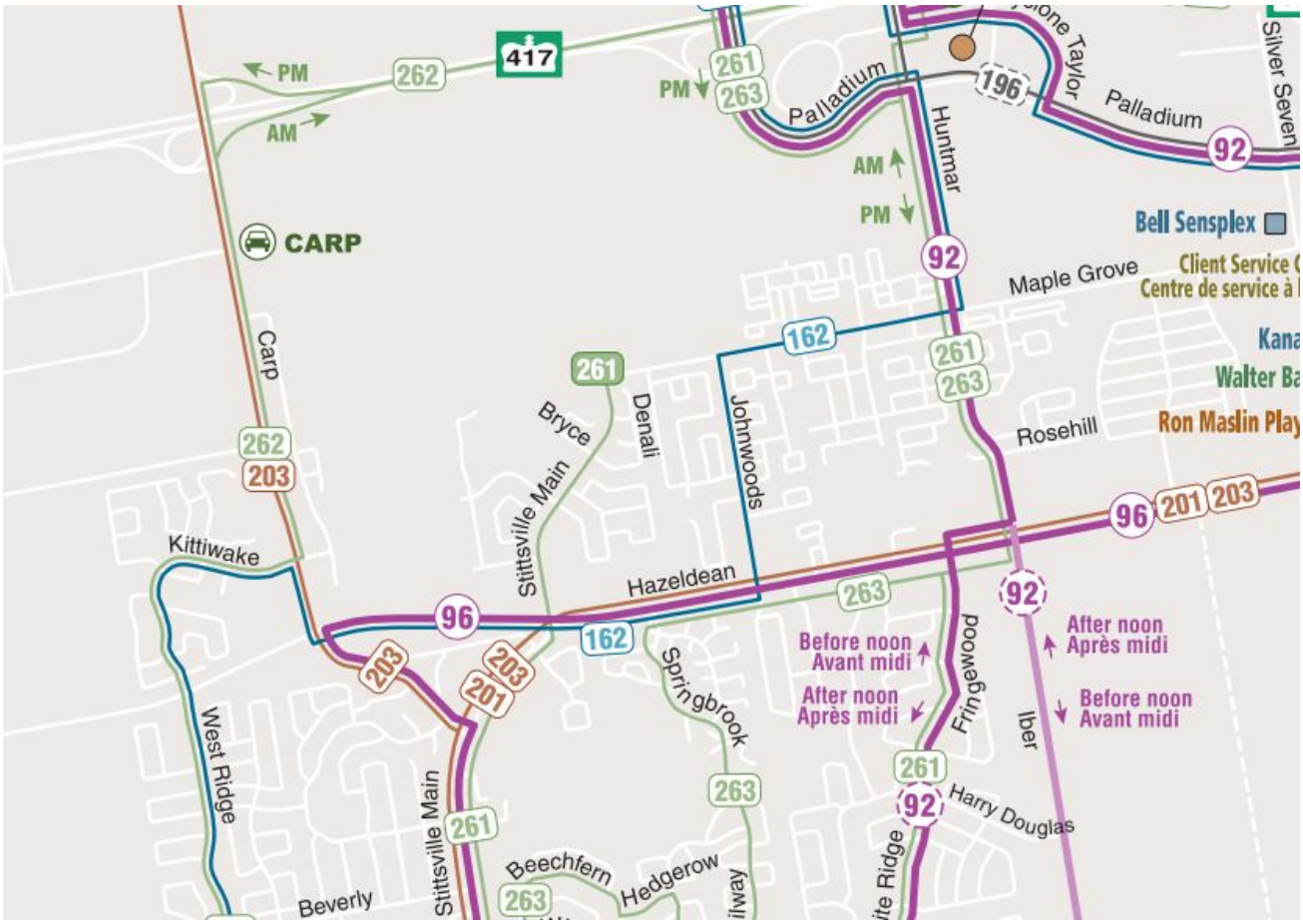


Figure 2-12: Existing OC Transpo Routes

2.2.1.6 Existing Intersection Operations

Based on the peak hour volumes depicted in Figure 2-6 and available traffic data, the following Table 2-1 provides a summary of existing traffic operations at study area intersections based on the SYNCHRO (V8) traffic analysis software. The subject intersections were assessed in terms of the volume-to-capacity (v/c) ratio and the corresponding Level of Service (LoS) for critical movement(s). The subject intersections 'as a whole' were assessed based on a weighted v/c ratio.

As shown in Table 2-1, study area intersections 'as a whole' are currently operating at an acceptable LoS 'D' or better during both peak hours, with respect to the City of Ottawa operating standards of LoS 'D' or better (*0.90 > v/c > 0.00*) with the exception of the Carp/Hwy 417 westbound On/Off-Ramps, Carp/Westbrook and Carp/Kittiwake intersections during the weekday afternoon peak hour.

With regard to 'critical movements' at study area intersections, they are noted as currently operating at an acceptable LoS 'D' or better during the morning peak hour, with the exception of the eastbound movement at the Carp/Rothbourne intersection. During the afternoon peak hour, there are several failing 'critical movements' along Carp Road north of Hobin/McCooeye Road, as shown in Table 2-1.

Table 2-1: Existing Performance at Study Area Intersections

Intersection	Weekday AM Peak (PM Peak)					
	Critical Movement			Intersection 'as a whole'		
	LoS	max. v/c or avg. delay (s)	Movement	Delay (s)	LoS	v/c
Carp/HWY 417 WB On/Off-Ramps	D(F)	0.81(1.00)	WBL(WBL)	30.9(57.7)	C(E)	0.76(0.99)
Carp/Westbrook	C(F)	0.75(1.24)	NBT(EBL)	14.5(64.8)	C(F)	0.72(1.08)
Carp/Rothbourne	E(D)	35.3(34.1)	EBT(EBT)	0.7(0.6)	-	-
Carp/Kittiwake/Echowoods	D(F)	0.86(1.10)	NBT(SBT)	30.4(52.0)	D(F)	0.84(1.04)
Carp/Hazeldean	D(F)	0.84(1.12)	EBL(EBL)	23.9(32.7)	A(C)	0.48(0.74)
Carp/Hobin/McCooeye	A(A)	0.47(0.35)	EBT(SBT)	7.7(6.8)	A(A)	0.30(0.32)
Stittsville Main/Carp	B(D)	0.61(0.90)	WBL(WBL)	16.4(32.8)	A(C)	0.40(0.77)
Stittsville Main/Hazeldean	B(A)	0.64(0.54)	NBR(NBR)	17.4(24.2)	A(A)	0.38(0.34)

Note: Analysis of signalized intersections assumes a PHF of 0.95 and a saturation flow rate of 1800 veh/h/lane.

Other notable failing movements during the afternoon peak hour, according to SYNCHRO, include the southbound through movements operating with a v/c of 0.97 and 1.00 at the Carp/Hwy 417 westbound On/Off-Ramps and the Carp/Westbrook intersections respectively.

Recent field observations confirm these findings with queues in the southbound direction observed from Kittiwake Drive to approximately Westbrook Road during the weekday afternoon peak hour. Other notable observations during both peak hours include:

- significant queues on portions of Carp Road generated by north or southbound left-turning vehicles (and at bus stops);
- where possible, vehicles on Carp Road using the shoulder for "slip around" movements to avoid delays due to north or southbound left-turning vehicles; and
- significant delays to vehicles attempting to turn onto Carp Road at un-signalized intersections or driveways.

Other notable observations include a high number of southbound left-turning vehicles at the Carp/Hazeldean intersection which currently operates at an acceptable level of service during peak hours and significant queuing/delays have been observed at the Carp/Stittsville Main intersection.

2.2.1.7 Observed Travel Speeds

Speed survey data gathered by the City of Ottawa for Carp Road is summarized in the following Figure 2-13. The posted speed limit along Carp Road is 50 km/h south of Hazeldean Road and 60 km/h north of Hazeldean Road. As shown in Figure 2-13, the average compliance level is approximately 35% south of Hazeldean Road with 85th percentile travel speeds of approximately 10 km/h greater than the posted speed limit. North of Hazeldean Road, the average compliance level is approximately 10% with 85th percentile travel speeds of approximately 15 km/h greater than the posted speed limit.

Based on the available data, there does not appear to be any significant safety issues with respect to observed travel speeds. Typically, concerns over travel speeds are raised when the 85th percentile speed is greater than 15 km/h the posted speed limit.

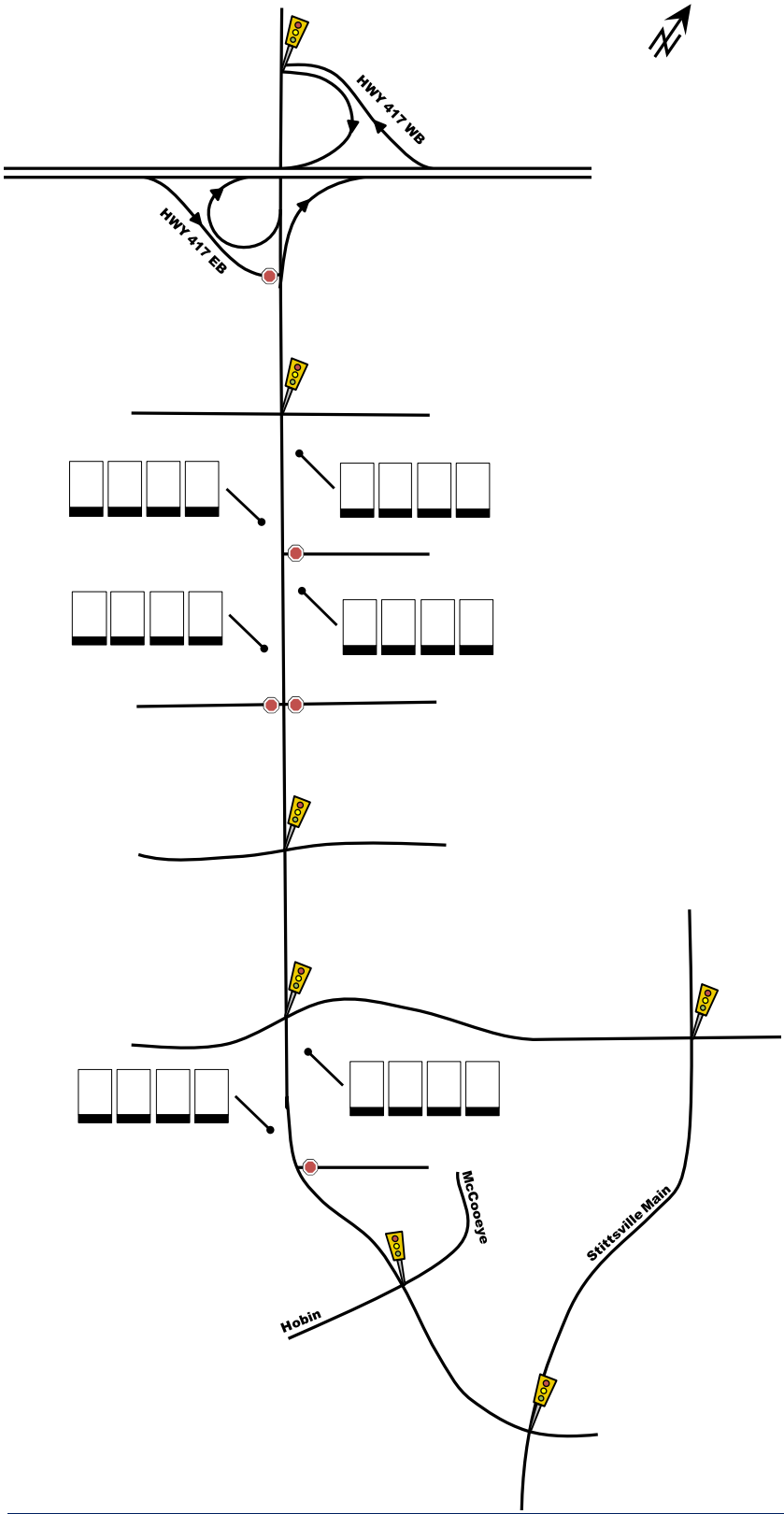


Figure 2-13: Existing Speed Survey Data

2.2.1.8 Safety/ Collision History and Risk

Collision history for study area roads (years 2010 to 2012, inclusive) was obtained from the City of Ottawa. A total of 143 collisions were reported with most collisions (85%) involving only property damage, indicating low impact speeds and 15% were reported as "non-fatal". The primary causes of collisions cited by police include rear end (61%), single vehicle (11%), angle (8%) and turning movement (8%) type collisions.

At notable intersections or mid-block sections of roadway (i.e. where more than 10 collisions were reported) within the study area, a standard rate of Collisions/MEV (Collisions per Million Entering Vehicles) was calculated, which are as follows:

- Carp/Hazeldean – 0.93 Collisions/MEV
- Carp/Stittsville Main – 0.81 Collisions/MEV
- Carp Road between Lloydalex/Rothbourne – 0.93 Collisions/MEV
- Carp Road between Echowoods/Rothbourne – 1.00 Collisions/MEV

In consultation with the City's Traffic Safety and Mobility Unit of the Traffic Management and Operational Support Branch, an intersection or mid-block section of roadway exhibiting a standard Collisions/MEV approaching or exceeding 2.0 is considered to be problematic and will require further investigation. Therefore, based on the available data, there is not a record of significant safety issues. It should be noted that the City has received a number of complaints from the public regarding unsafe turning movements to/from individual properties, and poor sightlines with respect to the northbound left-turn at the Carp/Hazeldean intersection.

2.2.1.9 Heavy Vehicles

As part of the City's designated Truck Route network, Carp Road is expected to accommodate the movement of heavy vehicles for a range of sizes and purposes. The corridor serves a large industrial park (the A.G. Reed Industrial Area) to the west, served by Westbrook Road and Rothbourne Road. Carp Road also provides direct access to many commercial and industrial lots fronting onto it.

As depicted in Figure 2-10, truck traffic flows are represented by relatively high percentages (up to 14% of traffic, northbound north of Westbrook Road) along the corridor and very high percentages of truck traffic turning to/from Westbrook Road and Rothbourne Road.

2.2.2 Projected Travel Demand Analysis

2.2.2.1 TMP Transportation Infrastructure Assumptions (Regional Model)

Per the 2008 TMP, Hazeldean Road was to be widened from Terry Fox Drive to Carp Road in three stages (Terry Fox Drive to Iber Road, Iber Road to Stittsville Main Street and Stittsville Main Street to Carp Road), with full project completion not anticipated until after 2023. However, due to a combination of Federal Stimulus Funding and front-ending agreements with private developers, the entire section of Hazeldean Road was widened to four lanes by early 2012.

For the purpose of this assessment, it is important to note the planned increase in other north-south vehicle capacity in the vicinity of the study area as per the 2013 TMP (2031 Network Concept), which includes:

- Stittsville North-South Arterial (Phase 2: 2020-2025);
- Stittsville Main Street Extension (Phase 3: 2026-2031);
- Huntmar Drive widening (Phase 3: 2026-2031); and
- Terry Fox Drive widening (not part of the Affordable Plan: post 2031).

These increases in network capacity will all affect the requirements for the Carp Road widening. In addition to increased roadway capacity, the TMP also identifies increased mass transit capacity within the vicinity of the study area which will lessen the reliance on the private automobile. The implementation of rapid transit will be phased with interim priority measures planned within the Stittsville North-South Arterial in advance of the West Transitway Extension (exclusive BRT between Fernbank Road and Eagleson Station) that forms part of the Rapid Transit and Transit Priority Network –2031 Network Concept.

Study Area Screenlines

Figure 2-14 depicts the existing study area screenlines where the City currently collects annual traffic data. As there is currently no north-south screenline in the vicinity of the study area, a screenline that crosses Carp Road, Huntmar Drive and Terry Fox Drive was assumed for the purpose of this study to assess the performance of the area north-south network capacity.

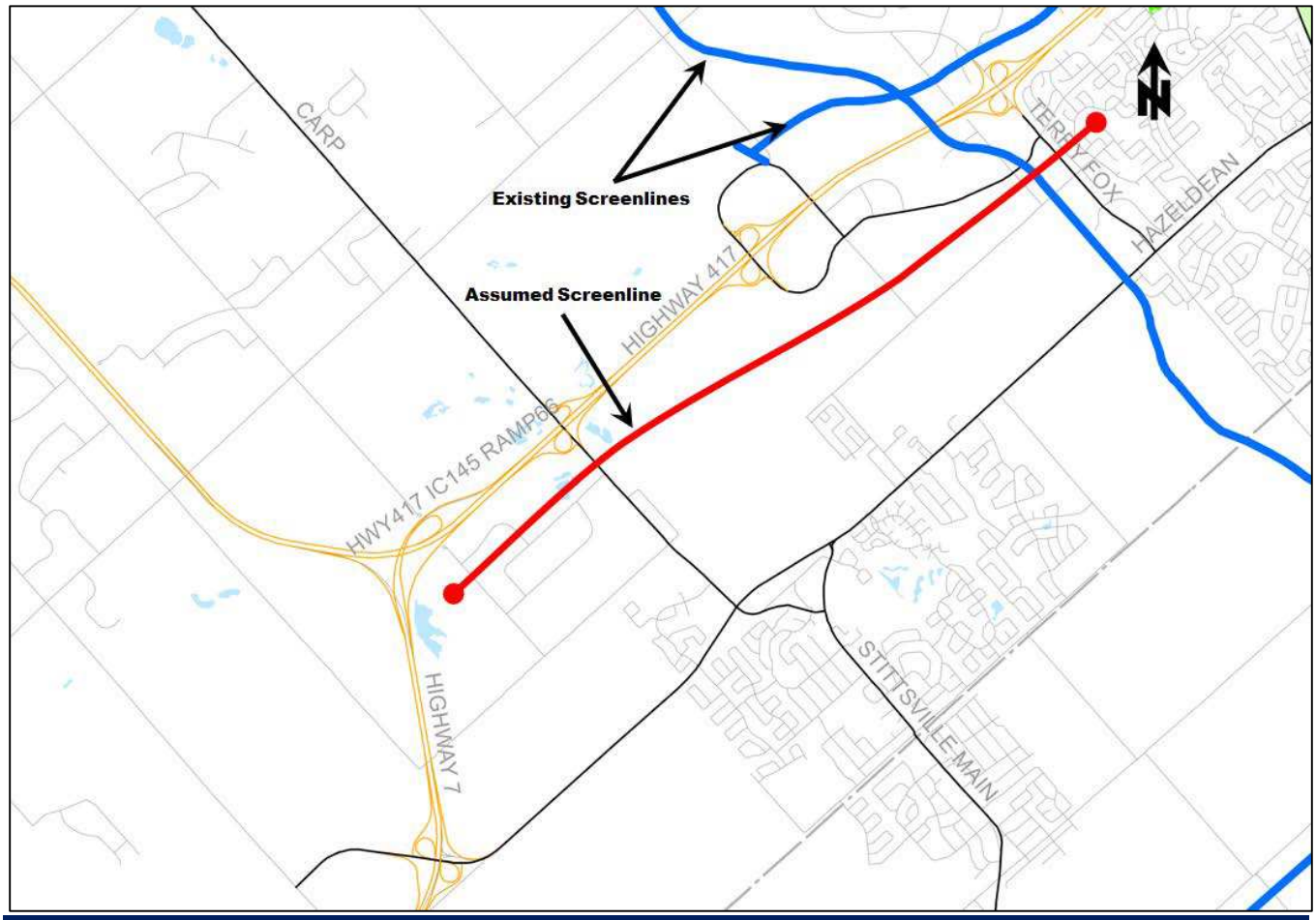


Figure 2-14: Existing/Assumed (or Project) Study Area Screenlines

TMP Land Use Assumptions

To assess the future performance of the assumed study area screenline, projected volumes were obtained from the City's TRANS Regional Travel Demand Model, which accounts for future land development/vehicle trip generation within assumed traffic zones and assigns it to network roadways. Figure 2-15 depicts the traffic zones and coded road network for the subject study area included in the City's TRANS Model. The subject Carp Road Corridor is contained within a single traffic zone, namely 5180.

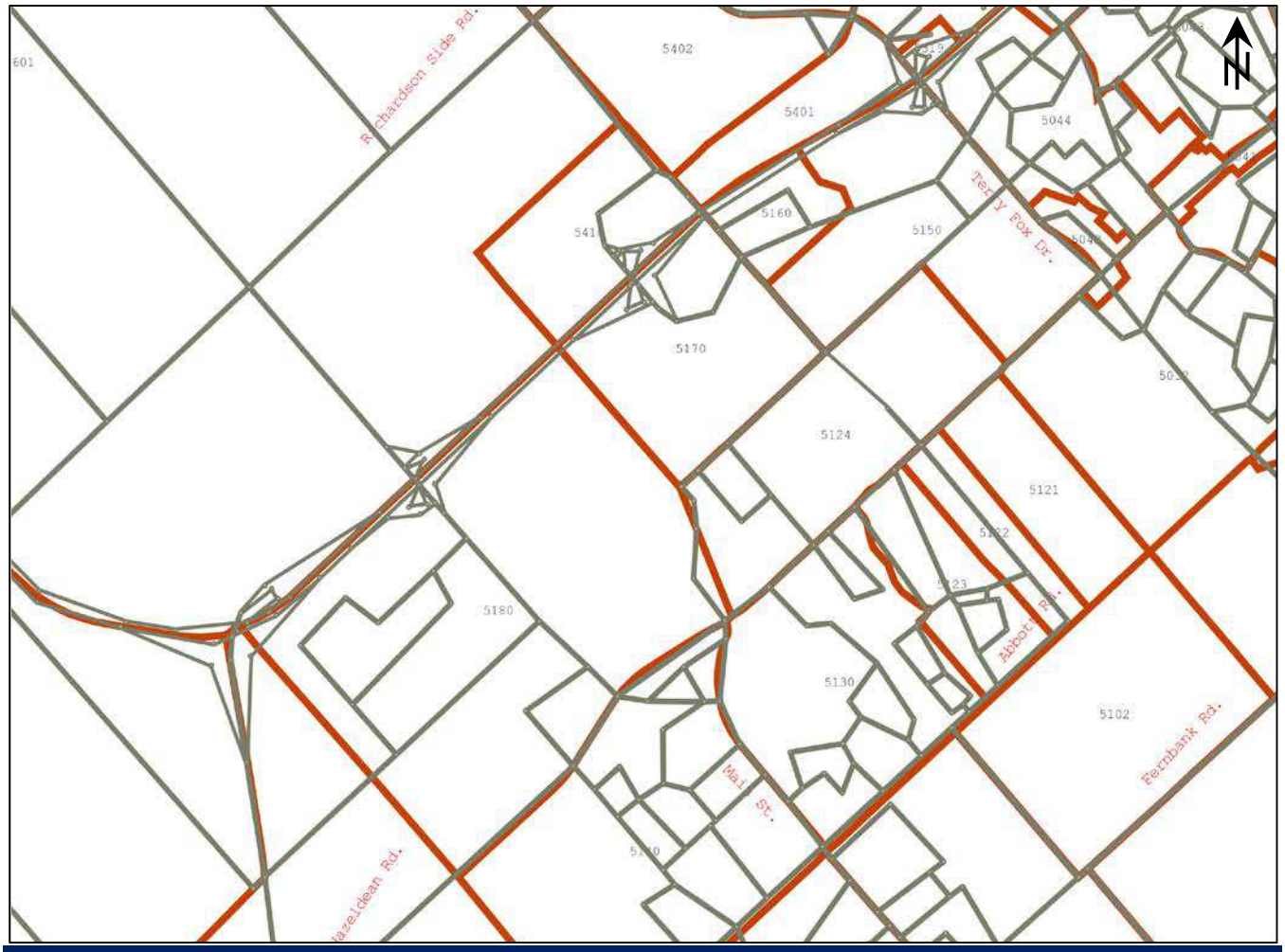


Figure 2-15: Study Area TRANS Model

Table 2-2 summarizes the existing/future population, number of dwelling units and employment assumed in the City's TRANS Model for area traffic zones.

Table 2-2: TRANS Population, Household and Employment Assumptions

Traffic Zone	2011			2031		
	Population	Dwelling Units	Employment	Population	Dwelling Units	Employment
5121	0	0	1,994	0	0	3,494
5122	0	0	1,994	0	0	3,494
5123	2,240	793	575	2,272	793	575
5124	4,012	1,413	859	9,714	3,418	909
5130	5,025	1,723	1,063	4,562	1,820	1,063

Traffic Zone	2011			2031		
	Population	Dwelling Units	Employment	Population	Dwelling Units	Employment
5140	4,928	1,601	810	4,548	1,601	810
5150	2	1	1,983	289	122	2,033
5160	0	0	1,994	0	0	3,494
5170	751	300	738	2,269	789	938
5180	*2,989*	*956*	*2,064*	*5,569*	*1,968*	*2,339*
5410	30	15	0	0	0	3,494
Total	19,977	6,802	14,074	29,223	10,511	22,643

As shown in Table 2-2, the area population, number of dwelling units and employment is anticipated to increase by approximately 45%, 55% and 60%, respectively.

Baseline TRANS Model Projections

Tables 2-3 and 2-4 summarize the TRANS Model results based on the assumed network identified in the City's TMP and the population, number of dwelling units/employment summarized in Table 2-2. TRANS Model results should be noted at weekday morning peak hour only and the peak direction is northbound, towards Hwy 417.

Table 2-3: Existing Peak Direction TRANS Model Projections at Project Screenline

Link	TRANS Volume (veh/h)	#Lanes	Capacity (veh/h)	v/c	LoS
Carp Road	367	1	800	0.46	A
Stittsville Main Street	-	-	-	-	n/a
Huntmar Drive	236	1	800	0.30	A
N-S Arterial	-	-	-	-	n/a
Terry Fox Drive	1,222	2	2,000	0.61	B
Total	1,825	4	3,600	0.51	A

Table 2-4: Projected Peak Direction TRANS Model Projections at Project Screenline

Link	TRANS Volume (veh/h)	#Lanes	Capacity (veh/h)	v/c	LoS
Carp Road	631	2	1,600	0.39	A
Stittsville Main Street	570	1	1,000	0.57	A
Huntmar Drive	532	2	1,600	0.33	A
N-S Arterial	0	2	1,600	0.00	A
Terry Fox Drive	1,538	2	2,000	0.77	C
Total	3,271	8	7,000	0.47	A

As shown in Tables 2-3 and 2-4, the TRANS Model projects an increase of approximately 1,450 new vehicle trips in the northbound direction during the weekday morning peak hour. With the completed construction of the Stittsville Main Extension, N-S Arterial and the widening of Huntmar Drive, the projected new trips across the Project Screenline can be easily accommodated with a Level of Service 'A', according to the TRANS Model. This is indicative of significant spare capacity across the Project Screenline.

However, it should be noted that the model results for existing conditions do not accurately reflect the observed traffic volumes (i.e., ground counts). Table 2-5 summarizes recent weekday morning peak hour traffic volumes across the Project Screenline, in the peak northbound direction.

Table 2-5: Existing Peak Direction Traffic Volumes Observed at Project Screenline

Link	Observed Volume (veh/h)	#Lanes	Capacity (veh/h)	v/c	LoS
Carp Road	1,008	1	800	1.26	F
Stittsville Main Street	-	-	-	-	n/a
Huntmar Drive	408	1	800	0.51	A
N-S Arterial	-	-	-	-	n/a
Terry Fox Drive	1,274	2	2,000	0.64	B
Total	2,690	4	3,600	0.75	C

As shown in Table 2-5, the observed volumes across the Project Screenline are approximately 865 veh/h higher than the existing TRANS Model volumes (Table 2-3) and Carp Road is currently operating above capacity.

Assuming the projected increase/distribution of traffic volumes across the Project Screenline contained in the 2031 TRANS Model (Table 2-4) are valid, new 2031 volumes can be derived by superimposing the projected TRANS Model increase/distribution of traffic volumes onto existing observed volumes. The following Table 2-6 summarizes a revised projected performance across the Project Screenline.

Table 2-6: Revised Projected Peak Direction Volume at Project Screenline

Link	Derived Volume	#Lanes	Capacity	v/c	LoS
Carp Road	1,272	2	1,600	0.80	C
Stittsville Main Street	570	1	1,000	0.57	A
Huntmar Drive	704	2	1,600	0.44	A
N-S Arterial	0	2	1,600	0.00	A
Terry Fox Drive	1,590	2	2,000	0.80	C
Total	4,136	9	7,800	0.53	A

As shown in Table 2-6, despite increasing the projected traffic volume across the assumed screenline by 865 veh/h, the projected Level of Service remains an 'A', which is indicative of significant spare capacity. It should be noted that given the significant future spare capacity, the TRANS Model does not assign traffic to the new N-S Arterial and that if Carp Road were to remain as a 2-lane facility (i.e. a single lane in each direction), the Level of Service along the Project Screenline would remain an 'A'.

Therefore, solely from a screenline perspective, the widening of Carp Road from 2 to 4-lanes is not warranted. However, this is only one consideration within the needs assessment for the Carp Road Widening project.

2.2.2.2 Modified Land Use Assumptions (Local Model)

Area Development/ Redevelopment Intensification Potential

With respect to screenline analysis, it assumes traffic will distribute evenly across the screenline and does not consider area development potential along specific routes. The following analysis is summarized from the *Carp Road EA - Development Potential Analysis* memorandum prepared by Delcan, dated July 25, 2013. A copy of the memorandum is provided in Appendix C. The assumptions from this memorandum are outlined below.

Land use in the Carp Road Corridor is guided by the City of Ottawa Official Plan. The lands within the corridor are designated in the OP as *General Urban Area* south of Rothbourne Road and designated *General Rural Area* and *Carp Road Corridor Rural Employment Area* north of Rothbourne Road. More recently, lands to the east of the Carp Road Corridor, formerly within Rural Area designations in the City have been added to the Urban Area of the City as a *Developing Community (Expansion Area)*. Therefore, to capture localized projected traffic growth an analysis of the area development/redevelopment and intensification potential was prepared based on the following:

1. Vacant or underutilized lots and partial lots immediately abutting Carp Road;
2. Vacant lots available in the A.G. Reed Industrial Area (not including lots abutting Carp Road); and
3. Large vacant residential lands located in the Urban Expansion Area and General Urban Area in close proximity to Carp Road, or that would be most likely attracted to Carp Road at least in part in regards to travel.

The existing corridor contains a mixture of land uses including single family residential, commercial, and light industrial land uses. Many of the residential uses adjacent to the corridor have been converted to commercial and service uses (i.e. medical offices, veterinarian hospital, spa and aesthetics) in recent years. Zoning in the area reflects the existing conditions with a mixture of urban designated general mixed-use zones south of Rothbourne Road and rural residential, highway commercial and

industrial zones north of Rothbourne Road (Figure 2-16). The land use designations of the Official Plan and the development potential permitted through zoning will, in the fullness of time, contribute to traffic conditions on Carp Road.

Intensification on these properties was considered based on current zoning standards and development would be on the basis of private septic service (Scenario A) or full public services (scenario B). Scenario A would be considered a conservative estimate whereas scenario B would be considered the highest case scenario with regard to future travel demand on Carp Road within the project study limits.

Potential Development/Redevelopment of Properties abutting Carp Road

All properties from Hwy 417 to Hazeldean Road, immediately abutting Carp Road and determined to have additional intensification potential (large underutilized lots) were considered for future contribution of traffic to Carp Road. Development potential was obtained based on a calculation of the forecasted gross floor area yield based on existing zoning for each parcel (Figure 2-16), taking into consideration the proposed use of the lands. Commercial uses were assigned a Floor Space Index (FSI) of 0.15 under scenario A (0.2 under scenario B), and industrial uses were assigned an FSI of 0.25 under scenario A (0.3 under scenario B). Given this, a total of 56,515 m² (74,325 m² under scenario B) of additional gross floor area could be generated on properties abutting the Carp Road Corridor.

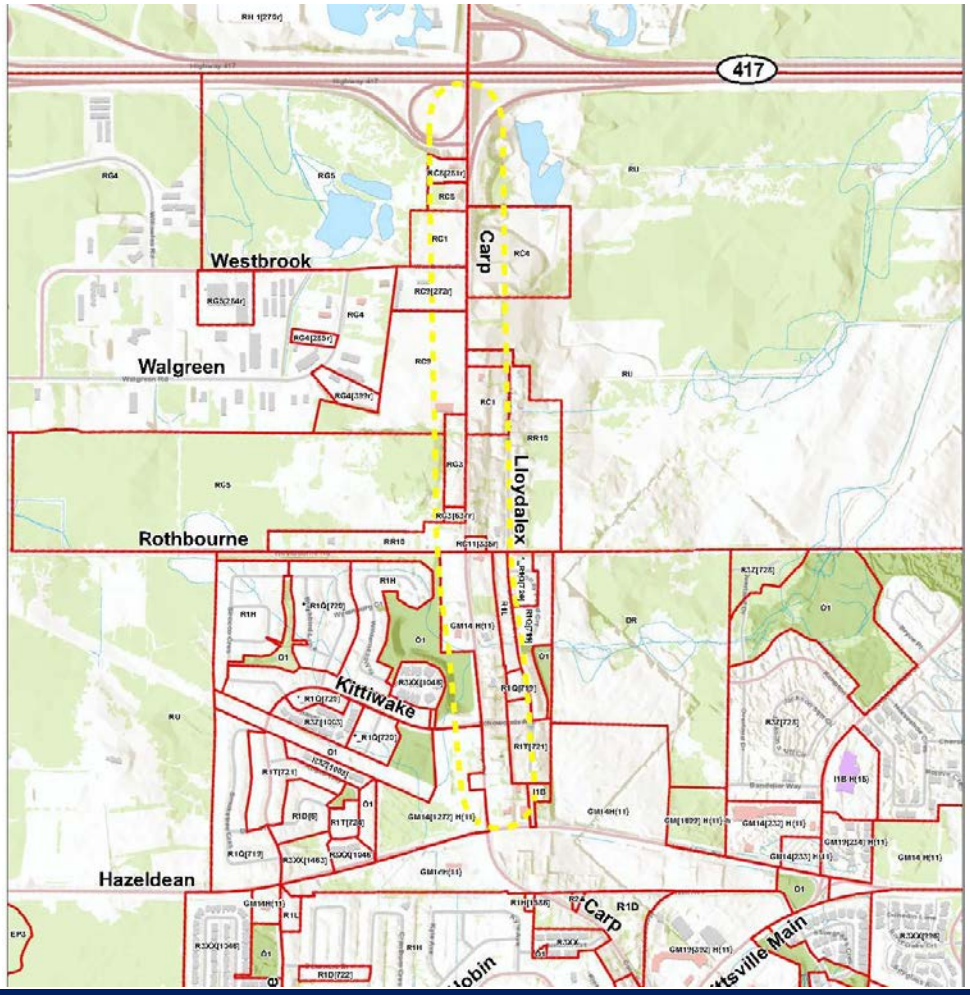


Figure 2-16: Zoning in the Carp Road Corridor

The development potential analysis also accounted for all vacant industrial lands available within the A.G. Reed Industrial Area located in the quadrant bound by Hwy 417 (north), Carp Road (east), Moonstone Road (west) and Rothbourne Road (south). Parcel size for lands within the industrial area was obtained from the City of Ottawa's *Inventory of Vacant Industrial and Business Park Lands, 2008-2009 Update* Report issued in February 2011 (Figure 2-17).

The parcels considered as subject to potential development are currently vacant lots within the industrial area that do not have permanent structures on them nor are they used for temporary outdoor storage facilities and/or parking. It is assumed that once these lots developed, they would contribute additional truck and vehicle trips on Carp Road. It is important to note that site #24 on Figure 2-17 has been assumed to accommodate a future City of Ottawa snow management facility and is not anticipated to generate significant floor space or travel demand.

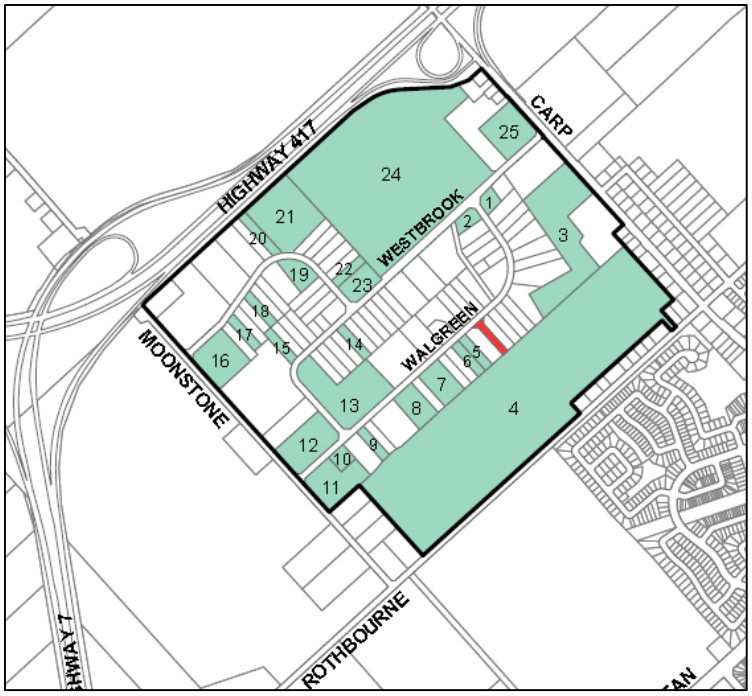


Figure 2-17: Vacant Lands within the A.G. Reed Industrial Area

Similar to land uses abutting Carp Road, a development potential of 0.25 FSI under scenario A (0.3 under scenario B) was assigned to these properties. As such, a total of 115,000 m² (138,000 m² under scenario B) of additional gross floor area could be generated on vacant lands within the industrial area.

Vacant Urban Residential Land Survey – 2013 Update

The *City's Vacant Urban Residential Land Survey*, *2013 Update* (VURLS) monitors the supply of vacant residential land in Ottawa and provides an estimate of the development potential, as well as the planned density of development, for these lands. All vacant urban residential lands located between Carp Road/Stittsville Main Street and west of Shea Road are considered to have medium to high potential of using the Carp Road Corridor as a means to access Hwy 417 (Figure 2-18). The VURLS provides development capacity for vacant land parcels in terms of unit potential as approximately 4,850 units.

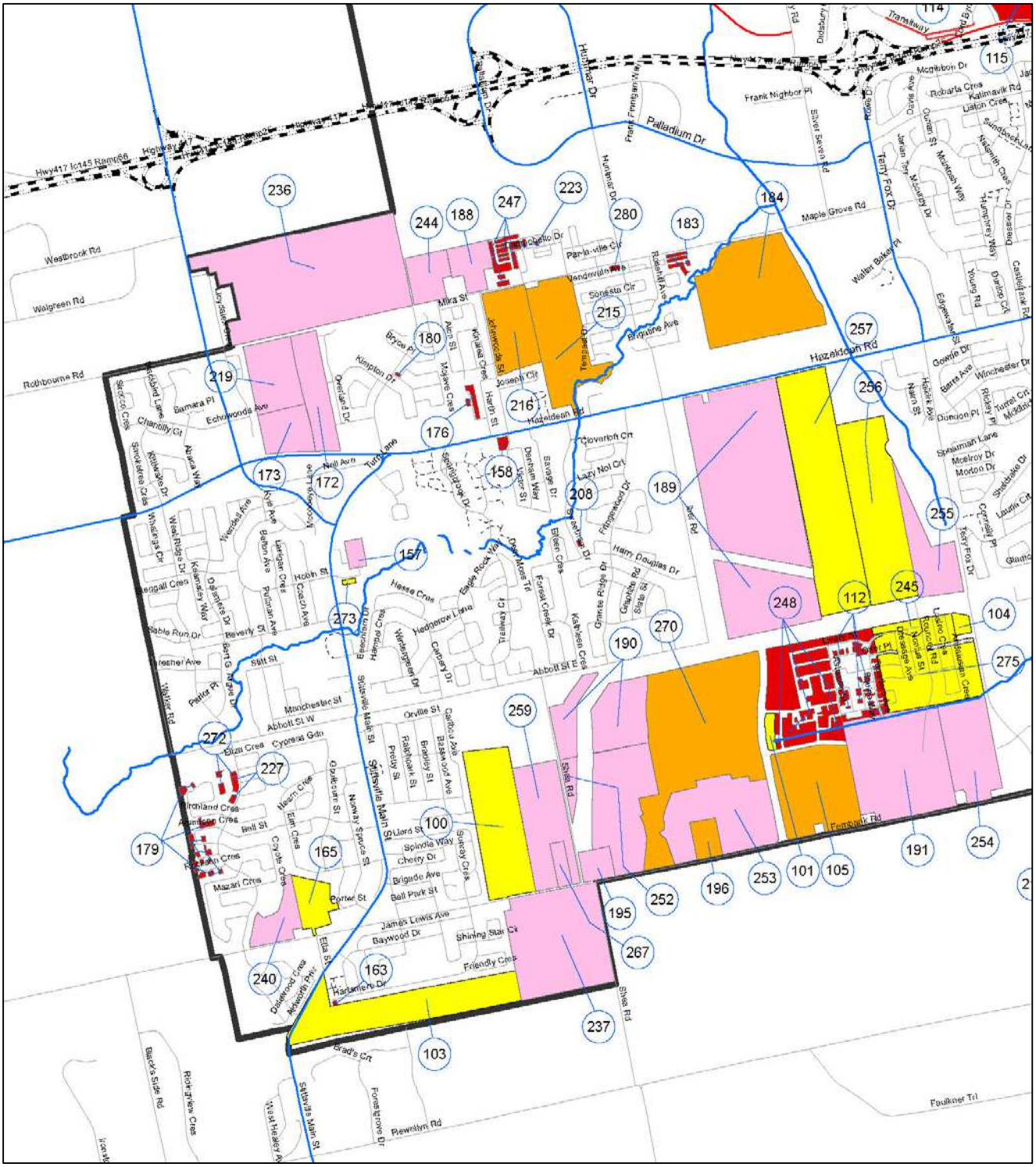


Figure 2-19 conceptually depicts the development/redevelopment and intensification areas in vicinity of the Carp Road corridor and Table 2-7 summarizes the total development/redevelopment and intensification potential in terms of gross floor area (GFA)/dwelling units.

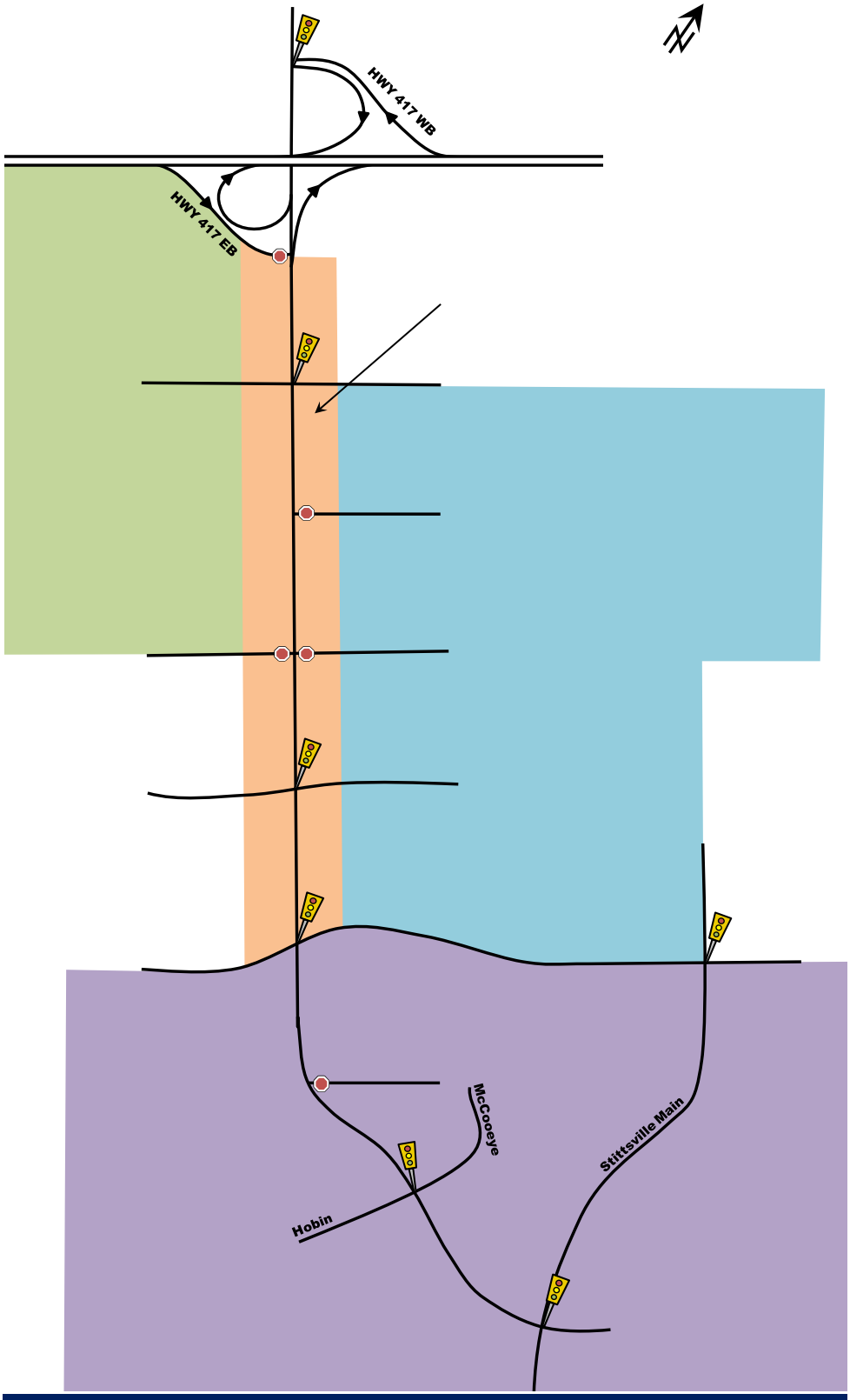


Figure 2-19: Development/Redevelopment and Intensification Area

Table 2-7: Development/Redevelopment and Intensification Potential

Development Area	Total Site Area	Scenario A Anticipated Gross Floor Area	Scenario B Anticipated Gross Floor Area
1	370,050 m^2	56,515 m^2	74,325 m^2
2	460,000 m^2	115,000 m^2	138,000 m^2
3A	90 ha	2,004 du	2,004 du
3B	87 ha	2,810 du	2,810 du
Total (Commercial/Industrial)	830,050 m^2	171,515 m^2	212,325 m^2
Total (Residential)	177 ha	4,814 du	4,814 du

Note: du = dwelling units

Scenario A = Current Zoning; Partial Services; Commercial FSI 0.15; Ind FSI 0.25
Scenario B = Current Zoning; Full Services; Commercial FSI 0.2; Ind FSI 0.3

As shown in Table 2-7, areas in the vicinity of the Carp Road corridor have significant development/redevelopment and intensification potential based on current zoning.

In terms of vehicle trip generation, appropriate trip generation rates obtained from the 9th Edition of the Institute of Transportation Engineers (ITE) Trip Generation Manual were used to project future traffic volumes along Carp Road. Table 2-8 summarizes the projected vehicle trip generation for Scenario B (greatest potential impact) using ITE Trip Generation Land Use codes 130, 210, 230 and 820.

Table 2-8: Total Projected Vehicle Trip Generation

Development Area	Area	AM Peak (veh/h)			PM Peak (veh/h)		
		In	Out	Total	In	Out	Total
1 (ITE 820)	74,325 m^2	224	137	361	753	816	1,569
2 (ITE 130)	138,000 m^2	424	94	518	162	611	773
3A (ITE 210/230)	2,004 du	185	600	785	577	329	906
3B (ITE 210/230)	2,810 du	255	826	1,081	774	442	1,216
Less Com 'Pass-by' (40%)		-72	-72	-144	-314	-314	-628
Total 'New' Auto Trips		1,016	1,585	2,601	1,952	1,884	3,836

Note:
- *A 1.3 factor to account for typical North American auto occupancy values of approximately 1.15 and combined transit and non-motorized modal shares of less than 10% was applied to obtain projected person trips.*
- *Person trips were then split into appropriate modal shares (50% Auto; 10% Auto Passenger; 20% Transit; 20% Non-motorized) to obtain 'new' vehicle trips.*

As shown in Table 2-8, the resulting number of potential 'new' two-way vehicles trips generated by the development/redevelopment and intensification areas in the vicinity of Carp Road is approximately 2,600 and 3,800 veh/h during the weekday morning and afternoon peak hours, respectively.

Assigning the projected 'new' vehicle trips to Carp Road, the following distribution was derived based on the different types of land uses, the proximity to Hwy 417 and knowledge of the surrounding area. The resultant distribution is outlined as follows:

Development Area #1 (100% assigned to Carp Road)

- 50% to/from the south via Stittsville Main Street/Carp Road; and
- 50% to/from the west via Hazeldean Road.

100%

Development Area #2 (100% assigned to Carp Road)

- 80% to/from the east via Hwy 417;
- 10% to/from the south/west Moonstone/Rothbourne; and
- 10% to/from the west via Hazeldean Road.

100%

Development Area #3A (40% assigned to Carp Road)

- 40% to/from the east via Carp Road and Hwy 417;
- 40% to/from the east via Stittsville Main Extension and Hwy 417; and
- 20% to/from the east via Hazeldean Road.

100%

Development Area #3B (50% assigned to Carp Road)

- 50% to/from the east via routes outside study area (e.g. Fernbank Road, Hazeldean Road, etc.); and
- 50% to/from the east via Carp Road and Hwy 417.

100%

Based on the above-noted distribution, projected 'new' vehicle trips were assigned to the study area network and are illustrated as Figure 2-20.

Projected Peak Hour Operations

For the purpose of this assessment, total projected volumes along Carp Road were derived by superimposing projected 'new' vehicle trips onto existing volumes, where north-southbound through volumes along Carp Road were reduced by 40%. Given the planned increase in north-south capacity identified in the City's TMP, (e.g. Stittsville Main extension, Huntmar Drive widening, etc.), it is reasonable to assume some traffic currently on Carp Road will divert to other routes. Figure 2-21 depicts projected peak hour volumes along the Carp Road corridor.

As shown in Figure 2-21, the peak directional volumes along Carp Road are projected to be in the order of 1,200 and 1,900 veh/h during the weekday morning and afternoon peak hours, respectively. Based on these projected volumes, Carp Road as a 4-lane facility (i.e. two travel lanes in each direction) would be considered to be operating at a Level of Service 'D' and 'F' during the weekday morning and afternoon peak hours, respectively.

Therefore, based on the projected area development/redevelopment and intensification potential, the widening of Carp Road from two lanes to four lanes is necessary in order to accommodate projected peak hour traffic.

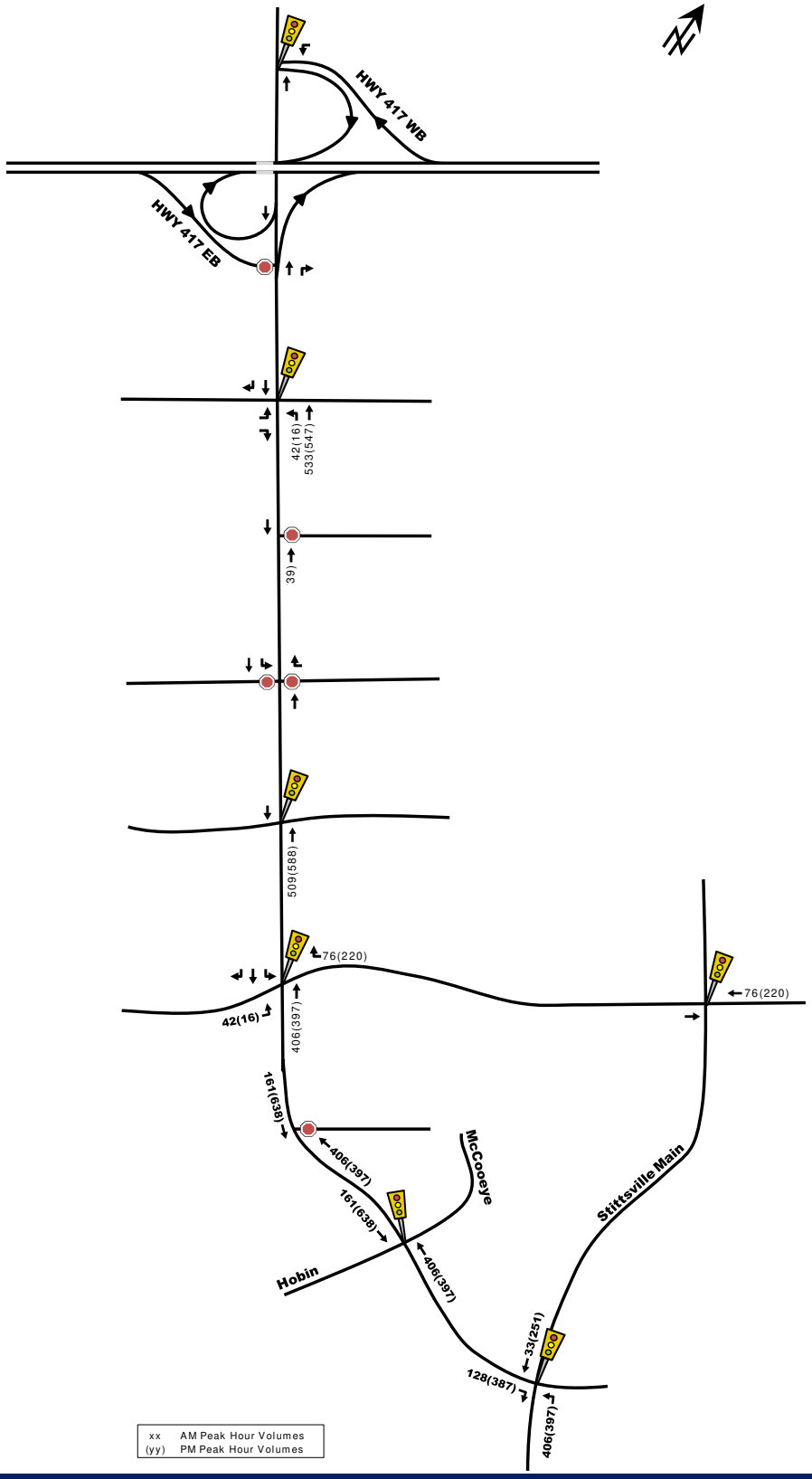


Figure 2-20: Projected 'New' Area Vehicle Traffic

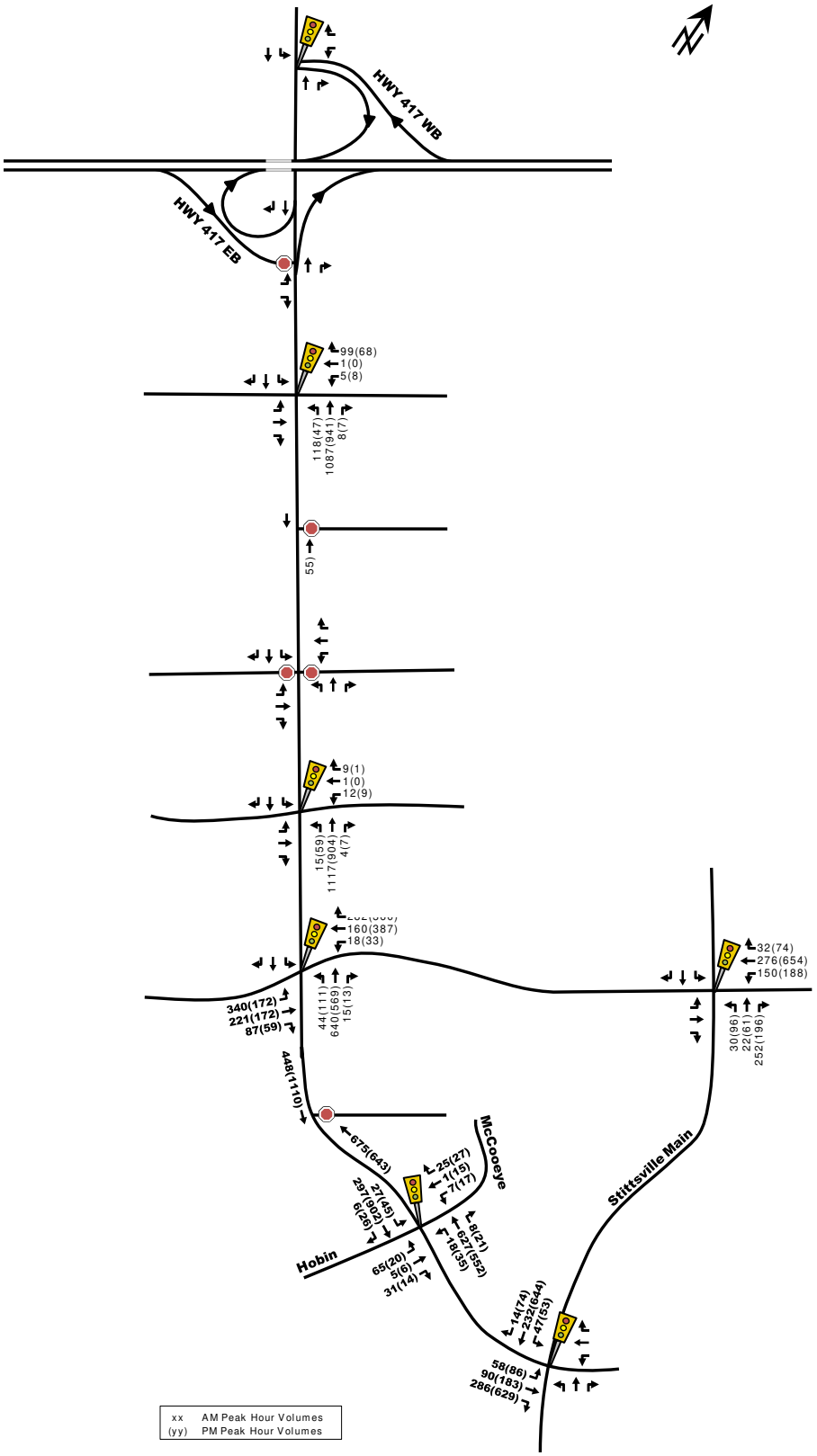


Figure 2-21: Total Projected Peak Hour Traffic

Downstream Impacts

With respect to downstream impacts, it should be noted that there are no plans to increase capacity south of Hazeldean Road (i.e. Carp Road and Stittsville Main Street), which is projected to result in failing conditions at the Carp/Stittsville Main intersection. Regarding the configuration of the Carp Road Bridge over the Highway 417, two southbound lanes and a single northbound travel lane will be sufficient based on the total projected volumes depicted in Figure 2-21.

Projected Peak Period Operations

With respect to peak hour analysis, it should be noted that with increased congestion, commuters will consider adjusting their schedules (up to approximately an hour) to avoid the travel time delays associated with travel during the peak hour. It is understood that this phenomenon is being contemplated by the City of Ottawa as part of their update of the Transportation Master Plan and identification of transportation infrastructure needs.

In the theoretical world of travel demand modelling, the standard practice by the City of Ottawa has been to derive the peak hour travel demand by taking the result of the 2.5 hour peak period assignment and dividing by a factor of 2.1. By comparison, the *average* hourly demand over the duration of the peak period could be derived by taking the result of the 2.5 hour peak period assignment and dividing by a factor of 2.5. This adjustment results in an approximate 15% reduction in the typical projected peak hour volumes emerging from the TRANS model.

Based on the foregoing logic, the projected peak hour volumes depicted in Figure 2-21 were adjusted to derive the average hourly directional volumes along Carp Road. These are estimated to be in the order of 1,200 and 1,400 veh/h during the weekday morning and afternoon peak periods, respectively. Based on these projected peak period volumes, Carp Road as a 4-lane facility (i.e. two travel lanes in each direction) would be considered to be operating at Level of Service 'D' or better during peak periods.

Therefore, based on the projected area development/redevelopment and intensification potential, the widening of Carp Road to 4-lanes remains necessary based on projected average hourly volumes over the duration of the peak period.

2.2.3 Operational Performance

Based on the projected peak hour volumes depicted in Figure 2-21, the following Table 2-9 provides a summary of projected peak hour performance at study area intersections based on the SYNCHRO (V8) traffic analysis software, assuming Carp Road as a 4-lane facility and optimized signal timing plans/signal timing offsets.

Table 2-9: Projected Peak Hour Intersection Operations

Intersection	Weekday AM Peak (PM Peak)					
	Critical Movement			Intersection 'as a whole'		
	LoS	max. v/c or avg. delay (s)	Movement	Delay (s)	LoS	v/c
Carp/HWY 417 WB On/Off-Ramps	C(D)	0.78(0.90)	WBL(WBL)	26.8(41.0)	C(D)	0.76(0.88)
Carp/Westbrook	A(D)	0.57(0.90)	NBT(EBL)	17.9(31.9)	A(C)	0.54(0.80)
Carp/Rothbourne	A(D)	0.59(0.90)	WBT(EBT)	8.0(16.3)	A(A)	0.48(0.60)
Carp/Kittiwake/Echowoods	D(C)	0.81(0.73)	EBL(SBT)	16.0(13.7)	A(C)	0.45(0.71)
Carp/Hazeldean	D(F)	0.88(1.27)	EBL(SBT)	28.8(76.9)	B(F)	0.63(1.12)

Intersection	Weekday AM Peak (PM Peak)					
	Critical Movement			Intersection 'as a whole'		
	LoS	max. v/c or avg. delay (s)	Movement	Delay (s)	LoS	v/c
Carp/Hobin/McCooeye	A(B)	0.49(0.69)	NBT(SBT)	8.7(10.3)	A(B)	0.46(0.63)
Stittsville Main/Carp	D(F)	0.81(2.03)	NBL(NBL)	18.1(151.3)	B(F)	0.64(1.45)
Stittsville Main/Hazeldean	B(A)	0.64(0.54)	NBR(NBR)	15.7(23.3)	A(A)	0.38(0.45)

Note:
- *Analysis of signalized intersections assumes a Peak Hour Factor (PHF) of 0.95 and a saturation flow rate of 1800 veh/h/lane.*
- *Assumes 4-lane cross-section within Carp Road Corridor*

Despite an assumed widening of Carp Road, other operational improvements (e.g. auxiliary turn-lanes, advanced/protected signal phasing, etc.) are warranted to mitigate projected failing intersections/turning movements at study area intersection. These will be determined as part of the identification and evaluation of alternative designs. The conclusion is that a four lane facility, with turn lanes at intersections as appropriate, can operate at a satisfactory level of service.

2.3 Opportunities for the Corridor

The accommodation of active transportation is a common theme in both the OP and TMP and will be important determinants in the selection of the preferred solution and ultimately the preferred design for the widening of Carp Road.

2.3.1 Opportunities for Pedestrian Integration

Based on field observations, sidewalks currently exist along the east side of Carp Road from Stittsville Main Street to Hazeldean Road and along the west side of Carp Road from Hazeldean Road to Kittiwake Drive. For approximately 75 m on either side of the Carp/Hazeldean intersection, sidewalks exist along both sides of Carp Road. Where sidewalks do not currently existing along the corridor, paved or unpaved shoulders are provided.

In the Official Plan review (2013) the City adopted a Complete Streets policy and are committed to promoting Active Transportation Modes including walking and cycling. Within the City's transportation policies of the OP; in the construction or reconstruction of transportation facilities, the City "will ensure the provision of facilities to address the needs of pedestrians and cyclists, where feasible" (s.2.3.1.3).

Supporting the City's Official Plan, Section 4.1 of the Transportation Master Plan, provides policy direction with regards to walking to:

"Require the provision of pedestrian facilities on all existing, new and reconstructed roads as follows:
- *On both sides of arterials…in the urban area and arterials in the villages.*
- *On both sides of all roads that carry transit service in the urban area and in rural villages.*

In road corridors where the context is appropriate, a multi-use pathway may be used in lieu of a sidewalk and should be maintained year-round, subject to winter maintenance policies."

On this basis, there is an opportunity to improve the pedestrian environment within the project limits.

2.3.2 Opportunities for Cycling Integration

An existing paved shoulder from Stittsville Main Street to Neil Avenue and on-road bike lanes from Neil Avenue to Kittiwake Drive are the existing cycling amenities with the Carp Road Corridor. The Ottawa Cycling Plan (OCP), updated in 2013 designates Carp Road from Stittsville Main Street to beyond the study area in the north as a Spine Route. The Official Plan also designates Carp Road from Stittsville Main Street to Highway 417 and beyond as a spine route in the Primary Urban Cycling Network (Schedule C). Spine routes provide access along major road corridors, connecting cross-town bikeways and multi-use pathways to neighbourhood bikeways and feeder routes.

As noted in the previous section, the Official Plan contains policies to promote Active Transportation Modes in the City in their strategic transportation policies. These include *in the construction or reconstruction of transportation facilities, the City shall ensure the provision of facilities to address the needs of pedestrians and cyclists where feasible" (s.2.3.1.3) and "protect corridors for the network of Primary urban cycling routes identified on Schedule C" (s2.3.2.4).*

Cycling projects identified in the ultimate network, however not within the affordability criteria, such as Carp Road, will be enabled through external sources of funding such as road construction or re-construction projects (Action 5.2, TMP, 2013). On this basis, there is an opportunity to improve the cycling environment within the project limits.

2.3.3 Opportunities to improve Visual Character

Appendix C includes a report provided by Lashley & Associates, namely the *Right-of-Way Characterization Study* (2013). This report includes a Road Character Matrix and identifies area context, lot frontage, uses, drainage conditions, road frontage and visual impacts anticipated with the project. The report provides additional detail to what is described below.

The Carp Road Corridor north of Rothbourne Road is largely within the designated Rural Area of the City, whereas the corridor south of Rothbourne Road is within the designated Urban Area of the City. On the east side of the corridor, between Westbrook Drive and Rothbourne road, approximately 70 ha of lands have been added to the Urban Area. Whereas, from a policy perspective, some of the corridor has a rural land use planning designation, the visual environment has common characteristics throughout as a semi-urban area at Stittsville's urban/rural fringe. There is little that remains or that is planned to remain of the corridor's prior rural setting south of Hwy 417, other than perhaps some longer views to the east from the Hwy 417 interchange area overlooking a former aggregate operation and designated Rural Natural features area (which itself is undergoing extensive tree removal and site alteration).

The Carp Road Corridor serves as a gateway, or perhaps a side entrance, to the Stittsville community from the rural area north of Hwy 417 and from Hwy 417 itself, for primarily motor vehicle travellers. It is however, not a Design Priority Area within the City. The lands immediately abutting the corridor are a mix of residential, commercial and service, and light industrial uses with buildings of varying ages, sizes and site conditions. Lands south of Rothbourne Road, immediately adjacent to the corridor are slowly converting from residential uses to commercial uses, reusing the existing former homes. Future lot consolidation and complete redevelopment are permitted by zoning and perhaps inevitable.

Drainage for the area is presently in the form of roadside ditches for the majority of the Corridor within the project limits with only the roadway south of Kittiwake Drive being served by storm sewers. As noted, the City of Ottawa OP protects for a 37.5m Right-of-Way for the Carp Road Corridor throughout the project limits from Hazeldean Road to Hwy 417. This would imply an urban cross-section and provision of drainage via curbs and catch basins, except perhaps in the vicinity of the Hwy 417 interchange ramps. Areas of visible outside storage exist on some lots, and large billboard signs exist throughout the corridor. Overhead pole mounted utility lines are located along each side of the corridor, and this contributes to a cluttered and unpleasing visual environment.

In conclusion, there is an opportunity to prepare a design for Carp Road that result in an improvement to the visual environment and that has regard for the corridor's location in what is essentially planned as a new and redeveloping urban area at the rural urban fringe. There is an opportunity to provide a quality visual environment within a widened right-of-way that will in turn encourage a quality built form adjacent to it. This can be accomplished through a compact urban cross-section, with appropriate landscaping improvements including the introduction of street trees within the right-of-way.

2.4 Conclusion of Need and Opportunity on Carp Road

The findings and conclusions in regards to the need and opportunity for a renewed Carp Road from Hwy 417 to Hazeldean Road are as follows:

- According to the City's TMP, significant roadway and transit capacity is planned in Stittsville and Kanata West areas. With respect to solely the results of the City's current TRANS model, the widening of Carp Road from 2 to 4-lanes is not justifiable, however, there are other considerations;
- Based on the planned development and the redevelopment and intensification potential within the Carp Road capture area, approximately 2,600 and 3,800 'new' two-way vehicle trips are projected on Carp Road during the weekday morning and afternoon peak hours, respectively. With respect to the projected peak hour and average peak period volumes based on the planned development within the vicinity of Carp Road, the widening of Carp Road from two lanes to four lanes is required;
- There exists some traffic movements and safety considerations that warrant the need to improve traffic operations on Carp Road that can be best addressed with a four lane roadway;
- There is an opportunity to provide pedestrian and cycling facilities on Carp Road in accordance with the current policy direction of the City's Official Plan and Transportation Master Plan; and
- There is also an opportunity to improve the visual environment and functionality of Carp Road to provide a pleasing entrance to Stittsville and to encourage new development and redevelopment on lands adjacent to it.

Based on the forgoing, alternative solutions should be evaluated that respond to the above noted needs and opportunities.

3.0 Existing Environmental Conditions

This section of the ESR represents the studies and investigations undertaken to date on the existing conditions within the study area corridor. It is intended to document the baseline conditions for the corridor against which the potential environmental effects of the alternatives can be assessed. This information will be updated progressively as investigations continue and additional information becomes available. Overall, the baseline data was collected and analyzed for key environmental parameters in order to:

- provide an understanding of existing conditions;
- allow for future predictions of how the proposed project may cause these environmental conditions to change;
- allow for future predictions of how adverse effects can be mitigated and beneficial effects enhanced; and
- provide a basis for designing monitoring programs.

The following sub-sections describe the existing natural, economic, social, and transportation conditions encompassing the corridor.

3.1 Study Area Boundaries

As explained in Section 1.1, the Carp Road Widening project limits extend from the south side of Hwy 417 south to Hazeldean Road. Study Area limits may change depending on the element of the environment discussed but generally include the extension of Carp Road beyond Hazeldean Road to Stittsville Mainstreet. This is because some potential environmental effects may be localized, such as noise, whereas others like the movement of people may have broader implications.

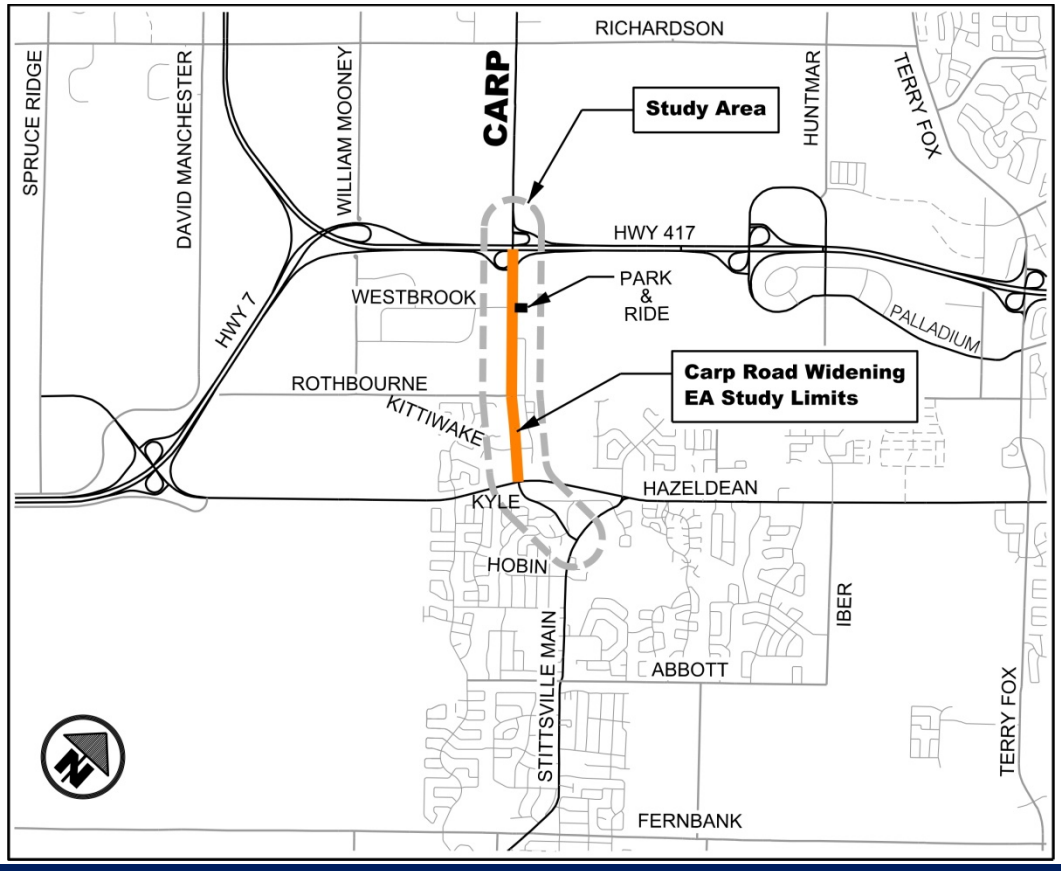


Figure 3-1: Project Limits

3.2 Methods of Investigation

This information was prepared by a multidisciplinary team of land use planners, biologists, geologists, archaeologists, cultural landscape planners, municipal engineers, transportation planners, and experts in air quality, noise and vibration. This team of specialists collected, consolidated, reviewed and screened all available information with a view towards establishing the basis for development, analysis and evaluation of alternative solutions.

The inventory considered all available background material and where necessary, supplemented this information through on-site surveys and/or detailed studies which are included, in full, in Appendix C. The inventory is of sufficient detail to enable the analysis and evaluation of alternative transportation solutions, designs and mitigating measures.

The general methodology involved the following elements:

- The submission of requests for data, drawings, reports to affected agencies;
- Contacting and meeting with affected parties as required;
- Consolidating, reviewing and analysing relevant material for each element;
- Conducting air photo interpretation and field verification as required;
- Identifying elements or criteria that could be considered potential evaluation criteria; and
- Preparing a draft baseline report to be reviewed by all participants to ensure thoroughness, reliance and reflectivity of agencies and public interests.

Specific methods of investigation may be discussed in further detail in the respective sections as warranted. Transportation conditions were summarized in Section 2.0 and form part of the existing conditions for the study area.

3.3 Social Environment

3.3.1 Municipal Plans and Policies

Land use planning policy within the study area is guided by the plans and policies of provincial and municipal levels of government. The municipal plans and policies that will affect development of the Carp Road corridor are outlined below.

3.3.1.1 Official Plan

The City of Ottawa's Official Plan, 2013 as amended, and its supporting Master Plans provide a vision for future growth within Ottawa and set the policy framework to guide its physical development over the plan horizon to 2031. The OP serves as a basis for, and provides guidance on, a wide range of municipal activities. The section of Carp Road within the study area transects various OP designations as per Schedules A (Rural Policy Plan) and B (Urban Policy Plan) of the OP (Figure 3-2).

From Hwy 417 to Rothbourne Road, Carp Road is designated as *Carp Road Corridor Rural Employment Area*, allowing for a unique and diverse range of employment and industrial opportunities, including manufacturing, mining (aggregates), retail trade, construction, agriculture, transportation as well as personal, professional and business services. The rural reference is an acknowledgement that the lands are serviced with on-site private individual services.

Along the east side of Carp Road, from Westbrook Drive to Rothbourne Road, exists a pocket of lands designated *General Rural Area* and the merely reflects that fact that seven (7) residential lots front onto Carp Road that are serviced with on-site private individual services. This pocket is orphaned between a newly designated urban expansion area (see below) and other General Urban Area lands to the south of that.

From Rothbourne to Hazeldean Roads, Carp Road is designated *General Urban Area*, permitting the development of a full range and choice of housing types to meet the needs of all ages, incomes and life circumstances, in combination with conveniently located employment, retail, service, cultural, leisure, entertainment and institutional uses.

Urban Expansion Areas

A 69.5 hectare parcel of land, designated *Developing Community (Expansion Area)*, is located along the east side of Carp Road, between Hwy 417 and Rothbourne Road, and its unit potential has been estimated at 1,299 dwelling units. These lands, are to "develop primarily for residential purposes, although minor, non-residential uses to meet the needs of a neighbourhood may also be located here" (OP, Section 3.12). Prior to being developed, these lands will require an OP amendment to provide a *General Urban Area* designation and may also be required to implement infrastructure, environmental and open space provisions of plans approved for individual areas. Opportunities for access to Carp Road and the surrounding network will be determined through future study.

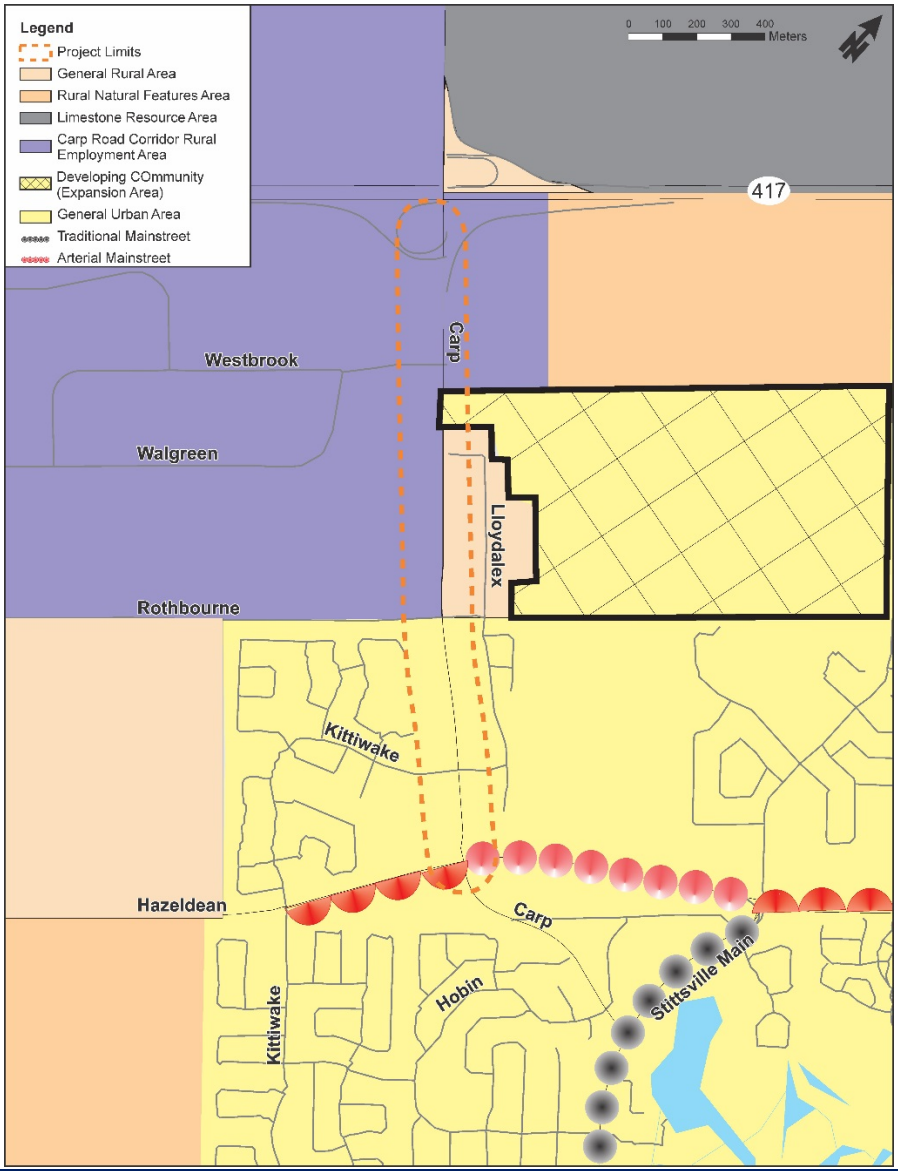


Figure 3-2: Official Plan (2013) Policy Designations

3.3.1.2 Local Area Planning and Community Design Plans

In order to translate the goals of the OP to the community scale, the City of Ottawa may undertake a variety of planning studies, concept plans, zoning studies or community design plans. Community Design Plans (CDPs) are planning tools that focus primarily on land use and development issues and may produce any number of strategies required to address the physical development of the study area. As they relate to the study area, the Carp Road Corridor and Stittsville Main Street CDPs are discussed below.

3.3.1.3 Carp Road Corridor Community Design Plan

The Carp Road Corridor CDP, as approved by City Council (June 2004) sets out area-specific land use policies as well as strategies for servicing, the environment, road improvements, visual appearance and marketing of the rural employment area along the Carp Road Corridor. This corridor extends from Rothbourne Road in the south, across Hwy 417 to March Road in the north.

The CDP provides a framework to guide future development along the corridor and addresses issues that have been identified as concerns in the community. One of the key objectives of the CDP which forms an important consideration to attract businesses to the Carp Road Corridor is to "*ensure that Carp Road continues to function as a major arterial road that provides easy accessibility to Hwy 417 and the Carp Airport and businesses in the Corridor*". Other objectives outlined in the CDP include:

- to promote the corridor as a rural employment area;
- to enhance the corridor's visual appearance; and
- to ensure future land-use compatibility.

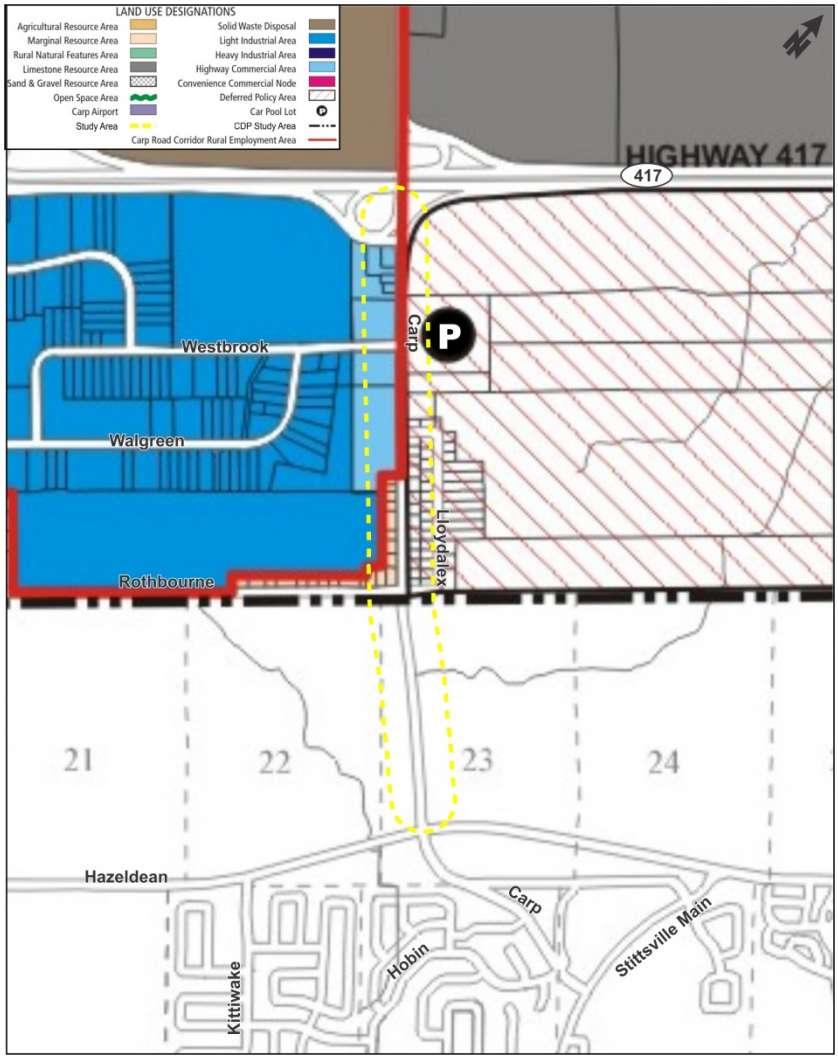


Figure 3-3: Carp Road Corridor Community Design Plan

As a result of the CDP, Schedule A of the City's OP was amended to include a new land-use designation ("Carp Road Corridor Rural Employment Area"). Amendments to the Zoning By-Law were adopted by the City to implement the CDP's land use plan along the Carp Road Corridor. Figure 3-3 illustrates the land-use plan prepared for the Carp Road Corridor along the project limits, which includes "Highway Commercial" land uses along the west side, and a lack of land use direction (Deferred Policy Area) on the east side.

3.3.1.1 Stittsville Main Street Community Design Plan

The City of Ottawa is currently completing a CDP focused on Stittsville Main Street, from Bell Street to Carp Road (Figure 3-4). The City is undertaking this CDP to update the planning framework in response to recent development activity along the Stittsville Main Street corridor. Additionally, the community of Stittsville is expected to undergo significant growth; from its current population of 27,000 to an estimated 70,000 by the year 2031.

The Stittsville Main Street CDP will contain a 20-year outlook for Main Street, and will provide guidance on balancing a mix of residential and commercial development with a vibrant street that supports the community. To achieve this, CDP recommendations will be made on: the scale and design of future development; the transit, walking, and cycling improvements; how to address any future traffic congestion; sewer and water improvements; and greenspace and streetscape improvements, amongst others.

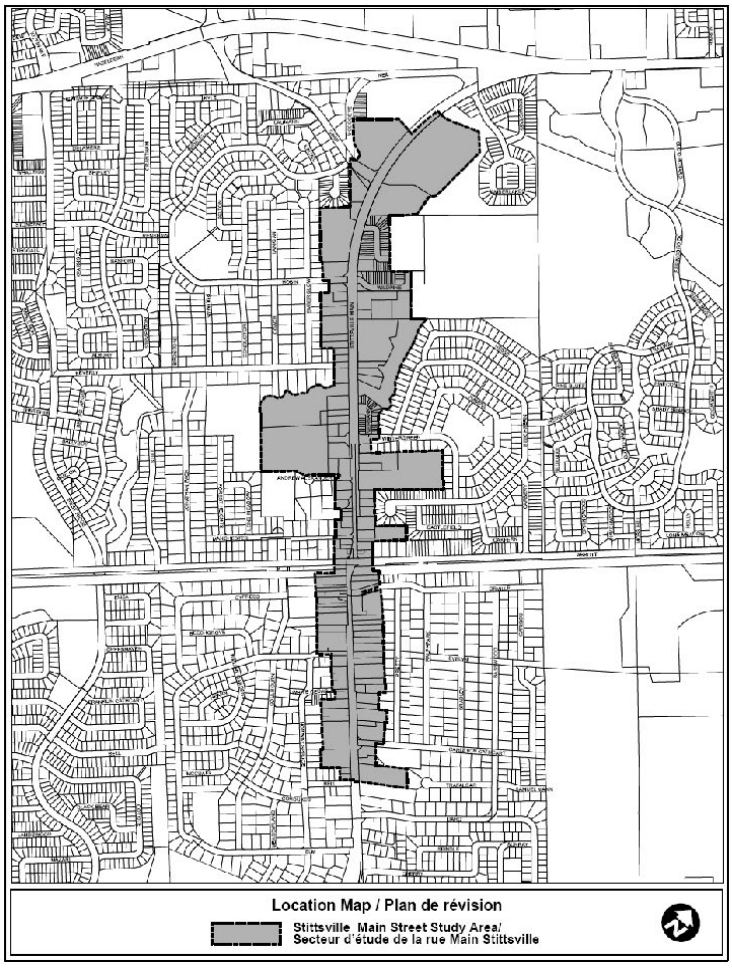


Figure 3-4: Stittsville Main Street CDP Area

3.3.1.2 Comprehensive Zoning By-Law

A comprehensive Zoning By-Law (ZBL) for the City of Ottawa was passed by Council in 2008 (See Figure 2-16). From Hwy 417 to Rothbourne Road, the lands adjacent to the corridor are zoned *Rural Commercial* (RC), *Rural General Industrial* (RG) or *Rural Countryside* (RU).

The RC zone permits the development of Hwy and recreational commercial uses which serve the rural community and visiting public. The purpose of the RG zone is to accommodate a range of light industrial uses and limited service commercial uses for the travelling public. The RU zone recognizes and permits a wide range of rural-based land uses which often have large lot or distance separation requirements, such as agricultural, forestry, country residential lots created by severance and other land uses characteristic of Ottawa's countryside. It is understood that a portion of the RU zone on the east side of the corridor will be replaced with urban zoning as plans and approvals for the urban expansion area are advanced.

South of Rothbourne Road, to Hazeldean Road, lands adjacent to the corridor are zoned *General Mixed-Use* (GM), allowing for residential, commercial and institutional uses. This zone also permits uses that are often large and serve or draw from broader areas than the surrounding community and which may generate traffic, noise or other impacts.

Lands in the periphery of Carp Road are zoned for various uses. To the east of Carp Road, from Hwy 417 to Hazeldean Road, most of the lands that border parcels abutting Carp Road are zoned *Rural Countryside Zone* (RU) and *Development Reserve* (DR). Whereas the RU Zone enables land uses characteristic of Ottawa's countryside, the DR zone recognizes lands intended for future urban development and therefore "limit the range of permitted uses to those which will not preclude future development

options". Through communications with City of Ottawa's staff, it was indicated that these parcels of land are already targeted for residential subdivision development in the near future, and it unit potential has been estimated at 2,036 dwelling units (Vacant Urban Residential Land Survey, 2013 Update).

To the west of Carp Road, from Highway 417 to Rothbourne Road, the lands (bordering parcels abutting Carp Road) are part of the A.G. Reed Industrial Area and are zoned for *Rural General Industrial* (RG) uses, enabling the development of light industrial uses which generate employment in the area. South of Rothbourne Road, to Hazeldean Road, periphery lands to the west of Carp Road are all zoned for residential uses and have been developed.

3.3.2 Land Use

Figure 3-5 illustrates the land uses located along the study area. This information was prepared using the City's Land Use surveys completed in 2010. Land use immediately adjacent to Carp Road corridor, from Hwy 417 to Hazeldean Road, consists mostly of formerly single detached dwellings, many of which have been converted to commercial uses, as well as gas bars, automotive-related uses and businesses catering to the agriculture industry and corresponding to the Highway commercial, semi-urban environment. A large parcel of idle and shrub land is located on the east side of Carp Road, south of Hwy 417, overlooking a former aggregate resource use and natural environmental areas further to the east.

The majority of vacant land parcels located along, or in close proximity to the west side of Carp Road is part of the A.G. Reed Industrial Area. More specifically, the industrial park is located in the quadrant bound by Hwy 417 (north), Carp Road (east), Moonstone Road (west) and Rothbourne Road (south). This industrial park provides opportunities for rural industrial uses and generates employment in the area. Most industrial lots develop with few permanent structures on them, are used for temporary outdoor storage facilities and/or surface parking. Municipal water is available only to the easternmost lots within the park.

Open recreational uses are located at the west side of Carp Road and Kittiwake Drive, including a large stormwater management area and pathway connections into the community.

3.3.2.1 Agricultural Potential

There are no designated agricultural lands adjacent to the Carp Road projects or within the study area.

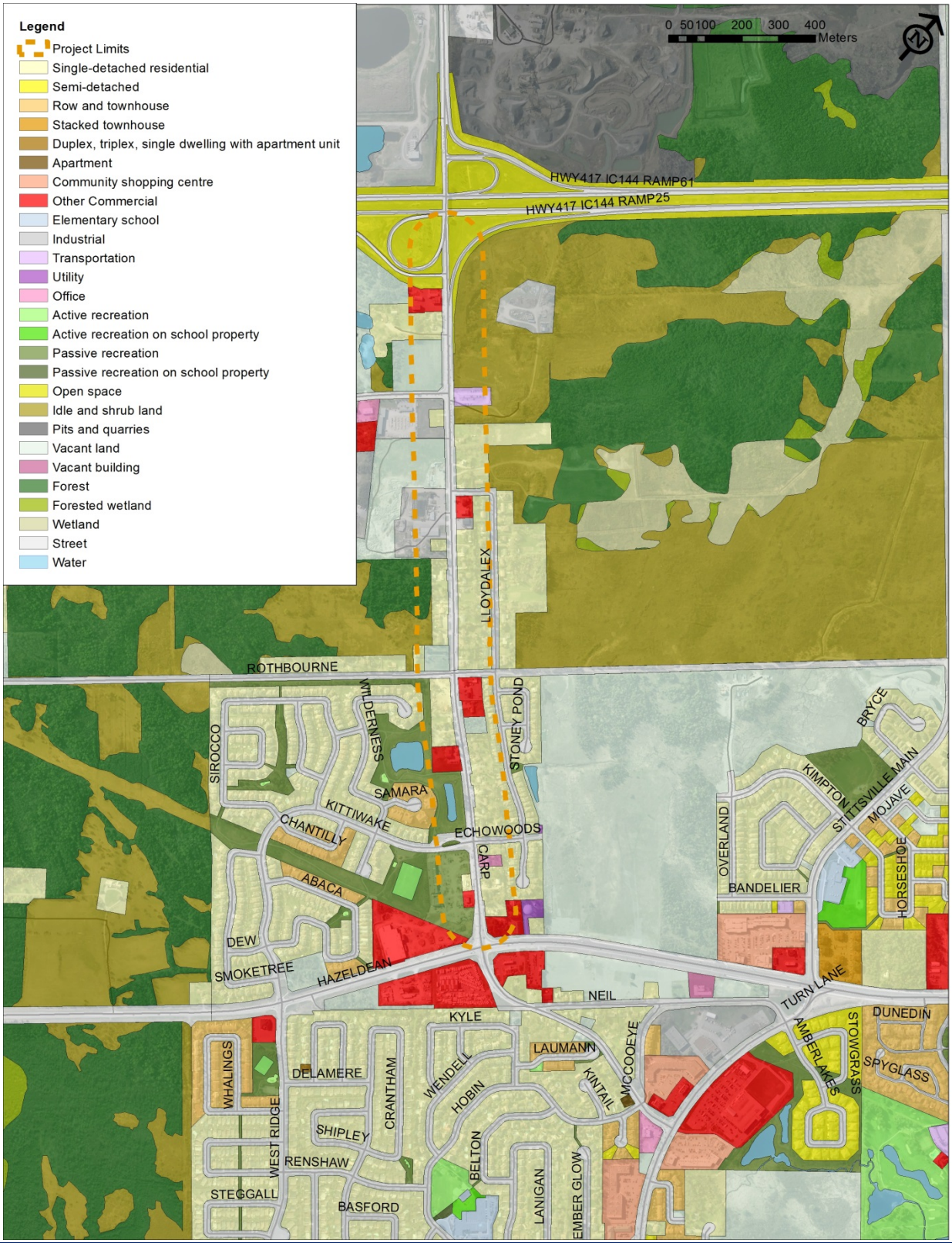


Figure 3-5: Existing Land Use (2010 Survey)

3.3.3 Land Ownership and ROW Considerations

Carp Road is a municipally owned ROW, as illustrated on Figure 3-6. Hwy 417, located to the north of the study area, is owned by the Ministry of Transportation of Ontario, who also owns the roads adjacent to the Hwy and uses these lands as on-ramps to the Hwy. The MTO's corridor control area extends southerly from the ramp system to a point approximately 45 m from the centre of the Hwy 417 structure. MTO also owns the ROW to a point just south of the southernmost ramp terminals at the interchange.

The City of Ottawa also owns large vacant parcels of land adjacent to Carp Road, most notably between Hwy 417 and Lloydalex Crescent on which the City operates a Park and Ride Lot, as well as the stormwater management area and park/pathway connections north of Kittiwake Drive. No other public parcels of land have been identified within the study corridor.

As noted in section 2.1, the Official Plan protects land within the Project limits to allow for a 37.5 m ROW however less than this exists throughout the corridor as noted in Table 3.1. Many of the lots fronting Carp Road within the project limits are small, relatively shallow lots with direct access onto Carp Road. Larger parcels are located on the east side of Carp Road, north of Rothbourne Road. As such, property acquisitions and impacts on private property will be an important consideration. This is a particularly important consideration in the instances where existing smaller buildings are set close to the existing street lot line and where the lands between the buildings and the street lot line are used for parking lots, driveway parking, and private landscape (front yard) area. Many of these buildings are former residences that have been re-purposed for commercial and service uses, where access and parking are important to the functionality of those land uses. The existing corridor conditions including the location of the protected 37.5 m ROW is depicted in Appendix B – Existing Corridor Conditions.

Table 3-1: Existing Average ROW Widths

Sector	ROW Width (Range)	Protected ROW Width (Official Plan)
Hwy 417 to Westbrook	31.0 m to 37.0 m	37.5 m
Westbrook to Llydalex	27.0 m to 30.0 m	37.5 m
Lloydalex to Rothbourne	24.0 m to 28.0 m	37.5 m
Rothbourne to Kittiwake/Echowoods	22.0 m to 30.0 m	37.5 m
Kittiwake/Echowoods to Hazeldean	29.0 m to 30.0 m	37.5 m

3.3.4 Community and Recreation Facilities

Community and recreation facilities are illustrated on Figure 3-7. Within an urban setting parks and leisure areas provide people with the most frequent and immediate contact with greenspace, and three parks are located in the vicinity of the project limits.

Feedmill Creek Park is located at 1080 Carp Road, and is the only City of Ottawa Park located within the study area. The park provides pathway connections through greenspace associated with the Timbermere Holding Pond. Kittiwake Park is located at 15 Kittiwake Drive, and Echowoods (Lloydalex) Park is located at 66 Lloydalex Crescent, both of which are located adjacent to the study area on either side of the corridor.

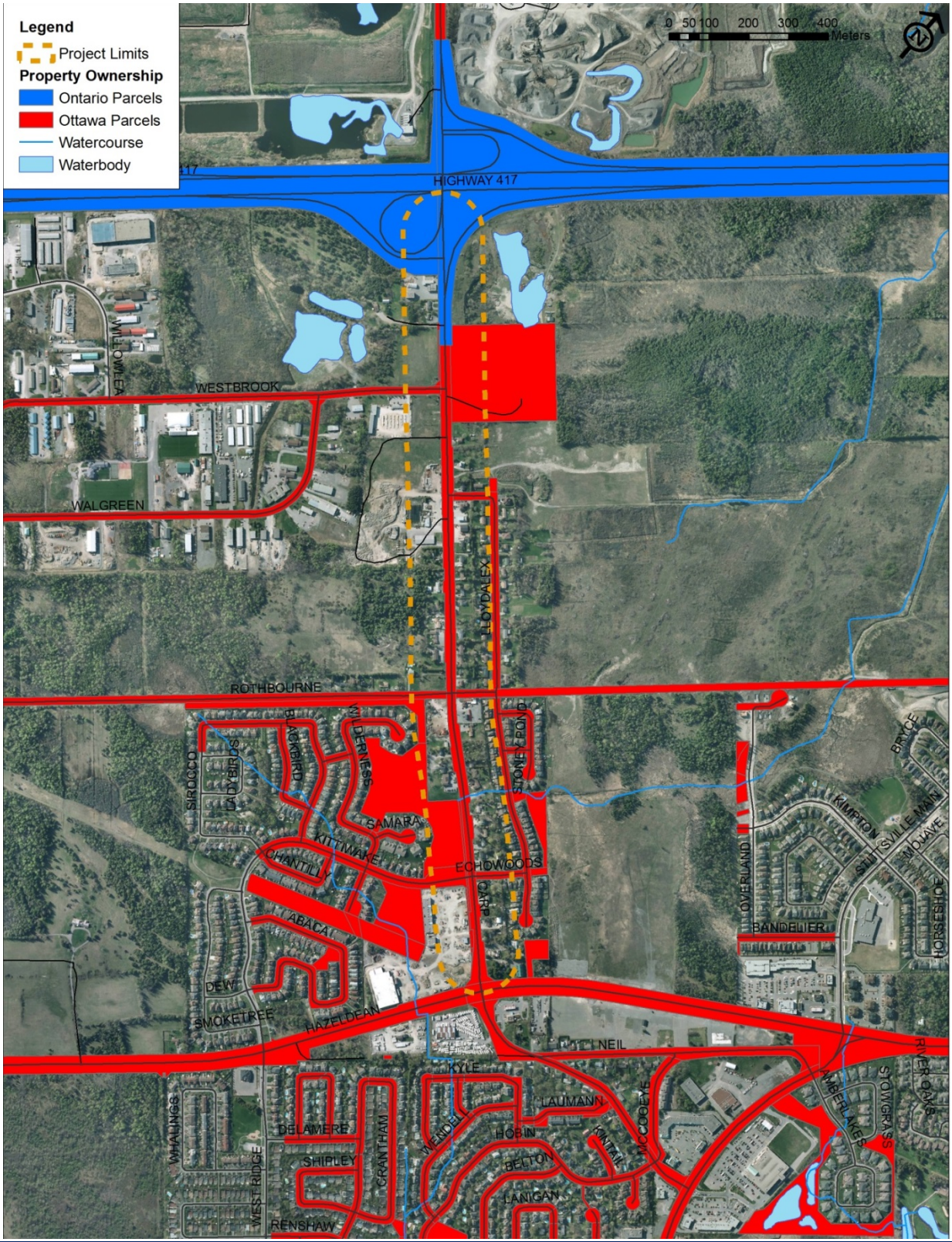


Figure 3-6: Land Ownership

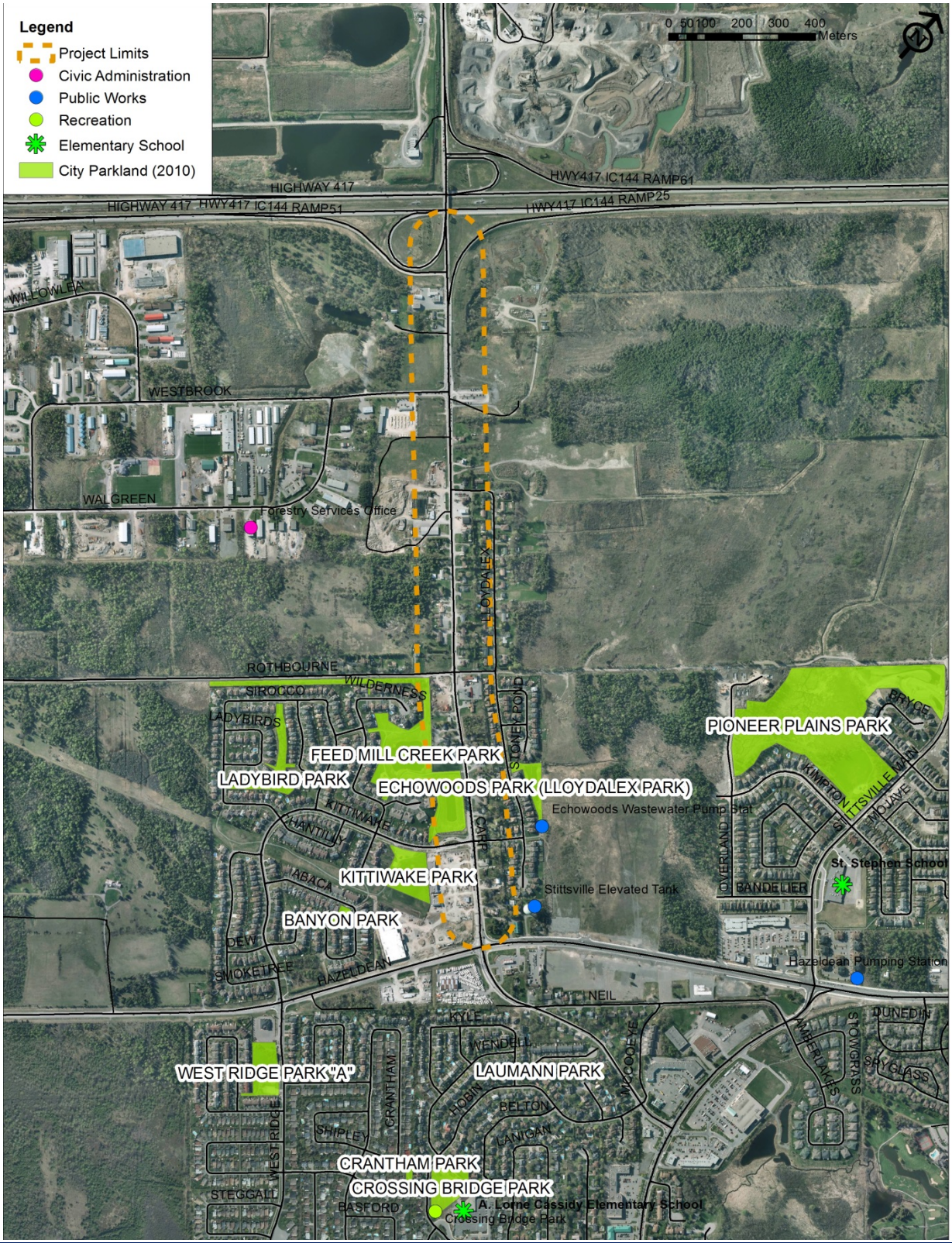


Figure 3-7: Community and Recreation Facilities

3.3.5 Air Quality, Noise and Vibration

Gradient Wind Engineers (GWE, formerly Gradient Microclimate Engineering Inc) has completed a qualitative assessment of existing air quality, noise and vibration within the study area (See Appendix C). The work was based on mapping, aerial photographs and GWE's experience on similar projects. The overall study area was confined to the immediate area of the Carp Road corridor between Stittsville Main Street to the south and Hwy 417 in the north. The primary roadways that affect air quality, noise and vibration within the study area include Carp Road, Hazeldean Road, Stittsville Main Street and Hwy 417.

The qualitative existing conditions assessment was based on a review of transportation related activities within the study area, generalized noise calculations using STAMSON 5.04, and generalized air quality calculations using CAL3QHCR and research into local geology.

3.3.5.1 Air Quality

In general, GWE has determined that vehicle traffic is the primary source of harmful air-borne pollutants in the study area (GmE, 2013). In addition to roadway sources, stationary pollution sources exist within the same area, which include emergency diesel generators, steam and hot water boilers and numerous other processes and equipment at commercial and industrial facilities (GmE, 2013). Examples include the A.G. Reed Industrial Area, shopping plazas, a landfill, a quarry and several landscaping companies.

The quarry (located at the northeast quadrant of the Hwy 417 interchange) and landscaping companies have stock piles which are fugitive sources of dust and particulates. Emissions from roadway vehicles and stationary sources include Carbon Monoxide (CO), Hydrocarbons (HC), Oxides of Nitrogen (NO_X) and Particulate Matter (PM), among others, which contribute to ambient air quality levels.

GWE completed an assessment of ambient air quality that required estimating the concentrations of the noted pollutants, measured in either parts per million (ppm) or micrograms per cubic meter ($\mu g/m^3$). The estimated pollutant concentrations were compared to clean air standards developed by the Ontario Ministry of Environment's (MOE) Standards Development Branch including:

i. The *Ambient Air Quality Criteria* (AAQC)[1] are the Ministry's targets for clean air from all sources of pollutants.
ii. *Ontario Regulation 419: Air Pollution – Local Air Quality Standards* (O.Reg. 419/05)[2], are the legal limits for single or multiple sources falling within a single property, such as an industrial facility.

The AAQC and O.Reg. 419/05 standards for representative pollutants are listed in Table 3-2 below, with the averaging period for each pollutant indicated in parenthesis.

[1] Standards Development Branch, Ontario Ministry of the Environment, *Ontario's Ambient Air Quality Criteria (AAQC)*, April 2012.
[2] Standards Development Branch, Ontario Ministry of the Environment, *Summary of Standards and Guidelines to Support Ontario Regulation 419: Air Pollution – Local Air Quality*, April 2012.

Table 3-2: Ambient Air Quality Criteria and O.Reg. 419/05 Standards

Pollutant	AAQC (µg/m³)		O.Reg. 419/05 (µg/m³)		Limiting Effect
CO	36200 (1 hr)	15700 (8 hr)	6000 (1/2 hr)		Health
HC*	2500 (24 hr)		2500 (24 hr)		Health
NO_X	400 (1 hr)	200 (24 hr)	400 (1 hr)	200 (24 hr)	Health
(PM_{10}, < 10 µm)	50 (24 hr)		Not Available		Health
($PM_{2.5}$, < 2.5 µm)	30 (24 hr)		Not Available		Health

*Note: * Represented by Hexane, n-(part of a mixture)*

Current ambient concentration levels for the noted pollutants are available from the MOE permanent monitoring station at 960 Carling Avenue in Ottawa, Ontario. The conservative 90th percentile ambient levels for each major vehicle emission are included in Table 3-3 below.

Table 3-3: Ambient Air Quality Background Levels

Pollutant	Background (µg/m³)
Carbon Monoxide (CO)	293*
Hydro Carbons (HC)	Not Available
Oxides of Nitrogen (NO_X)	36
Particulate Matter ($PM_{2.5}$, < 2.5 µm)	10

*Note: * Measured at the Ottawa Downtown Monitoring Station*

Based on the AAQC, recorded ambient levels and land usage within the study area, the following categories are applicable to describe air quality conditions in the study area:

SEVERE — Selected pollutants are expected to approach AAQC standards on a regular basis, or occasionally exceed them;

MODERATE — Selected pollutants are expected to approach AAQC standards occasionally;

LOW — Selected pollutants are expected to rarely approach AAQC standards.

Figure 3-8 illustrates the zones within the study area for which the forgoing descriptions are applied. In general, the concentrations of pollutants produced by vehicle emissions are low in areas at minimum of 100 m from Hwy 417. Within the 100 m distance limit, air quality impacts gradually increase to moderate levels, although they remain below the AAQC limit. Commercial, industrial, and institutional facilities were assumed to have undergone MOE compliance approval screening and are not considered to have significant impacts. Where multiple facilities existing in close proximity to Carp Road, their cumulative impacts may require more detailed analysis.

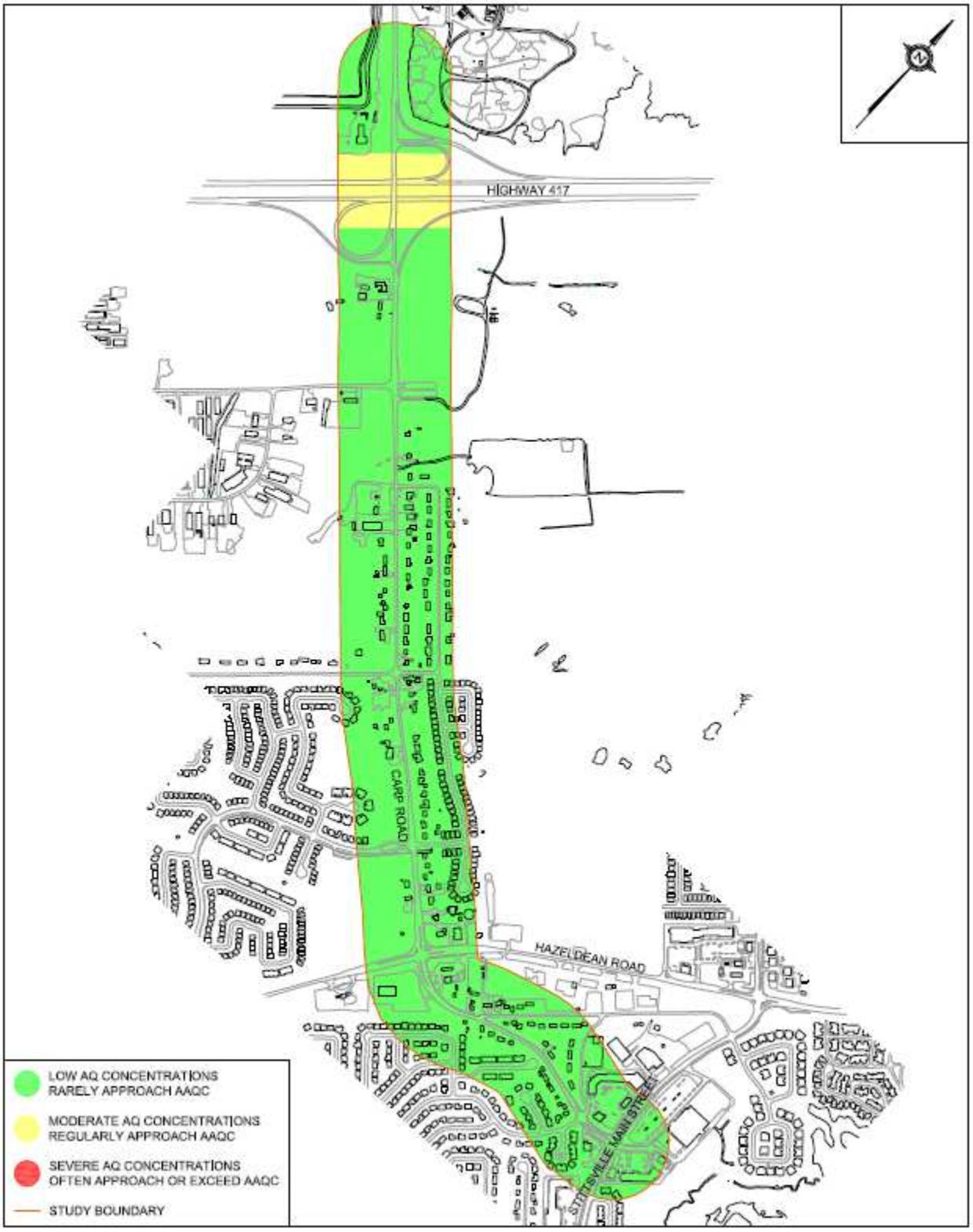


Figure 3-8: Local Air Quality

Source: GME Carp Road Widening – Qualitative Study (Figure 1)

3.3.5.2 Noise

Vehicular noise is the primary source of environmental noise within the study area. Stationary noise sources exist within the study area and include emergency generators, steam and hot water boilers; and numerous other processes at commercial and industrial facilties.

The quantification of roadway noise is based on the decibel unit, dBA. With this scale, a doubling of sound power at the source results in a 3 dBA increase in measured noise at the receiver, and is just perceptible to most people. An increase of 10 dBA is usually perceived to be twice as loud.

The results of roadway noise calculations are expressed in terms of the equivalent sound level (L_{EQ}) for daytime and nighttime periods. L_{EQ} is defined as the continuous sound level that has the same energy as a time varying noise level over a selectable period of time. For roadways in Ottawa, the L_{EQ} is calculated based on a 16 hour daytime / 8 hour nighttime split.

The City of Ottawa has a comprehensive technical document for the purpose of assessing and controlling oise impacts within its urban boundary, named the *Environmental Noise Control Guideline* (ENCG). According to the ENCG, daytime L_{EQ} of 55 dBA or lower are acceptable for outdoor living areas (OLA's), with mitigating measures being required as the noise levels exceed 60 dBA. Noise sensitive areas defined by the ENCG and MOE guidelines include residential and institution land uses such as schools, hospitals, parks, and places of worship.

Based on the ENCG, the following categories are applicable to describe the existing noise conditions for the study area:

SEVERE	Daytime L_{EQ} noise levels at receivers are expected to exceed 60 dBA
MODERATE	Daytime L_{EQ} noise levels at receivers are expeted to fall in the range of 55 to 60 dBA
LOW	Daytime L_{EQ} noise levels are expeted to fall below 55 dBA

Figure 3-9 illustrates the zones within the study area for which the foregoing descriptions are appropriate. Generally, the noise levels throughout the corridor fall into one of the three categories. The levels are dicated by proximity to high-volume roadways. Noise levels will exceed 55 dBA where receptors are located in close proximity to arterial roadways, and will fall below 55 dBA in more isolated areas. With respect to stationary noise sources, the noted industrial and commercial facility types are considered to have undergone screening under MOE's environmental compliance approval process and NPC-205, therefore their impact on overall noise levels within the study area are assumed to be negligible. The conclusion is that all lands abutting Carp Road within the study area fall into the "severe" category in regards noise levels, and this noise is primarily associated with vehicles travelling along Carp Road.

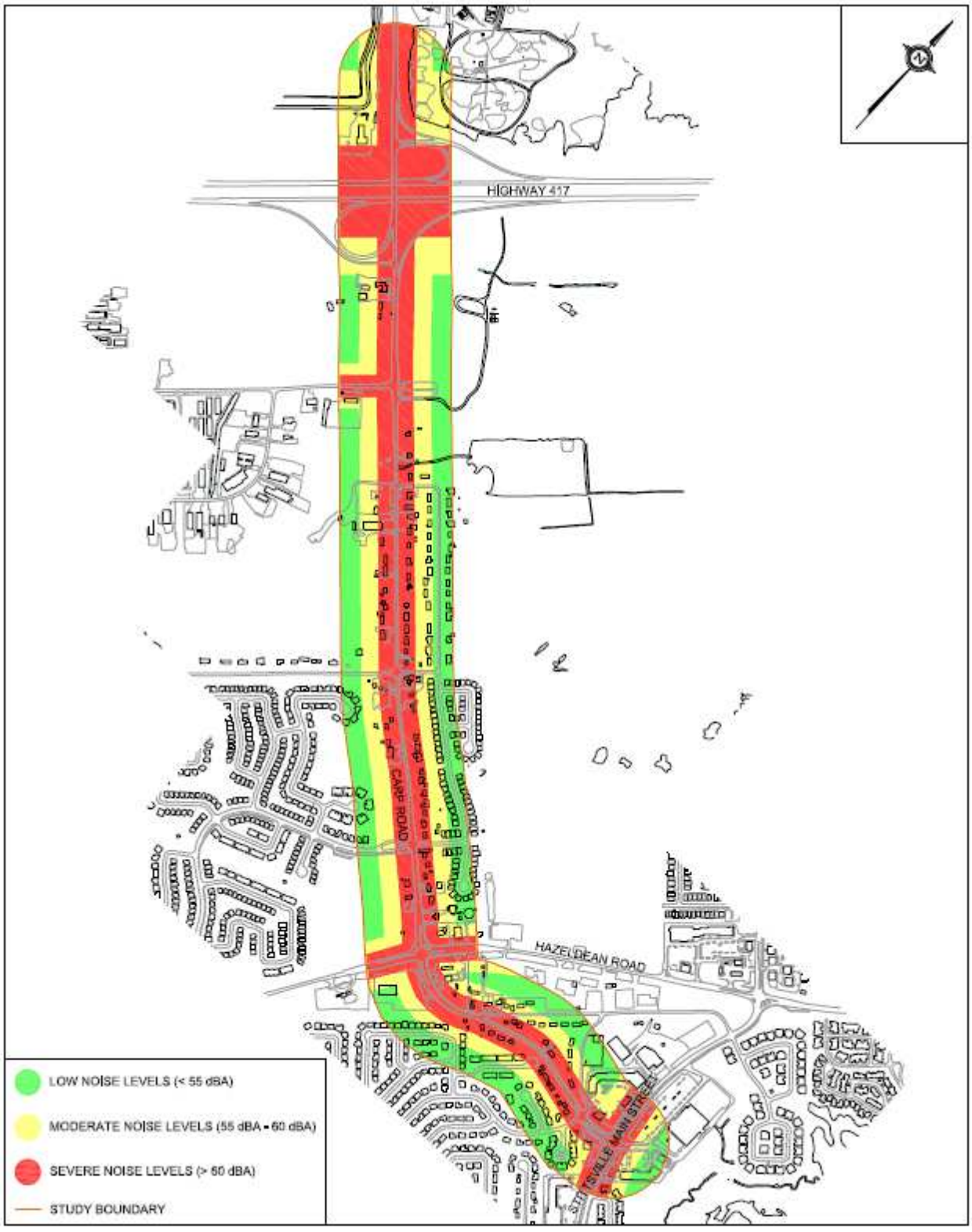


Figure 3-9: Local Traffic Noise Conditions

Source: GME Carp Road Widening – Qualitative Study (Figure 2)

3.3.5.3 Ground Vibrations and Ground-Borne Noise

Railways and heavy vehicles (trucks and buses) passing over uneven roadway surfaces can produce perceptible levels of ground vibrations, and incidentally ground-borne noise. Human response to ground vibrations is measured by the root mean square (RMS) of the movement of a particle on a surface. Typical units of ground vibration measures are millimeters per second (mm/s), or inch per second (in/s). Since vibrations can vary over a wide range it is also appropriate to represent them in decibel units (dBV) referenced to one micro inch per second.

The threshold level of human perception to vibrations is about 0.1 mm/s RMS or about 72 dBV. Although somewhat variable, the threshold of annoyance for continuous vibrations is 1.0 mm/s or 92 dBV, ten times higher than the perception threshold. The threshold for significant cosmetic damage to buildings is 30 mm/s or 121 dBV at least three hundred times higher than the perception threshold level.

According to vibration criteria standards for a variety of building functions, the appropriate criteria for residential buildings are 0.1 mm/s RMS (72 dBV) for vibrations and 35 dBA for ground borne noise. Based on the ground vibration criteria for human perception, the following categories are applicable to describe the existing ground vibrations within the Carp Road study area:

SEVERE	Vibrations at receptors exceed 1 mm/s (92 dBV) RMS particle velocity and are likely to cause adverse reactions with building occupants;
MODERATE	Vibrations at receptors fall between 0.1 mm/s (72 dBV) to 1 mm/s (92 dBV) RMS particle velocity and will be noticeable but will not cause adverse reactions in the building occupants;
LOW	Vibrations at receptors fall below 0.1 mm/s (72 dBV) and will not be noticeable to building occupants.

Figure 3-10 illustrates the zones within the study area for which the forgoing descriptions are appropriate. In general terms, vibration levels throughout the area are expected to fall below the human perception level of 0.1 mm/s (72 dBV), except in close proximity to Carp Road, Hazeldean Road and Hwy 417, where low levels of vibrations may be perceptible to a small percentage of the human population. The conclusion is that all lands abutting Carp Road within the study area fall into the “moderate” category in regards vibrations, and the vibrations are primarily associated with vehicles travelling along Carp Road.

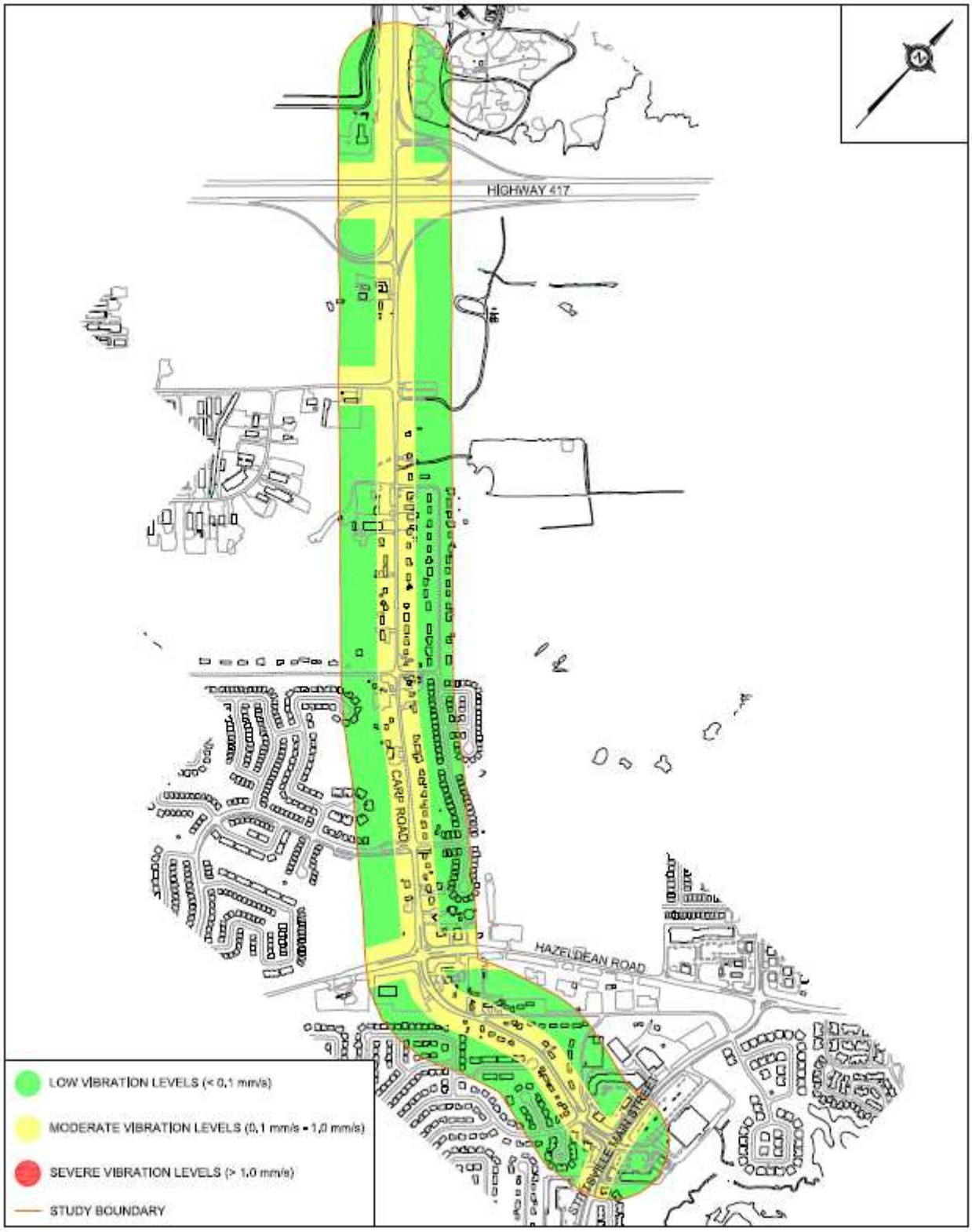


Figure 3-10: Local Vibration Conditions

Source: GmE Carp Road Widening – Qualitative Study (Figure 3)

3.3.6 Aboriginal Land Claims

In 1985, the Algonquin Nation asserted a claim against Canada and Ontario to Aboriginal rights and title of 8.9 million acres of land in southeastern Ontario. The Ottawa area is included in the claim settlement area (Figure 3-11).

A Preliminary Draft Agreement in Principle is an ongoing process that is currently available for public review. The timing of the Algonquin Agreement-in-Principle Ratification Vote is anticipated to take place in the spring of 2013, although the vote is dependent on the achievement of an Agreement-in-Principle, with work taking longer than originally anticipated. Negotiations are ongoing, with the Algonquin's of Ontario, Canada, and Ontario working to reach an agreement. A potential settlement is still a number of years away.

The settlement is expected to include a financial package, parcels of titled land, economic development opportunities and an agreement on harvesting rights, including hunting, fishing, trapping and gathering. It remains the position of all three negotiating parties, however, that private property will not be expropriated to settle this claim, and the rights of private land owners to make use of and access their land will be protected.

The parties have not identified any potential Algonquin settlement lands within the study corridor.

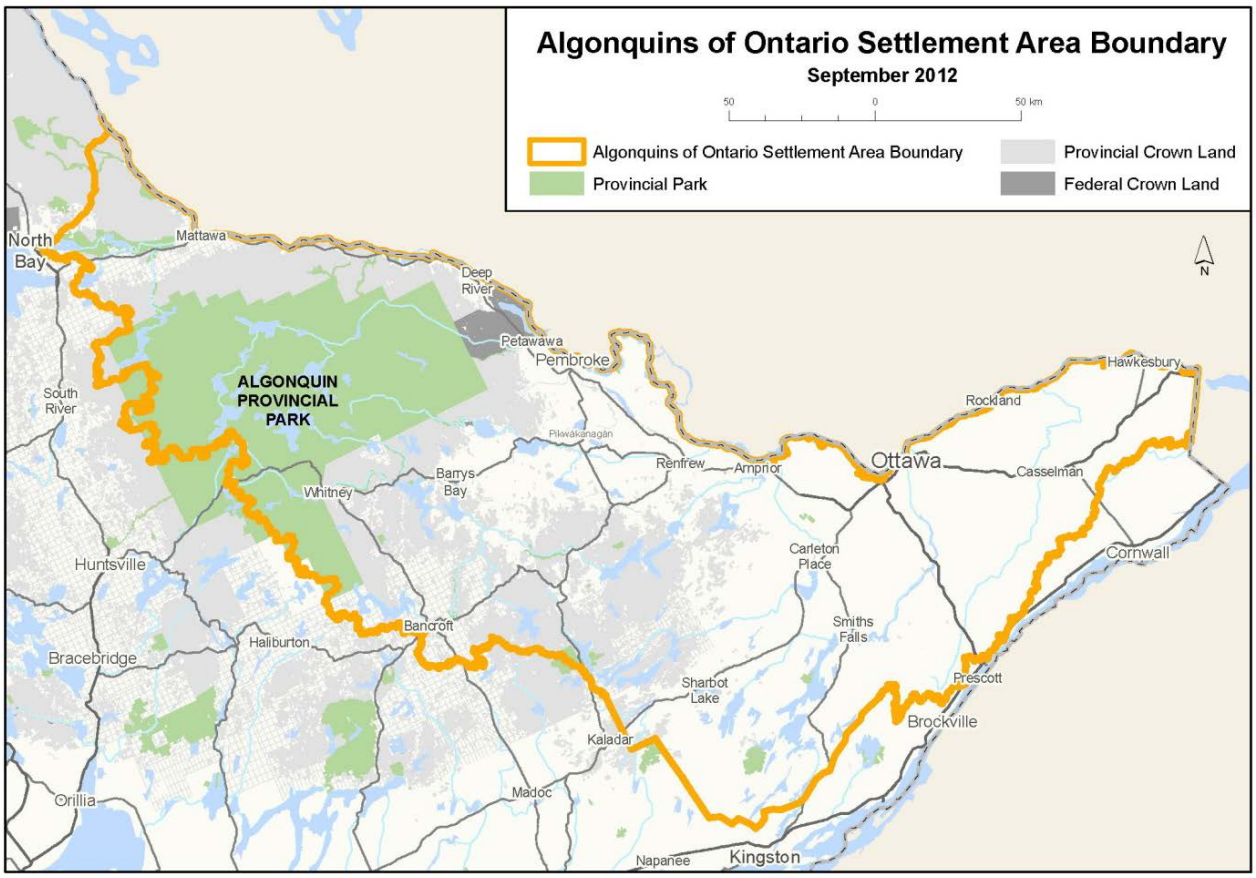


Figure 3-11: Algonquin's of Ontario Settlement Area Boundary

Source: (http://www.aboriginalaffairs.gov.on.ca/english/negotiate/algonquin/consultation_map.pdf)

3.3.7 Archaeological and Heritage Resources

Past Recovery Archaeological Services has completed a Stage 1 Archaeological Assessment (Appendix C) for the study corridor. Specifically the area examined included the segment of Carp Road from the north side of the Hwy 417 interchange to the intersection with Stittsville Main Street within a 100 m buffer on either side of the roadway. The project limits cuts through Lots 1, 2 and 3, Concession 2 and Lots 1, 2 and 3, Concession 3 in the geographic Township of Huntley, as well as Lots 23 and 24, Concession 11 and Lots 22 and 23, Concession 12 in the geographic Township of Goulbourn, which are now located within the City of Ottawa.

3.3.7.1 Archaeological Potential

The study area exhibits several characteristics that may be indicative of the potential for the presence of archaeological resources associated with historic Euro-Canadian settlement and/or land uses including the entire study corridor being within 300 m of an early Euro-Canadian settlement; and the entire study corridor lies within 100 metres of an early historic transportation route (Carp Road).

Historical and archaeological research was conducted and a list of known cultural resources within the study area was compiled, historical mapping and aerial photographs were consulted, and an environmental profile for the area was generated. Field studies were comprised of a visual inspection of the study area on 22 June 2013, in order to augment the archeological potential evaluation. The property inspection consisted of a wind-shield and walk through survey along the study corridor.

The majority of the study area was determined to exhibit conclusive evidence of deep and extensive disturbance as a result of the intense level of development that has occurred in recent decades. The exceptions are the historic farmstead located at 2090 Carp Road and the minimally disturbed lands immediately to the north of this property as well as lands on the west side of Carp Road to the north and south of Westbrook Road which also appear minimally disturbed. The Great Fire of 1870 devastated the entire area and consequently there are no pre-1870 residential or commercial structures remaining extant within the study corridor.

3.3.7.2 Archaeological Sites

Past Recovery Archaeological Services requested a search of the Archaeological Sites Database by the Ontario Ministry of Tourism, Culture and Sport within the vicinity of the study area. A search of the database for all registered sites located within the vicinity of the study area indicate that no sites have previously been recorded within 1 km of the present Carp Road study corridor.

3.3.7.3 Cultural Heritage Resources

No previously identified local cultural heritage resources were found to be located within or immediately adjacent to the present study area. However, the field inspection conducted by Past Recovery Archaeological Services identified four properties of heritage value within the study corridor. However, only one of the four cultural heritage properties is located north of Hazeldean Road (2090 Carp Road). This property is a storey-and-a-half frame gable end house with an extension located at 2090 Carp Road. The home has been renovated and refinished in stucco, but remains much of its late nineteenth century character (Past Recovery, 2013). Although the current building post-dates the 1870 destruction, cartographic evidence suggests that the building's location has not changed over time; indicating that the building has not changed locations over time and that it may have been rebuilt on the foundations of the earlier house.

The remaining three (3) potential cultural heritage properties are located to the south of the primary study corridor. These include:

- a large two-story frame building at 1268 Carp Road;
- a small storey-and-a-half gable end house at 1260 Carp Road; and
- a log house situated at 1194 Carp Road, with several buildings appearing on the lot in historic maps of the area.

Areas of archaeological potential have been identified in associated with the three historic properties in Old Stittsville (Figure 3-12).

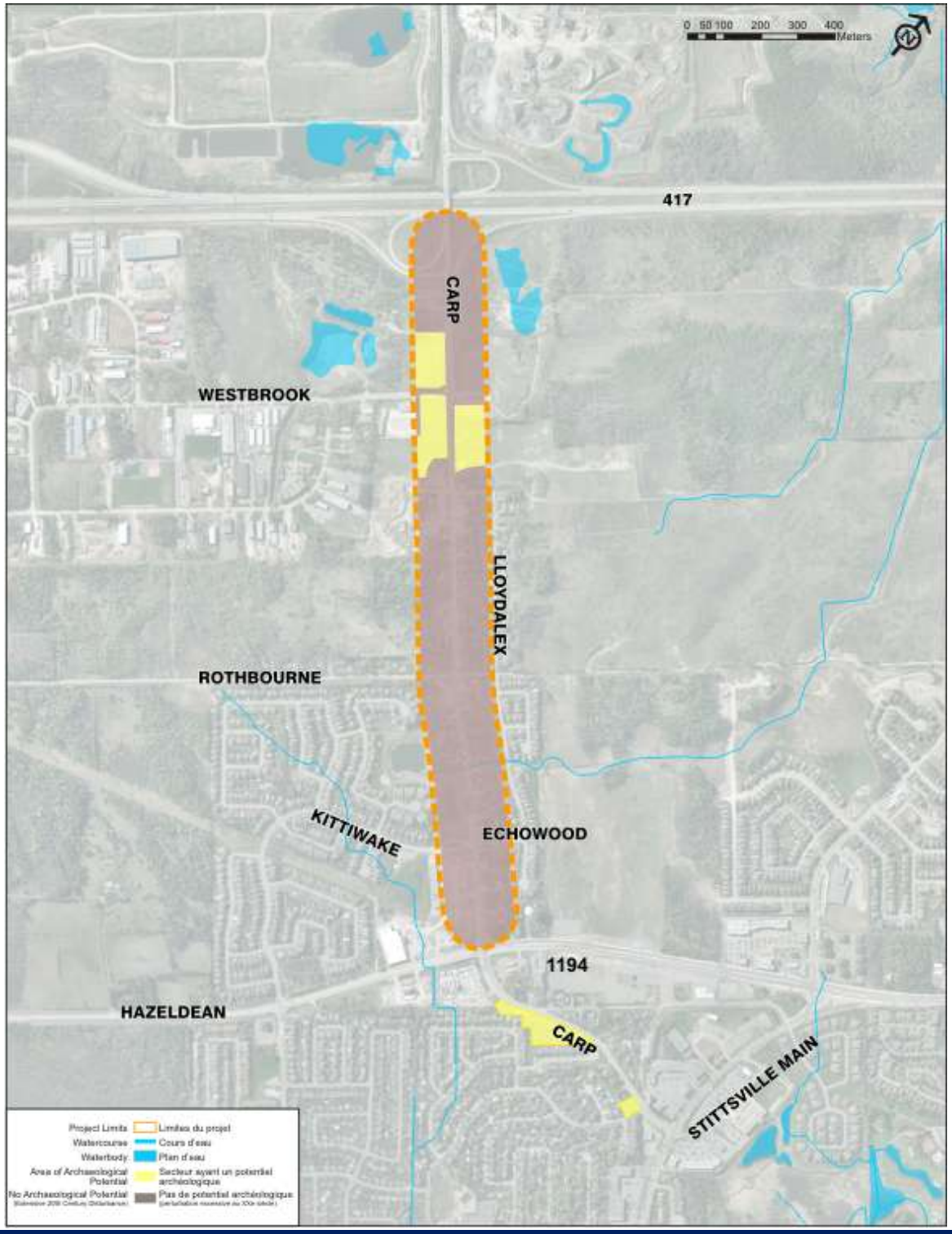


Figure 3-12: Archaeological Potential

Source: Past Recovery Archaeological Services (Figure 28)

3.4 Infrastructure and Utilities

This section summarizes existing utilities and infrastructure in the Carp Road Corridor between Hwy 417 and Hazeldean Road.

3.4.1 Water Distribution System

3.4.1.1 Existing Water Distribution System

The public water distribution system within the Carp Road Corridor includes feedermains, watermains, valves, and hydrants. The corridor is within pressure zone 3W and is serviced by the Stittsville elevated tank at 6237 Hazeldean Road. Watermains within the project limits are summarized in Table 3-4 and Table 3-5 below. The oldest watermain in the study area was installed in 1981.

Table 3-4: Watermains Routed along Carp Road Corridor

Section	Limits	Diameter (mm)	Material	Year Installed
Carp Rd	300 m north of Westbrook to Rothbourne	406	DI	1988 / 1989
	Rothbourne to Kittiwake	203	DI	1981
	Kittiwake to Hazeldean	406	DI	1988

Table 3-5: Watermains Crossing Carp Road Corridor

Section	Crossing	Diameter (mm)	Material	Year Installed
Carp Rd	At Westbrook west side	305	DI	1988
	At Lloydalex east side	152	DI	1988
	At Rothbourne east side	406	DI	1988
	At Kittiwake west side	254	PVC	2000
	At Echowoods east side	406	PVC	2002
	At Hazeldean west side	610 / 406	CONC/PVC	2006 / 1988
	At Hazeldean east side	610	CONC	2006

The 2009 Infrastructure Master Plan (IMP) indicates that the area south of Rothbourne Road is within the public service area, which corresponds with the historic City urban boundary. The IMP identifies public service areas as those areas where the City provides for public water and wastewater services; in the urban area, new development is required to proceed on the basis of public services.

The IMP also indicates an area north of Rothbourne Road and west of Carp Road as being within the public service area and identifies this area as the “Stittsville North Water Service Area”. Section 7.1 of the IMP states that public water with fire flow was provided to this area to remedy risk posed by groundwater contamination and that connection is limited to properties of record. The 2004 Carp Road Corridor Community Design Plan (applicable to those areas north of Rothbourne) states that the public water is for human consumption and not for commercial or industrial processing and that the availability may be conditional on acceptable wastewater treatment.

Based on records obtained from the City of Ottawa is appears that all existing buildings along the corridor have been connected to the public water supply.

3.4.1.2 Future Water System Projects

The 2009 IMP does not identify any growth related water projects within the Carp Road Corridor. Although the Stittsville Pumping Station is identified, it is to be located east of the study area, at the Stittsville elevated tank. The western branch of the Hazeldean watermain between the Glen Cairn Pumping Station and Carp Road was installed in 2010.

Schedule B of the City's OP identifies an approximately 70 hectare parcel of land north of Rothbourne Road and east of Carp Road as 'Developing Community (Expansion Area)'. A Planning Department report prepared in evaluating this area (identified as Area 3) indicates that no specific upgrades to any existing or proposed piping or pumping would be required. Therefore the expansion area does not present any water needs for the corridor.

3.4.2 Wastewater System

3.4.2.1 Existing Wastewater System

There is no public sanitary sewer routed along the Carp Road study corridor, however a sanitary sewer does begin within the corridor at Kittiwake Drive. This sewer flows westward on Kittiwake Drive into the Timbermere subdivision. There is a privately owned sanitary forcemain along Carp Road predominantly located on the west side. It originates at the waste management site at 2301 Carp Road and discharges into the public sanitary sewer at Kittiwake Drive.

Additionally there is a public sanitary forcemain that crosses Carp Road at Echowoods Drive and discharges into the sanitary sewer at Kittiwake Drive. The properties fronting onto Carp Road are therefore served by private on-site sewage disposal systems with the exception of the commercial properties south of Kittiwake along the west side of Carp Road. Sanitary sewer systems identified within the Corridor are listed in Table 3-6 and Table 3-7. The sanitary sewers and forcemains within the corridor are all serviced by the Stittsville Trunk Sewer.

Table 3-6: Sanitary Sewers/Forcemains Routed Along the Carp Road Corridor

Section	Limits	Diameter (mm)	Material	Year Installed
Carp Rd	200 m north of Hwy 417 to Kittiwake Drive	150 (private forcemain)	PE	2000

Table 3-7: Sanitary Sewers/Forcemains Crossing the Carp Road Corridor

Section	Limits	Diameter (mm)	Material	Year Installed
Carp Rd	At Kittiwake Drive west side	254	PVC	2000
	At Echowoods east side	100 (forcemain)	PVC	2002

The 2009 IMP indicates that the area south of Rothbourne Road is within the public service area, corresponding with the historic urban boundary. However it is understood that the area north of Rothbourne Road was intended to be included in the water service area only.

3.4.2.2 Future Wastewater Projects

The 2009 IMP does not identify any growth related wastewater projects within the Carp Road study corridor.

A Planning Department Reports prepared in evaluating the Developing Community (Expansion Area) indicates that the wastewater for area three would go eastward to the Kanata West Pumping Station. Therefore the expansion area, as identified in the planning department reports does not present any wastewater needs for the corridor.

3.4.3 Stormwater/Drainage System

3.4.3.1 Existing Stormwater Drainage

The study corridor is located within the Carp River watershed, with the vast majority feeding a tributary to the Feedmill Creek subwatershed. A small portion, south or Kittiwake Drive, is tributary to the Poole Creek subwatershed. The section of Carp Road south of Kittiwake Drive has been urbanized with curb, sidewalk and catchbasins along the west side. At the approach to Hazeldean Road, the east side is also urbanized with curbs and catchbasins.

The remainder of Carp Road is predominantly a rural-type cross section with paved shoulders and roadside ditches with many sections not having roadside ditches. It is unclear if the ditches have been filled in or never existed. This has created a rather undefined drainage pattern within the study corridor. For the most part, the properties on the east side of the road are lower than those on the west side. Much of the roadside drainage flows onto private property, particularly on the east side.

The limited amount of storm sewer system that does exist within the corridor includes sewers and maintenance holes. Storm sewers within the corridor are listed in Table 3-8 and Table 3-9.

Table 3-8: Storm Sewers Routed Along the Carp Road Corridor

Section	Limits	Diameter (mm)	Material	Year Installed
Carp Rd	45 m south of Kittiwake Drive to Hazeldean Road	450	PVC	2010 / 2011

Table 3-9: Storm Sewers Crossing the Carp Road Corridor

Section	Crossing	Diameter (mm)	Material	Year Installed
Carp Rd	195 m north of Kittiwake Drive	1,050	CONR	2000

One culvert does cross the corridor at approximately 110 m north of Westbrook Road. Roadside culverts (those installed in the place of roadside ditches) are numerous and have not been itemized in this report.

Two existing stormwater management facilities (SWMF) are located adjacent to the corridor. The Timbermere SWMF is located at 1080 Carp Road and services some lands along the west side of Carp Road including the Timbermere subdivision. The Timbermere SWMF outlets eastward across Carp Road and discharges into the Echowoods SWMF located at 123 Echowoods Drive. The Echowoods SWMF also services the storm sewers in the vicinity of Echowoods Avenue and Lloydalex Crescent.

The existing surface drainage along much of Carp Road is poorly defined. It would appear the Carp Road corridor between approximately Kittiwake and Rothbourne drains in some fashion to the Timbermere SWMF and/or the Echowoods SWMF. It appears that the area north of Rothbourne Road predominantly drains eastward in some fashion to tributaries of Feedmill Creek and are not serviced by any SWMF. The area south of Kittiwake drains predominantly to the Hazeldean Road storm sewer.

3.4.3.2 Future Stormwater/Drainage Projects

The 2009 IMP does not identify any growth related stormwater management or related projects within the study corridor. A Planning Department Report prepared in evaluating the Developing Community (Expansion Area), indicates that the stormwater from area 3 drains to Feedmill Creek. The creek is east of Carp Road in this location, and therefore no new stormwater/drainage infrastructure is required along Carp Road to service the expansion area.

The stud corridor is included in the Carp River Watershed/Subwatershed Study prepared by Robinson Consultants in December 2004. Future stormwater/drainage work will need to consider the recommendations of the watershed study.

3.4.4 Utilities

The majority of the study corridor exists as a rural-type cross section from Kittiwake Drive north to Hwy 417, with existing power and communication utilities on overhead wood pole lines situated on both side of the road. Natural gas runs in an underground conduit throughout the corridor.

The section of the study area from Hazeldean Road to Kittiwake Drive has recently been converted to an urbanized cross section and all west side utility services have been buried underground.

Street lights from Kittiwake Drive to Westbrook Road are generally joint-use located on the hydro poles on the east side of the roadway. The streetlights at the widened intersections and signal upgrades at Westbrook (including north to Hwy 417), Kittiwake, and Hazeldean include new aluminum poles on the west side of the road. The three intersection improvement areas also include signal masts, loops, and underground conduit infrastructure. Several high-mast light poles illuminate the Carp Road overpass and ramps within the Hwy 417 corridor.

The following provides additional detail for the various utility types found within the corridor.

Hydro

Hydro Ottawa owns the poles on the east side of the roadway from Hazeldean Road to Rothbourne Road. Hydro One owns the overhead poles on the east side of Carp Road from Rothbourne Road continuing north. Steel lattice transmission towers carrying 230-kV high-voltage overhead power lines cross the study corridor just north of the Carp Road/Hazeldean Road intersection.

Gas

A 100 mm buried Enbridge natural gas line runs down the west side of Carp Road within the study corridor. This is the primary feed for the residences and business that front on Carp Road and the adjacent streets. The line is feed from the 300mm natural gas line that runs down Hazeldean Road.

Telephone

Bell Canada owns the wood pole line on the west side of the roadway from Westbrook to Kittiwake. The west pole line ends just north of Kittiwake Drive, adjacent to the Timbermere SWMF, at which point it is buried and contained within a duct bank. Select sections of Bell communication lines are also buried on the east side of the road or contained on the east hydro poles.

Cable Television

Rogers lines are located on Bell's overhead pole line along the east side of Carp Road, from Kittiwake to Hwy 417, as well as buried on both sides of the road within the right-of-way between Hazeldean Road and Kittiwake Drive.

Fibre Optic Cables

An Atria Networks fibre optics line is present on the west side of the roadway between Hazeldean Road and Echowoods Avenue.

3.5 Natural Environment

The broader study area includes some urban natural features including watercourses, Areas of Natural and Scientific Interest (ANSIs) and other environmental features, however there are few features within immediate proximity to the project limits. A desktop review of existing Ontario Base Mapping, publicly available Natural Heritage Information Centre (NHIC) data on species at risk observations and vegetation communities, City of Ottawa aerial photography and city natural features maps within the Official Plan was completed by Kilgour & Associates Ltd. (See Appendix C). In addition to the desktop review, a site visit was conducted to determine further details with respect to the presence of aquatic habitat, types of vegetation present in open fields, the presence/absence of at-risk grassland bird species and the accessibility of road side areas to turtles possibly occurring in wetland areas near the study area along Carp Road.

Background information regarding biological and physical components of the environment that may be affected by the proposed project was collected and is described below.

3.5.1 Aquatic Environment

3.5.1.1 Surface Water

The study area is subject to the jurisdiction of Mississippi Valley Conservation Authority. The local, watershed management agency delivers services and programs to help protect and manage water and other natural resources within the Mississippi River watershed.

Feedmill Creek

The Carp River Watershed Study – Subwatershed Studies, Surface Water Management Component indicates that the study area falls within the Feedmill Creek subcatchment drainage area. To the east of the study corridor is a protected stream corridor indicating good water quality conditions however this stream does not cross Carp Road and is not within the protected ROW limits.

The Carp River Watershed/Subwatershed Plan, completed by the City of Ottawa indicates that the majority of tributaries are intermittent and only a few, including Feedmill Creek, are permanently flowing, with the remainder of flow in Carp River being from groundwater.

Poole Creek

The Poole Creek Watershed, encompasses the southernmost portions of the study area between Kittiwake Drive to south of Hazeldean Road. Poole Creek itself is well to the south and east of the Carp Road project limits. The watershed includes drainage areas east of Carp Road north to Hwy 417. Poole Creek is located along the south-eastern boundary of the Mississippi Valley watershed within the City of Ottawa, in the community of Stittsville (MVCA, 2009). Poole's Creek headwaters are located in a large Provincially Significant Wetland that is known as the Upper Poole Creek Wetland Complex, located outside of the study area. The banks of Poole Creek were found to mostly be stable, with 84% of the banks having little or no erosion (MVCA, 2009).

3.5.1.2 Fish and Aquatic Habitat

City aerial photographs indicated a small roadside drain flowing under Carp Road leading into a marsh/pond area at the south east corner of Carp and the 417. Desktop review indicted that the pond feature is a headwater area to Feedmill Creek, and as such, it likely contains some fish, although the pond is not within the ROW limits of Carp Road. A field visit confirmed the presence of a single drain crossing Carp Road though a culvert north of Westbrook Drive, conducting water eastward. The culvert outflow however, is perched by 75 cm on the east side and empties into a swale cascading down a steep embankment. The marshy pond itself is 140 m east of Carp Road. Thus, while this feature conveys some water to the pond, no direct fish habitat is located near Carp Road. The feature only appeared to be wet during the spring freshet and was dry by mid spring.

The only other aquatic features within 120 metre of Carp Rd. is the Timbermere SWMF to the west side of the road between Rothbourne Rd. and Kittiwake Dr. Storm water management ponds do not constitute fish habitat.

3.5.2 Vegetation, and Terrestrial Habitat

Lashley & Associates have completed a *ROW site characterization study* including a vegetation inventory (See Appendix C). The study area is located within the Great Lakes-St. Lawrence Forest region. The remnant stands of vegetation occurring in the study area contain many species typical of this forest region, in addition to introduced species that are considered to be either invasive or exotic to Ontario.

The inventory focused on identifying deciduous and coniferous species with a DBH greater than 10 cm and dominant understory species such as small trees, shrubs, grasses and wildflowers. Two surveys were conducted between July 23 and July 31, 2013 utilizing aerial photography and field review. In general, the study area supports vegetation that is both indicative of the region and culturally influenced, and has been, or is subject to, disturbance caused by development. A large percentage of the trees identified (DBH >10) are Eastern White Cedar and thickets of Staghorn Sumac are ubiquitous along the roadside where no maintenance is being done. The remainder of the trees found were mixes between native, invasive and exotic species, with the majority being located on residential lots.

Within the study area, wildflowers and grasses occur in focused clusters predominantly on vacant lands. Of the wildflowers and grasses identified, only St.-John's Wort, Hoary Alyssum and Smooth Brome grass are native species. The other species identified are non-native to Ontario.

In general the study area has been divided into nine different vegetative community units for east of classification. These vegetation units are illustrated on Figure 3-13 to Figure 3-15 and are described in greater detail below.

The following points summarize the findings of the vascular plants located within the study area:

- A total of 218 trees with a DBH greater than 10 cm were recorded;
- Of the species recorded, 134 were reported to be in good conditions; 36 fair conditions; 40 poor conditions; and 8 dead. The major problems arising with poorly rated trees were leaf blight, crown dieback and trunk damage;
- Of the 218 species, 43 species (20%) are non-native to Ontario. The species are distributed across the study area and most were located on residential lots;
- Of the native species, 173 species (79%) of the study area are ranked as S5 and considered widespread and secure in Ontario;
- No provincially rare vegetation communities were recorded in the study area; and
- No natural heritage features or significant natural features are located in the study area.

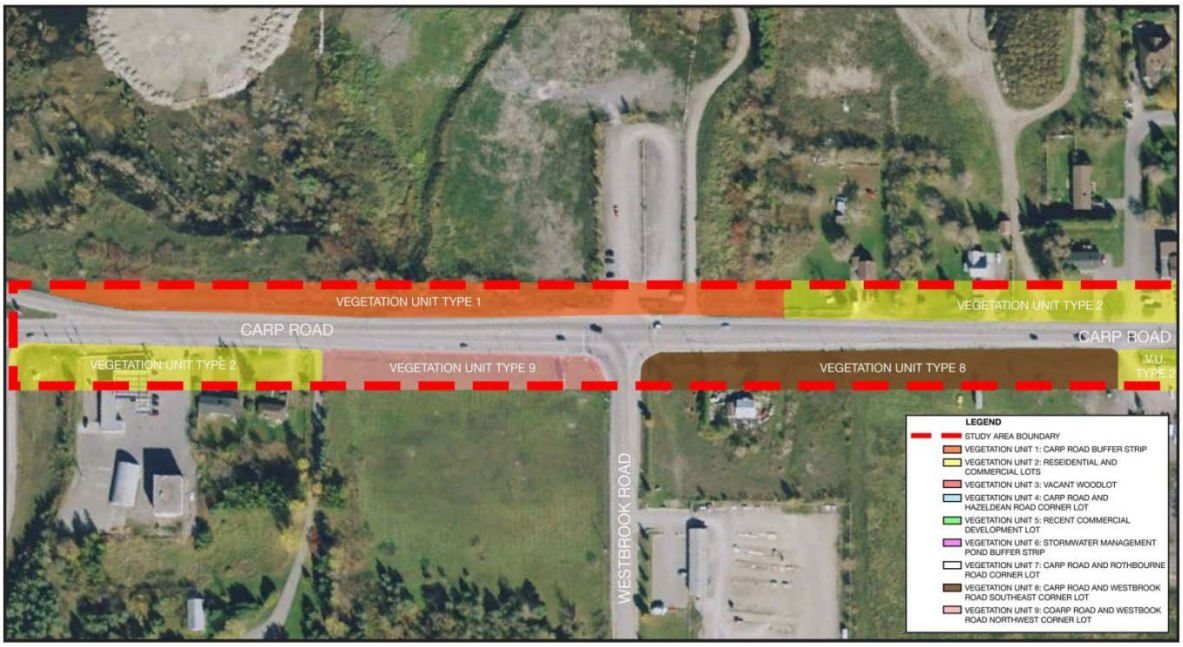


Figure 3-13: Vegetation Units – North Section

Figure 3-14: Vegetation Units – Mid-Section

Figure 3-15: Vegetation Units – South Section

Vegetation Unit 1 – Carp Road Buffer Strip

Species in order of prevalence include Trembling Aspen, Manitoba Maple, Eastern Cottonwood, Sugar Maple and American Elm. Interspersed thickets of Staghorn Sumac dominate the area in front of the deciduous trees and are typical along road ROWs. White sweet clover, chicory, Queen Anne's Lace, and common dandelion were also commonly observed.

Vegetation Unit 2 – Residential and Commercial Lots

This vegetative unit is the most dominant within the study area and is characterized by hedgerows, single tree plantings, and manicured laws. Hedgerows were dominantly comprised of Eastern White Cedar, and Manitoba Maple saplings and vigorous weed growth among the rows was common. Single stands of deciduous trees consisted of: Basswood, Sugar Maple, Norway Maple, Crimson King Norway Maple, Red Maple, Manitoba Maple, Paper Birch and Common Lilac. Single stands of coniferous trees included: Eastern White Cedar, Blue Spruce, Norway Spruce, Scots Pine, Austrian Pine and White Pine. A few of the residential lots also supported fruit trees. Seven of the trees surveyed are considered by the City of Ottawa to be "distinctive" in that they had diameter at breast height greater than 50 cm. These included 4 white spruce, 2 white pine and 1 white oak.

Vegetation Unit 3 – Vacant Woodlot

The vacant commercial lot is comprised of a young to mid-aged regenerating forest. The area surveyed is 85% covered by eastern white cedar, with the remaining 15% being Sugar Maple. There is also a white oak and a bitternut hickory located on the southeast perimeter of the vegetative unit. All but seven of the trees surveyed in the area are in good condition. The edge of the woodlot is colonized by groupings of Staghorn Sumac.

Vegetation Unit 4 – Carp Road and Hazeldean Road Corner Lot

A portion of the lot is sloped up away from the roadway, and the portion of slope along Hazeldean is maintained to ensure sightlines are not obstructed for vehicles merging onto Carp Road. Located approximately 5 m from the edge of the sidewalk and behind wildflowers and grasses is a planted buffer dominated by eastern white cedar and mountain ash.

Vegetation Unit 5 – Recent Commercial Development Strip

No vegetation inventory was conducted in this area as little to no older vegetation remains. The vegetative material consisted of small caliper trees and shrubs all of which were recently planted nursery stock.

Vegetation Unit 6 – Stormwater Management Pond Buffer Strip

The vegetative strip running parallel to the Stormwater Management pond is covered by single stands of trees and thickets. The tree stands surveyed consisted of Eastern White Cedar groupings and single stands of American Elms. Thickets of Staghorn Sumac dominate the northwestern portion of the vegetative unit.

Of the trees surveyed only 20% appeared to be in good condition, the remaining 80% were either rated to be fair, poor or dead. Leaf blight and trunk damage were the most visible ailments.

Vegetation Unit 7 – Carp Road and Rothbourne Road Corner Lot

This corner lot was possibly an old agricultural field and is still currently maintained (mowed). The upkeep of the lot is minimal and regenerating hedgerows with an understory of wildflowers, grasses and vines can be observed. The only tree with a DBH larger than 10 cm within the vegetative unit is a paper birch in fair condition. Leaf blight and crown dieback plague the tree. Queen Anne's Lace, hoary alyssum, smooth brome grass, and grape vines are common.

Vegetation Unit 8 – Carp Road and Westbrook Road Southeast Corner Lot

This vegetative unit is characterized by a mosaic of wildflowers and grasses above 3 feet in height. Smooth bromegrass and other grasses dominate the regenerating open field, along with wildflowers such as chicory, crown vetch and hoary alyssum. Other wildflowers present include field thistle, knapweed and Queen Anne's Lace. Knapweed is considered to be a noxious weed in Ontario. A small group of Staghorn sumacs are located at the southeast corner of the lot, and at the opposite end is one Norway maple.

Vegetation Unit 9 – Carp Road and Westbrook Road Northwest Corner Lot

The open field dominates this vegetative unit and is at an early stage of regeneration; the wildflowers and grasses are generally below 2 feet in height. Crown vetch, Queen Anne's Lace, and hoary alyssum were the most common wildflowers observed.

3.5.3 Urban Natural Areas and Other Designated Areas

Although there are no urban natural areas (UNAs) within the narrow study area encompassing Carp Road, the 2005 Urban Natural Area Environmental Evaluation Study (UNAEES) did identify a site to the east of the study area. Site #29 – North of Hazeldean was identified as requiring an "Ecological Condition Check" as it was not evaluated in 2003 and as such did not receive an environmental rating. The unevaluated UNA #29 site has been developed since identified in the 2005 UNAEES report.

Significant woodlands are present on the east side of Carp Road (as defined by the City of Ottawa in OPA 76). There are no provincially significant wetlands present within or near the study area.

No other significant features, including well head areas, unstable slopes, valley lands or Areas of Natural and Scientific Interest (ANSIs) have been identified within 180 m of Carp Road.

3.5.4 Species at Risk

The study area supports a variety of wildlife. Species present within the study area were determined from existing information including the Ontario Breeding Bird Atlas, the Natural Heritage Information Centre (NHIC), the Ontario Herpetofaunal Atlas, and Ontario's Reptile and Amphibian Atlas.

The Kilgour & Associates NHIC records review produced element occurrence records for only three listed species in the area and did not indicate the presence any restricted records. Further consultation with the Ontario Ministry of Natural Resources (MNR) was thus limited to their provision of a list of species of concern known to occur within the broader region around the project area.

The three species records from the NHIC search were for Loggerhead Shrike, Blanding's Turtle and Milksnake. The Shrike and Milksnake records however, date from the early 1980s and the turtle record is from the Kanata Highlands over 6 km away. The MNR's list of known species-at-risk for the broader area, presented in Table 3-10, indicates the habitat requirements of species-at-risk known from the general vicinity and whether the individuals or their habitat are likely be of concern for this project.

Table 3-10: Species at Risk (Provincial List) Potential

Species Name	Provincial (ESA) Status	Habitat Requirement	Habitat Suitability/Presence	Concerns Associated with Habitat on Site
Birds				
Barn Swallow (*Hirundo rustica*)	THR	Terrestrial open & manmade structures for nesting.	Barns swallows will forage through open areas near water even with much human activity present. Only the nesting areas are of concern. Every house, building or bridge along the route provides a potential nesting site.	Limited concern. Any structures (buildings or bridges) to be removed must be searched before deconstruction. Removal of any nest containing structures cannot take place between May 1st and August 31st unless cleared of nests (with MNR notification) prior to May 1st.
Black Tern (*Chlidonias niger*)	SC	Marshes with open water.	No suitable habitat	Not a concern.
Bobolink (*Dolichonyx oryzivorus*)	THR	Tall grassland areas (meadow) should be > 10 ha, and preferably > 30 ha before bobolink are attracted to the site. Not near tall trees	Very limited, poor quality habitat in small fields at the north end of Carp Rd. No bobolinks were observed there. Grassy areas near SWM ponds are regularly mowed.	Not a concern.
Canada Warbler (*Wilsonia canadensis*)	SC	Mixed coniferous, deciduous forests. Often in wet, low lying areas	No suitable habitat adjacent to road.	Not a concern.
Chimney Swift (*Chaetura pelagica*)	THR	Nests in open chimneys and sometimes in tree hollows (tree > 60 cm dbh).	Possible but very unlikely in house chimneys along the route. Possible but extremely unlikely in tree cavities.	Not a concern. Any structures (houses with chimneys) to be removed must be searched before deconstruction. Removal of any nest containing structures cannot take place between May 1st and August 31st unless cleared of nests (with MNR notification) prior to May 1st.
Common Nighthawk (*Chordeiles minor*)	SC	Terrestrial open – rock barrens, limestone pavement, openings in forest	No suitable habitat.	Not a concern.
Eastern Meadowlark (*Sturnella magna*)	THR	Tall grassland areas (meadow) should be > 10 ha, and preferably > 30 ha before bobolink are attracted to the site. Not near tall trees	Very limited, poor quality habitat in small fields at the north end of Carp Rd. No meadowlarks were observed there. Grassy areas near SWM ponds are regularly mowed.	Not a concern.
Least Bittern (*Ixobrychus exilis*)	THR	Found in large quiet marshes and, usually near cattails.	No suitable habitat	Not a concern.
Loggerhead Shrike (*Lanius ludovicianus*)	END	Short, sparsely vegetated "pasture land" with scattered shrub species (hawthorn)	No suitable habitat	Not a concern.
Whip poor will (*Caprimulgus vociferus*)	THR	Terrestrial mix of open and forested	No suitable habitat adjacent to road.	Not a concern.

Species Name	Provincial (ESA) Status	Habitat Requirement	Habitat Suitability/Presence	Concerns Associated with Habitat on Site
Yellow Rail (*Coturnicops noveboracensis*)	SC	Grass or sedge dominated marsh	No suitable habitat	Not a concern.
Insects				
Bogbean Buckmoth (*Hemileuca sp*)	END	Graminoid fens with Buckbean (*Menyanthes trifoliate*)	No suitable habitat	Not a concern.
Monarch (*Danaus plexippus*)	SC	Terrestrial open – milkweed species present	Some milkweed present along route. Species is likely present.	Not a concern. As special concern, neither species nor habitat has specific protection along project limits.
Plants				
Butternut (*Juglans cinerea*)	END	Variable but typically on well-drained soils. Only naturally occurring trees are protected (planted trees are exempt unless part of a specific compensation effort).	Potential to be present along the route. Species is likely present.	Not a concern. As special concern, neither species nor habitat has specific protection along the project limits.
Reptiles				
Blanding's Turtle (*Emydoidea blandingii*)	THR	Quiet lakes, streams, wetlands with abundant emergent vegetation and hummock development and associated upland areas. Hibernates in bogs.	Extremely unlikely in SWM ponds or in pond area at the north end of the road. Banks road sides in along these areas are would be too to provide access to very minimal gravel strip. MVCA has records for turtles through the broader area but none along the project route.	Not a concern.
Eastern Musk Turtle (*Sternotherus odoratus*)	SC*	Wetlands in shallow, well vegetated, clear water and part of, or closely associated with, larger aquatic systems	No suitable habitat. MVCA has records for turtles through the broader area but none along the project route.	Not a concern.
Northern Map Turtle (*Graptemys geographica*)	SC	Lakes and large rivers	No suitable habitat.	Not a concern.
Snapping Turtle (*Chelydra serpentina*)	SC	A variety of creek, river, and lake environment with soft muddy banks or bottoms.	Potentially present in pond at north end of Carp Road, but outside the project area.	Not a concern.
Spotted Turtle (Clemmys guttata)	END	Unpolluted, shallow bodies of water (streams, ponds, wet meadows, marshes or swamps) with aquatic vegetation, logs or clumps of vegetation for basking; nest is dug near water in fine-textured soil (e.g. sand) or moss.	No suitable habitat. MVCA has records for turtles through the broader area but none along the project route.	Not a concern.

Species Name	Provincial (ESA) Status	Habitat Requirement	Habitat Suitability/Presence	Concerns Associated with Habitat on Site
		Average home range size -3.7 ha		
Eastern Ribbonsnake (*Thamnophis sauritus*)	SC	Wetland edge habitat – marshes primarily	Potentially present in pond at north end of Carp Road, but likely only outside the project area.	Not a concern.
Milksnake (*Lampropeltis triangulum*)	SC	Wide range of habitats, especially old fields and farm buildings where rodents are common.	Possibly but unlikely present throughout the study area.	Not a concern. As a special concern, species does not have specific habitat protection. Individuals may not be harmed under the *Fish and Wildlife Conservation Act*. Construction crews should be briefed to not harass individuals if observed.

END = Endangered THR = Threatened SC = Special Concern

*Updated September, 2015

3.5.4.1 Birds

A desktop review for potential species at risk habitat (as described in Table 3-10 was conducted to determine the location of further field surveys conducted by Kilgour & Associates. The desktop review of City aerial photographs indicated the presence of several large open fields near the north end of the study area, which could provide habitat for grassland bird species at risk.

Two site visits were conducted by Kilgour & Associates biologists to the grassland areas on June 18 and July 8, 2013 to determine bird habitat potential and to conduct species point counts. The fields were considered too small (west of side of Carp Rd. - 1 ha), too disturbed (east side of Carp Rd.) and too close to tall trees (both sides) to provide effective habitat for either Bobolink or Eastern Meadowlark. Point counts did not indicate any presence of the bobolink or eastern meadowlark grassland species.

Barn Swallows may be present in the area though were not specifically observed during the point counts. Impacts to their habitat however would only become a potential issue if existing buildings and/or bridges were required to be removed to accommodate the project implementation.

3.5.4.2 Herpetozoa

Discussions with the local conservation authority indicated the existence of many turtle observation records throughout the broader area, but none along Carp Road. The nearest turtle observation by the Mississippi Valley Conservation Authority was for a Blanding's Turtle off of Tansley Road, well north of the Queensway.

The marsh/pond area located approximately 140 m east of Carp Road potentially provides some very limited turtle habitat. Turtles can make use of roadside gravel shoulders near wetland areas as potentially nesting grounds. Carp Road however, is situated high above the wetland at the top of a very steep slope, making the road shoulder inaccessible to any turtles below. Similarly, the SWM ponds are separated from the roadway by a vertical stone block wall. Thus the Carp Road corridor is not considered potential turtle habitat.

One snake species, the Milksnake, could itinerantly pass through the Carp Road corridor. The habitat of the species however, is not protected.

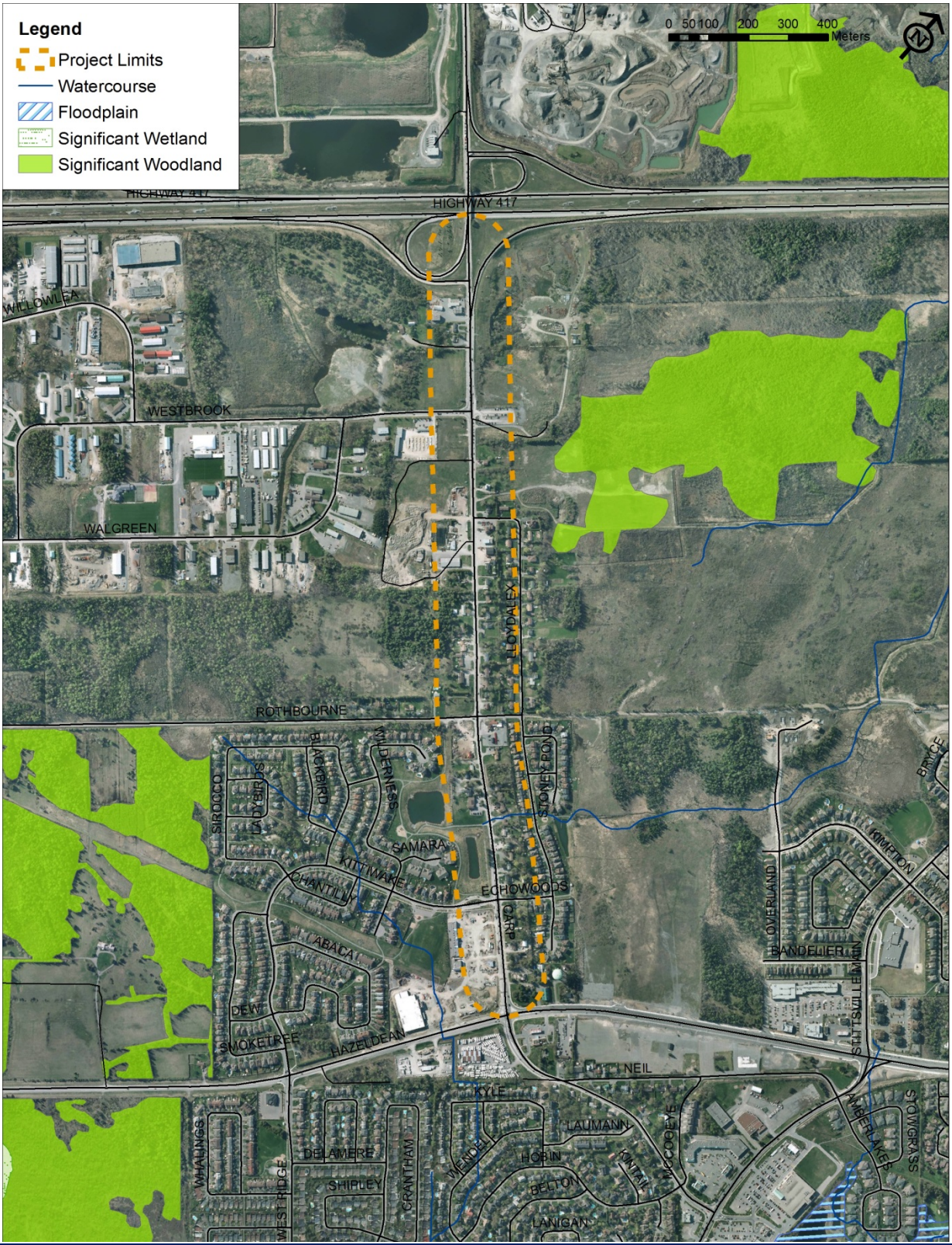


Figure 3-16: Natural Features

3.6 Physical Environment

3.6.1 Geotechnical Conditions

Houle Chevrier has provided an overview of existing geotechnical conditions, based on visual inspection and available soil, bedrock and groundwater information collected and collated to provide information on the subsurface conditions in the vicinity of the study corridor. It should be noted that localized soil conditions may differ from those identified on geological mapping, although Houle Chevrier notes that the overall soil, drift thickness and bedrock mapping is generally consistent with their experience in the study area. The Houle Chevrier Geotechnical Report (August 2013, Appendix C) indicates that:

- the roadway slopes downwards from an elevation of about 128 m near Hwy 417 to an elevation of about 116 m (geodetic datum) near Stittsville Main Street;
- the topography slopes downwards on the east side of Carp Road along the length of the study area;
- the topography on the west side of Carp Road between Hwy 417 and Rothbourne Road is relatively flat with some low laying areas;
- between Rothbourne Road and Hazeldean Road the topography on the west side of the road slopes downwards towards the southwest; and
- from Hazeldean Road to Stittsville Main Street the topography on the west side of Carp Road ranges from relatively flat to sloping upwards to the west.

3.6.1.1 Subsurface Conditions

Overburden deposits within the study area consist primarily of glaciofluvial deposits of sand (Figure 3-17). Drift thickness and bedrock geology maps indicate that the overburden deposits are underlain by Paleozoic limestone of the Bobcaygeon formation at depths ranging from 2 to 25 m as illustrated on Figure 3-18 and Figure 3-19. Fill material should also be expected in the former sand pits that are known to have been present along both the east and west sides of Carp Road (Houle Chevrier, 2013).

Houle Chevrier provides a summary of previous geological and hydrogeological conditions reports that have been previously prepared in the vicinity of the study corridor, including: the Waste Management Landfill located on the west side of Carp Road, north of Hwy 17; a report for a proposed Temporary Snow Disposal Facility located at 2110 Carp Road; a draft report for a proposed Snow Disposal Facility at 2125 Carp Road; and the geotechnical investigation reports completed by the Ontario Ministry of Transportation for the Carp Road/Hwy 417 Interchange.

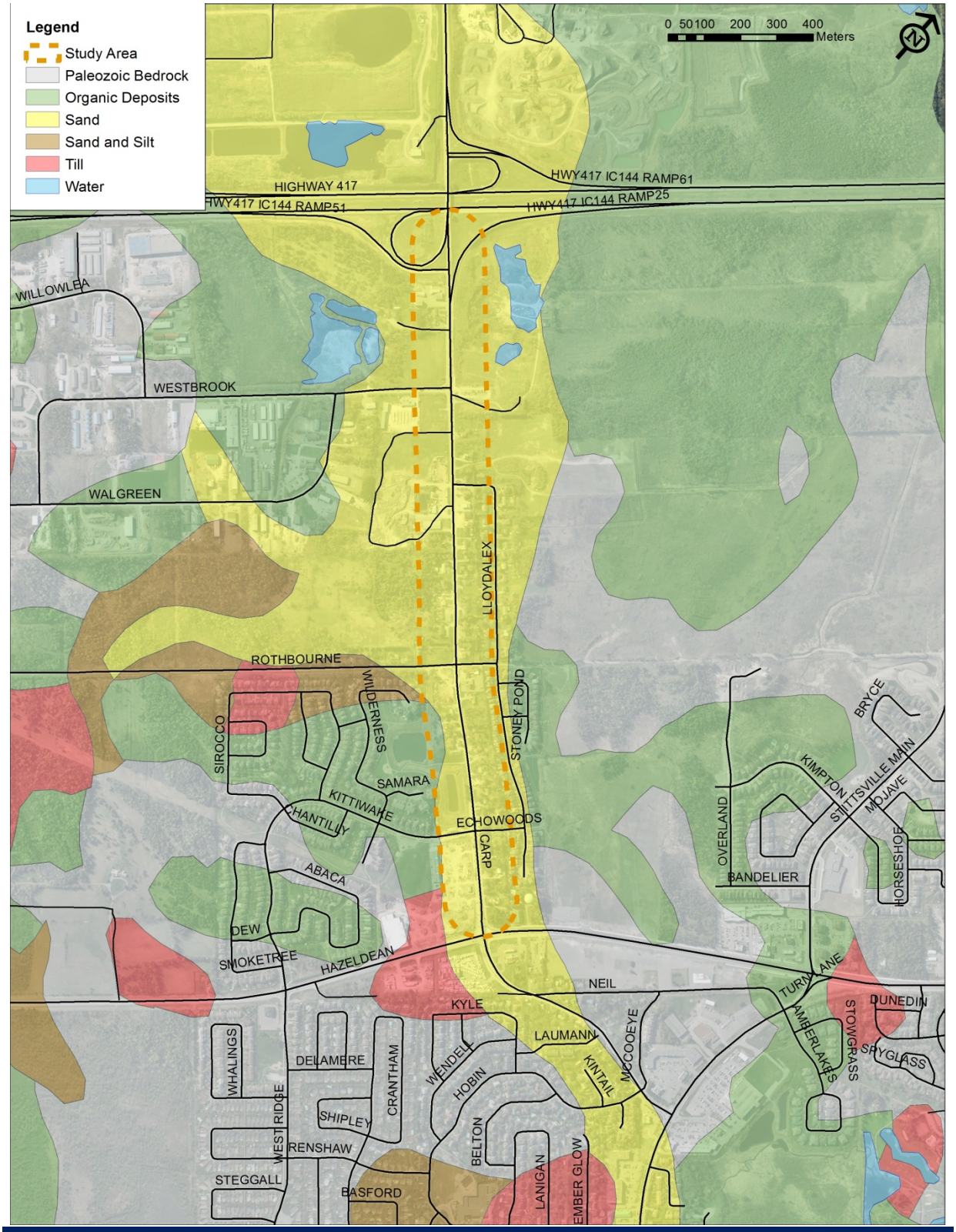


Figure 3-17: Surficial Geology

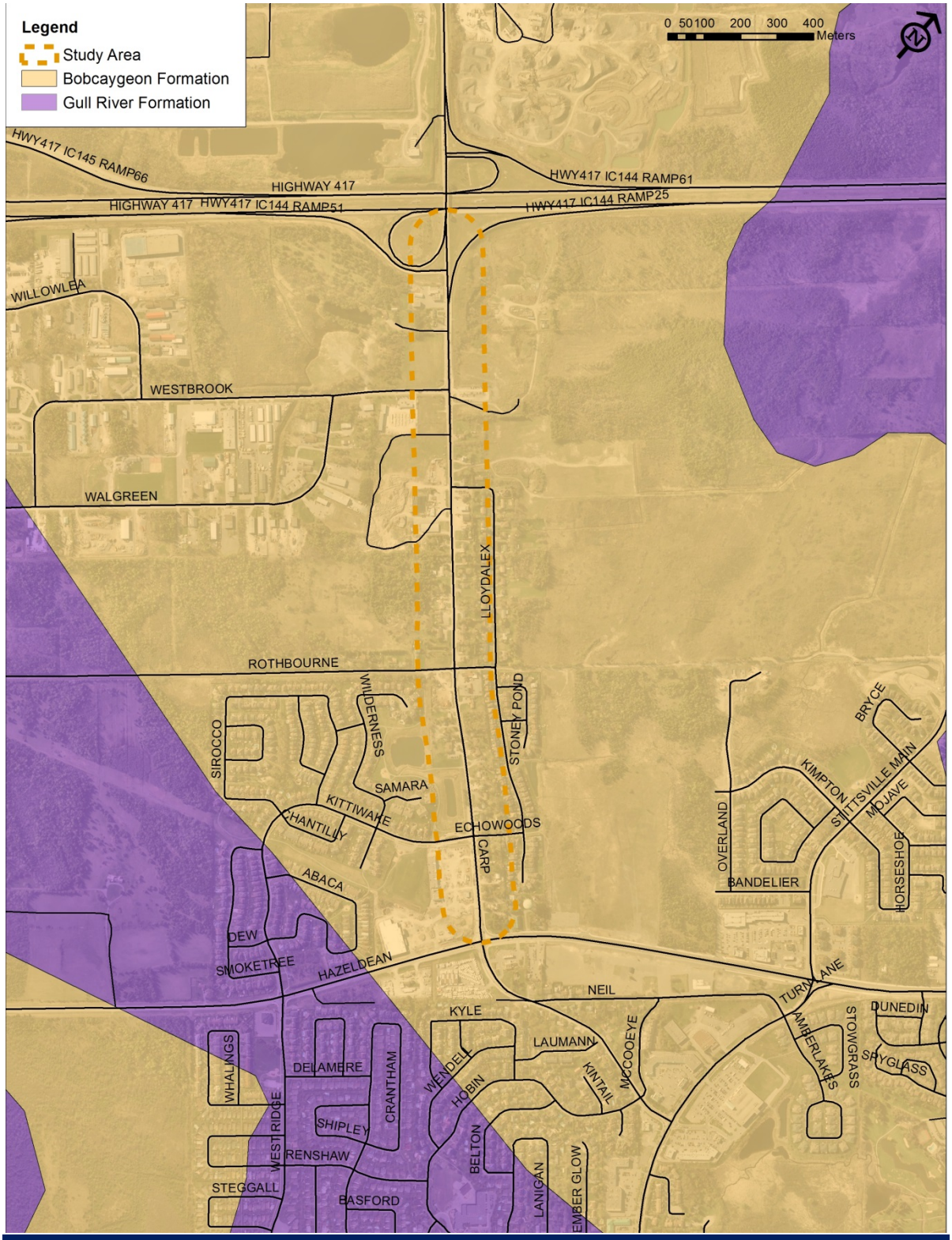


Figure 3-18: Bedrock Geology

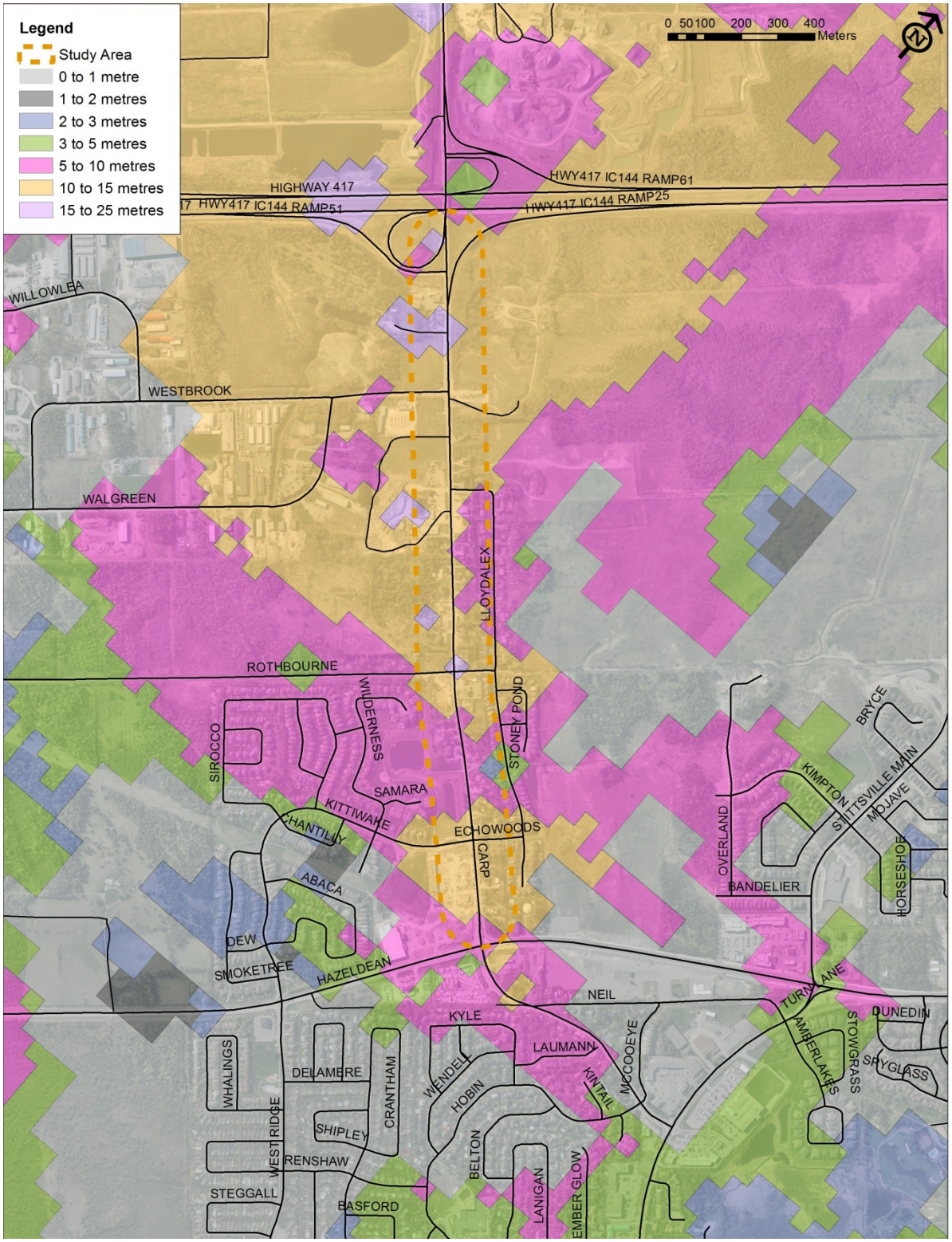


Figure 3-19: Drift Thickness

3.6.2 Groundwater

The topography of the subject site slopes gently downward from Hwy 417 to Stittsville Main Street. Groundwater flow often reflects topographic features and typically flows toward nearby lakes, rivers and wetland areas. The topography surrounding the subject site generally slopes gently downward to the east, and as such it is expected that the local, shallow groundwater flow is to the east (Houle Chevrier, 2013). However, localized groundwater flow may also be influenced by subsurface trenches, such as storm sewers and public utility services (Houle Chevrier, 2013).

The subject site is expected to be well drained based on the soil conditions in the area and the general topography, however, some low laying areas exist on the west side of the site near Westbrook Road and localized areas of elevated groundwater should be expected in this area (Houle Chevrier, 2013). The groundwater levels are expected to be higher during wet periods of the year, such as early spring, or following periods of heavy precipitation. The groundwater levels are also likely influenced by surface water levels in the streams, creeks and wetlands in the low laying areas.

3.6.2.1 Groundwater Wells

The Ontario Ministry of Environment Provincial Groundwater Monitoring Network was examined to generate an overview of potential groundwater well locations within the study area. The Provincial Groundwater Monitoring Network provides a comprehensive groundwater database for Ontario to characterize the location, quality and sustainable yield of the resource and describe where, how, and why the resource is changing.

As indicated on Figure 3-20, approximately 50 wells historically are located within a 100 m offset of the Carp Road Corridor between Hwy 417 and Hazeldean Road that have domestic, public and monitoring uses identified. Well depths range from approximately 10 m to 83 m in depth. The earliest well on-record within the study corridor was completed in 1951, with the majority of other domestic water supply wells being completed in the 1960's, 70's and 80's. The MOE records do, however, indicate that a domestic water supply was completed in 2005, with the only more recent well being completed in 2009 for monitoring.

Concentrations of wells are noted in the residential and commercial development beyond the 100 m offset between Westbrook Road and Rothbourne Road. Houle Chevrier notes that the houses and commercial buildings along the subject site are serviced by municipal water, and therefore it is expected that the majority of the wells within the study area are either abandoned or no longer in use (Houle Chevrier, 2013).

3.6.2.2 Aquifer Vulnerability

Houle Chevrier has provided a synopsis of the *Waterloo Hydrogeologic and CH2M Hill Study – City of Ottawa* which assesses the relative vulnerability of aquifers to contamination within the City of Ottawa, in order that sensitive areas can be identified, and more detailed evaluations of these areas can be planned and implemented. It is noted that the results of the *Waterloo Hydrogeologic and CH2M Hill Study* indicates medium to very high vulnerability zones in the area, where vulnerability to contamination was determined based on depth to water table, recharge, aquifer media, soil media, topography, impact to vadose zone media and conductivity.

3.6.2.3 Esker Formation

The Stittsville Ride esker has been mapped along the length of the study area. Eskers are typically good sources of groundwater supply. The short and long term impacts of the options on the quantity and quality of the groundwater in the esker formation should be considered.

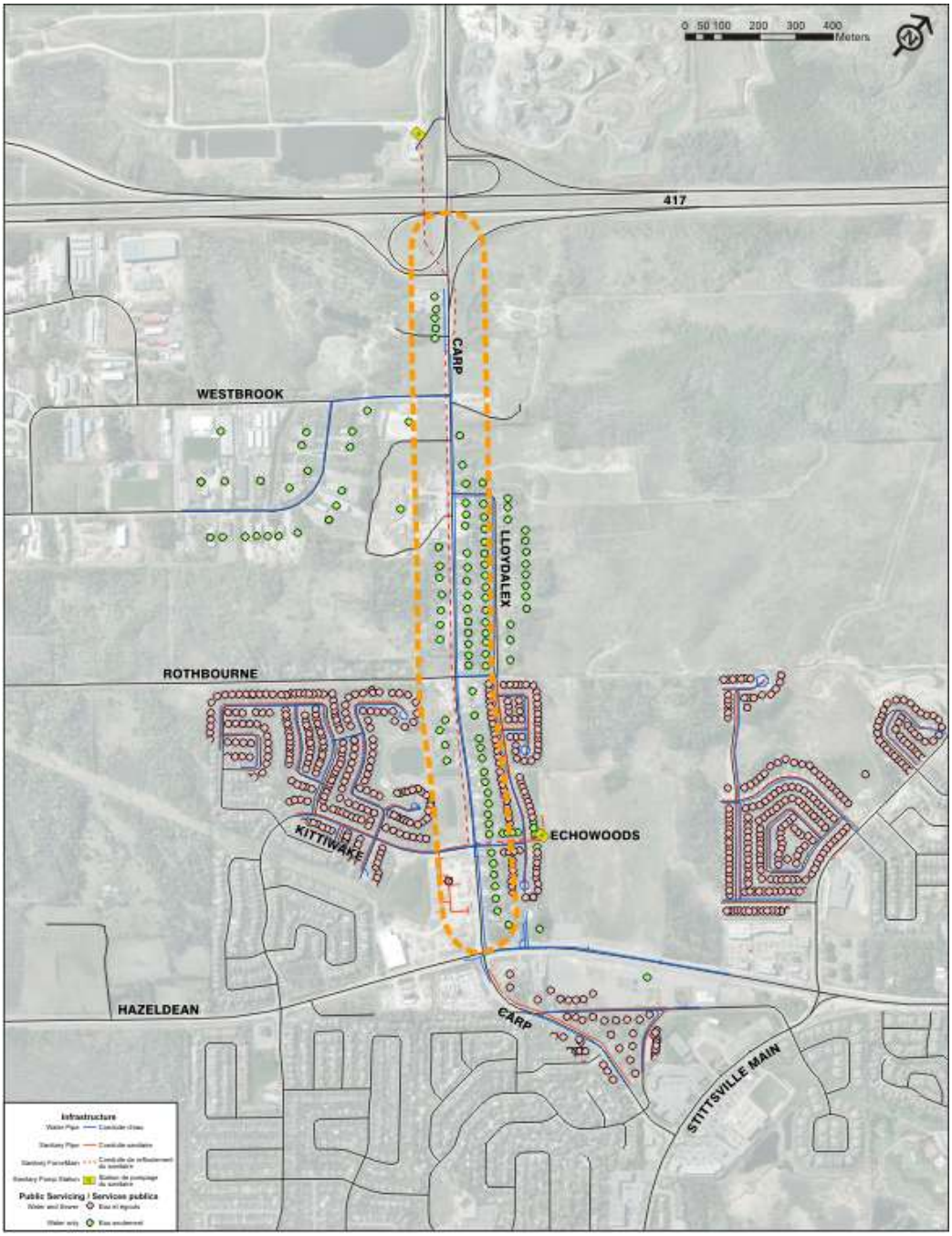


Figure 3-20: Groundwater Wells

3.6.3 Potentially Contaminated Land

A Phase I Environmental Site Assessment (Appendix C) was completed by Houle Chevrier Engineering in order to identify any former or current practices in the vicinity of the study area that may represent areas of potential environmental concern. The principle components of the Phase I ESA are a records review, site reconnaissance, and an evaluation of information which is then presented in a report. The records review included sources from geological maps, aerial photographs, MOE records, an Ecolog Eris Report, Technical Standards and Safety Authority records, City of Ottawa HLUI database, Fire Insurance Plans,

previous environmental site assessment reports and available geotechnical reports. The site visit occurred on 30 July 2013 and consisted of a walk through inspection of the site and inspections of adjacent properties from publicly available areas.

General observations made during the site visit include but are not limited to:

- Three (3) gasoline service stations were observed at 2145 Carp Road, 2070 Carp Road and 6250 Hazeldean Road;
- Five (5) automotive repair facilities were observed at 2076 Carp Road, 2060 Carp Road, 2043 Carp Road,, 69 Neil Avenue, and 105 Walgreen Road;
- Old above ground storage tanks (ASTs) were observed at 2060 Carp Road;
- Sales and service/maintenance activity at three (3) locations including the southwest corner of Carp Road and Hazeldean Road, 1189 Carp Road and 1017 Carp Road;
- Two (2) laundry/dry cleaning facilities located in the Sobey's Development strip mall at the northwest corner of Carp Road and Stittsville Main Street;
- Potential pesticides and piles of fill material at 2079 Carp Road; and
- A custom metal fabrication facility at 113 Walgreen Road.

The following tables summarize the potential environmental concerns identified in the Phase I ESA and the likelihood of them impacting the subject site. Figures 3-21 and 3-22 highlight areas of potential environmental concern in the northern and southern sections of the study area, respectively.

Table 3-11: North Section of Subject Site (Hwy 417 Interchange to Rothbourne Rd)

Address	Distance from Subject Site	Activity	Opinion on Likelihood of Impact
2301 Carp Road	Adjacent (northwest of Hwy 417 interchange)	Landfill	High Based on distance to subject site and groundwater quality monitoring carried out southeast of the Hwy 417 interchange showing slightly elevated concentrations of ammonia, TKN, potassium, chloride, sodium and iron.
2300 Carp Road	Northeast of Hwy 417 and Carp Road interchange	Ready mix concrete industry	Low Based on likely groundwater flow direction to the northeast.
Carp Road at Hwy 417	On subject site	Spill of 15 gallons of hydraulic fluid in 2004 Spill of gasoline from tractor trailer overturn in 1999	Medium Based on soil contamination to land listed as possible for the gasoline spill.
Southeast of Carp Road and Hwy 417	Adjacent	Fill Placement Record of Site Condition (RSC)	Low to Medium Based on likely groundwater flow direction to northeast and downward sloping topography from subject site to area of fill placement and RSC has been filed.
2141/2145 Carp Road	Adjacent to the west and south of Hwy 417	Fuel Storage Tanks Gasoline Service Station	High Based on distance to subject site and likely groundwater flow direction towards subject site.

Address	Distance from Subject Site	Activity	Opinion on Likelihood of Impact
2125 Carp Road	100 metres west of Carp Road, south of Hwy 417	Fill of questionable quality Snow Dump Facility	Medium Based on likely groundwater flow direction towards subject site.
2110 Carp Road	Adjacent to the east and south of Hwy 417	Fill of questionable quality Presence of buried waste Snow Dump Facility	Low to Medium Based on likely groundwater flow direction away from subject site, topography sloping downwards from subject site to the property.
2079 Carp Road	Adjacent to the west	Fill Placement Pesticides	Medium Based on distance to subject site and likely groundwater flow direction being towards the subject site.
2076 Carp Road	Adjacent to the west and south of Lloydalex Crescent	Automotive repair facility	High Based on it being an automotive repair facility and proximity to subject site.
2070 Carp Road	Adjacent to the west and south of Lloydalex Crescent	Gasoline Service Station Fuel Storage Tanks	High Based on proximity to subject site and presence of underground fuel storage tanks.
2060 Carp Road	Adjacent to the east and north of Rothbourne Road	Fuel Storage Tanks Waste generator of waste oils & lubricants Vehicle maintenance and repair facility	High Based on having fuel storage tanks and performing vehicle repairs and maintenance.
2043 Carp Road	Adjacent to west and between Westbrook Road and Rothbourne Avenue	Motorcycle repair and maintenance facility Platemaking, typesetting and bindery industry facility	Medium Based on motorcycle repairs and maintenance performed at the property.
1017 Carp Road	Adjacent to the east and south of Rothbourne Road	Pesticide Vendor	Low Based on likely small quantities of pesticides stored.
1017B Carp Road	Adjacent to the east and south of Rothbourne Road	Waste generator of waste crankcase oils and lubricants	Medium Based on likelihood of performing vehicle and equipment maintenance.
1027 Carp Road	Adjacent to the east and south of Rothbourne Road	Manufacturer of automotive trimmings, apparel findings, and related products, commercial printing, not elsewhere classified, coating, engraving and allied services, not elsewhere classified	Medium Based on proximity to subject site and possible solvent use.
Various Addresses on Carp Road	Adjacent to subject site	Vent/fill pipes commonly associated with fuel oil tanks	Low Based on distances set back from roadway.

Address	Distance from Subject Site	Activity	Opinion on Likelihood of Impact
195 Westbrook Road	175 metres west of subject site	Manufacturer of computer and peripheral equipment, and semiconductor and other electronic components	Low Based on distance to subject site.
104 Walgreen Road	320 metres southwest of subject site	Motor vehicle repair shop	Low Based on distance to subject site.
105 Walgreen Road	190 metres southwest of subject site	Motor vehicle repair shop	Low Based on distance to subject site.
113 Walgreen Road	200 metres west of subject site	Metal fabrication facility	Low Based on distance to subject site.
152 Lloydalex Crescent	115 metres northeast of subject site	A&M Typewriter Repairs Electrical and electronic machinery, equipment and supplies facility	Low Based on distance to subject site and facility type.

Table 3-12: South Section of Subject Site (Rothbourne Rd to Stittsville Main St)

Address	Distance from Subject Site	Activity	Opinion on Likelihood of Impact
1054 Carp Road	Adjacent to the east and midway between Rothbourne Road and Kittiwake Drive	Waste generator of pharmaceuticals, pathological wastes and photo-processing wastes	Low Based on quantities likely used.
1127 Carp Road	Adjacent to east and south of Echowoods Avenue	Spill of 246 litres of furnace oil in 1997	Medium Based on proximity to subject site, volume of spill and soil contamination being listed as possible.
1139 Carp Road	Adjacent to east and north of Hazeldean Road	Listed as manufacturer of non-metallic mineral products and glass products	Low Based on manufacturing activities.
1174 Carp Road	South of intersection of Carp Road and Hazeldean Road	Motor vehicle repair shop	Medium Based on proximity to subject site.
1189 Carp Road	Adjacent to north, west of Hazeldean Road	Oil Changers Facility	Low Based on the building being constructed within the last two years.
1208 Carp Road	Adjacent to west and south of Neil Avenue	Spill of 250 mL of heating fuel	Low Based on small volume of spill.
Carp Road and Stittsville Main Street	Adjacent to subject site	Spill of 450 litres of gasoline to pavement and gravel in 1988	Medium Based on quantity of gasoline spilled.
Various Addresses on Carp Road	Adjacent to subject site	Vent/fill pipes commonly associated with fuel oil tanks	Low Based on distances set back from roadway.

Address	Distance from Subject Site	Activity	Opinion on Likelihood of Impact
40 Wilderness Way	215 metres west of subject site	Listed in Scott's Manufacturing Directory	Low Based on being a residential home and listed in manufacturing director as a wholesaler-distributor.
20 Kittiwake Drive	200 metres west of subject site	Manufacturer of soaps, cleaning compounds and toilet preparation. Wholesaler-distributor of toiletries, cosmetics, sundries and chemical (except agricultural) allied products.	Low Based on distance to subject site.
6230 Hazeldean Road	35 metres north of Neil Avenue and Carp Road	Motor vehicle repair shop	Medium Based on proximity to subject site.
6250 Hazeldean Road	Adjacent, southeast corner of intersection of Hazeldean Road and Carp Road	Gasoline Service Station Fuel Storage Tanks	High Based on proximity to subject site and presence of underground storage tanks.
6303 Hazeldean Road	Adjacent to the west	Fill Placement	Medium Based on distance to subject site and likely groundwater flow direction being towards the subject site.
6303 Hazeldean Road	Adjacent to west, south of Kittiwake Drive	Browns Cleaners, dry cleaning facility	Low Based on the building being constructed within the last two years.
6310 Hazeldean Road	190 metres southwest of intersection of Carp Road and Hazeldean Road	Motor Vehicle Repair Shop	Medium Based on likely groundwater flow direction to the northeast.
65 Neil Avenue	40 metres north of intersection of Carp Road and Neil Avenue	Certificate of approval for waste management systems	Medium Based on lack of information regarding the waste management system.
1224 Main Street (Stittsville Main Street)	100 metres north of subject site	Multiple wastes generator Spill of waste motor oil TSSA variance for abandonment of UST	Low Based on distance to subject site and likely groundwater flow to the northeast.
1250 Main Street (Stittsville Main Street)	Adjacent	Waste generator of pathological wastes and pharmaceuticals	Low Based on likely quantities generated.
1250 Stittsville Main Street	Adjacent to subject site (building set back 100 metres north of Carp Road)	Hilary's Cleaners (dry cleaning)	Medium Based on activity type and proximity to subject site.

Address	Distance from Subject Site	Activity	Opinion on Likelihood of Impact
1251 Main Street	125 metres northeast of subject site	Listed as pesticide vendor Spill of 390 lbs of refrigerant gas	Low Based on distance to subject site.
1280 Stittsville Main Street	80 metres south of subject site	Former gasoline service station	Medium Based on insufficient information regarding the closure of the gasoline service station.
1300 Stittsville Main Street	125 metres south of subject site	Waste generator of pathological wastes and pharmaceuticals	Low Based on distance to subject site and small quantities likely used.

Groundwater quality monitoring carried out southeast of the Hwy 417/Carp Road Interchange show slightly elevated concentrations of ammonia, TKN, potassium, chloride, sodium and iron, with no volatile organic compounds were detected in samples from this location.

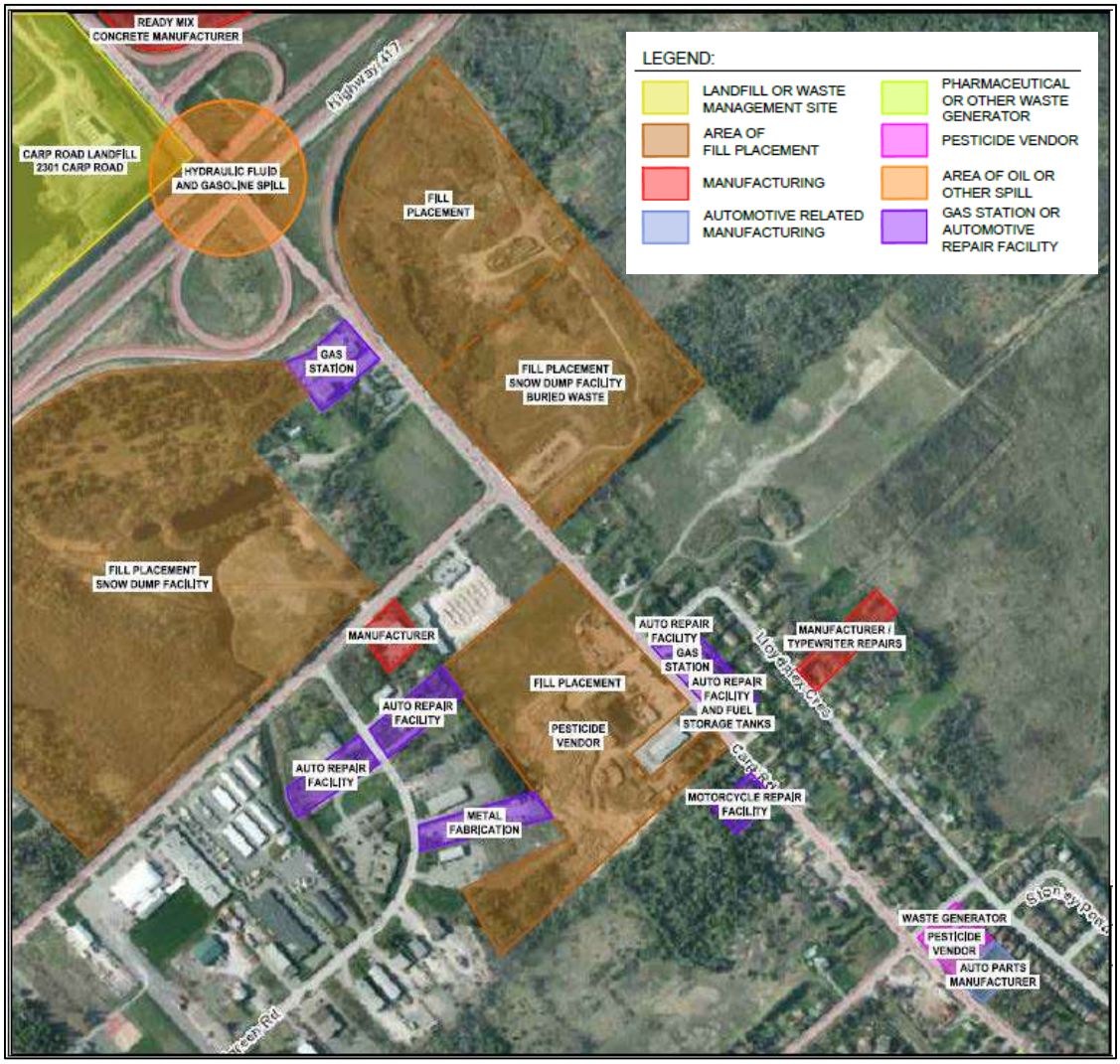


Figure 3-21: Potential Areas of Contamination and Hazardous Land Uses (Northern Section)

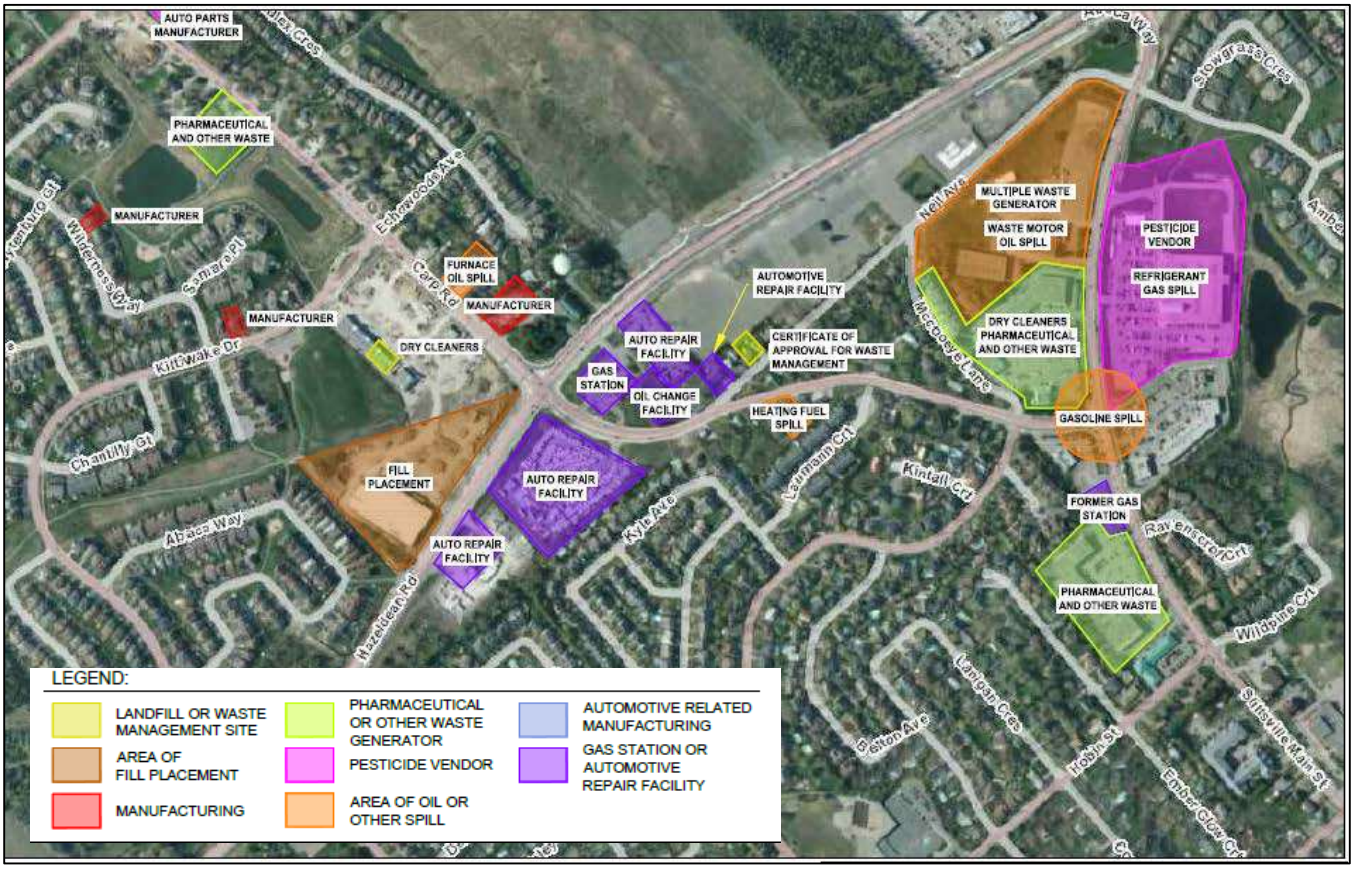


Figure 3-22: Potential Areas of Contamination and Hazardous Land Uses (Southern Section)

4.0 Alternative Solutions

This section documents the process used to develop and evaluate the alternative solutions that respond to the need and opportunity for the renewal of Carp Road. "Alternative Solutions" are defined by the MCEA (2011) as, "feasible ways of solving an identified problem (deficiency) or addressing an opportunity, from which a preferred solution is selected. Note: alternative solutions include the "Do Nothing" alternative. These are not to be confused with "alternative designs", which are, "alternative ways of designing or carrying out the preferred solution".

The City's Official Plan and Transportation Master Plan identified the need for a widened Carp Road from a two-lane road to a four-lane road. This subsequent study now confirms that there continues to be a need, in the future, to provide additional transportation capacity on Carp Road and/or on adjacent areas within the project limits. As such, this study examined alternative solutions for the corridor or adjacent areas to accommodate the anticipated projected travel demand.

As summarized in section 2.0, the Carp Road corridor has five primary needs/opportunities which would require a renewal solution:

1. A need to provide additional transportation capacity within the corridor or on alternative routes equivalent to a four lane roadway;
2. A need to improve traffic operations along the corridor;
3. An opportunity to improve the pedestrian environment within the corridor;
4. An opportunity to improve the cycling environment within the corridor;
5. An opportunity to improve the visual character of the corridor; and
6. An opportunity to improve the functionality of the corridor to respond to existing and planned land uses.

It is important to note that the EA process identified the broadest possible range of potential solutions which were subjected to a screening process based on their ability to fulfill the needs and opportunities of this EA Study. Specifically, whereas they may have fulfilled some of the criteria, they failed to provide the required transportation capacity along Carp Road or in adjacent areas in the planning horizon. These "screened out" options include:

Localized Intersection Improvements

In the Localized Intersection Improvements alternative, the following measures would be considered at intersections within the project limits:

- Adding lanes for storage of traffic;
- Addition of new signal controlled intersections;
- Addition of new traffic controls (i.e. prohibiting turning movements);
- Alterations to existing signals timing;
- Cycling and pedestrian improvements at intersections; and
- Installation of appropriate rural/urban streetscaping elements at intersections.

Mid-Block Operational Improvements

In the Mid-Block Operational Improvements alternative, the following measures would be considered by implementing operational improvements between intersections within the project limits:

- Turning restrictions and/or installation of medians;
- Construction of roadside curbs to constrain shoulder use;
- Mid-block pedestrian crossings;

- Cyclists could be accommodated in shared-use lanes or paved shoulders;
- Maintenance of existing roadside ditches; and
- Installation of appropriate rural/urban streetscaping elements in mid-block locations.

Two Lane Road Renewal

In the Two Lane Urbanization alternative, the following measures would be considered by reconstructing the street as a two lane urbanized cross-section. This may include:

- Provision for turn lanes at intersections and major driveways;
- Localized intersection improvements (as noted in section 4.0);
- Mid-block operational improvements (as noted in section 4.0);
- Sidewalks and cycling lanes throughout the corridor; and
- Installation of appropriate rural/urban streetscaping elements throughout the corridor.

On the basis of this screening process, three (3) alternative solutions remain that would possibly meet the identified needs and opportunities as well as to respond to the existing conditions outlined in section 4.0. These three (3) alternative solutions include 1) Do Nothing, 2) Two Lane Carp Road Renewal with new Parallel Road, and 3) Four Lane Carp Road Renewal. These solutions are described and evaluated in Section 4.1.

4.1 Description of the Alternative Solutions

4.1.1 Alternative Solution #1: Do Nothing

In the Do Nothing alternative, no improvements or changes would be made to the Carp Road Corridor or on adjacent lands. This means that the problem would remain in the system and there would be no opportunity to respond to the City's Official Plan, Transportation Master Plan and Community Design Plan objectives or other council policies that guide reconstruction of City roadways.

4.1.2 Alternative Solution #2: Two Lane Carp Road Renewal with new 1.8km Parallel Road

This alternative involves renewing Carp Road as a two lane urban road, with one lane in each direction plus turn lanes where appropriate, together with the construction of a new 1.8 km long parallel major road on vacant lands to the east of Carp Road. The two roads together would add transportation capacity to the Carp Road corridor and adjacent lands. For Carp Road, the solution would include:

- Urban cross-section;
- Provision for turn lanes at intersections and major driveways;
- Localized intersection improvements (as noted in Section 4.0);
- Mid-block operational improvements (as noted in Section 4.0);
- Sidewalks and cycling facilities throughout the corridor; and
- Installation of appropriate rural/urban streetscaping elements throughout the corridor.

The 1.8km long parallel road would function either as an Arterial Road or a Major Collector Road. This alternative solution is illustrated (conceptually) on Figure 4-1.

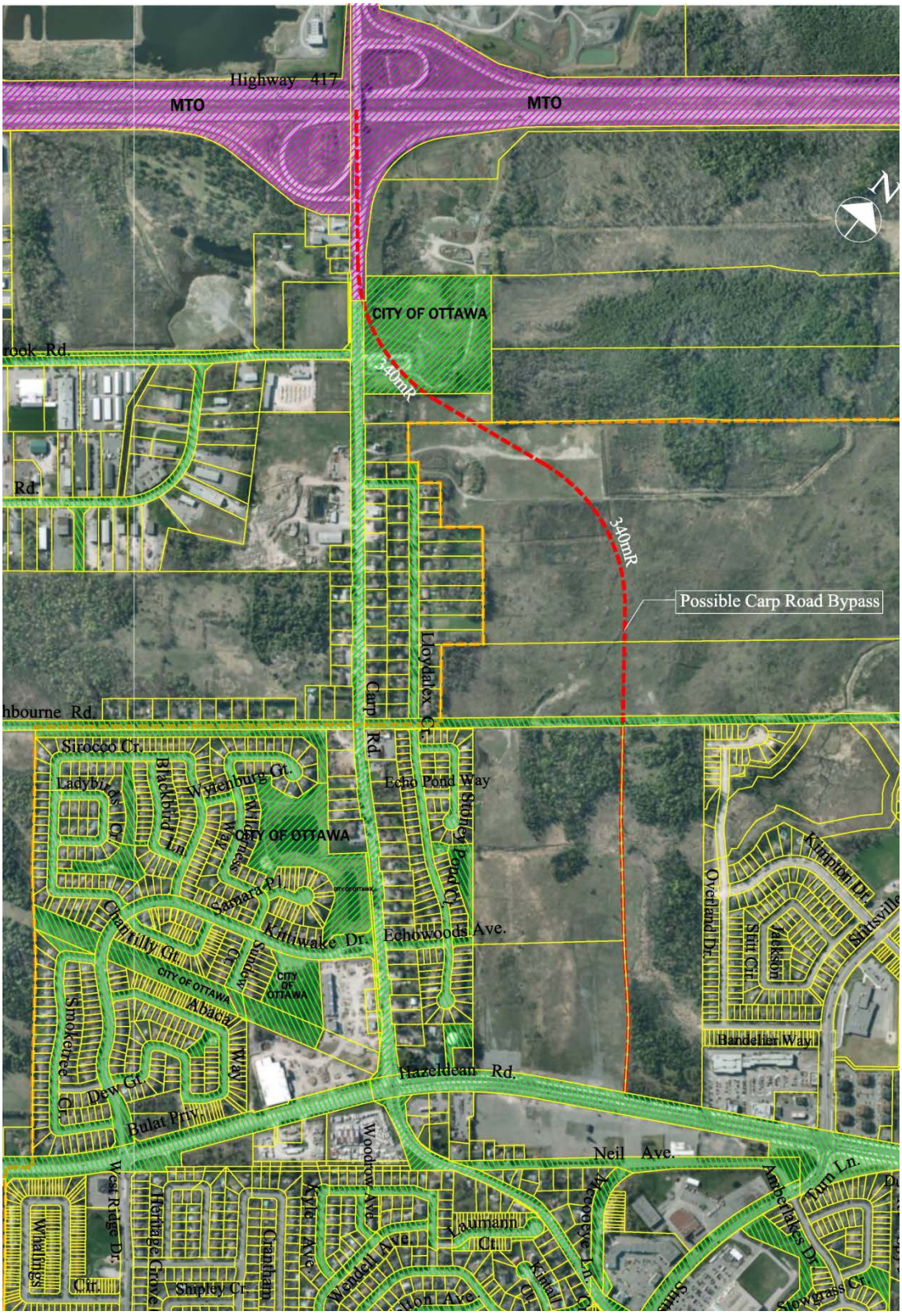


Figure 4-1: Two Lane Carp Road and new Parallel Road

4.1.3 *Alternative Solution #3: Four Lane Road Renewal*

This alternative involves renewing Carp Road as a new four lane urban road, with two lanes in each direction, plus turn lanes where appropriate. This alternative would provide additional transportation capacity within the Carp Road corridor and would include:

- Urban cross-section;
- Provision for turn lanes at intersections and major driveways;
- Localized intersection improvements (as noted in section 4.0);
- Mid-block operational improvements (as noted in section 4.0);
- Sidewalks and cycling lanes throughout the corridor; and
- Installation of appropriate rural/urban streetscaping elements throughout the corridor.

Figure 4-2 illustrates a typical four-lane urban cross-section as illustrated in the City's Regional Road Corridor Design Guidelines (2000). This corresponds to the 37.5 ROW width as protected for Carp Road in the Official Plan. It is possible that alternative designs to implement this solution would have a lesser ROW, responding to the constrained existing ROW and existing land use conditions.

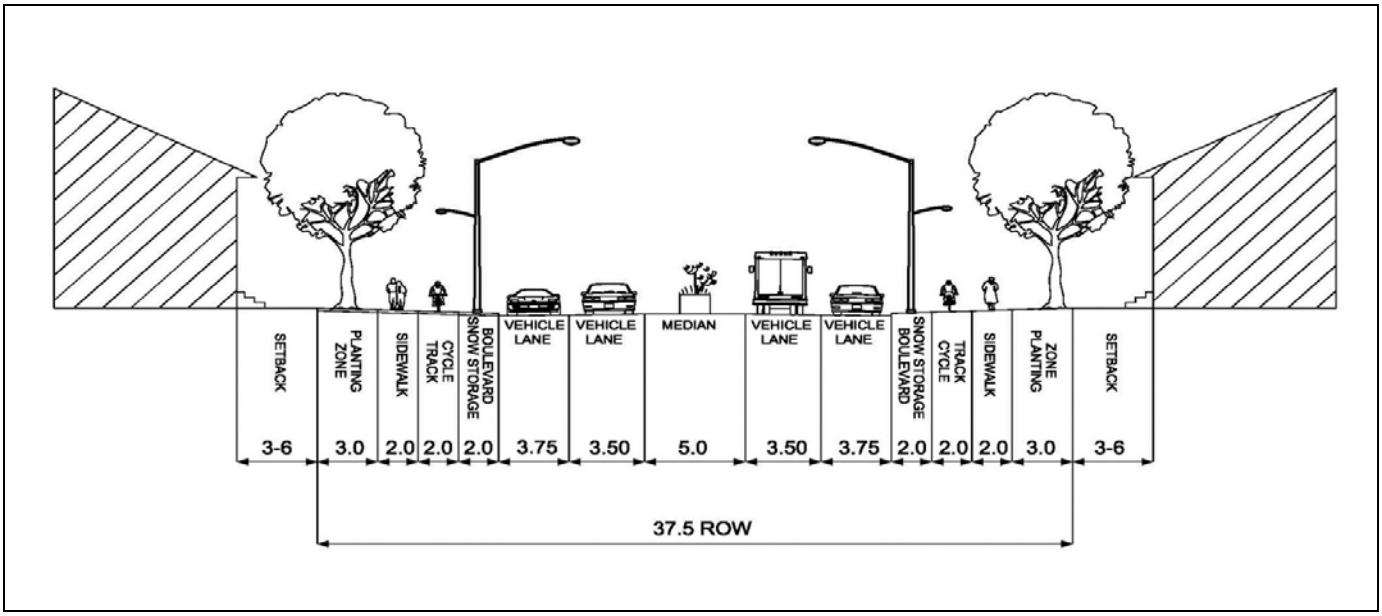


Figure 4-2: Typical four-lane urban cross-section

4.2 Evaluation of Alternative Solutions

4.2.1 *Evaluation Process*

The evaluation of alternatives is a key component of the EA process. An evaluation method maybe defined as a "formal procedure for establishing an order of preference among alternatives" (MOE, 1990). It reveals the reasons for the decisions (i.e. the rationale), but is not to be used to make the decision (i.e., evaluation methods are designed as *decision* aids for decision makers). Using a formal evaluation method has two main advantages:

- It provides a better basis for decision-making that would otherwise exist; and
- It results in reasons for decisions that on examination can be traced.

4.2.2 Evaluation Criteria

The following five broad environmental groups of evaluation criteria were applied to analyze and evaluate the suitability of each alterative solution based on a review of the need and opportunities of the corridor presented in Section 2.0 and an analysis of Existing Conditions (Section 3.0):

- Transportation;
- Social;
- Natural;
- Physical; and
- Economic.

Within these five categories, several specific criteria and indicators were developed to assess the characteristics of each alternative. Table 4-1 below, lists the criteria, rationale and indicators used for this assessment.

Table 4-1: Alternative Solution Evaluation Criteria

Criteria		Rationale for Criteria	Indicators
Transportation	Travel Demand	• Meets capacity demand for the corridor and adjacent lands.	• Travel Demand Forecast (Local Model)
	Level of Service/Traffic Operations	• Provides appropriate level of service within the corridor	• LoS at intersections • Corridor capacity
	Cycling	• Opportunity to enhance cycling in the corridor.	• Provision of cycling facility and other cycling amenities.
	Walking	• Opportunity to enhance walking in the corridor.	• Provision of sidewalks, crosswalks and other pedestrian amenities.
Social	New Communities	• Minimizes impacts on planned communities	• Disruption to planned residential communities
	Property Impacts	• Minimize impacts on private individual properties.	• Number of properties required presently in private ownership. Impact on individual private properties.
	Built Heritage Resources and Archaeological Potential	• Protection of built heritage and/or archaeological features important to the community.	• Extent of impact on identified built heritage value. • Extent of impact on areas identified as having archaeological potential.
	Visual Character	• Opportunity to enhance the visual environment and create a gateway to and character for to the corridor.	• Extent of streetscaping to be provided.
Natural	Natural Environment	• Protection of the natural environment.	• Potential impact on natural heritage features (i.e. surface water, aquatic habitats, wildlife and terrestrial habitats)

	Criteria	Rationale for Criteria	Indicators
Physical	Contaminated Lands	• Protection to human, animal and plant health.	• Proximity to areas of known or potential contamination.
Economic	Business Vitality	• Encourage and enhance area businesses.	• Ease of access to individual businesses within the corridor. • Provision of pedestrian and cycling facilities
	Cost	• Cost to implement the alternative.	• Class D Capital Cost estimate.

4.2.3 Evaluation Methodology

The impact-based analysis ranked each alternative from highest (1) to lowest (3), for each criterion. Environmental effects where predicted by the Study Team considering the interaction of the project (planning, design, construction and operation) with the environment. Potential effects were predicted and mitigated measures were identified to reduce the adverse effects. The extent of the effect determined the rank assigned to the alternative.

The criteria include a combination of quantitative and qualitative indicators. The majority of indicators require qualitative assessment by the Study Team. Table 4-2 provides a summary of the results of the preference-ranking evaluation based on the criteria utilized to compare the three (3) alternative solutions described in Section 4.1 above. Highlighted cells indicate the preferred alternative for each criterion.

Table 4-2: Evaluation of Alternative Solutions

Criteria	Indicators	Do Nothing	Two Lane Carp Road Renewal with New 1.8 km Parallel Road	Four Lane Carp Road Renewal
Travel Demand	• Travel Demand Forecast	Rank = 3 Provides no additional capacity.	Rank = 2 Provides additional vehicle capacity and may divert some trips away from Carp Road but does not negate the need for Carp Road to be widened to four lanes. The Parallel Road therefore provides redundant capacity and is not needed. Provides capacity for walkers and cyclists.	Rank = 1 Provides the needed capacity throughout project limits and includes capacity for walkers and cyclists.
Level of Service/Traffic Operations	• LoS at intersections • Corridor capacity • Queuing	Rank = 3 Provides no improvement to existing LoS and no additional corridor capacity for any mode.	Rank = 2 The two roads could be designed with intersections with appropriate LOS, however queuing and other issues would remain on Carp Road.	Rank = 1 Carp Road would be designed with intersections with appropriate LOS
Cycling	• Provision of cycling facility	Rank = 2 Provides no cycling facility in the corridor.	Rank = 1 Provides a cycling facility throughout the corridor. High level of improvement to the cycling environment.	Rank = 1 Provides a cycling facility throughout the corridor. High level of improvement to the cycling environment.
Walking	• Provision of sidewalks and other pedestrian amenities including crosswalks.	Rank = 2 Provides no pedestrian facilities in the corridor.	Rank = 1 Provides a sidewalk throughout the corridor. High level of improvement to the walking environment.	Rank = 1 Provides a sidewalk throughout the corridor. High level of improvement to the walking environment.

Criteria	Indicators	Do Nothing	Two Lane Carp Road Renewal with New 1.8 km Parallel Road	Four Lane Carp Road Renewal
New Communities	• Disruption to planned residential communities	Rank = 1	Rank = 2	Rank = 1
		Has no implication to planned residential communities	Parallel major road would divide and separate a planned residential area of approximately 2,000 units to the east of Carp Road. This would be a major constraint to the development of a successful residential neighbourhood, unnecessarily bringing vehicle traffic through it, and creating challenges to connect neighbourhoods on either side of it.	Has no implication to planned residential communities
Property Impacts	• Number of properties required presently in private ownership. • Impact on individual properties.	Rank = 1	Rank = 2	Rank = 3
		Requires no additional properties.	Requires some additional property throughout the Carp Road corridor and to accommodate a new parallel road. Individual property impacts within the Carp Road corridor will still occur.	Requires additional property throughout the corridor. Highest impact on private individual properties.
Built Heritage Resources and Archaeological Potential	• Extent of impact on identified built heritage value. • Extent of impact on areas identified as having archaeological potential.	Rank = 1	Rank = 3	Rank = 2
		No impact on identified areas of archaeological potential or built heritage resources.	Some potential front yard impacts on identified built heritage properties (2090 Carp Road) but likely not structures. Highest impact on areas identified as having archaeological potential.	Moderate impact on identified built heritage property (2090 Carp Road) but not structures. Highest impact on areas identified as having archaeological potential.

Criteria	Indicators	Do Nothing	Two Lane Carp Road Renewal with New 1.8 km Parallel Road	Four Lane Carp Road Renewal
Visual Character	• Extent of streetscaping to be provided.	Rank = 2 No streetscaping to be provided.	Rank = 1 High amount of streetscaping to be provided as part of solution. Best impact on visual character.	Rank = 1 High amount of streetscaping to be provided as part of solution. Best impact on visual character.
Natural Environment	• Potential impact on natural heritage features (i.e. surface water, aquatic habitats, wildlife and terrestrial habitats)	Rank = 1 No new impacts on natural heritage features.	Rank = 3 Additional stormwater to be generated from additional hard surfaces on a renewed Carp Road and new roadway. Impact considered moderate.	Rank = 2 Additional stormwater to be generated from additional hard surfaces including cycling and pedestrian facilities. Impact considered low.
Contaminated Lands	• Proximity to areas of known or potential contamination.	Rank = 1 No impacts on areas of known potential contamination.	Rank = 2 Potential to encounter areas of known contamination along a renewed Carp Road. Impact considered low.	Rank = 3 Potential to encounter areas of known contamination along the Carp Road corridor. Impact considered moderate.
Business Vitality	• Ease of access to individual businesses. • Provision of pedestrian and cycling facilities	Rank = 3 No improvement to existing access situation in the corridor. No provision of pedestrian and cycling facilities.	Rank = 2 Short term improvement to existing traffic operations with provision for protected turning movements along Carp Road. High improvement to pedestrian and cycling facilities to provide additional means to access businesses however, traffic will be diverted from Carp Road businesses (less pass-by traffic).	Rank = 1 High improvement to existing traffic operations with provision for turning in central shared turn lane. High improvement to pedestrian and cycling facilities providing additional means to access businesses. Maintenance of business pass-by traffic.

Criteria	Indicators	Do Nothing	Two Lane Carp Road Renewal with New 1.8 km Parallel Road	Four Lane Carp Road Renewal
Cost	• Class D Capital Cost estimate.	Rank = 1	Rank = 3	Rank = 2
		No Class D Capital Costs.	Highest class D capital costs, due to the requirement to construct two parallel major roads.	Moderate class D capital costs.

4.3 Evaluation Summary

Table 4-3 provides a summary of the ranking assigned to each of the alternative on a criteria-by-criteria basis. The preferred solution for each criterion is highlighted in blue.

Table 4-3: Alternative Solutions - Evaluation Summary

Criteria		Do Nothing	Two Lane Road Renewal With New Parallel Road	Four Lane Road Renewal
TRANSPORTATION	Travel Demand Forecast	3	2	1
	Level of Service	3	2	1
	Cycling	2	1	1
	Walking	2	1	1
SOCIAL	New Communities	1	2	1
	Property Impacts	1	2	3
	Built Heritage Resources and Archaeological Potential	1	3	2
	Visual Character	2	1	1
NAT.	Natural Environment	1	3	2
PHY.	Contaminated Lands	1	2	3
ECONOMIC	Business Vitality	3	2	1
	Cost	1	3	2
Preferred				✓

4.4 Preliminary Preferred Solution

This preference-ranking method provides a useful tool to aid in the evaluation of the alternative solutions. Using solely this method, and without applying weightings, the most-preferred solution is Alternative #3: Four Lane Carp Road Renewal. Alternative #3 is identified as having the greatest number of first place rankings and was preferred for all transportation criteria including travel demand, level of service, and the provision of walking and cycling opportunities, provides a good opportunity to enhance the visual character of the corridor within the project limits, and the greatest opportunity to enhance area businesses.

In fact, Alternative #3 is the only alternative that satisfactorily addresses the need. Alternative #1 obviously fails the need in terms of transportation capacity (it adds nothing). However, Alternative #2 also fails the need in terms of transportation capacity, because the analysis shows that even if a parallel road was constructed to the east of Carp Road, Carp Road itself would still need to be renewed as a four-lane road. The reasons are as follows:

- A large aspect of the justification for widening of Carp Road is future development along and adjacent to Carp Road itself, including vacant industrial, commercial, and residential lands;
- The 1.8 km parallel road is viewed as beneficial mostly for northbound traffic originating from the east on Hazeldean, and southbound traffic destined to the east, and would not attract traffic from the Carp Road corridor itself or from Stittsville Main Street to the south;
- Traffic to/from the west and to/from the south are better served by the alignment of the existing Carp Road Corridor;
- Analysis indicates volume projections of approximately 300 veh/h in the peak direction attracted to the By-pass and 1,400 per direction on Carp Road; and
- Given that the per-direction capacity of a single lane is approximately 900 veh/h, a two-lane Carp Road would fail to accommodate projected traffic remaining on the road. Hence, the four-lane renewal of Carp Road would still be required.

The analyses also considered the possibility of "punching" the parallel road associated with Alternative #3 into the residential enclave south of Hazeldean Road and intersecting with Carp Road at a point north of Stittsville Main Street. This would involve the southerly extension of the road for an additional approximately 250m to 400m, depending on the alignment. This possibility has also been screened out on the basis that:

- It would dramatically impact the neighbourhood character of the residential enclave bounded by Carp Road, McCooey Lane, and Neil Avenue;
- It would result in the physical displacement of three or four residences, requiring their property acquisition;
- It would trigger the need for widening and modifications to Carp Road at the new intersection, which is a constrained right-of-way;
- For southbound travellers headed for Stittsville Main Street, it would create the need for an awkward left-turn movement from the new major road onto Carp Road, likely requiring double left-turn lanes;
- There exists a signalized intersection today at Carp Road and Hobin Street/McCooeye Lane which is necessary to service the Crossing Bridge Estates neighbourhood to the west of Carp Road. If the new major road replaced McCooeye Lane and lined up with Hobin Street, this would change the functionality of this intersection which is just 110m from Stittsville Main Street, creating operational concerns; and
- As there is only 640m between the Carp/Hazeldean intersection and the Carp/Hobin intersection, the equidistant separation between a new mid-block major road intersection to either intersection be 330m and would create four (4) signalized intersections within a span of 750m.

Alternative #3 does have a notable impact on adjacent private property due to ROW widening requirements, however it is the only alternative that responds to the future transportation demand along Carp Road as confirmed in Section 2.0. This reconfirms the Council approved TMP which calls for a four lane widening of Carp Road. This reconfirmation should now be subject to stakeholder review.

Given the clear need for the four-lane renewal of Carp Road, the development and evaluation of alternative designs will focus on cross-sectional elements and will address matters such as: lane widths, access management (including medians), turn-lanes, intersection treatments (including roundabouts), bus stops, cycling/pedestrian facilities, servicing, utilities, landscaping and private approaches. Reducing the "footprint" and ROW requirements will be a major design objective.

4.5 Stakeholder Consultation

4.5.1 Consultation Group Meetings

A second round of consultation group meetings (Agency, Business and Public) was held on September 12, 2013. The Study Team, including members from the City of Ottawa and the consultant team, were available to discuss the Study and answer questions in a round table forum. Attendees were asked to sign-in at each meeting. At these meetings, participants were presented with the information that was to be communicated at the first public open house including: confirmation of the Need and Justification for the widening, an overview of existing conditions, the evaluation of alternative solutions and the preliminary preferred solution. Input received at these meetings included discussion on the following topics:

- Use of Roundabouts in the corridor;
- Status of area Development Applications and other planned modifications;
- Design standards, criteria and processes;
- Considerations for cycling;
- Roadway division and property access;
- Property impacts; and
- Servicing in the corridor.

4.5.2 Open house

The first Public Open House was held on September 18th, 2013 at the Goulbourn Recreation Complex. Throughout the event, Study Team members from the City of Ottawa and the consultant team were available to discuss the Study with the public and answer questions in an informal setting.

The material presented at the Public Open House included information on:

- Study Overview and Purpose
- Environmental Assessment Process
- Consultation Activities
- Needs and Opportunities
- Existing Conditions
- Transportation Conditions
- Alternative Solutions
- Reversible Lanes as a solution
- Evaluation Criteria and Methodology
- Evaluation Summary
- Preliminary Preferred Solution
- Design Principles
- Cross-Sectional Development
- Undivided Roadway
- Alternative Designs
- Next Steps

A resource table was also provided with background materials for review by members of the public. The material included copies of the City of Ottawa Official Plan and Transportation Master Plan, the Ontario Environmental Assessment Act, the Pedestrian Plan and Cycling Plan, and the Carp Road Corridor CDP.

To further assist in obtaining feedback from attendees, a Comment-Questionnaire was distributed at the Public Open House. Members of the public were encouraged to provide written comments and submit them either before leaving the Open House or by fax, email or regular mail by October 2nd, 2013. The questions were as follows:

1. *Where do you live in the City?*
2. *What specific interest do you have in this Study?*
3. *Do you have any comments on the background information presented tonight?*

4. *Do you have any comments or specific concerns regarding the evaluation of alternative solutions or the Preliminary Preferred Solution?*
5. *Do you feel that the information at this meeting has given you a better understanding of the project?*

All display boards, resource materials and handouts were provided in both French and English. A complete list and copies of the exhibit boards were posted on the City of Ottawa Carp Road Widening project web-site.

Notification of the Open House occurred through advertisements in weekly community or citywide newspapers on the following dates:

- EMC News, September 5, 2013 and September 12, 2013
- Le Droit, September 6, 2013 and September 13, 2013

Attendees were asked to sign-in upon entering the Public Open House. A total of 26 people signed in over the course of the evening. Based on the addresses provided, individuals attending the Public Open House were largely located along the Carp Road corridor within the project limits (Figure 4-3). A total of 3 Comment-Questionnaires were completed. All of the comments received are included in Appendix A.

When asked if the Public Open House has given a better understanding of the project, the results were:

Yes	–	1
No	–	0
Somewhat	–	2

Study Team members were asked to record comments and questions received over the course of the evening. The following is an overview of the comments received through direct discussions with the Study Team or through submission of comment questionnaires or email correspondence:

- Roadway division and property access;
- Widening identified most often as preferred solution;
- Property impacts was noted as a concern;
- Alternative design considerations; and
- Construction and timing considerations.

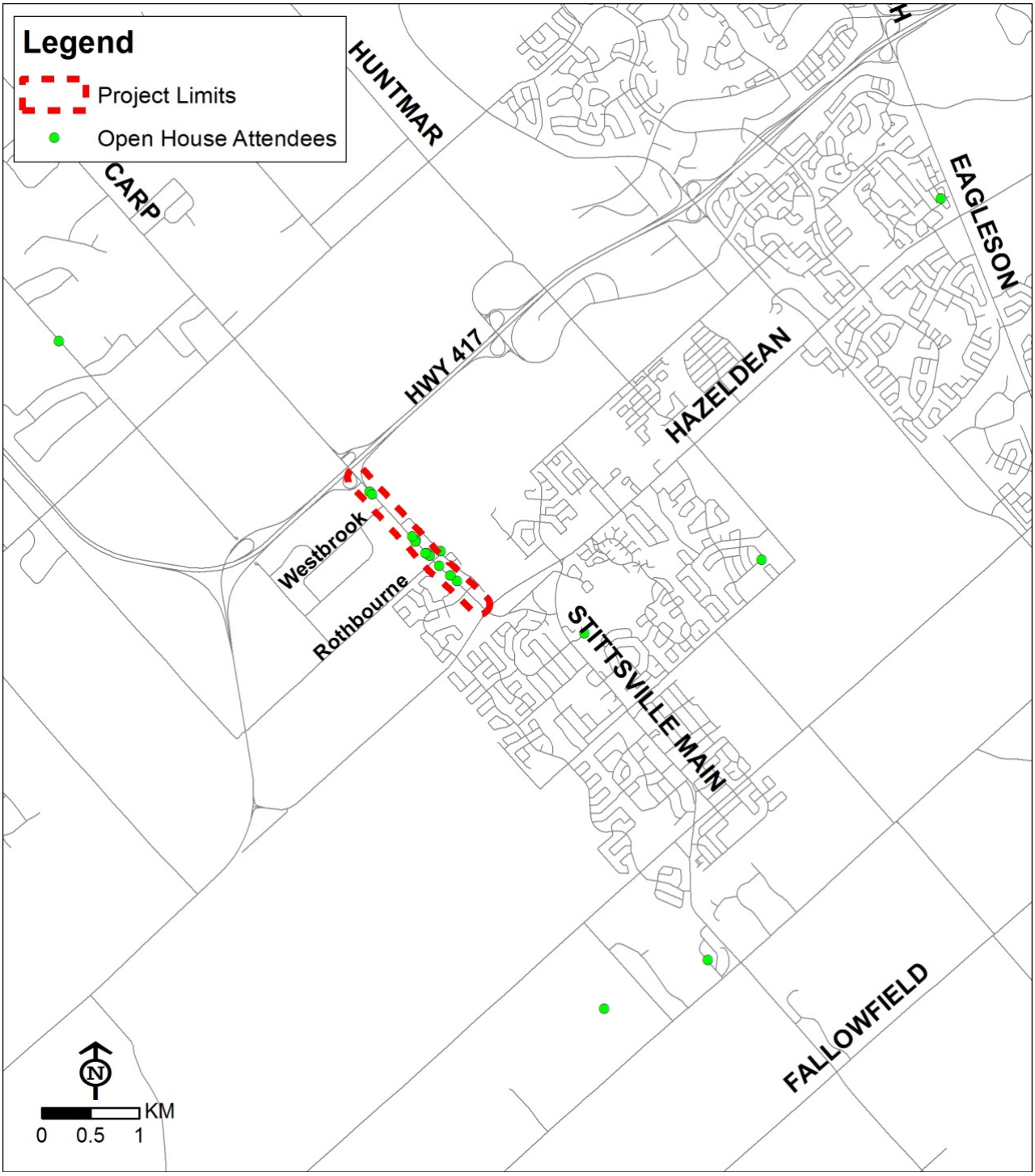


Figure 4-3: Geographical Distribution of Participants at Open House #1

Comments received from the first Public Open House, those from the Consultation Group and others received by email correspondence were used to inform the study and assisted in confirming the need for widening of Carp Road from two lanes to four lanes and the Preferred Solution.

5.0 Alternative Designs for a Four Lane Renewal of Carp Road

5.1 Design Principles

Given the need, opportunities and understanding of the study area conditions, the following principles will guide the identification and evaluation of alternative designs:

Future Capability: A preferred design will anticipate the long-term economic growth of Stittsville's residential and employment areas, and provide appropriate transportation capacity to service travel needs.

Site Access: A preferred design will provide vehicle access to adjacent properties in both north and south directions, recognizing the need for barrier separation associated with travel speeds and volumes.

Property Implications: A preferred design will have the most efficient and compact footprint possible, while providing for transportation needs, in an effort to minimize effects on adjacent private properties (front yards, parking areas, etc.) and to minimize the cost of land acquisition.

Mobility: A preferred design will provide for all travel modes across the corridor, including walking, cycling, bus transit, passenger and heavy trucks.

Greening: A preferred design will improve the visual environment within the right-of-way providing suitable space and setbacks to support healthy trees, grass, and other low maintenance plantings.

Flexibility: A preferred design will provide for some flexibility in implementation, possibly including a phased construction that corresponds to growing travel demand over the planning period.

5.2 Alternative Design (Cross-Section) Development Consideration

There are various design considerations to be regarded in the development and evaluation of alternative designs for a four-lane facility. These considerations include:

- What provisions are made for pedestrians;
- Are cyclists accommodated on-road or off-road;
- By what means are intersections controlled;
- What measures are used to manage turning movements and access to adjacent properties, including medians, or two-way left-turn lanes.

City policies such as the *Official Plan* and *Transportation Master Plan, Ottawa Cycling Plan, Ottawa Pedestrian Plan,* as well as council approved guidelines such as the *Regional Road Corridor Design Guidelines* also provide some guidance on minimum design standards for corridor such as Carp Road. Some of these more specific design criteria will include:

- Sidewalk widths of 2.0 m (1.8 m absolute minimum) or multi-use pathways of 3.0 m width;
- On-road cycling lane widths of 1.8 m to 2.0 m;
- Off-road cycling lane widths (cycle tracks) of 1.5m to 1.8 m or multi-use pathways of 3.0 m width;
- Design speed of 70 km/h with anticipated posted speed of 60 km/h;
- Vehicle lane widths of 3.3 m minimum, with additional curb offset of 0.25 m;

- Roadside snow storage zones of 1.5 m to 2.5 m; and
- Street lights and trees not closer than 1.5 m from curb.

5.3 Description of Alternative Designs

Having re-confirmed that Preferred Solution is to renew Carp Road as a four-lane roadway, and considering design principles and other considerations presented above, six (6) alternative designs have been identified. Each of the alternative designs includes the following basic characteristics and components:

- Renewal of the corridor to include four travel lanes and turn lanes where warranted to be designed as an urban cross-section that includes curbs, catchbasins and a new stormwater catchment system;
- Streetscape elements including street lights, landscaping, and other street amenities in keeping with the street's designation as an Arterial Road; and
- Maintaining signalization of the Hazeldean Road/Carp Road intersection.

The alternatives are comprised of cross-section arrangements that represent the corridor's varied opportunities and constraints. The alternatives are distinguished primarily by the following design variables:

- Type and location of pedestrian facility within the cross-section;
- Type and location of in-corridor cycling facility;
- Means for access to adjacent land uses;
- Medians or two-way left-turn lanes;
- Intersection Treatment (signalized or roundabout); and
- Amount and location of space for landscaping and other corridor elements (i.e. street lights and utility poles).

It is important to note that the vehicle lane arrangement of all six alternative designs is constant within the MTO corridor management area/property north of Westbrook. Specifically:

- North of Westbrook Road, a pedestrian facility is provided only on the west side of Carp Road which connects to the existing west side only sidewalk on the Carp Road bridge over Highway 417;
- Cycling facilities on the east side of Carp Road, north of Westbrook, are provided as a shared-use lane in keeping with the MTO design for the HWY 417 bridge structure; and
- Access restrictions are required within the MTO corridor management limits.

The vehicle lane arrangement is also consistent for all six alternative designs south of Kittiwake. The design includes:

- Provision for an additional left-turn lane at Hazeldean/Carp intersection; and
- One through-lane north and south of the intersection.

In addition, the historical road centreline has been maintained through the majority of the corridor except in the vicinity of Rothbourne Road where the centreline has been shifted to the west to avoid large front yard impacts on the east side of the corridor where larger front yards exist on the west side of the corridor.

The following section presents the alternative designs for the corridor. The distinguishing components of each alternative are described below and illustrations are provided in Appendix D.

5.3.1 Alternative Design #1: Signalized Intersection, On-Road Cycling Facility, Two-Way Left-Turn Lane

Alternative Design #1 includes intersection signalization at Westbrook Road, Rothbourne Road, Kittiwake Drive/Echowoods Avenue as well as provision for future signalization at Lloydalex Crescent if/when warranted. Cycling within the corridor would be provided as 2.0 m, dedicated, on-road bike lanes. The boulevard area of the corridor would be divided in the following ways: 2.0 m area to accommodate snow storage and room for a corridor tree/landscaping, a 2.0 m sidewalk, and a 0.75 m area that will provide space for overhead utilities and space to blend grades with adjacent properties. This alternative also includes a compressed cross-section if needed at pinch points in the corridor. This variation maintains a 2.5 m snow storage area and area for landscaping and street lighting and maintains a 0.75 m area at the back of the sidewalk to place overhead utilities and tie in adjacent grades. The centre of the roadway would include a 5.0 m lane that could be designed to be a two-way left-turn lane in the short-term to provide unrestricted access to adjacent properties, except at intersections, but be built as a full height median as warrants for separation along the corridor are met. The average corridor width between intersections (where some flaring and sight-triangles are required) would be 36.70 m.

5.3.2 Alternative Design #2: Signalized Intersections, Off-Road Cycling Facility, Two-Way Left-Turn Lane

Alternative Design #2 includes signalization at the Carp Road and Westbrook Road, Rothbourne Road, Kittiwake Drive/Echowoods Avenue intersections as well as provision for future signalization at Lloydalex Crescent if/when warranted. Cycling within the corridor would be provided off-road as either a 2.0 m segregated uni-directional cycle track in the boulevard with a parallel 2.0 m sidewalk on both sides of the corridor or a 3.0 m multi-use pathway on both sides of the corridor that would accommodate bi-directional cyclists and pedestrians. The remainder of the boulevard area would be used for snow storage, landscaping, street trees, overhead utilities and tying in grades. This alternative also includes a variation for constrained areas of the corridor which minimizes the separation between cyclists and pedestrians and/or places a wider cycle track at the road edge to economize space and reduce the overall cross-section width. The centre of the roadway would include a 5.0 m lane that could be designed to be a two-way left-turn lane in the short-term to provide unrestricted access to adjacent properties, except at intersections, but be built as a full height median as warrants for separation along the corridor are met. The average corridor width between intersections would be 33.20 m.

5.3.3 Alternative Design #3: Roundabouts, On-Road Cycling Facility, Narrow Median

Alternative Design #3 includes roundabouts at the Westbrook Road, Rothbourne Road, and Kittiwake Drive/Echowoods Avenue intersections as well provision for a future roundabout at Lloydalex Crescent if/when warranted. Cycling within the corridor would be provided as 2.0 m, dedicated, on-road bike lanes. Coupled with the roundabout designs would be the installation of a 1.5 m full-height median between roundabouts. Provision for left-turn access to adjacent properties would be provided through use of the roundabouts. As with alternative design #1, cycling would be accommodated within a 2.0 m dedicated, on-road bike lane. The boulevard area would be divided in the following ways: 2.0 m area to accommodate snow storage and room for a corridor tree/landscaping, a 2.0 m sidewalk, and a 0.75 m area that will provide space for overhead utilities and space to blend grades with adjacent properties. This alternative also includes a compressed cross-section if needed at pinch points in the corridor. This variation maintains a 2.5 m snow storage area and area for landscaping and street lighting and maintains a 0.75 m area at the back of the sidewalk to place overhead utilities and tie in adjacent grades. The average corridor width between intersections would be between 33.20 and 36.70 m. Additional land would be required at intersections to accommodate a roundabout design.

5.3.4 Alternative Design #4: Roundabouts, Off-Road Cycling Facility, Narrow Median

Alternative Design #4 includes roundabouts at the Westbrook Road, Rothbourne Road, Kittiwake Drive/Echowoods Avenue intersections as well as provision for a future roundabout at Lloydalex Crescent if/when warranted. Coupled with the roundabout designs would be the installation of a 1.5 m full-height median between roundabouts. Provision for left-turn access to adjacent properties would be provided through use of the roundabouts. Cycling within the corridor would be provided, as with alternative design #2, as an off-road facility, designed either as a 1.5 m segregated uni-directional cycle track in the boulevard with a parallel 2.0 m sidewalk on both sides of the corridor or a 3.0 m multi-use pathway on both sides of the corridor that would accommodate bi-directional cyclists and pedestrians. The remainder of the boulevard area would be used for snow storage, landscaping, street trees, overhead utilities and tying as with Alternative 2. This alternative also includes a variation for constrained areas of the

corridor which minimizes the separation between cyclists and pedestrians and/or places a wider cycle track at the road edge to economize space and reduce the overall cross-section width. The average corridor width between intersections would be 29.70 m and 33.20 m. Additional land would be required at intersections to accommodate a roundabout design.

5.3.5 Alternative Design #5: Roundabouts, On-Road Cycling Facility, Wide Median

Alternative Design #5 includes roundabouts at the Westbrook Road, Rothbourne Road, Kittiwake Drive/Echowoods Avenue intersections as well as provision for a future roundabout at Lloydalex Crescent if/when warranted. Coupled with this roundabout design would be installation of a 5.0 m full-height median between roundabouts. Provision for left-turn access to adjacent properties would be provided through the use of the roundabouts expect for larger scale developments or where traffic studies warrant dedicated left-turn lanes or median breaks. Cycling would be accommodated in a 2.0 m dedicated, on-road bike lane. As with alternative design # 1 and #3, the boulevard area would be divided in the following ways: 2.0 m area to accommodate snow storage and room for a corridor tree/landscaping, a 2.0 m sidewalk, and a 0.75 m area that will provide space for overhead utilities and space to blend grades with adjacent properties. This alternative also includes a compressed cross-section if needed at pinch points in the corridor. This variation maintains a 2.5 m snow storage area and area for landscaping and street lighting and maintains a 0.75 m area at the back of the sidewalk to place overhead utilities and tie in adjacent grades. The average corridor width between intersections would be 36.70 m. Additional land would be required at intersections to accommodate a roundabout design.

5.3.6 Alternative Design #6: Roundabouts, Off-Road Cycling Facility, Wide Median

Alternative Design #6 includes roundabouts at the Westbrook Road, Rothbourne Road, Kittiwake Drive/Echowoods Avenue intersections as well as provision for a future roundabout at Lloydalex Crescent if/when warranted. Coupled with this roundabout design would be installation of a 5.0 m full-height median between roundabouts. Provision for left-turn access to adjacent properties would be provided through the use of the roundabouts expect for larger scale developments or where traffic studies warrant dedicated left-turn lanes or median breaks. Cycling within the corridor would be provided, as with alternative design #2, and #4, off-road, as either a 1.5 m segregated uni-directional cycle track in the boulevard with a parallel 2.0 m sidewalk on both sides of the corridor or a 3.0 m multi-use pathway on both sides of the corridor that would accommodate bi-directional cyclists and pedestrians. The remainder of the boulevard area would be used for snow storage, landscaping, street trees, overhead utilities and tying in grades. This alternative also includes a variation for constrained areas of the corridor which minimizes the separation between cyclists and pedestrians and/or places a wider cycle track at the road edge to economize space and reduce the overall cross-section width. The average corridor width between intersections would be 33.20 m. Additional land would be required at intersections to accommodate a roundabout design.

5.4 Evaluation of Alternative Designs

5.4.1 Evaluation Methodology

In selecting an appropriate evaluation method for the study, consideration was given to a method, which would reflect:

- Project complexity;
- Varied community interests; and
- A traceable and defensible process.

Criteria were identified along with the indicator(s) used to qualify/quantify it. The criteria were developed from all key components of the existing environment. An evaluation matrix was selected as the methodology for this study as it provides a method of objectively evaluating a number of options against a number of criteria. For this EA, the evaluation included the followings steps:

Step 1 – Criteria Development: Evaluation criteria were developed and refined having particular regard for policies of the OP, TMP, Ottawa Cycling Plan, Ottawa Pedestrian Plan, and the Carp Road Corridor CDP as well other council policy documents. These are the primary policy documents that guide decisions on transportation infrastructure and

community planning in the City of Ottawa. The design principles set out in section 5.1 and 5.2 also informed the criteria. A draft list was established and reviewed by the consultation groups and the general public for input and refined by the Study Team.

Step 2 – Performance Review: The performance of each alternative was reviewed on an indicator by indicator basis based on the professional judgement of the Study Team. The alternatives were assigned a performance score for each indicator. The Study Team included subject matter experts in:

- Community Planning and Design;
- Noise, Air Quality and Vibration;
- Landscape Architecture and Visual Analysis;
- Active Transportation and Transit Planning;
- Biology;
- Heritage Resources;
- Traffic Engineering and Road Safety; and
- Environmental Planning.

Step 3 – Results Tabulation: The assessment results were tabulated to show how the alternatives performed relative to each other, within criteria groups, criteria and individual indicators. The alternative design that performed the best across indicators was recommended as the Preliminary Preferred Design for the corridor.

5.4.2 Evaluation Criteria and Evaluation Results

This section introduces the evaluation criteria and indicators that were used as the basis for the evaluation of alternative designs, together with a narrative that explains how the alternative designs performed relative to each other. A total of eighteen (18) evaluation criteria were selected for this EA which include 42 indicators. These criteria and their indicators, as well as their performance ratings on an indicator by indicator basis, are presented on a series of tables within this section. The narrative is to be read in conjunction with the table. The criteria are grouped into three (3) broad categories covering all aspects of the environment including:

- Part A: Socio-Economic Environment;
- Part B: Transportation Environment; and
- Part C: Biophysical Environment.

To assist in understanding how the evaluation was conducted, Table 5-1 details the evaluation scale used. Each design was evaluated based on how it performs in meeting each individual indicator ranging from failure to performing very well.

Table 5-1: Evaluation Scale and Descriptive Terms

Assessment	Rating	Definition
Performs Very Well	4	The alternative is evaluated by subject matter experts to have a highly favourable result in regards to fulfillment of the indicator. The design is expected to result in the achievement of best design practices, benchmarks, regulatory standards, or values expressed by stakeholders and in policy and guidelines, with the performance often exceeding benchmarks.
Performs Well	3	The alternative is evaluated by subject matter experts to have a favourable result in regards to fulfillment of the indictor. The design is expected to result in the achievement of best design practices, benchmarks, regulatory standards, or values expressed by stakeholders and in policy and guidelines.
Performs Adequately	2	The alternative is evaluated by subject matter experts to have an acceptable result in regards to fulfillment of the indicator. The design is expected to result in the achievement of best design practices, benchmarks, regulatory standards, or values expressed by stakeholders and in policy and guidelines, with the performance just meeting or approaching benchmarks.
Performs Poorly	1	The alternative is evaluated by subject matter experts to have an undesirable result in regards to fulfillment of the indicator. There is a risk that the design may fall short of best design practices, benchmarks, regulatory standards, or values expressed by stakeholders and in policy and guidelines.
Fails	0	The alternative is evaluated by subject matter experts to have an unacceptable result in regards to fulfillment of the indicator. The design is expected to fall short of best design practices, benchmarks, regulatory standards, or values expressed by stakeholders and in policy and guidelines with the performance often below benchmarks.

For each criterion, a preferred alternative (or alternatives) is identified and highlighted in blue which is derived by averaging the performance scores of all of the indicators.

Part A: Social Environment

Criteria A1: Corridor Land Use and Access

A road corridor that enables growth, development and business prosperity including:

i. maximization of all-movement access directly to abutting lots in the short-term; and
ii. maximization of all-movement access directly to abutting lots in the long-term.

This criterion includes two indicators that are designed to understand the access impacts to road corridor designs. In general, alternatives that facilitate unencumbered access to adjacent lands within the corridor are favoured. In the short-term, Alternatives 1 and 2 will include two-way left-turn lanes throughout the corridor except for a distance from intersections and therefore perform very well for this indicator. In the fullness of time, as land develops, a full, non-traversable median may be installed for these alternatives thereby reducing all-movement access to many lots within the corridor. However, the median may be carved out as parcels consolidate along the corridor and traffic studies support breaks. As such in the long-term these alternatives will perform adequately for this indicator. Alternatives 3, 4, 5, and 6 are expected to perform well for this indicator in the short-term as well as long-term. While these alternatives include full medians from the onset, roundabouts at the intersections will provide a safe and convenient way for travellers to access properties on both sides of the corridor in both the short and long-term. On balance, the alternatives are equally preferred and should perform well.

Criteria A1	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
i.	4	4	3	3	3	3
ii.	2	2	3	3	3	3
Average Rating	3.00	3.00	3.00	3.00	3.00	3.00
Preferred (✓)	✓	✓	✓	✓	✓	✓

Criteria A2: Land Implications

A road corridor that minimizes the effects on adjacent private properties including:

i. minimization of amount of Right-of-Way acquisition required at mid-block locations;
ii. minimization of amount of Right-of-Way acquisition required at intersections; and
iii. minimization of impact on functionality/use of the lot (on-site parking, front yards).

The three indicators for this criterion were developed to evaluate the impact of each of the alternatives on private properties. Alternatives that minimize the need to acquire land to implement the project or minimize the impact of the project on remaining private lands in terms of the ability to park and use front yards along the corridor are preferred. The alternatives are differentiated by intersection treatment (signalized versus roundabout), type of cycling facility (on-road versus off-road) and mid-block treatment (narrow versus median). Each of these families of alternatives has different right-of-way width requirements. Wide median options will have some additional land implications at mid-block locations as will alternatives that include on-road cycling facilities. In off-road cycling alternatives, the space for this facility is taken from the available boulevard space or edge treatment. Similarly, roundabout options will have additional land requirements at intersections. Those alternatives that have the smallest land requirements will be preferred for this criterion. Alternative 4 performs very well on minimizing land requirements at mid-block locations as it includes both narrow medians and off-road cycling facilities. Alternatives 2, 3, and 6 perform similarly well because they include either off-road cycling facilities or a narrow median. It was determined that required parking could be accommodated on remnant private property in each alternative. While required parking would be accommodated it was recognized that compared to the existing space for parking and use of front yards which is greater than what will be afforded at implementation of the project, all the alternatives were evaluated to perform adequately for this indicator. Alternative 2 is most preferred for this criterion with its combination of signalization at intersections and inclusion of off-road cycling facilities.

Criteria A2	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
i.	2	3	3	4	2	3
ii.	3	3	1	1	1	1
iii.	3	3	2	2	2	2
Average Rating	2.67	3.00	2.00	2.33	1.67	2.00
Preferred (✓)		✓				

Criteria A3: Building Implications

A road corridor that minimizes the effect on individual buildings and on-site private wastewater systems including:

i. minimization of the requirement to alter/demolish buildings; and
ii. minimization of impact to on-site private wastewater systems.

This criterion includes two indicators that assist in determining impacts on the built and engineered environment. The encroachment of the project onto private property carries the possibility of impacting existing buildings as well as private on-site wastewater systems. An equal minor shifting in the historical centreline of the road in some locations created a design for each of the alternatives that minimize the impact on existing buildings. Notwithstanding, there is at least one building that will potentially be impacted by the implementation of a roundabout as such, roundabout options have been evaluated to perform slightly less, but well, for this indicator. Available information indicates that the trend for the location of on-site private wastewater systems is in the rear yards of lots that front onto the corridor. At intersections, with roundabout alternatives, some driveways may require relocation to side streets and have the potential to impact on-site private wastewater systems. The impact is limited to a small number of corner lots and therefore they still perform well for this indicator.

Criteria A3	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
i.	4	4	3	3	3	3
ii.	4	4	3	3	3	3
Average Rating	4.00	4.00	3.00	3.00	3.00	3.00
Preferred (✓)	✓	✓				

Criteria A4: Visual Environment

A road corridor with a pleasing visual environment including:

i. maximization of attractiveness of the corridor.

The criterion includes one indicator to evaluate the attractiveness of the corridor. Alternatives that minimize curb-to-curb pavement width, maximize spaces for corridor landscaping and include opportunities for variation in the corridor will be preferred. Alternatives that include on-road cycling facilities (Alternatives 1, 3, 5) generally perform less well than those with off-road cycling facilities as the roadway curb-to-curb width is wider for these alternatives. Alternatives that include wide grassy medians of 5.0 m (Alternatives 5 & 6) are characterized as being most attractive compared to alternatives with a narrow median (1.5 m) in constrained areas of the corridor where the opportunity to provide landscaping is limited and perhaps only corridor lighting can be accommodated. Alternatives that include roundabouts provide for interesting variation in the corridor as well as additional opportunities for landscaping. All alternatives include a 7.0 m boulevard area and also equally a modified boulevard treatment in constrained areas. Some of this boulevard area is used to accommodate the off-road cycling facility (either cycle tracks or a multi-use pathway) however, this boulevard treatment is still evaluated to be an attractive road edge. As such, Alternatives 4 & 6 are most preferred because they include all the characteristics that add to a more visually attractive corridor from implementation including roundabouts, off-road cycling facilities, and wide space to accommodate more landscape elements and corridor lighting.

Criteria A4	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
i.	1	2	3	4	3	4
Average Rating	1.00	2.00	3.00	4.00	3.00	4.00
Preferred (✓)				✓		✓

Criteria A5: Sustainable Landscaping

A road corridor that allows for green design features including:

i. maximization of space for trees and/or landscaping.

This criterion includes one indicator to evaluate the alternative designs performance with regard to provision for a green corridor (opportunities for corridor landscaping). Alternatives that provide more room for landscaping will be preferred over less green alternatives. Alternatives 5 and 6 perform very well on both indicators providing the greatest opportunity for landscaping elements and permeable surface to promote stormwater infiltration. Alternative 5 and 6 only differ in their provision for a cycling facility both of which will be hard surfaces and the location of this facility doesn't change its overall performance. As such, Alternative 5 and 6 are preferred and perform very well as their designs include roundabouts, wide medians, and room in the boulevard area for soft landscape features. Alternatives 3 and 4 also provide better opportunities for landscaping as they include roundabouts and there are areas where a wide landscape median can be accommodated (where the corridor is not constrained).

Criteria A5	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
i.	2	2	3	3	4	4
Average Rating	2.00	2.00	3.00	3.00	4.00	4.00
Preferred (✓)					✓	✓

Criteria A6: Community Heritage

A road corridor that enables appreciation of heritage resources including:

i. maximization of appreciation of adjacent heritage resources.

The criterion was included to evaluate the impact of various designs on adjacent heritage resources including areas of archaeological potential. Assuming that a Stage II Archaeological Assessment indicates the significance of these areas, alternatives that limit the footprint of the project would be preferred and perform very well. Areas of archaeological potential have been identified in the vicinity of the Westbrook/Carp intersection (Figure 3-12) and are areas that have little past disturbance or where the greater property contains existing older structures. There is very little variation between the proposed ROW width with each of the alternatives at mid-block locations. Some staging areas and grading activities associated with the project may require minimal disturbance to the adjacent properties identified with archaeological potential but would be similar for all alternatives. Due to the high volume of trucks required to make left turns at the Westbrook/Carp intersection, alternatives with a roundabout design will be required to be designed of a sufficient size to accommodate this movement, as such, additional property would be required at corners at this intersection. Alternatives that include a roundabout design are anticipated to perform slightly less favorably than signalized intersection alternatives and are evaluated to perform adequately for this indicator, as the remainder of the parcel would be left unaltered post-implementation.

Criteria A6	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
i.	3	3	2	2	2	2
Average Rating	3.00	3.00	2.00	2.00	2.00	2.00
Preferred (✓)	✓	✓				

Criteria A7: Noise

A road corridor with noise levels along the corridor that remains at or below existing conditions including:

i. maximization of separation between noise sources (primarily trucks and buses) and receivers.

This criterion includes one indicator that enables an evaluation of alternatives in regards to noise conditions on sensitive land uses adjacent to the corridor. Sensitive land uses include outside areas for residential and day care uses that are located

adjacent to the corridor; more specifically, backyard or outdoor living areas for residential uses and playgrounds for daycare centres. Since all alternatives include a complete reconstruction of the corridor the determining factor in regards to noise will be the separation of the roadway to adjacent sensitive receptors. Designs that have greater separation between noise sources (moving vehicles) and receivers will perform better. Whereas speed is typically a contributing factor to corridor noise, whereby faster vehicles generally contribute more to corridor noise than slower speeds, the expected speed differences in the corridor among the alternatives is not anticipated to be perceptively different. In regards to separation, there is no significant difference in the alternatives with regard to the proximity of moving vehicles to the land uses and separation distances vary between 7.0 m to 10.75 m from vehicle travel lanes (greater when an on-road cycling facility is proposed) to property limits. It was evaluated that there would not be any perceivable difference in noise levels between the alternatives and are all expected to perform adequately. In the fullness of time, and as congestion increases, the roadway will approach regulatory limits but it is not anticipated that mitigation measures for noise will be required for any of the alternatives.

Criteria A7	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
i.	2	2	2	2	2	2
Average Rating	2.00	2.00	2.00	2.00	2.00	2.00
Preferred (✓)	✓	✓	✓	✓	✓	✓

Criteria A8: Vibration

A road corridor with vibration levels along the corridor remain at or below existing conditions including:

i. maximization of separation between vibration source (primarily trucks and buses) and receivers.

The criterion includes one indicator that enables the evaluation of the alternatives in regards to vibration conditions adjacent to the corridor. Similar to the evaluation of noise within the corridor, the evaluation of possible vibrations from vehicular traffic focuses on the outdoor amenity areas of adjacent residential (backyards) and daycares (playgrounds) of the sensitive receivers. As with noise, alternatives that have a greater separation between the vibration source (moving vehicles) and receivers will perform better. The speed of vehicles is not anticipated to be perceivable different between the alternatives and therefore not considered a contributing factor to vibration levels in the corridor. Based on what is a perceivable level of difference in vibration levels, all alternatives are expected to perform equally. While most vehicular traffic in not anticipated to result in perceivable vibrations for sensitive land uses, some may (i.e. truck traffic) and therefore all alternatives are evaluated to perform adequately for this indicator.

Criteria A8	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
i.	2	2	2	2	2	2
Average Rating	2.00	2.00	2.00	2.00	2.00	2.00
Preferred (✓)	✓	✓	✓	✓	✓	✓

Criteria A9: Outdoor Air Quality

A road corridor with reduced vehicle emissions including:

i. encouragement of fuel efficient driving behaviour.

This criterion includes one indicator that enables an evaluation of the alternatives in regards to the quality of outdoor air. Ambient Air Quality is measures by, “a desirable concentration of contaminant in air, based on protection against adverse effects on

health or the environment." The term ambient is used to reflect general air quality independent of location or source of the contaminant (MOE, 2013). The amount of emissions is related to the amount of fuel consumed in travel. The road design cannot influence the type of motor vehicles using a corridor or their individual fuel efficiency ratings. Therefore, all that can be influenced is the number of vehicles travelling (not a determining factor among these alternatives) and the enabling of fuel efficient driving techniques including: 1) gentle acceleration, 2) maintenance of a steady speed, 3) anticipation of traffic conditions, 4) coasting to decelerate, and 5) avoidance of high speeds (NRCan, 2013). There is not expected to be a perceptible difference between the alternatives.

Criteria A9	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
i.	2	2	2	2	2	2
Average Rating	2.00	2.00	2.00	2.00	2.00	2.00
Preferred (✓)	✓	✓	✓	✓	✓	✓

Criteria A10: Life Cycle Costs

A road corridor that is affordable to construct and maintain including:

i. minimization of capital infrastructure construction costs;
ii. minimization of cost of road and intersection maintenance and replacement cost; and
iii. minimization of property acquisition cost.

This criterion includes three indicators that assist in evaluating the alternatives with respect to their affordability including construction costs as well as costs associated with maintenance and replacement of corridor elements. The construction costs will be comparatively similar and perform well with Alternative 4 performing very well based on the combination of off-road cycling facility, variable median width, and roundabouts. Maintenance and replacement costs will vary between alternatives based on intersection designs as signalized intersection will have an additional maintenance cost that would not be required for roundabouts. Off-road cycling facilities will also be less costly to maintain than on-road cycling facilities. Alternatives 4 and 6 perform very well for this indicator. Property acquisition costs will be slightly higher for alternatives that include roundabouts as whole parcels may need to be acquired. Alternative 4 is considered the most affordable amongst the alternatives.

Criteria A10	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
i.	3	3	3	4	3	3
ii.	2	2	3	4	3	4
iii.	3	3	2	2	2	2
Average Rating	2.67	2.67	2.67	3.33	2.67	3.00
Preferred (✓)				✓		

Part B: Transportation Environment

Criteria B1: Pedestrian Convenience, Comfort, and Safety

A road corridor with appropriate pedestrian capacity, safety and comfort including:

i. maximization of separation of pedestrian route from vehicle travel lanes;
ii. minimization of length of travel time; and
iii. minimization of crosswalk length.

This criterion includes three indicators that assist in evaluating the variation among the designs of the pedestrian environment. Pedestrian routes that have a good separation from other uses of the corridor including vehicles, a direct route that minimizes the amount of time required to traverse the corridor, and a design that provides for a shorter crosswalk length at intersections will be more preferred for this criteria and lead to a pedestrian facility that is safe and comfortable to navigate. All of the alternatives do a good job of separating pedestrians from motor vehicles. Alternatives that include an on-road cycling facility (Alternatives 1, 3, and 5) will have greater separation between the motor vehicle travel lanes and the pedestrian facility and are therefore evaluated to perform very well for this indicator. In terms of length of travel time, all the alternatives will perform similarly well as the length of travel can either be increased by crossing roundabouts or standing at a signalized intersection. In regards to crosswalk length, alternatives that include roundabouts, offer a protected space between opposing travel lanes for pedestrians and will therefore have the shortest crosswalk length and be preferred for this indicator. Alternatives that include on-road bike lanes are least preferred because they have the additional 2.0 m of crossing length on either side across the roadway and are least preferred with Alternative 1 performing poorly for this indicator. The remaining alternatives include combinations of either cycle tracks and/or roundabouts and therefore are better at minimizing crosswalk length.

Criteria B1	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
i.	4	3	4	3	4	3
ii.	3	3	3	3	3	3
iii.	1	2	3	4	3	4
Average Rating	2.67	2.67	3.33	3.33	3.33	3.33
Preferred (✓)			✓	✓	✓	✓

Criteria B2: Cycling Convenience, Comfort, and Safety

A road corridor where cyclists are well-separated from moving vehicles

i. maximization of horizontal and/or vertical separation of cyclists from vehicles;
ii. maximization of a comfortable environment for cyclists of all ages and all abilities;
iii. minimization of length of travel; and
iv. maximization of safety of left-turn movements.

This criterion includes four indicators that assist in assessing how alternatives provide for a safe, comfortable and convenient cycling environment. All alternatives provide for a dedicated cycling facility and in so doing provide a horizontally separated facility from motoring vehicles. Off-road cycling facilities are both horizontally and vertically separated from motor vehicles and as such, perform very well and are preferred for the first indicator. On-road cycling facilities are not considered comfortable for many users including children, seniors or other of varying ability and fail to provide a comfortable environment for all. In terms of travel time, combinations with off-road cycling and roundabouts will have the most unencumbered trip (i.e. no signalized intersections) and have been evaluated to perform very well for this indicator. On-road cyclists will have potentially the longest travel time as they will have to navigate on and off the road at intersections. Therefore, Alternatives 3 and 5 are evaluated to perform adequately. Left-turn movements are considered safest in a roundabout design when coupled with an off-road cycling facility. These cyclists will be given unencumbered cross-rides through the intersection. On-road Cyclists are considered least safe as they will be required to merge on and off the road in roundabout designs (Alternatives 3 & 5), and merge with vehicular traffic in signalized intersection designs (Alternatives 1 & 2). Alternatives 4 and 6 are preferred for this criterion and expected to perform very well in regard to providing a cycling environment that is convenient, comfortable and safe.

Criteria B2	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
i.	2	4	2	4	2	4
ii.	0	4	0	4	0	4
iii.	3	3	2	4	2	4
iv.	1	2	3	4	3	4
Average Rating	1.50	3.25	1.75	4.00	1.75	4.00
Preferred (✓)				✓		✓

Criteria B3: Universal Accessibility

A road corridor that addresses the needs of diverse users, with or without disabilities.

i. provision of sidewalks with clear zone not less than 1.8m;
ii. provision of street design features that enable barrier free movement; and
iii. maximization of protection at crossings.

This criterion was developed to evaluate whether the road corridor was a suitable environment for all users, and includes three indicators. Alternatives that have the greatest number of attributes that assist in achieving universal accessibility will be preferred. All of the alternative designs include provision for 2.0 m sidewalks and street design features that will enable barrier free movement (i.e. depressed curbs, ripple strips, etc.), accordingly they have all been evaluated to perform very well for these first two indicators. With regard to maximization of protection at crossings, while roundabout designs minimize the crossing length and provide a refuge area between opposing lanes of traffic at crossings, there is no provision for dedicated protection of the pedestrian movement itself. As such they are expected to perform adequately but not as well as signalized intersections where pedestrian signalization will be provided.

Criteria B3	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
i.	4	4	4	4	4	4
ii.	4	4	4	4	4	4
iii.	4	4	2	2	2	2
Average Rating	4.00	4.00	3.33	3.33	3.33	3.33
Preferred (✓)	✓	✓				

Criteria B4: Bus Transit Travel Time and Reliability

A road corridor where buses travel efficiently and reliably through the corridor including:

i. minimization of length of travel time along the corridor; and
ii. consistency of travel time along the corridor.

This criterion includes two indicators that enable an evaluation of the alternatives in regards to the provision of bus transit service. In general, alternatives that enable buses to quickly travel through the corridor, and that have reliability in travel conditions (the bus arriving on the scheduled time), are favored. Alternatives that include signalized intersections (Alternatives 1 and 2) introduce a greater risk for buses to stop for red traffic lights within the corridor. Alternatives with roundabout designs (Alternatives 3, 4, 5, and 6) at intersections are anticipated to provide a more free-flowing travel environment and therefore faster travel time to traverse the corridor. As the corridor design anticipates the long-term capacity of the corridor, alternatives

that include signalized intersections are expected to perform well however, the remaining alternatives include roundabout designs that are expected to perform very well and therefore preferred for this criterion.

Criteria B4	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
i.	3	3	4	4	4	4
ii.	3	3	4	4	4	4
Average Rating	3.00	3.00	4.00	4.00	4.00	4.00
Preferred (✓)			✓	✓	✓	✓

Criteria B5: Motor Vehicle Travel Performance

A road corridor where passenger vehicles, emergency service vehicles, and trucks move safely and efficiently through the corridor including:

i. maximization of vehicle Level of Service at intersections;
ii. minimization of roadway (curb to curb) width to increase friction and reduce travel speed;
iii. maximization of safety of left turning movements at intersections in the short-term;
iv. maximization of safety of left turning movements at intersection in the long term;
v. maximization of safety of left turning movements at mid-block in the short term; and
vi. maximization of safety of left turning movements at mid-block in the long term.

This criterion includes six indicators that evaluate the short-term and long-term performance (as traffic grows) in terms of safety and efficiency of the corridor, for motor vehicles including passenger vehicles, emergency vehicles and trucks. All of the alternatives are designed to expect an acceptable level of service at intersections and therefore assessed to perform very well for the first indicator; vehicle Level of Service at intersections. The study has reported community perceptions of vehicle speeds over the posted limit; as such the second indicator was developed to evaluate how the alternatives differ in regards to creating friction and reducing travel speeds. Alternatives that minimize the roadway (curb to curb) width and other corridor elements (i.e. corridor landscaping, lighting) will be nearer to the road edge, will create friction in the corridor, and cause vehicles to inherently slow down. All of the alternatives have economized lane widths to reduce the amount of paved roadway as well as minimize the amount of land required for the ROW. Alternatives that include on-road bike lanes (1, 3, & 5) have a slightly wider curb to curb width (2.0 m on either side of the roadway) and without a cyclist in the bike lane will give the motorist the perception of a wider and freer space to travel. At times, when a cyclist is in this travel lane, it will create friction; therefore these alternatives are expected to perform well for this indicator. Alternatives that include a cycle track facility will have an even narrower curb to curb width and therefore have the greatest influence on reducing travel speed in the corridor. Alternatives 2, 4, & 6 are expected to perform very well and are preferred for this indicator. A temporal factor has been included in the evaluation of the safety of the left-turning movements within the corridor as well as location (intersection versus mid-block). Over time, as traffic builds within the corridor, the ability to perform left-turn movements at either intersections or in mid-block locations will change. At intersections, the roundabout options provide the safest design for these movements as cars are slower moving and the severity of potential collisions is less than that at a signalized intersection. While signalized intersections are anticipated to perform well, roundabouts are preferred for these indicators and expected to perform very well both in the short and long term. With Alternatives 1 and 2, at mid-block locations, in the short-term vehicles will be able to make left-turns freely to and from adjacent properties by way of a two-way left-turn lane which may introduce a greatest risk for collisions in the corridor compared to prohibited movements mid-block in roundabout alternatives. In the long-term, as traffic builds in the corridor, the two-way left-turn lanes will be more controlled and safety improved for these alternatives. Alternatives 4 and 6 are preferred overall for this criterion.

Criteria B5	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
i.	4	4	4	4	4	4
ii.	3	4	3	4	3	4
iii.	3	3	4	4	4	4
iv.	3	3	4	4	4	4
v.	1	1	4	4	4	4
vi.	3	3	4	4	4	4
Average Rating	2.83	3.00	3.83	4.00	3.83	4.00
Preferred (✓)				✓		✓

Part C: Biophysical Environment

Criteria C1: Terrestrial Habitat and Species

A road corridor that provides habitat for urban wildlife including:

i. minimization of loss of existing road corridor trees; and
ii. maximization of space for new trees.

This criterion includes two indicators that enable the evaluation of alternatives in regards to their ability to conserve and/or enhance existing terrestrial habitat for urban wildlife in corridor trees. In general, alternatives that are able to maintain existing street trees or provide opportunities for additional street trees within the corridor and including adjacent lands will be favored over those that remove existing street trees or fail to provide opportunities for new street tree plantings. On this basis, alternatives with the narrowest cross-section footprint will be most preferred to maximize the potential retention of existing corridor trees and those alternatives that provide the greatest space for landscaping within the cross-section will be most preferred for creating space for new trees. Alternative 4 provides the greatest opportunity to preserve existing street trees presently close to the road edge as it has the narrowest cross-section. Alternatives 5 and 6 have the greatest potential for providing new street trees as these alternatives include roundabout designs and have 5 metre landscape medians from the project implementation whereas alternatives 1 and 2 may only have the opportunity in the future to incorporate street trees. Where the corridor is not constrained, all alternatives provide a space within the boulevard area to include street trees. However alternatives that contain a cycle track option will include areas where a street tree cannot be included within the public ROW when the boulevard areas will need to be economized to minimize impacts on private properties. These areas however, are not found in the majority of the corridor. All alternatives have similar opportunities to plant new trees on private property. Alternatives 4 and 6, on balance, are preferred overall for this criterion.

Criteria C1	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
i.	2	3	3	4	2	3
ii.	2	2	3	3	4	4
Average Rating	2.00	2.50	3.00	3.50	3.00	3.50
Preferred (✓)				✓		✓

Criteria C2: Surface Water and Aquatic Habitat

A road corridor that minimizes risk to aquatic habitats and manages quality and quantity of surface water runoff

i. minimization of stormwater runoff; and

ii. avoidance of harmful alterations or disruption to fish or fish habitat in receiving watercourses.

This criterion includes two indicators that enable the evaluation in regards to impacts on surface water quantity and quality and its impacts on aquatic habitats. In evaluating the minimization of stormwater runoff, alternatives that minimize the amount of hard surfaces or maximize the amount of permeable surfaces will be preferred for this indicator. Alternative 5 and 6 are preferred for this indicator as these designs include a wide landscape median and room for additional landscaping at the centre of roundabouts. The difference between on-road versus off-road cycling facility did not become a determining factor even though with on-road cycling facilities there is more room for landscaping elements in the boulevard. Where off-road cycling facilities are part of the design, ROW widths are generally narrower and as such maintain adjacent landscaping. With respect to fish habitat, all alternatives include the design of a stormwater system that will use contemporary design practices to mitigate or avoid impacts to fish or fish habitat. Therefore, all alternatives will perform equally for this indicator and no negative impacts are anticipated.

Criteria C2	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
i.	2	2	3	3	4	4
ii.	4	4	4	4	4	4
Average Rating	3.00	3.00	3.50	3.50	4.00	4.00
Preferred (✓)					✓	✓

Criteria C3: Impacted Materials

A road corridor that manages potential risks associated with soil and/or groundwater contamination including:

i. minimization of interaction with potentially impacted soil and/or groundwater.

This criterion includes an indicator that enables the evaluation in regards to determining the extent to which each of the alternatives has the potential to interact with impacted or contaminated soil or groundwater. Alternatives that minimize the construction footprint will be favored. While roundabout alternatives require more land at intersections, the intersections are shifted slightly to the west where more vacant land exists and minimizes the impact on lands that may have potential contamination which studies show to be located more on the east side at intersections. As such, it is mid-block locations where more potential contamination has been identified and corridor width would be the determining factor for performance of the alternatives for this indicator. Alternatives 5 & 6 have the largest footprint both between intersections and at intersections and are considered adequate at avoiding impacted materials. The remaining alternatives are considered well for this indicator and preferred.

Criteria D3	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
i.	3	3	3	3	2	2
Average Rating	3.00	3.00	3.00	3.00	2.00	2.00
Preferred (✓)	✓	✓	✓	✓		

5.5 Summary Results

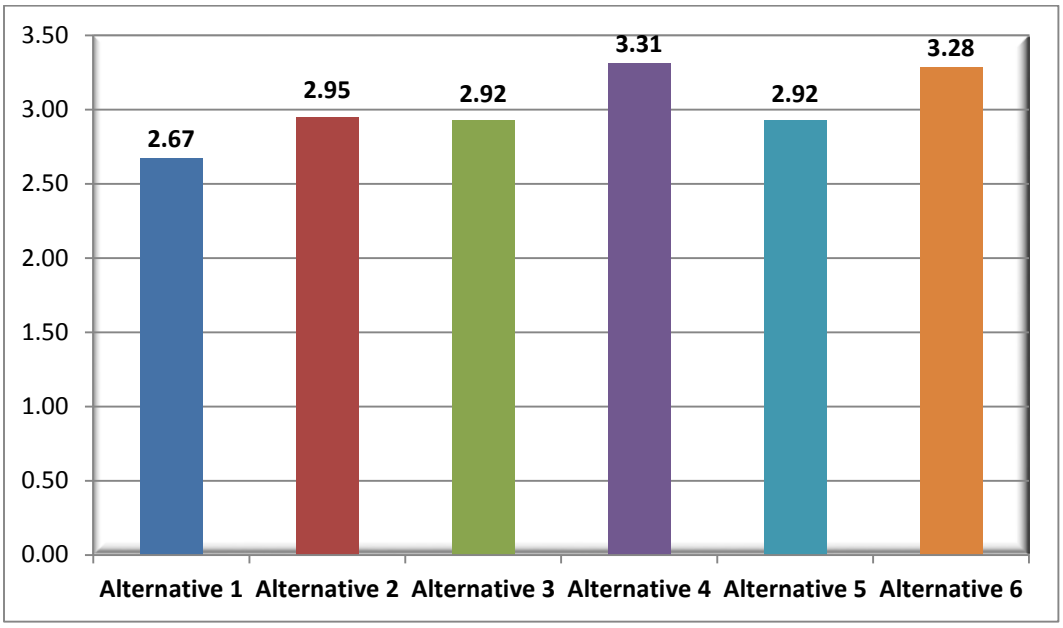
In order to interpret the results, a summary table was produced to evaluate any trends in performance on criteria and criteria groups as well as to determine a preliminary preferred alternative. The findings are shown in the following Table 5-2.

Table 5-2: Average Indictor Performance Rating

Criteria Groupings	Alternative 1 Signalized/ Wide Median/ On-Road Cycling	Alternative 2 Signalized/ Wide Median/ Off-Road Cycling	Alternative 3 Roundabouts/ Narrow Median/ On-Road Cycling	Alternative 4 Roundabouts/ Narrow Median/ Off-Road Cycling	Alternative 5 Roundabouts/ Wide Median/ On-Road Cycling	Alternative 6 Roundabouts/ Wide Median/ Off-Road Cycling
Average Socio-economic Indicators	2.63	2.75	2.50	2.75	2.50	2.69
Average Transportation Indicators	2.72	3.17	3.22	3.78	3.22	3.78
Average Biophysical Indicators	2.60	2.80	3.20	3.40	3.20	3.40
Average Across Indicators	2.67	2.95	2.92	3.31	2.92	3.28
Preliminary Preferred (✓)				✓		

Alternative 4 has the highest average rating across all indicators. Alternative 4 is also among the preferred for each criteria group including socio-economic, transportation and biophysical indicators. The distribution of average indicator scores is illustrated in Figure 5-1.

Figure 5-1: Average Indicator Rating



On the basis of the foregoing analysis, Alternative 4 was selected as the preliminary preferred design for the corridor. Input from stakeholders was sought by the study team on determination of a Preferred Design for the project. It is important to note, however, that all alternatives performed quite well. Between the highest rated alternative (3.31) and the lowest rated alternative (2.67), there is a gap of less than 0.7. This implies that all the alternatives could be considered to provide a good result for the widening of Carp Road, with a high likelihood of their being effective ways to manage potential environmental effects. In instances such as this, it is particularly important to consider public input on the Preliminary Preferred Design. Hence, a third round of stakeholder consultation was undertaken.

5.6 Consultation on Alternative Designs

5.6.1 Advisory Committees

The third round of consultation group meetings was held on January 21st, 2014 (Agency Consultation Groups) and February 3rd, 2014 (Business and Public Consultation Groups). At these meetings, participants were presented with the information that was to be communicated at the second Public Open House. This included the evaluation results and the identification of Alternative Design #4 (Roundabouts and Narrow Median) as the Preliminary Preferred Design. The Study Team, including members from the City of Ottawa and the consultant team, were available to discuss the Study and answer questions in a round table forum. Attendees were asked to sign-in at each meeting. A record of these meetings is included in Appendix A: Consultation Record. The following items were discussed.

- Proposal for future snow dump facility in the Westbrook Business Park;
- Accommodation of utilities in the corridor;
- Cyclist and pedestrians;
- Westbrook intersection and impacts of the Park and Ride Facility and ability to accommodate large trucks;
- Corridor drainage alternatives;
- Private individual services (septic) and provision for municipal services;
- Roundabouts;
- Property values; and
- Two-way left-turn lane and installation of a future barrier median.

5.6.2 Open House

Public Open House #2 was held on Wednesday, February 26, 2014 at the Goulbourn Recreation Complex from 6:30 to 9:00 p.m. Throughout the event, Study Team members from the City of Ottawa and the consultant team were available to discuss the Study with the public and answer questions in an informal setting.

The material presented at the Public Open House included information on:

- Study Overview and Purpose
- Environmental Assessment Process
- Consultation Activities
- Needs and Opportunities
- Existing Conditions
- Transportation Conditions
- Alternative Solutions
- Evaluation of Alternative Solutions
- Design Principles, Evaluation Criteria and Methodology
- Evaluation Scale
- Evaluation of Alternative Designs
- Preliminary Preferred Design
- Benefits of Roundabouts
- Benefits of Multi-Use Pathways
- Next Steps

A resource table was also provided with background materials available for review by members of the public. This material included copies of the City of Ottawa Official Plan and Transportation Master Plan, the Ontario Environmental Assessment Act, the Pedestrian Plan and Cycling Plan, and the Carp Road Corridor CDP. A project summary bulletin was also made available as a handout to open house participants.

To further assist in obtaining feedback from attendees, a Comment-Questionnaire was distributed at the Public Open House. Members of the public were encouraged to provide written comments via the Comment-Questionnaire and submit them either before leaving the Open House or by fax, email or regular mail by 12 March 2014. The questions were as follows:

1. *Where do you live in the City?*
2. *What specific interest do you have in this Study?*
3. *Do you have any comments or concerns regarding the evaluation of Alternative Designs or the Preliminary Preferred Design?*
4. *Do you have any additional considerations for the Study Team during the upcoming process of confirming a Preferred Design and/or developing the Functional Design/Recommended Plan?*
5. *Do you feel that the information presented at this Open House has given you a better understanding of the study?*

All display boards, resource materials and handouts were provided in both French and English. A complete list and copies of the exhibit boards are posted on the City of Ottawa Carp Road Widening project web-site.

Notification of the Open House occurred through advertisements in weekly citywide newspapers on the following dates:

- EMC News, February 13th, 2014 and February 20th, 2014
- Le Droit, February 14th, 2014 and February 21st, 2014

An email notification was sent on February 13th to all persons on the study's master mailing list and included members of the ACG, BCG and PCG. A reminder email was also sent the day prior to the Public Open House.

5.6.3 What We Heard

Attendees were asked to sign-in upon entering the Public Open House. A total of 27 people signed-in over the course of the evening. Based on the addresses provided, individuals attending the Public Open House were largely located along the Carp Road corridor within the project limits (Figure 5-2). A total of seven (7) Comment-Questionnaires were completed and submitted before leaving the Open House or submitted after the Open House. All of the comments received are listed below:

What Specific interest do you have in this Study?

- Heading south being able to turn left at Carp and Lloydalex (beside Kellco).
- That the design is to the benefit of the community, particularly 4 lanes, curbs, sidewalks, etc., access to some of the commercial properties.
- Property interests/impacts (3).
- Safety of access to/from properties (2).

Do you have any comments or concerns regarding the evaluation of Alternative Designs or the Preliminary Preferred Design?

- Agree that #4 should be the preferred design (2).
- I do not agree with the concept of roundabouts. Main thoroughfare off Queensway – major dump, many trucks, and concrete plant – buses (city and school).
- 1 or 2 lane turning lane in centre. There are too many lots or businesses on Carp Road for roundabouts.
- Like the multi-use pathway versus separate facilities.

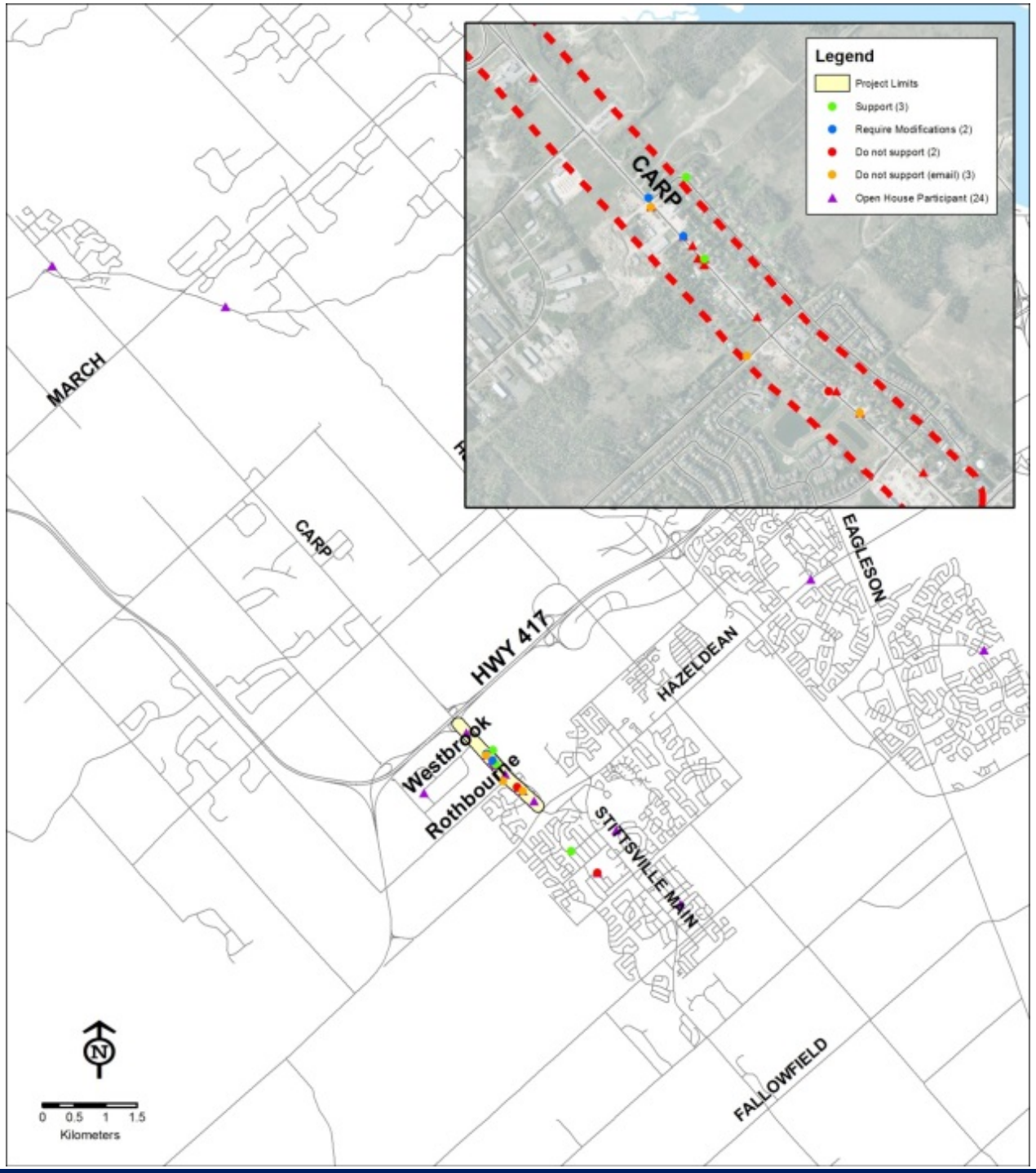


Figure 5-2: Geographical Distribution and General Response of Participants at Open House #2

Do you have any additional considerations for the Study Team during the upcoming process of confirming a Preferred Design and/or developing the Functional Design/Recommended Plan?

- The roundabout with separate walkway and bike path are a good design.
- There should be some form of separation between the cycling and pedestrian functions on the multi-use pathways. Specific in and out accesses designed for some of the commercial properties (e.g., McEwens Gas, Ritchies).

- Move the traffic off this road to other roads. Let Timbermere out and West Ridge.
- Require a depressed median to provide access to properties at Lloydalex (Kellco, Kondruss Galleries, flea market, Moores Truck and Trailer, etc.).
- Roundabout not needed at Lloydalex because of access north from Lloydalex and all-movement access via roundabout at Rothbourne.

Do you feel that the information presented at this Open House has given you a better understanding of the Study? If no, or somewhat, please describe what we could do differently or what additional information you would like to have.

- This was not a proper meeting, whereby people could express their concerns, re the project. I would like to be contacted at the below email.
- Would have liked more take-home information or information to be sent to home as a resident living on the corridor.
- Would like to have more information about the provision of sewers along Carp Road.

When asked if the Public Open House has given a better understanding of the project, the results were:

Yes	–	4
No	–	1
Somewhat	–	3

A full record of comments received during the public open house, via email and through submission of comment-questionnaire sheets is included in Appendix A: Consultation Record.

5.6.4 Individual Stakeholder Submissions

Following the Public Open House # 2, the Study Team reviewed the comments received from study stakeholders including submissions from individual residents and business owners along the corridor who had expressed a strong concern that a roundabout design for Carp Road would be detrimental for the corridor and would provide insufficient/ineffective/inconvenient access mid-block to properties, and in particular, businesses fronting on the corridor. At this time the Study Team entered into discussions with concerned stakeholders. Moreover, the additional property requirements at intersections to implement a roundabout design were expressed as a major concern. Having regard for public input, the Study Team re-evaluated the alternatives, placing a greater emphasis on providing for adjacent site access and on minimizing property requirements.

5.7 Confirming a Preferred Design for Carp Road

The evaluation of alternative designs that was presented at the February 2014 Public Open House noted three alternatives scoring similarly high including alternatives #2, #4, and #6. These alternatives all include provision for an off-road cycling facilities and perform similarly well to very well. However, alternatives #4 and #6 are roundabout designs that included raised barrier medians between intersections which did not provide for mid-block turning/access, compared to alternative #2 that includes signalized intersection designs and mid-block turning/access opportunities via a two-way left-turn (TWLT) lane where feasible. On the basis of stakeholder input and the emphasis assigned to including a more acceptable mid-block access to individual properties and minimizing the property requirements at intersections, roundabout alternatives were eliminated for further consideration.

As such, following the consultations with study stakeholders, a Preferred Design for Carp Road was selected by the Study Team. It is a refinement of the original Alternative Design #2 that includes minimization of property requirements and has some opportunity for greening of the corridor. Key components of the Preferred Design include:

- Five-lane cross-section including a central Two-Way Left-Turn (TWLT) Lane in some locations;
- Signalized intersections and channelized left-turn lanes at Westbrook Road, Rothbourne Road and Kittiwake Drive/Echowoods Avenue;
- Minor modifications to the Hazeldean Road signalized intersection arrangement;
- TWLT lane at Lloydalex Crescent, with protection for possible future signalization;
- Intermittent mid-block raised medians to provide guidance to motorists and opportunities for greening; and
- Multi-Use Pathways on both sides, for most sections along the corridor.

The implications/impacts of this design for the corridor include:

- Slightly less opportunity for greening of the corridor than other alternatives;
- Right-in/right-out access to properties in the vicinity of signalized intersections due to channelization required for median-mounted traffic signal plants; and
- In the long term, as traffic volumes grow, a raised median may replace the TWLT lane to address potential safety concerns associated with left-turn movements to and from adjacent lots. Individual site access would be restricted to right-in/right-out movements at that time, if required.

This preferred design provided the basis for developing the Recommended Plan for the project.

5.8 Long-Term Modifications to the Carp/Hazeldean Intersection

It is important to note that the projected performance of the southbound through movement at the Carp/Hazeldean intersection would be operating beyond capacity during the PM peak hour (v/c of 1.27; characterized by delays greater than 1 minute and extensive queuing of several hundred metres or more). The analysis indicates that an overall intersection v/c ratio of better than 0.90 can be achieved at this location by providing a second southbound through lane. The provision of dual eastbound left-turn lanes also contributes to improved intersection performance during the AM peak hour. Should there be an absolute need to achieve LoS D conditions for vehicles at the Carp/Hazeldean intersection during peak hours, then at that time, consideration should be given to reconstructing the intersection to allow for two southbound through lanes approaching the intersection, and also downstream of the intersection, as well as two eastbound left-turn lanes. The proposed functional design of this intersection modification and its associated additional property requirements is depicted in Appendix F.

In the interim, a single southbound through lane and single eastbound left-turn lane, as illustrated in the Recommended Plan (Appendix E) will provide adequate intersection performance. Given the relatively modest southbound right-turn traffic volume at the Carp/Hazeldean intersection, provision of an auxiliary right-turn lane is not considered an essential element of the design should there be limitations on the desired cross-section.

6.0 Recommended Plan and Assessment

6.1 Overview of the Preferred Design

Recommended Plan for Carp Road is a widening from two to four lanes within the project limits and includes pedestrian and cycling facilities along the corridor. The historical road centreline has generally been maintained through the majority of the corridor except in the vicinity of Rothbourne Road where the centreline has been shifted to the west to avoid large front yard impacts on the east side of the corridor.

The EA study recommends a two phase strategy for implementation of the Recommended Plan:

1. An Affordable Plan which conforms to the City of Ottawa's budget envelope identified for this project, and
2. An Ultimate Plan (post 2031) which includes additional measures at the Carp/Hazeldean Roads intersection (as described in section 5.8) to meet long-term travel demand needs.

Key aspects of the Recommended Plan include:

1. Affordable Plan

- A five-lane urban cross-section for most of the two (2) km corridor which includes two lanes in each direction for NB and SB traffic and a central two-way left turn lane at intermittent locations to facilitate access to/from abutting properties and businesses along the corridor;
- A four-lane section between Westbrook Road and the eastbound highway on-ramp. The western portion has an urban cross-section while the eastern portion has a rural cross-section. The design also incorporates the modifications undertaken by the Ministry of Transportation (MTO) in 2014 at the Highway 417/Carp Roads interchange which allow for one northbound and two southbound lanes over the Carp Road overpass;
- At the Carp/Hazeldean Roads intersection, the southbound traffic will have two left turn lanes, a straight through lane, and a right turning lane. In the northbound direction, there are two lanes.
- Signalized intersections and left turn lanes at Westbrook Road, Rothbourne Road, Kittiwake Drive/Echowoods Avenue and Hazeldean Road;
- A two-way left turn lane at Lloydalex Crescent with protection for possible future signalization at the intersection;
- Walking and cycling facilities are generally provided as a 3.0 m wide multi-use pathway on both sides of the road between Westbrook Road and Hazeldean Road. However, at about 120 m south of Kittiwake Drive, the multi-use pathway on the west side converts into a sidewalk and an on-road cycling lane which connects to the existing cycle lane south of the Carp/Hazeldean Roads intersection. Furthermore, north of Westbrook Road, the multi-use pathway is provided on the west side only which converts into a sidewalk facility north of Highway 417 eastbound off-ramp. This connects to the existing west side only sidewalk on the Carp Road Bridge over the Highway. On the east side, north of Westbrook Road, cycling is provided as a shared-use lane;
- Intermittent mid-block raised medians; and

- Right-in/out movement (as advised by MTO) to properties within the MTO Controlled Access Highway limits.

The recommended design for the Affordable Plan is shown in Appendix E.

2. Ultimate Plan: Modifications to the Carp/Hazeldean Roads Intersection

   For the longer-term solution, the addition of a second through-lane for southbound traffic and an eastbound left-turn lane will improve the overall intersection performance during the peak periods. It should be noted that in the interim, the Affordable Plan will provide adequate intersection performance at the Carp/Hazeldean Roads intersection. The impacts and associated mitigation measures are noted below.

   - Additional property acquisition is required south of Hazeldean Road, on the west side of Carp Road (1174 Carp Road); and

   - Residences located on Kyle Avenue (and backing onto Carp Road) are currently experiencing ambient sound levels above the City of Ottawa's Environmental Noise Control Guidelines of 60 dBA. With the proposed intersection modifications, future noise levels are expected to marginally increase by less than one dBA which, by itself, does not warrant installation of a noise attenuation. However, it is recommended that at the time of detailed design and project cost refinement, noise attenuation be considered as part of the Affordable Plan to bring the noise conditions to a more acceptable level. Alternatively, should residents on Kyle Avenue wish to install noise attenuation in the interim, the City's local improvement policy and procedure is also available to them, with the expected cost-sharing.

The recommended design for the Ultimate Plan is shown in Appendix F.

3. Modifications at Carp Interchange undertaken by MTO

   The recommended design is consistent within the MTO corridor management area/property north of Westbrook Road. Specifically:

   - A sidewalk is only provided on the west side of Carp Road north of eastbound off-ramp, which is consistent with the arrangement provided by MTO on Highway 417/Carp bridge;

   - Cycling facilities on the east side of Carp Road, north of Westbrook Road are provided as a shared-use lane in keeping with the MTO design for the Highway 417 bridge structure. Southbound cyclists will need to use the southbound curb lane at the bridge structure and continue on multi-use pathway south of eastbound off-ramp; and

Access restrictions are required within the MTO corridor management limits.

Appendix E provides demonstration/engineering drawings of the plans of the Recommended Plan.

<u>Landscaping Design Approach</u>

A Recommended Landscape Plan is contained within Appendix E.

The combination of ornamental boulevard planting and simple, modern median plantings will create a clean, urban streetscape for Carp Road. Wider boulevards with ornamental trees will create a comfortable multi-use pathway space for both cyclists and pedestrians. Planted center medians with large canopy trees and low grasses will soften the roadway and provide an additional

sense of unity while driving along Carp Road. In order to preserve as many existing trees as possible, the proposed trees coordinate with and complement the locations of salvaged existing trees that will survive the road widening construction. This will allow the existing and proposed vegetation to blend together as new trees mature.

The landscape plan for Carp Road was primarily guided by proposed site conditions and restraints. Plant species are recommended for their aesthetics, size, salt tolerance, maintainability, and hardiness to the Ottawa area. The tree species, the majority being native cultivars, have been recommended primarily for their limited vertical size to fit below the hydro and Bell lines. These trees will also function along the multi-use pathways by fitting well into the pedestrian scale of the boulevards. The crabapple species are recommended because of their small, hard fruit that is persist through the winter, keeping sidewalks clean and reducing maintenance. Both apples and serviceberries would provide a colourful and ornamental boulevard along the Carp Road corridor. Should fruit bearing species be considered by the City as unacceptable within the Right of Way, they may be substituted by trees of similar size. This can confirmed during the detailed design phase.

The plant species in the center medians are recommended for their ability to withstand the harsh effects of snow and salt from winter road maintenance. The center medians should be planted with a hardy, salt tolerant and native grass mix which should reach a maximum height of one meter. The large, drought tolerant maples would provide a green canopy and central axis along the roadway corridor.

Drainage and Stormwater Management Approach

During the detailed design phase of the project, a detailed Drainage and Stormwater Management Study is required to confirm the proposed drainage infrastructure and stormwater management facilities and provide design specifics. The following is an overview of the drainage and stormwater management strategy recommended through this study:

- The high point in Carp Road is located approximately 250 m north of Rothbourne Road. Minor and major drainage will flow north and south from this high point.
- Minor system drainage to be provided by storm sewers and catchbasins.
- Major system drainage to be provided by overland flow along the roadway.
- Contributing drainage area to minor system to include existing properties adjacent to Carp Road to a width of approximately 40 m to 45 m.
- Low point on the northern section is located at the existing culvert that crosses Carp Road approximately 100 m north of Westbrook Road.
- Hydro-dynamic type separator required at north outlet to provide water quality control. Quantity control, if required, would be located downstream (east) of the hydro-dynamic separator at the base of the embankment.
- Low point on the southern portion is located approximately 270 m south of Rothbourne Road.
- Southern low point is located between two stormwater management facilities (SWMF) – Timbermere located on the west side of Carp Road and Echowoods located east of Carp Road at 123 Echowoods Avenue.
- Water quality and quantity control at the southern outlet to be provided by retrofitting the Timbermere SWMF. Possible modifications could include:
  - Side slopes are typically 5:1. Regrade to 3:1 to provide additional volume.
  - Berm between the Timbermere cells could be eliminated to increase the pond volume. Would require a small bridge to maintain the pathway between the cells.
  - Use an inverted siphon to bypass the outflow from Timbermere SWMF around Timbermere SWMF. This would protect the Echowoods SWMF from excess flow. The outflow from Timbermere is reported to be very clear and long term maintenance of an inverted siphon should not be an issue.

Property Requirements

The Recommended Plan works generally within a 31.2 m cross-section. There will be the need for the City to acquire right-of-way widenings from approximately 55 individual properties. The proposed property requirements are illustrated on the Recommended Plans contained in Appendices E and F showing larger requirements for day-light triangles in the vicinity of intersections.

6.2 Public Consultation on the Recommended Plan

6.2.1 *Consultation Groups*

The fourth round of consultation group meetings were held on May 28th, 2014 (Agency & Business Consultation Groups) and June 9th, 2014 (Public Consultation Group). At these meetings, participants were presented with the information that was to be communicated at the third Public Open House. This included the impact assessment of the Recommended Plan. The Study Team, including members from the City of Ottawa and the consultant team, were available to discuss the Study and answer questions in a round table forum. Attendees were asked to sign-in at each meeting. A record of these meetings in included in Appendix A: Consultation Record. The following items were discussed.

- Design details including median separation, private approaches, length and location of the two-way left-turn lane;
- The requirement for cycling in the corridor;
- Landscaping Design;
- Utility installations;
- Stormwater Management;
- MTO concerns with design in their corridor limits;
- The possibility of sanitary sewer to be installed in parallel to this project; and
- Required road modifications north and south of the project limits.

6.2.2 Open House

Public Open House #3 was held on Tuesday, June 17, 2014 at Holy Spirit Catholic School from 6:30 to 9:00 p.m. The open house included a series of display boards that informed the public of the work completed to date. Study team members were present to answer questions in an informal setting. The information included on the display boards was also shared in a presentation to the public at 7:30 pm which was followed by a question and answer period.

The material presented at the Public Open House included information on:

- Study Overview and Purpose
- Environmental Assessment Process
- Consultation Activities
- Needs and Opportunities
- Existing Conditions
- Transportation Conditions
- Confirming the Preferred Solution
- Design Principles
- Alternative Design Cross-Section Development
- Alternative Designs
- Evaluation Criteria and Methodology
- Preliminary Preferred Design
- Preferred Design
- Mitigation Measures
- Next Steps

A resource table was also provided with background materials available for review by members of the public. This material included copies of the City of Ottawa Official Plan and Transportation Master Plan, the Ontario Environmental Assessment Act, the Pedestrian Plan and Cycling Plan, and the Carp Road Corridor CDP.

To further assist in obtaining feedback from attendees, a Comment-Questionnaire was distributed at the Public Open House. Members of the public were encouraged to provide written comments via the Comment-Questionnaire and submit them either before leaving the Open House or by fax, email or regular mail by 12 March 2014. The questions were as follows:

1. Where do you live in the City?
2. Do you have any comments or concerns regarding the Recommended Plan?
3. Do you have any additional considerations for the Study Team during the upcoming process of finalizing the Recommended Plan?
4. Do you feel that the information presented at this Open House has given you a better understanding of the study?

All display boards, resource materials and handouts were provided in both French and English. A complete list and copies of the exhibit boards were posted on the City of Ottawa Carp Road Widening project web-site.

Notification of the Open House occurred through advertisements in weekly citywide newspapers on the following dates:

- EMC News, Thursday, June 5th, 2014 and Thursday June 12th, 2014
- Le Droit, Friday June 6th, 2014 and Friday, June 13th, 2014

An email notification was sent on June 13th to all persons on the study's master mailing list and included members of the ACG, BCG and PCG. A reminder email was also sent the day prior to the Public Open House.

6.2.3 What we heard

Attendees were asked to sign-in upon entering the Public Open House. A total of 22 people signed-in over the course of the evening. Based on the addresses provided, individuals attending the Public Open House were largely located along the Carp Road corridor within the project limits (Figure 6-1). A total of three (3) Comment-Questionnaires were returned during or following the Open House. All of the comments received are listed below:

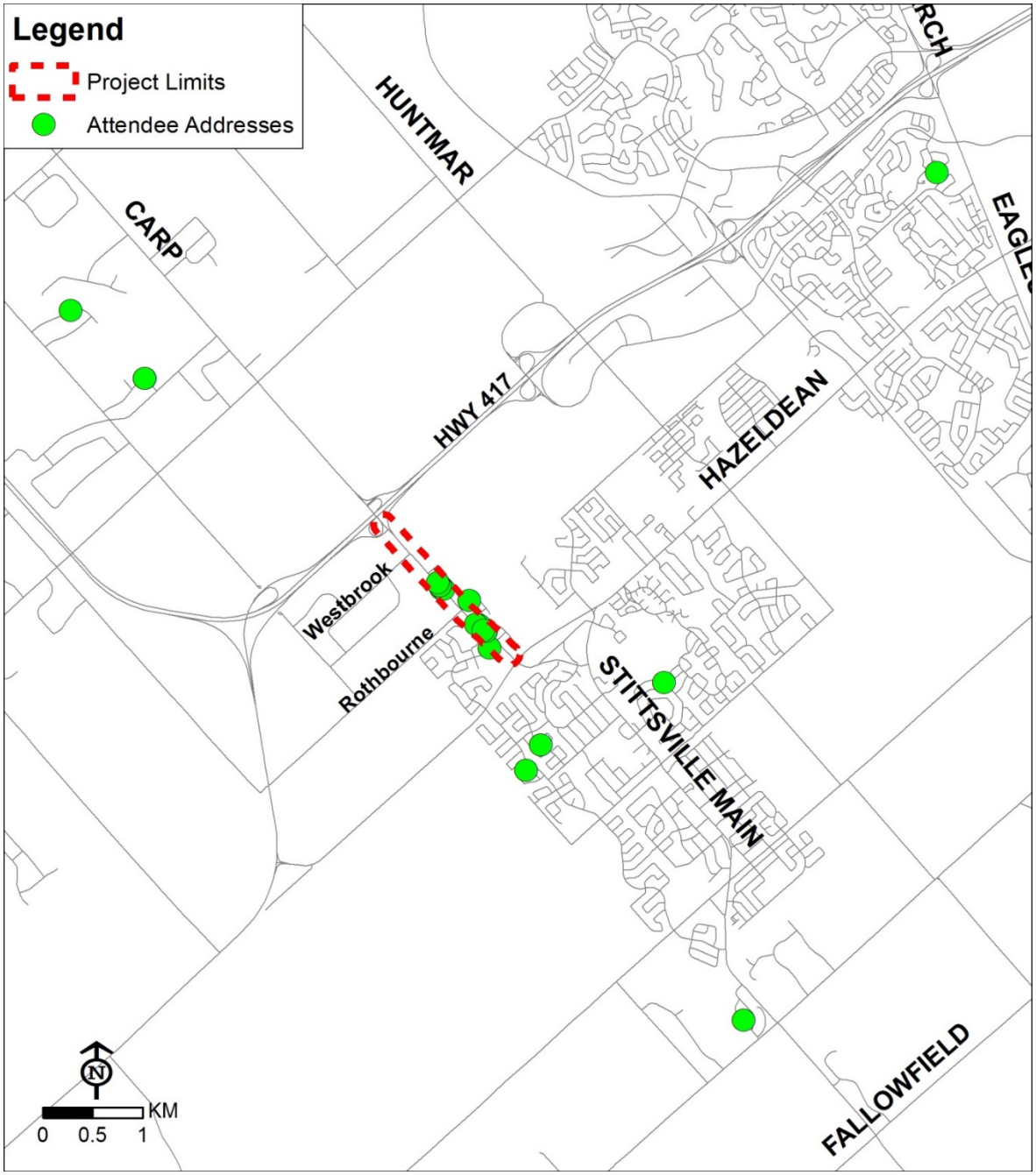


Figure 6-1: Geographical Distribution and General Response of Participants at Open House #3

What Specific interest do you have in this Study?

- Traffic, noise and vehicle pollution. Left turns off of Kittiwake onto Carp toward 417 and left turns off of Carp road onto Kittiwake.
- We live at this site and have a commercial garage.

Do you have any comments or concerns regarding the Recommended Plan?

- Increase of traffic on Kittiwake and speed of traffic on Kittiwake.
- Need a 9m driveway entrance moved to be in front of truck garage doors and also the 6.86m driveway to house needs to be 9m also as there is another garage at the north end of house and it needs access.
- In my view, we need a road widening now. Whatever you do will not be right away. Walkway can be asphalt and not concrete same with bicycle path same cost. The road here now is in bad shape all mud for a sidewalk, all holes and water. 1 lane each way, turning lane in centre with good shoulder. 1 sidewalk on west side of bicycle path.

Do you have any additional considerations for the Study Team during the upcoming process of finalizing the Recommended Plan?

- On Kittiwake, speed bumps would allow 40 km speed to become a reality. Would also discourage excessive traffic.

Do you feel that the information presented at this Open House has given you a better understanding of the Study? If no, or somewhat, please describe what we could do differently or what additional information you would like to have.

When asked if the Public Open House has given a better understanding of the project, the results were:

Yes	–	1
No	–	0
Somewhat	–	0

A full record of comments received during the public open house, via email and through submission of comment-questionnaire sheets is included in Appendix A: Consultation Record.

Study Team members were asked to record comments and questions received over the course of the evening. The following is a summary of these:

- Businesses and landowners appreciated that the City paid attention to their comments that were provided on the Roundabout option, and are very satisfied with the City's response.
- Businesses and landowners who live and work along the corridor are very pleased that the City is recommending a Two-Way Left-Turn plan, with signalized intersections.
- Businesses and landowners along the roundabout stated that the Roundabout option would have had severe negative implications to the success of their businesses.
- Several business and landowners had site specific questions about the proposed location and width of driveways.
- Many attendees were pleased that cyclists and pedestrians were proposed to be accommodated on multi-use pathways along each side of the corridor.
- Some business and landowners asked about the need for pathways specifically in front of their property, with a view towards minimizing the width of right-of-way (ROW) required for the project.
- One landowner/resident asked if the city be considering the installation of fences for residential property owners to minimize noise/dust impacts.
- Some business and landowners asked how and when the City goes about acquiring ROW widening.
- One Stittsville area resident and business person advised that the Roundabout option was preferred.
- One resident that lives on Hazeldean and uses Carp Road advised that the Roundabout option was preferred.
- A Stittsville area resident (who previously lived in an area of Europe with an abundance of roundabouts) advised that he was in favor of the roundabout option. He felt that the majority of Carp Road users that do not live on the corridor would prefer the roundabout option.

- One landowner on Carp Road stated concerns about the amount of private land required from the east side as compared to the west side of the road.
- Some landowners and businesses that front the proposed Two-way Left-Turn lane had concerns about what could trigger the City to build a fully raised median in the future.

Additional comments and questions were recorded following the presentation and during the question and answer period. These include:

- It was asked how the alternatives were re-evaluated and if weight was assigned to the views of those along the corridor versus those in the neighbouring communities that use Carp Road.
- It was asked how the cost compared between the preliminary preferred alternative (roundabouts) versus now the recommended plan (signalized intersections).
- It was asked if/how/when a barrier median would be implemented.
- It was asked if sanitary sewers would be part of the project.
- It was asked how the property requirements differ between the preliminary preferred alternative (roundabouts) and the now recommended plan (signalized intersections).
- It was asked if all of the property requirements for the Recommended Plan were indicated on the drawings.
- It was asked what the timing would be for implementation/there is a perception that the project should be implemented sooner than 2020-2025 timeframe.

Following the June 17, 2014 Open House the Study Team continued to review stakeholder input and consider opportunities to "fine tune" the Recommended Plan. There were three modifications made during this period. The first was a modification to the geometry of the roadway between HWY 417 and Westbrook Road. In that location, the Recommended Plan had initially shown a northbound left-turn lane and median break serving the commercially-zoned property at the southwest quadrant of the HWY 417 interchange. The MTO requested and received additional information from the Study Team in regards the operation of this left-turn movement. This information is enclosed in Appendix C.

Following review of the supplementary information, the MTO advised the City of Ottawa that it preferred the prohibition of this left-turn movement. Due to the fact that this sector of Carp Road is within the MTO Controlled Access Highway limits and that the MTO has design authority, the Study Team proceeded to amend the plan accordingly, as shown on the Recommended Plan provided in Appendix E.

The second modification responds to suggestions that the corridor could be made "greener". The study team investigated opportunities to insert small green median areas within the roadway in sections where the TWLT lanes were not essential. These and other minor geometric modifications are also shown on the Recommended Plan (Appendix E).

The third modification is the addition of a longer-term proposal to add one additional southbound through-lane on Carp Road at the Hazeldean intersection (section 5.8). This was recommended to address possible longer-term level of service concerns towards the end of the planning period.

6.3 Intersection Options Review

Following Public Open House #3 and prior to presentation of the Recommended Plan to Transportation Committee, additional comments were received from the Stittsville Village Association and residents mostly residing outside the widening limits of Carp Road. These residents expressed their disagreement with an aspect of the Recommended Plan and expressed a preference

for Roundabouts instead of signalized intersections. The Study Team revisited the draft Recommended Plan and developed an additional alternative design that included two roundabouts (at Rothbourne Road and Kittiwake Drive), instead of signalized intersections. This option was evaluated and presented at a fourth Public Open House in June 2015. At this point, two alternatives were under review.

6.3.1 Intersection Evaluation

The intersection treatment evaluation compared Signalized intersections (Alternative A, Recommended Plan) with Roundabout intersections (Alternative B) at Rothbourne Road and Kittiwake Drive. Both Alternatives include protection for future signals at Lloydalex Crescent as well as intermittent green medians in some sections of the corridor.

Alternative A, which is the Recommended Plan described in Section 6.1, includes signalized intersections and channelized left-turn lanes at Westbrooke Road, Rothbourne Road, Kittiwake Drive/Echowoods Avenue, and Hazeldean Road. Intersection designs are illustrated in Figure 6.2 and 6.3.

Figure 6-2: Alternative A - Signalized Intersections, Rothbourne Road

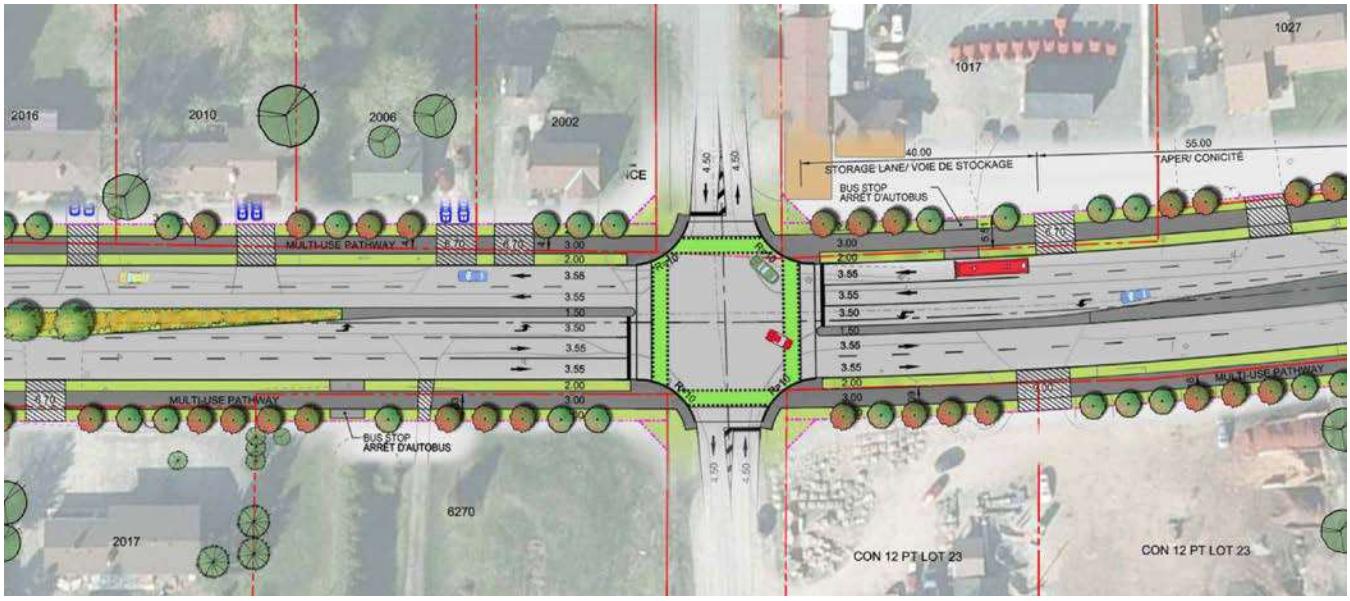


Figure 6-3: Alternative A - Signalized Intersections, Kittiwake Drive/Echowoods Avenue

Alternative B includes roundabout designs at Rothbourne Road and Kittiwake Drive/Echowoods Avenue as illustrated in Figure 6-4 and 6-5, and signalized intersections and channelized left-turn lanes at Westbrook Road and Hazeldean Road.

Figure 6-4: Alternative B - Roundabout at Rothbourne Road

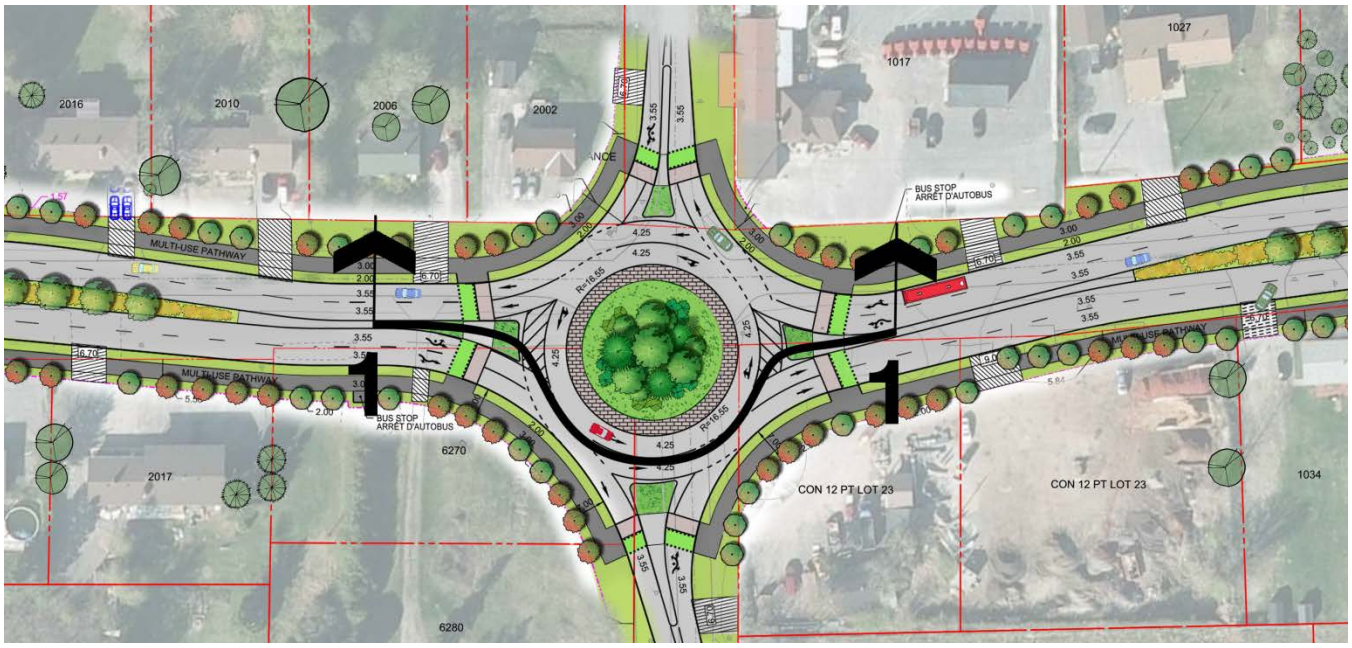
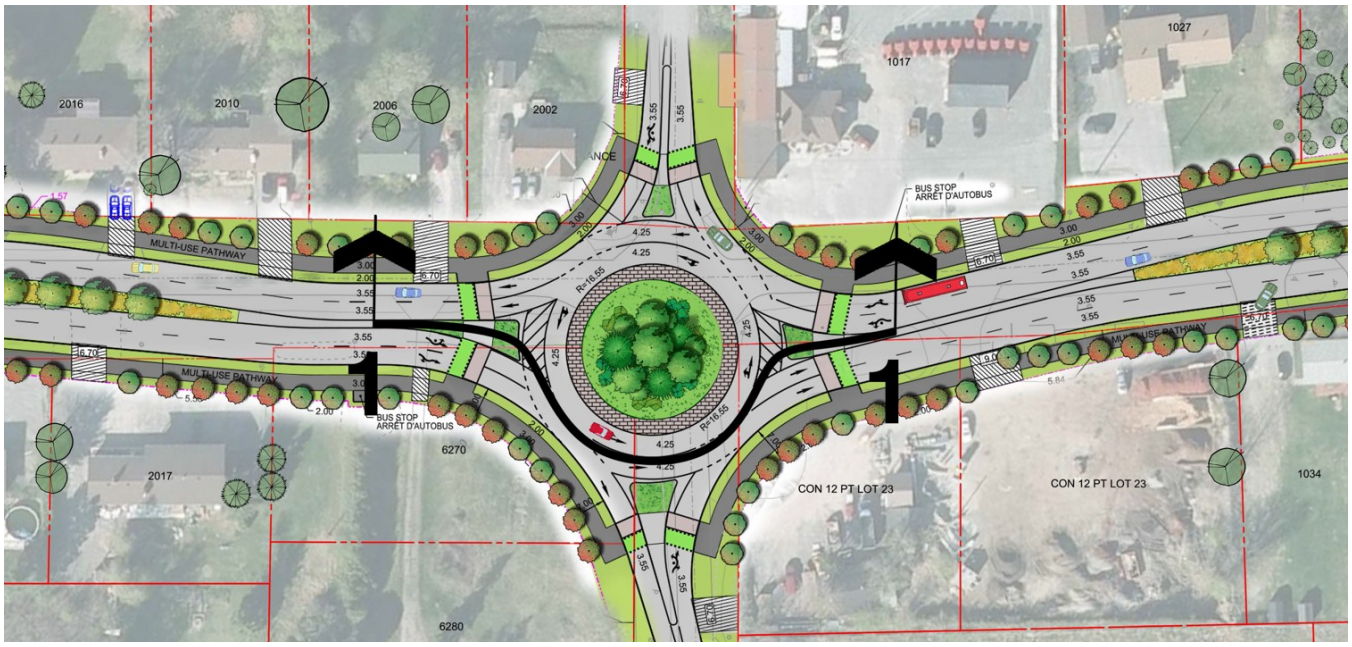


Figure 6-5: Alternative B - Roundabout at Kittiwake Drive/Echowoods Avenue



The method of distinguishing characteristics from the Evaluation of Alternative Designs (described in section 5) was again used to evaluate the performance of the two alternatives. A summary of the evaluation is shown in Table 6-1.

The distinguishing characteristics of Alternative A (Signalized Intersections) are that it performs:

- very well for access to adjacent properties in the vicinity of intersections
- well at minimizing right-of-way land acquisition and associated cost requirement
- well at minimizing impacts on the functionality of adjacent developments
- very well in regards potential impacts to buildings or septic systems
- adequately at maximizing separation of the noise source (roadway) and receivers
- well at minimizing length of travel for pedestrians
- very well in protecting pedestrians of all abilities and cyclists at intersections
- well in providing vehicle level of service at intersections
- adequately in minimizing capital construction costs

The distinguishing characteristics of Alternative B (Roundabouts) are that it performs:

- well at maximizing the attractiveness of the corridor
- well at maximizing space for trees and landscaping
- well at minimizing crosswalk lengths (two stage crossings)
- very well at maximizing safety of left-turning movements at intersections
- well at minimizing infrastructure operation costs

Table 6-1: Intersection Analysis Evaluation Results

Criteria	Objectives	Indicators	Alternative A Signalized Intersections	Alternative B Roundabouts at Rothbourne & Kittiwake/Echowoods	Notes
Corridor Land Use and Access	A road corridor that enables growth, development and business prosperity	i. maximization for all-movement access directly to abutting lots in the short-term	●		With Alternative B, some lots near the roundabouts would have diminished access
		ii. maximization for all-movement access directly to abutting lots in the long-term	●	●	Both Alternatives have the possibility of the two-way left-turn lanes being replaced with medians should conditions warrant
Land Implications	A road corridor that minimizes the effects on adjacent private properties	i. minimization of amount of Right-of-Way acquisition required at mid-block locations	●	●	With Alternative B, some lots near the roundabouts would have diminished access
		ii. minimization of amount of Right-of-Way acquisition required at intersections	●		Alternative B requires a greater ROW widening at the roundabout corners
		iii. minimization of impact on functionality/use of the lot (on-site parking, front yards)	●		Alternative B creates some challenges in maintaining existing land use and site configuration at the roundabout corners
Building Implications	A road corridor that minimizes the effect on individual buildings and on-site private wastewater systems	i. minimization of the requirement to alter/demolish existing or proposed buildings	●		Alternative B may require the demolition of buildings at roundabout corners if sites cannot be rearranged in a functional manner
		ii. minimization of impact on on-site private wastewater systems	●		Alternative B has greater likelihood of displacing systems at the roundabout corners
Visual Environment	A road corridor with a pleasing visual environment	i. maximization of attractiveness of the corridor		●	Alternative B has greater potential for greening and attractiveness at the roundabouts
Sustainable Landscaping	A road corridor that allows for green design features	i. maximization of space for trees and landscaping		●	Alternative B provides additional space for landscaping in the roundabout islands

Criteria	Objectives	Indicators	Alternative A Signalized Intersections	Alternative B Roundabouts at Rothbourne & Kittiwake/Echowoods	Notes
Noise	A road corridor with lower noise levels	i. maximization of separation between noise sources and receivers	●		Alternative B brings the noise generating roadway closer to adjacent buildings at the roundabout corners
Vibration	A road corridor with lower vibration levels experienced by adjacent structures	i. maximization of separation between vibration source (primarily trucks and buses) and receivers	●		Alternative B brings the noise generating roadway closer to adjacent buildings at the roundabout corners
Outdoor Air Quality	A road corridor with reduced contributions to ambient air quality criteria	i. maximization of fuel efficient driving behaviour.	●	●	Both alternatives are projected to have similar fuel consumption and emission rates.
Life Cycle Costs	A road that is affordable to construct and maintain	i. minimization of capital infrastructure cost	●		Alternative B is $2.652M more/less expensive
		ii. minimization of road and infrastructure maintenance and replacement cost		●	Alternative B has slightly lesser maintenance and replacement costs as fewer traffic signals are required
		iii. minimization of property acquisition cost	●		Alternative B has a greater land acquisition cost
Pedestrian Convenience, Comfort, and Safety	A road corridor with appropriate pedestrian capacity, safety and comfort	i. maximization of separation of pedestrian route from vehicle travel lanes	●	●	Both alternatives achieve good separation of pedestrians from travel lanes
		ii. minimization of length of travel	●		Pedestrians using roundabout crossings have a longer distance to travel
		iii. minimization of crosswalk length		●	Crosswalks at the roundabouts are include splitter islands and hence shorter individual crosswalks
Cycling Convenience, Comfort, and Safety	A road corridor where cyclists are well-separated from moving vehicles	i. maximization of horizontal and/or vertical separation of cyclists from vehicles	●	●	Both alternatives achieve good separation of cyclists from travel lanes (on multi-use pathways)
		ii. maximization of a comfortable environment for cyclists of all ages and all abilities	●	●	Both alternatives result in a very comfortable environment for cycling (on multi-use pathways)
		iii. minimization of length of travel	●		Cyclists using roundabout crossings have a longer distance to travel

Criteria	Objectives	Indicators	Alternative A Signalized Intersections	Alternative B Roundabouts at Rothbourne & Kittiwake/Echowoods	Notes
		iv. maximization of safety of left turn movements	●	●	Both alternatives require cyclists using the multi-use pathway to perform a two-stage crossing
Universal Accessibility	A road corridor that can be used by all users of all abilities	i. provision of sidewalks with clear zone not less than 1.8 m	●	●	Both alternatives have sufficient clear walking width
		ii. provision for street design features that enable barrier free movement	●	●	Both alternatives provide barrier free movement
		iii. maximization of protection at crossings	●		Alternative A provides protected phase visible and audible crosswalk signals
Motor Vehicle Safety and Performance	A road corridor where passenger vehicles, emergency service vehicles, and trucks move safely and efficiently through the corridor	i. maximization of consistency of travel time along the corridor.		●	Alternative B results in slightly improved reliability.
		i. maximization of vehicle Level of Service at intersections	●		Alternative A provides slightly improved level of service (LOS) for vehicles at Kittiwake intersection. Similar LOS at Rothbourne.
		ii. minimization of roadway width (curb to curb width) to increase friction and reduce travel speed	●	●	Both alternatives have the same curb to curb width in mid-block locations along the corridor
		iii. maximization of safety of left turning movements at intersections in short-term		●	Alternative B provides for less-vulnerable left-turn movements at the two roundabout intersections
		iv. maximization of safety of left turning movements at mid-block in short-term	●	●	Both alternatives provide for left-turns in mid-block locations
		v. maximization of safety of left turning movements at mid-block in long-term	●	●	Both alternatives have the possibility of the median needing to be filled in over the long term to address safety issues that may emerge

Criteria	Objectives	Indicators	Alternative A Signalized Intersections	Alternative B Roundabouts at Rothbourne & Kittiwake/Echowoods	Notes
		vi. minimization of travel time along the corridor			Both alternatives have similar projected travel times through the entire corridor. Overall intersection spacing and traffic patterns result in good progression opportunities using traffic signals.

Vehicle travel time through the entire corridor was expressed by stakeholders as an important criterion. Both alternatives are projected to have a similar average travel times in the commuter peak periods. This is based on traffic modelling software (SIMTRAFFIC) analyses of the corridor between Highway 417 and Hazeldean Road and includes all 5 major intersections. A four (4) minute travel time is expected for southbound traffic during the critical peak hour and estimated to be 2.5 to 3 minute time travel during the off-peak direction. Alternative A (Signalized Intersections) offers good progression opportunities given the spacing of intersections and forecasted travel patterns which has a predominant north-south vehicle flow and lower side street volumes. In addition, Alternative A provides a slightly improved overall level of service (LoS) for vehicles at Kittiwake Drive/Echowoods Avenue and a similar LoS at Rothbourne Road. Alternative B (roundabouts) reduces vehicle speeds to approximately 30 km/h (max) through the roundabout, which is beneficial from the perspective of collision severity.

Specific implications of Alternative B include the following:

- Additional ROW widening requirement to accommodate roundabouts at corners (0.98 ha required vs. 0.86 ha);
- Notable implications on the use and function of 6 properties;
- New opportunities for greening the corridor within the centre of roundabouts; and
- Right-in/Right-out access to properties in the vicinity of intersections.

6.4 Public Consultation on Intersection Options Review

6.4.1 Consultation Groups

A combined Public and Business Consultation Group meeting was held on May 25th, 2015. At these meetings, participants were presented with the information that was to be communicated to area residents in an additional Open House that was beyond the original scope of work for this EA Study. This included the following information:

- Project Overview
- Design Considerations
- Preferred Alternative (signalized intersections) versus roundabouts at Kittiwake and Rothbourne
- Mitigation recommendations
- Property impacts
- Project Schedule and Stakeholder Involvement

The Study Team, including members from the City of Ottawa and the consultant team, were available to discuss the Study and answer questions in a round table forum. Attendees were asked to sign-in. A total of fifteen (15) people signed in at this meeting, representing many local business owners and a representative from the City's Accessibility Advisory Committee. The majority of individuals in attendance preferred the signalized intersection alternative as opposed to the plan containing roundabouts. Minutes from this meeting are attached in Appendix A

6.4.2 Open House

Public Open House #4 was held on Wednesday, June 24, 2015 at Holy Spirit Catholic School from 6:30 to 9:00 p.m. The open house included a series of display boards that informed the public of the work completed to date, including the two intersection treatments being considered at Rothbourne and Kittiwake. Study team members were present to answer questions in an informal setting. The information included on the display boards was also shared in a presentation to the public at 7:00 pm followed by a question and answer period. All display boards, resource materials and handouts were provided in both French and English. A complete list and copies of the exhibit boards were posted on the City of Ottawa Carp Road Widening project web-site.

The material presented at the Public Open House included information on:

- Project Background
- EA Process
- Study Schedule
- Design Principles
- Common Features of the Two Alternatives
- Evaluation of Alternatives
- Possible Long-Term Modifications to Hazeldean Intersection
- Cost Comparison
- Vehicle Travel Efficiency
- Next Steps

6.4.2.1 Notification

Notification of the Open House occurred through advertisements in weekly citywide newspapers on the following dates:

- EMC News: 11th June and 18th June, 2015; and
- LeDroit: 12th June and 19th June, 2015.

An email notification was sent on June 10th to all persons on the study's master mailing list and included members of the ACG, BCG and PCG. A reminder email was also sent on June 17th.

6.4.2.2 Summary of Participants Comments

Attendees were asked to sign-in upon entering the Public Open House. A total of 62 people signed-in over the course of the evening. Based on the addresses provided, individuals attending the Public Open House were largely located either along the Carp Road corridor within the project limits, or further south in the community of Stittsville (Figure 6-6).

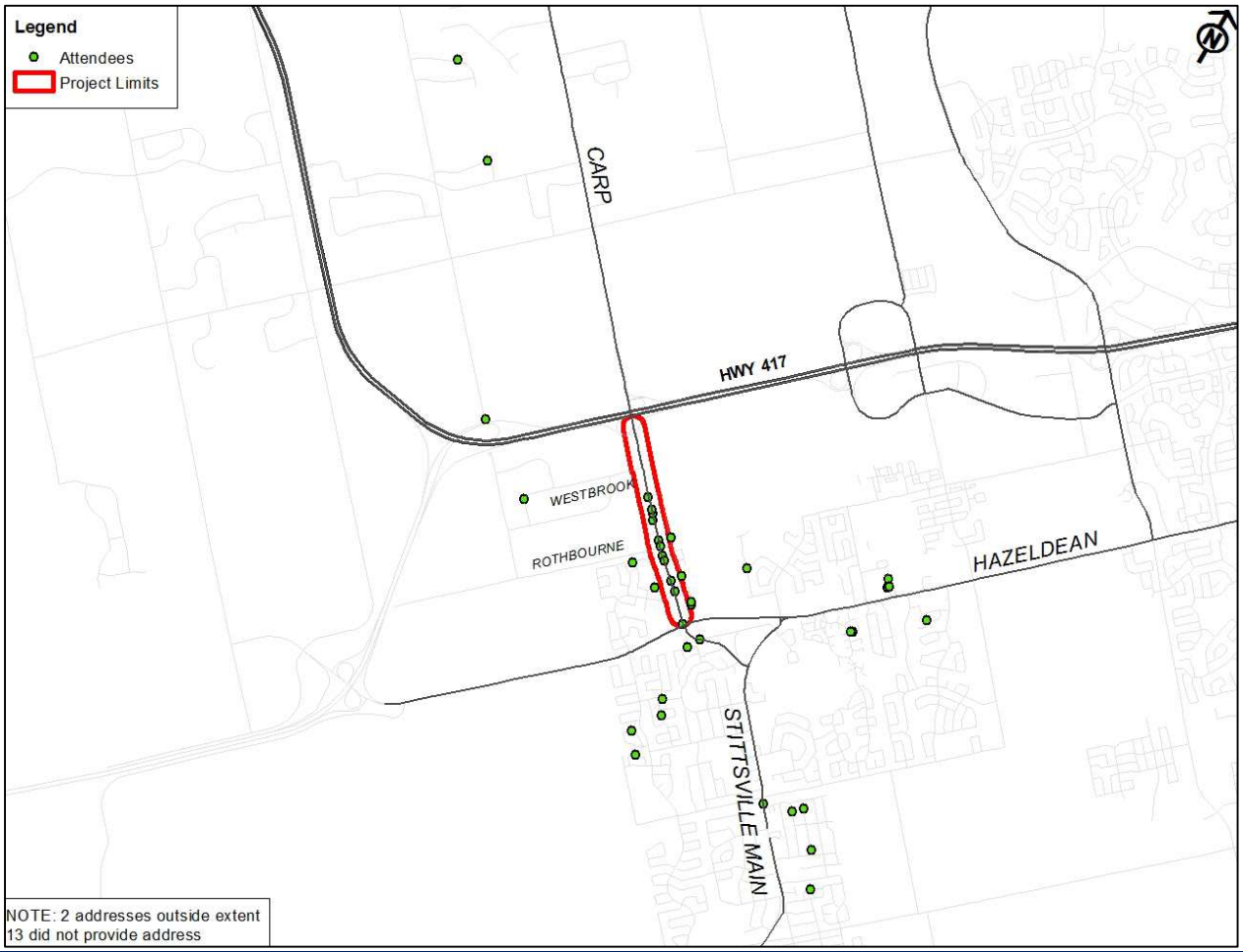


Figure 6-6: Geographical Distribution and General Response of Participants at Open House #4

A resource table was also provided with background materials available for review by members of the public. This material included copies of the City of Ottawa Official Plan and Transportation Master Plan, the Ontario Environmental Assessment Act, the Pedestrian Plan and Cycling Plan, and the Carp Road Corridor CDP.

To further assist in obtaining feedback from attendees, a Comment-Questionnaire was distributed at the Public Open House. Members of the public were encouraged to provide written comments via the Comment-Questionnaire and submit them either before leaving the Open House or by fax, email or regular mail by 9 July 2015.

A total of twenty (20) Comment-Questionnaires were returned during or following the Open House. All of the comments received are listed below:

What specific interest do you have in this study?

- I don't want roundabout
- Drive down Carp Road to Stittsville almost every day (3)
- Shop along Carp Road

- Travel to Stittsville a lot (4)
- Sustainable and multi-modal alternative
- Better access into Stittsville via Carp Road (more capacity)
- This is near my Community
- Roundabout Safety
- Loss of greenspace
- Live on section of road effected by widening

Do you have any comments on the two (2) plans presented tonight?

- Support for signalized intersections (5)
- Support for Roundabouts (10)
- Safety improved in roundabouts (2)
- Cost should not be a factor in considering roundabouts
- Land asset cost should be factored into estimate
- Concern for safety in left-turns to properties along corridor
- Just keeping the traffic moving on Carp Road
- Sewer should be on the plan

When asked if the materials presented gave the attendees a better understanding, the responses were:

1. Yes (11)
2. Somewhat (5)
3. Did not answer (2)
4. No (1)

Study Team members recorded comments and questions received over the course of the evening, which are summarized below (study team responses in italics):

- My understanding is that the stopping and starting area big source of noise, wouldn't signals then create more noise than roundabouts? *No. The greatest source of noise is the distance between sources to receiver. As roundabouts move closer to peripheral houses, they increase noise.*
- We do not want roundabouts. Do we have a say? *There is a range of opinions in the community. We are having the meeting tonight to listen to everyone.*
- What is the current time it takes to drive this stretch of Carp Road? *Depending on the driving conditions, 5-8 minutes.*
- Are you factoring cyclist safety in the roundabout analysis? *Cyclists are accommodated in the design. Cyclists have multi use pathways outside the roundabouts. They would not travel through - they would dismount and cross beside the roundabout where pedestrians would cross. The regulations are evolving, and we will adapt the design to reflect the current best practises.*
- Would the cumulative maintenance costs make roundabouts cheaper over time? *The savings per intersection is about $5,000.00 per year. The reality is, that with two intersections if you weight the annual savings it would take far too many years to equalize this discrepancy.*
- How high is the raised median? *It is a standard curb median. For the most part there is no median, it is a center left turn lane. Where the median is necessary, we minimize them as much as possible.*
- How will winter maintenance be addressed? *You will see along the edge of the road a 2 metre wide grass strip. This is the width required by the City for snow storage.*
- How does a wheelchair cross a roundabout? *They cross the very same way pedestrians do.*

- Will there be sanitary sewers, and will the inhabitants get the hookup? *No. This is not part of the affordable budget we are working within*
- How will wastewater be managed from the road? *Stormwater will be managed within the road corridor and outlet into the City's stormwater management network.*
- If you happen to have a laneway in front of one of the green raised medians, are you allowed to U-turn at an intersection? *Yes you are. Unless it is marked otherwise, this is permitted. The need to prohibit U-turns at any of these intersections, but this could change in accordance with safety performance over the long term*
- How high will the greenery be in the roundabouts? I want as much of a clear view as possible to react accordingly. *Higher in the center, gradually moving towards low to none at the edge. The greenery would not interfere with the sightlines.*
- My understanding is roundabouts are supposed to be much faster and allow traffic flow. *This is an instinct shared by many. However this is a comparison between a 5 signal option, and a 3 signal/2 roundabout option. The signal option works well because of spacing and flow. In this context, with the flow, the roundabouts do not offer the benefits typically experienced in other installations.*
- Will you be building ditches further in from the snow areas? *No. There will be curbs – typical of an urban cross section – using drains and outlets via piping to manage the wastewater.*
- The wastewater will be stored in pools? Salt is considered a hazardous material, how will it be managed? *Salt will be managed in engineered stormwater facilities. They are specially designed to manage this. It is managed the same way in every urban facility across the city.*
- Why are the land acquisition costs almost doubled for roundabouts when the land acquired is only roughly 10% more? Would the city be acquiring assets to sell later? *The city forecasts the need to buy entire properties with roundabouts with the additional acreage. The city then would have the property and it would be considered an asset in the fullness of time.*
- Your project goes into Hazeldean Road. Is there any possibility to examine westbound turning lane going north? The sight lane is very bad. *We will note this and consider this observation when finalizing the designs.*

Additional correspondence was received by email following the open house showing support for both the signalized intersection alternative and the roundabout alternative. The complete consultation summary is provided in Appendix A.

6.5 Confirmation of the Recommended Plan

Following the last round of stakeholder involvement, the Study Team reviewed all the comments received during the course of study. On final analysis, the Recommended Plan (signalized intersection design) as presented at the June 17th, 2014 and June 24th, 2015 Public Open Houses was reconfirmed as the best overall plan for the widening of Carp Road.

6.6 Transportation Committee and Council Meetings

The re-confirmed Recommended Plan, impact assessment and study results were presented to City of Ottawa Transportation Committee on September 2nd, 2015. The staff report was available prior to the meeting on the City's website for review. An email notification of this meeting was sent to all individuals included on the Master Mailing List and included members of the Agency, Business and Public Consultation Group for the study. A presentation of the study findings was made by City Staff and stakeholders had an opportunity to make public delegations at this meeting. A full copy of the Staff Report and supporting documents is included in Appendix A. Delegations included:

- A Professional Planning consultant representing an adjacent landowner requesting that consideration be given to access to future development lands. *This was acknowledged and is accounted for in the Recommended Plan.*
- A landowner and business owner along the corridor, who endorsed the Recommended Plan.
- A representative from the Carp Road BIA, who also endorsed the Recommended Plan

Transportation Committee approved the Recommended Plan (functional design) as recommended in this report for the widening of Carp Road and directed staff to finalize the Environmental Study Report and file the report for Public Review. The recommendation from Transportation Committee was subsequently approved by full City Council on September 9th, 2015

6.7 Description of Project Activities

6.7.1 Pre-Construction Phase

A key requirement of the pre-construction phase will be the acquisition by the City of the required ROW widenings from the many affected properties. The specific widening requirements are illustrated on the Recommended Plan. The City will employ the usual process of contacting the landowners and working with them towards land acquisition, using the standard methods and tools that are available to the City.

This phase also includes the completion of preliminary and detailed engineering and landscape designs and preparation of contract drawings and specifications. This phase also involves obtaining all necessary permits as well as approvals from regulatory agencies (as required). Issues to be confirmed during the design phase include:

- Updating of existing conditions and confirmation of roadway geometry;
- Stormwater management design;
- Landscape materials and tree planting details;
- Location/width of sidewalks/ pedestrian routes;
- Street lighting design, frequency and location;
- Traffic plant design;
- Bus stop amenities;
- Utility reconstruction/relocations; and
- Detailed construction staging and phasing plans.

Other pre-construction activities include:

- Site surveying as required;
- Obtaining approvals for construction access and working areas;
- Identification of all existing utilities in the area; and
- Coordination with other projects in the vicinity of the corridor.

6.7.2 Construction Phase

This phase involves all activities related to construction. Physical construction activities for the road, pathway, and intersections will include:

- Clearing and grubbing of trees or any vegetation within the grading limits for construction of the project;
- Stripping of topsoil within the grading limits;
- Excavation of road surface;
- Removal of existing asphalt and disposing at approved facility;
- Preparing road bed including cutting and filling (potentially salvaging existing granular for reuse);
- Installation of storm catchbasins and storm sewers;
- Pouring concrete for curbs;
- Laying granular and application of hot mix asphalt;

- Installing lighting and traffic signals; and
- Installing landscaping features such as street trees, paving stones and street furniture.

6.7.3 Operation Phase

This phase begins with the first day of corridor operation, and covers the general operational activities such as maintenance and monitoring, on an as-required basis. Once construction is complete, monitoring of the widened Carp Road will be initiated as part of the normal City practice of operating a street. In addition, warranty reviews (such as landscape health) will be completed.

Route maintenance activities in accordance with current City standards will include:

- Spring sweeping of the road, sidewalks, and boulevards;
- Snow and ice removal in the winter;
- Landscaping maintenance including grass cutting, tree pruning in the summer; and
- Replacement of any landscaped materials.

6.8 Project Staging

There will be an opportunity to stage the project during the construction phase. Staging the project will be beneficial in maintaining the best possible level of service during construction, including some degree of traffic flow as well as maintaining utility services. This will include staging of activities across the corridor (cross-section staging), or section/portions along the corridor (component staging).

Although specific plans to stage the project will not be determined until the end of detailed design and beginning of construction, it is useful to present staging opportunities in general terms in this environmental assessment study so that potential effects can be assessed. Key aspects of the staging plan are expected to include:

- Advanced relocation of utilities as required, including relocation of overhead pole lines out towards the ROW limit;
- Construction of one half of the future road cross-section, while existing road surface is usable for traffic in one lane in each direction (some temporary widenings of existing road bed may be required);
- Opening of the new one half of the future road cross-section, with temporary hard surface, to enable construction of the other half of the road cross section;
- Finalization of the completion of the entire road surface; and
- Completion of the multi-use pathways on either side of the corridor.

The transportation objective will be to attempt to maintain one lane of traffic in each direction for the longest periods possible during construction. Full street closures may be considered on a block by block basis, while providing local access only.

6.9 Built-in Mitigation Measures

For this project, “built-in mitigation” is defined as actions and design features incorporated in the pre-construction, construction, and operational phases, which have the specific objective of lessening the significance or severity of environmental effects which may be caused by the project. They include standard construction practices and Best Management Practices (BMPs).

The widening of Carp Road will be designed and implemented with the benefit of contemporary planning, engineering, and environmental management practices. Regard shall be had for the legislation, policies, regulations, guidelines, and best practices of the day. Where possible, mitigation measures will be prescribed in the construction contracts and specifications. Examples of practices that should be employed, based on current standards, are described below. These measures can be

considered "built into" the preferred design for the roadway. They will be updated and refined during the pre-construction, construction, and operation phases of the project.

Erosion and Sediment Control Plan

A detailed plan will be prepared by the Contractor to manage the flow of sediment into storm sewers and watercourses. The plan will be based on best management practices.

Environmental Protection

It will be the responsibility of the contractor to ensure that no contamination, waste or other substances, which may be detrimental to aquatic life or water quality, will enter a watercourse as either a direct or indirect result of construction. In this regard, any floating debris resulting from construction which accumulates on watercourse beds and watercourse banks is to be immediately cleaned up and disposed of. Any spills or contamination, waste or other substances which may be detrimental to aquatic life or water quality will also be immediately cleaned up.

Any work which will cause or be the cause of discharge to watercourses is to be prohibited. At all times, construction activities are to be controlled in a manner that will prevent entry of deleterious materials to watercourses. In particular, construction material, excess material, construction debris and empty containers are to be stored away from watercourses and the banks of watercourses.

Air Quality, Noise and Vibration

Varied construction activities along the Carp Road corridor are expected to create isolated and short term noise, air quality and vibration impacts on the environment. The construction manager will be required to develop a strategy for mitigating the effects according to good practices intended to satisfy, as feasible, the fugitive dust limits specified in O.Reg. 419, the noise limits specified in MOE NPC-115 and NPC-118 and City of Ottawa By-laws for Noise; and MOE NPC -119 and NPC-207 for ground vibrations. A list of common mitigation strategies adapted to the current project includes, but is not limited to, the following:

Air emissions BMPs:

- Monitor wind conditions, and plan operations to take advantage of calm wind periods;
- Minimize site storage of granular material in height and extent;
- Locate storage piles in sheltered areas that can be covered;
- Provide movable wind breaks;
- Use water spray and suppression techniques to control fugitive dust; and
- Cover haul trucks and keep access routes to the construction site clean of debris.

Noise and vibration BMPs:

- Limit speeds of heavy vehicles within and approaching the site;
- Provide compacted smooth surfaces, avoiding abrupt steps and ditches;
- Install movable noise barriers or temporary enclosures, around blast sites for instance;
- Keep equipment properly maintained and functioning as intended by the manufacturer; and
- If required, implement a blast design program prepared by a blast design engineer.

Unexpected Discovery of Archaeological Resources

If during the course of construction archaeological resources are discovered, the site should be protected from further disturbance until a licensed archaeologist has completed the assessment and any necessary mitigation has been completed.

Emergency Response Plan

An *Emergency Response Plan* to be used by the contractor to allow full emergency service access during the construction period, such that anytime there is a method to access all residential, commercial and other land uses in the event of an emergency. Additionally, the *Emergency Response Plan* should include provisions for providing temporary services to end users in the event of a construction related service outage or other service disruption.

Spills Response and Reporting Plan

A Spills Response and Reporting Plan will be prepared and adhered to by the contractor. Spills or discharge of pollutants or contaminants will be reported immediately. Clean up shall be initiated quickly to ensure protection of the environment.

Management of Contaminated Materials

Studies will be completed to confirm the potential for the project to interact with contaminated soil or groundwater, where existing conditions are not known. Where the potential has been confirmed, a plan to remediate the environment to the applicable standards will be prepared. The Ontario Ministry of the Environment and Construction Project Manager would be notified immediately upon discovery of any contaminated material encountered within the construction area. If contaminated material or contaminated groundwater is encountered within the construction limits, these are to be removed and disposed of in accordance with all applicable Acts and Regulations. Treatment and discharge of contaminated groundwater are to also be in accordance with applicable legislation and regulations.

Lighting Treatment Plan

A *Lighting Plan* in accordance with City of Ottawa standards will be prepared as part of the detailed design. The Lighting Plan will include lighting fixtures and illumination along the various sections of the corridor.

Construction Waste Management Plan

During construction there will be some excess materials that will require disposal off the project site. These could include concrete rubble, asphalt, waste steel/metal structural components, earth, and road right-of-way appurtenances such as signs, lighting and utility poles. During the detailed design stage, a *Construction Waste Management Plan* will be developed to ensure that surplus material is recycled wherever practical and to describe the methods to be used by the Contractor for disposal of all other surplus material in accordance with provincial or local municipal practices and guidelines.

6.10 Site Specific Mitigation Measures

Once potential effects were predicted, mitigation measures were identified. Often these mitigation measures were sufficient to reduce potential negative effects to an insignificant or negligible status. Mitigation included environment rehabilitation and replacement. Localized site specific mitigation measures are summarized below for the transportation, natural, and social environments.

Construction and Traffic Management Plan

A *Construction and Traffic Management Plan* will be developed to manage the road's transportation function for all travel modes including equipment and material deliveries at various times during the construction period. The objective will be to maintain clear walking routes and to maintain as much functionality for traffic as possible. The plan will also outline the road signage program.

Landscape Plan

A detailed *Landscape Plan* will be prepared to guide the species selection, location and planting details for all proposed plantings and other streetscape elements within the corridor. The plan will be prepared by a professional landscape architect with experience in plantings along arterial roadways.

Geotechnical Investigations

Geotechnical investigations have been completed to advise on groundwater and subsurface conditions and potential impacts that will need to be considered in the detailed design of the project. Additional investigations will be completed as required during the detailed design phase.

Stage II Archaeological Assessment

Areas adjacent to the corridor and identified as having archaeological potential will be subject to a Stage II Archaeological assessment prior to construction should these lands be required to be disturbed through implementation of the Recommended Plan.

Public Communications Plan

The requirement for a *Public Communications Plan* stems from the need to keep the public informed about the work in progress and the end result of the construction activities. Businesses, institutions, residents and other stakeholders including emergency service vehicle providers must be aware of scheduled road closings and other disruptions to normal service ahead of time in order that their activities can be planned with minimum disruption. The *Public Communications Plan* should detail how to communicate the information to the public, what information should be disseminated, and at what project stage the communication should take place.

Property Impact Assessment

Costs associated with acquiring property and property rights on which to build or provide construction easements for the construction of widening Carp Road will need to be estimated. These will include, in addition to actual property value, the cost of right-of-way preparation, legal and appraisal services and land survey.

6.11 Assessment of the Preferred Design

6.11.1 Assessment Methodology

The preliminary impact analysis of alternatives went only so far as to be able to determine which alternative was preferred for the study area if the resulting effects for a particular criterion were the same for each alternative, or no residual effects were predicted; the results were not used to compare alternatives. This section describes the comprehensive analysis/assessment of all the identified impacts of implementing the preferred widening solution.

The values and conditions identified in the documentation of existing conditions were used as the basis for assessing the effects of the preferred alternative on the transportation, social, physical and biological environments. The impact analysis involved applying the following steps, as presented in Table 6-1.

Table 6-2: Impact Assessment Approach

Step 1	Identify and analyze activities where the project, as detailed in section 5.0, may interact with existing environmental conditions as detailed in section 3.0.
Step 2	Acknowledge predetermined project activities that act as *built-in mitigation* measures as outlined in section 6-8 and *site specific mitigation measures* outlined in Section 6-10 and Table 6-3.
Step 3	Identify the *residual* environmental effects, if any.
Step 4	Identify opportunities for further *mitigation of residual* effects, if possible/practical including monitoring

Step 5	Determine the *significance of the residual* environmental effects, after further mitigation

As described in the methodology, an environmental effect requires consideration of the interaction of the project (i.e. project activities) with the environment. Pre-construction, construction and operational activities, as described above were all assessed.

Professional judgement and experience formed the basis for identifying environmental effects and mitigation measures. The analysis was based primarily on comparing the existing environment with the anticipated future environment, during and after construction. Consideration was given to:

- the magnitude, spatial extent, and duration of effects;
- the proportion of a species population or the number of people affected;
- direct or indirect effects;
- the degree to which the effect responds to mitigation; and
- the level of uncertainty about the possible effect.

In this assessment, "residual" environmental effects are defined as changes to the environment caused by the project, and vice versa, when compared to existing conditions and taking into account all mitigation measures. Potential residual environmental effects are assessed as to their significance, including spatial and temporal considerations, and are categorized according to the following definitions:

"*Positive*" means an effect that exhibits a beneficial outcome.
"*Negligible*" means an effect that may exhibit one or more of the following characteristics:

- nearly-zero or hardly discernible effect; or
- affecting a population or a specific group of individuals at a localized area and/or over a short period.

"*Insignificant*" means an effect that may exhibit one or more of the following characteristics:

- not widespread;
- temporary or short-term duration (i.e., only during construction phase);
- recurring effect lasting for short periods of time during or after project implementation;
- affecting a specific group of individuals in a population or community at a localized area or over a short period; or
- not permanent, so that after the stimulus (i.e., project activity) is removed, the integrity of the environmental component would be resumed.

"*Significant*" means an effect that may exhibit one or more of the following characteristics:

- widespread;
- permanent transcendence or contravention of legislation, standards, or environmental guidelines or objectives;
- permanent reduction in species diversity or population of a species;
- permanent alteration to groundwater flow direction or available groundwater quantity and quality;
- permanent loss of critical/productive habitat;
- permanent loss of important community archaeological/heritage resources; or
- permanent alteration to community characteristics or services, established land use patterns, which is severe and undesirable to the community as a whole.

Study boundaries serve to focus the scope of the assessment such that a meaningful analysis of potential impacts arising from the proposed project can be made. Project boundaries are defined by the spatial and temporal limits of the proposed project activities, and their zones of influence.

Spatial: the physical area which may be disturbed (directly, indirectly) by construction activities within 200 metres of the work areas, as well as the physical area of the alignment (a general width of 40 metres).

Temporal: the duration of the active construction phase of the project, scheduled to occur over a number of months at any one location and 1 to 2 years for the entire alignment. The completed roadway is considered to be a permanent infrastructure, which will operate as constructed for the life span of the facility as determined by transportation needs in the City.

Once the potential effects were predicted, additional mitigation measures were identified. Often these mitigation measures were sufficient to reduce negative effects to an insignificant or negligible status.

Monitoring is important to verify the accuracy of effects predictions. Monitoring measures were recommended to determine what effects actually occurred with project implementation, and may result in the modification of mitigation measures to improve their effectiveness.

6.11.2 Assessment Results

Table 6-3 describes the potential effects, mitigation, residual effects and their significance, and monitoring recommendations for the preferred alternative.

Project phases are identified as follows: P - Pre-construction/Design; C - Construction; O - Operation

Table 6-3: Assessment of Environmental Effects of the Recommended Plan

Environmental Value		Project Activity / Environmental Interaction	Project Phase			Specific Location	Analysis of Potential Environmental Effect	Mitigation Measures *Built-in Mitigation Measures*	Mitigation Imple-mentation Stage		Potential Residual Effect	Level of Significance after Mitigation	Monitoring Recommendation
			P	C	O				Design	Construction			
Transportation	Vehicle Travel Performance	Construction activities may result in detours and lane reductions.		●		Throughout corridor	Construction activities will potentially slow traffic and be a possible irritant to Carp Road corridor users.	Contractor to implement a *Construction and Traffic Management Plan* to minimize the effects on traffic flow and to ensure roadway safety for all users. A public notification program will be implemented by the City.	✓	✓	Possible delays in travel time during construction may be an irritant to corridor users.	Insignificant.	Monitor complaints
		Additional travel lanes have been included in the preferred plan (4 planned, 2 existing)			●	Throughout corridor	Additional travel lanes are anticipated to increase roadway capacity.	None required	✓		This widening is necessary in order to accommodate projected traffic.	Positive	None required
	Transit Service	Construction activities may result in detours and lane reductions.		●		Throughout corridor	Construction activities will potentially slow traffic and be a possible irritant to Carp Road corridor users.	Contractor to implement a *Construction and Traffic Management Plan* in consultation with OC Transpo to minimize the effects on traffic flow. A public notification program should be implemented by the City in coordination with OC Transpo.	✓	✓	Possible delays in travel time during peak hours during construction may be an irritant to transit users.	Insignificant	Monitor complaints
		Construction activities may result in detours and lane reductions		●		Park and Ride	Construction activities will potentially slow traffic and alter access to the Park and Ride.	Contractor to implement a *Construction and Traffic Management Plan* in consultation with OC Transpo to minimize the effects on traffic flow. A public notification program should be implemented by the City in coordination with OC Transpo.	✓	✓	Possible delays in and detours during construction may be an irritant to Park and Ride users.	Insignificant	Monitor complaints
	Emergency Service Vehicle Travel	Construction activities may result in detours and lane reductions.		●		Throughout corridor	Construction activities will potentially slow traffic and may result in travel time delays for emergency services.	Contractor to implement a *Construction and Traffic Management Plan* in consultation with City of Ottawa Emergency Services to minimize the effects on traffic flow and to ensure roadway safety for all users. A public notification program should be implemented by the City.	✓	✓	Minor delays for emergency vehicles during construction are possible.	Insignificant	Monitor complaints
		Additional travel lanes have been included in the preferred plan (4 planned, 2 existing)			●	Throughout corridor	Additional travel lanes are anticipated to increase roadway capacity, including for emergency vehicles.	None required	✓		Provision of additional travel lanes may increase opportunities for emergency vehicles to pass general roadway users.	Positive	None required
	Safety/ Collisions	Road design provides for new 2-way left-turn lane.			●	Between Kittiwake and Lloydalex	Centre turn lane will provide a protected lane for left-turning movements to/from individual properties.	City to monitor effectiveness of two-left turn lane over time and through development applications to determine need/timing of raised median.	✓		Centre turn lane will provide safe left-turning movements to/from individual properties. Raised median in time will provide additional safety for corridor users.	Positive	City to monitor need for raised median over time.
	Heavy Vehicles	A new signalized intersection will be provided at Rothbourne Road.			●	Rothbourne Road	Heavy vehicle traffic flow turning to/from Rothbourne Road will be affected by a new signalized intersection.	None required	✓		Heavy vehicle traffic flow will benefit from new signalized intersection.	Positive	None required

Environmental Value		Project Activity / Environmental Interaction	Project Phase			Specific Location	Analysis of Potential Environmental Effect	Mitigation Measures *Built-in Mitigation Measures*	Mitigation Imple-mentation Stage		Potential Residual Effect	Level of Significance after Mitigation	Monitoring Recommendation
			P	C	O				Design	Construction			
Transportation	Pedestrians and Cyclists	Construction may require pedestrian and cycling detours throughout the works.		●		Throughout corridor	Disruption/Detours to pedestrian and cyclist movement during construction may be an inconvenience.	Key pedestrian and cycling routes should be maintained during construction. Contractor to implement a *Construction and Traffic Management Plan* to minimize the effects on traffic flow and to ensure roadway safety for all users.		✓	Temporary inconvenience to pedestrians and cyclists.	Insignificant	Monitor complaints
		A new multi-use pathway will be constructed along the corridor.			●	Throughout corridor	Pedestrians and cyclists will have use of a multi-use pathway within the Carp Road corridor.	A *Landscape Plan* will be implemented to include pedestrian and cycling amenities.	✓		Pedestrians and cyclists will be provided a safer transportation environment.	Positive	None required.
Socio-Economic	Property Impacts	Property acquisitions along both sides of the Carp Road corridor.		●	●	Throughout corridor	Loss of available parking space at various locations.	Provide at a minimum 1 vehicle length of available parking space at each property location. Acquisitions to occur in accordance with City of Ottawa policy and procedures.	✓		Loss of available parking space may be an irritant to property owners.	Insignificant	None required
		Changes to existing access to properties may be required during construction.		●		Throughout corridor.	Modified access during construction may be an irritant to local residents and businesses.	Contractor to ensure that some form of access is maintained to individual properties. Contractor to develop and implement a *Construction and Traffic Management Plan*.		✓	Some diminished private landowner use of public right-of-way. Detours and modified access may be an irritant to land owners.	Insignificant	Monitor complaints
		Implementation of medians as part of the ultimate plan			●	Throughout corridor	Property access will be restricted to right-in/out due to median implementation.	None required	✓		Alternate property access (such as driving to a break in the median or turning movements at intersections) may be an inconvenience to some roadway users.	Insignificant	None required
	Visual Character	Widening the roadways from 2 lanes to 4 lanes.			●	Throughout corridor	*Landscape Plan* and new multi-use pathway will result in visual improvements within the corridor.	None required		✓	None anticipated	Positive	None required
	New Communities	New communities adjacent to the corridor will generate additional traffic on Carp Road.			●	Throughout corridor.	Based on projected area development/ redevelopment and intensification potential, the widening of Carp Road from two lanes to four is necessary in order to accommodate projected peak hour traffic.	None required	✓		None anticipated	Positive	None required
	Community and Recreation Facilities	Active construction zone adjacent to Feedmill Creek Park		●		1080 Carp Road	Construction area in close vicinity may temporarily result in irritation and inconvenience for park users.	Contractor to develop and implement a Construction and Traffic Management Plan. Contractor is to ensure that some form of access is maintained to community and recreation facilities. The City should develop a Public Communications Plan to inform users of the park facilities of planned disruptions to the area.		✓	Construction activities may be an irritant to park users.	Insignificant	Monitor complaints

Environmental Value		Project Activity / Environmental Interaction	Project Phase			Specific Location	Analysis of Potential Environmental Effect	Mitigation Measures *Built-in Mitigation Measures*	Mitigation Imple-mentation Stage		Potential Residual Effect	Level of Significance after Mitigation	Monitoring Recommendation
			P	C	O				Design	Construction			
Socio-Economic	Air Quality	Construction activities will require the use of heavy equipment.		●		Throughout corridor	Air quality is likely to be temporarily degraded from equipment exhaust fumes during construction activities.	Contractor to ensure equipment is in good working order. Contractor to develop a strategy for mitigating potential decreases in air quality according to good practices intended to satisfy as feasible the fugitive dust limits specified in O.Reg 419.		✓	Fumes may be an irritant to residents and other corridor users.	Insignificant	Monitor complaints
		Works will require disturbance of soils and other materials.		●		Throughout corridor	Increase in suspended dust particles during construction may be an irritant to adjacent residents and passers-by.	Dust suppressants will be applied as warranted. Streets will be cleaned as per existing municipal standards.		✓	Dust may be an irritant to residents, and other corridor users.	Insignificant	Monitor complaints
	Noise	Construction equipment and activities will generate noise.		●		Throughout corridor	Noise level produced by stationary and moving construction equipment (dozers, trucks, loaders, scrapers, etc.) will occasionally be disruptive to adjacent land owners.	Contractor to develop a strategy for mitigating noise effects according to good practices intended to satisfy, as feasible, MOE NPC-115 and City of Ottawa Noise By-law.		✓	Noise may occasionally be disruptive to adjacent land owners.	Insignificant	Monitor complaints
		Widened road will be in closer proximity to some sensitive land uses			●	Throughout corridor	With increased traffic volumes and with the road in closer proximity to private properties, future noise levels are expected to marginally increase above existing conditions. Change in noise levels is predicted to be less than 5dBA and future noise levels would not exceed 60dBA.	None required			Noise may occasionally be an irritant to adjacent land owners.	Insignificant	None required
	Vibrations	Construction activities may generate ground vibrations.		●		Throughout corridor	Ground vibrations will be generated from construction activities which may be occasionally disruptive to adjacent land owners.	Contractor to develop a strategy for mitigating vibration effects according to good practices intended to satisfy, as feasible, MOE NPC-119. Pre-construction surveys may be conducted if requested by adjacent property owners.		✓	Vibrations may be an occasional irritant to adjacent land owners.	Insignificant	Monitor complaints
		Widened road will be in closer proximity to some sensitive land uses			●	Throughout corridor	The proponent source of vibrations is heavy trucks. Noise sensitive properties along Carp Road are considered far enough away so that any vibration impacts would be minimal.	None required			Vibrations may be an occasional irritant to adjacent land owners.	Insignificant	None required

Environmental Value		Project Activity / Environmental Interaction	Project Phase			Specific Location	Analysis of Potential Environmental Effect	Mitigation Measures *Built-in Mitigation Measures*	Mitigation Imple-mentation Stage		Potential Residual Effect	Level of Significance after Mitigation	Monitoring Recommendation
			P	C	O				Design	Construction			
Socio-Economic	Cultural Heritage Resources/Archaeological Resources	Road widening may disturb native soils.		●		2090 Carp Road and west of Carp Road to the north and south of Westbrook Road	Potential for disturbance of archaeological resources from ground disturbance, including removal of asphalt and widening the road bed.	A Stage II Archaeological assessment should be completed on any lands required identified as having archaeological potential. In the event that human remains are found, the *Funeral, Burial and Cremation Services Act, 2002* requires that any person discovering human remains must immediately notify the police or coroner and the Registrar of Cemeteries at the Ministry of Consumer Services (416-326-8393). Should previously undocumented archaeological resources be discovered, they may be a new archaeological site and therefore subject to Section 48 (1) of the *Ontario Heritage Act*. The proponent or person discovering the archeological resources must cease alteration of the site immediately and engage a licensed consultant archaeologist to carry our archaeological work.			None anticipated.	Insignificant	None required
	Business Vitality	General construction activities adjacent to business properties.		●		Throughout corridor	Construction activities and altered property access may be perceived to negatively affect business vitality.	Contractor to ensure that some form of access is maintained to business properties. Contractor to develop and implement a Construction and *Traffic Management Plan*. City should implement a *Public Communications Plan* to inform business owners as construction progresses.		✓	Construction detours and delays may be a temporary irritant to adjacent land owners and business patrons.	Insignificant	Monitor complaints
		Implementation of medians with widening of Carp Road.			●	Throughout corridor	Implementation of medians may be perceived to negatively affect business vitality.	Design ensures that some form of access is maintained to business properties and that breaks in the median are provided where appropriate.	✓		Detours around medians may be a temporary irritant to business patrons.	Insignificant	None required
Biophysical	Wastewater System	Widening of the road and general construction activities may have front yard impacts.	●			Throughout corridor	Septic systems may be impacted by construction works and road widening.	Complete a survey for septic systems during detailed design. Replace any septic systems identified to have potential impacts.	✓	✓	None anticipated	Insignificant	None required
	Stormwater/ Drainage	Road widening will increase non-permeable surface area.	●			Throughout corridor	Road widening will require stormwater management to accommodate differences in flow volumes.	A *Stormwater Management Report* to be prepared as part of detailed design. Provide catchbasins with outlets to existing stormwater management ponds during detailed design.	✓		None anticipated	Insignificant	None required
	Utilities	Existing utilities within the corridor will need to be relocated within the new road cross-section.	●	●		Throughout corridor	Relocations may cause some short-term disruptions to existing services.	Construction to be coordinated with utility companies to minimize impact and reduce duplication in construction activities.	✓	✓	Potential for short-term disruptions during construction.	Insignificant	None required

Environmental Value		Project Activity / Environmental Interaction	Project Phase			Specific Location	Analysis of Potential Environmental Effect	Mitigation Measures *Built-in Mitigation Measures*	Mitigation Imple-mentation Stage		Potential Residual Effect	Level of Significance after Mitigation	Monitoring Recommendation
			P	C	O				Design	Construction			
Biophysical	Surface Water/Aquatic Habitat	Stormwater runoff during construction may have increased sedimentation.		●		Poole Creek and Feedmill Creek subwatersheds	Increased sedimentation may reach the eventual drainage outlet at Poole Creek and Feedmill Creek.	Contractor to implement an *Erosion and Sediment Control Plan.*		✓	Temporary minor influx of sediments into receiving surface waters.	Insignificant	As per *Erosion and Sediment Control Plan*
	Vegetation	General vegetation removal is required for construction		●	●	Throughout corridor	Removals may result in an overall loss of vegetation within the corridor.	*Landscape Plan* to identify replacements of native dwarf species to be located in the outer Boulevard (i.e. under hydro/bell lines). A one year vegetation/ plantings warranty review to be included in the plan.	✓		For every tree removed approximately 2.7 trees will be planted, resulting in a net gain of vegetation in the corridor.	Positive	Monitor health of new plantings.
	Terrestrial Habitat	Removal of trees is necessary for the road widening.		●		Various locations throughout corridor	Removals may result in an overall loss of vegetation and associated habitat within the corridor.	No clearing of trees can occur between April 15 and July 31, unless a qualified biologist has determined that no nesting is occurring within 5 days prior to the clearing. This can also be done once trees slated for removal are identified.		✓	Temporary avoidance of the corridor during the construction period.	Insignificant	None required
	Wildlife	Construction activities may disrupt Milksnake using the corridor.		●		Throughout corridor	Milksnake could pass through the Carp Road corridor and be affected by construction.	As a special concern, species does not have specific habitat protection. Individuals may not be harmed under the *Fish and Wildlife Conservation Act*. Construction crews should be briefed to not harass individual species if observed.		✓	None anticipated	Negligible	None required
	Species at Risk	Construction activities will disrupt the natural environment and require vegetation removal.		●		Throughout corridor	Although no Species at Risk have been identified within the corridor, provincial and federal species lists are updated regularly and as such SAR and their habitat may be affected during construction.	SAR lists (provincial and federal) should be consulted prior to construction to determine any additional SAR potential.	✓	✓	None anticipated	Insignificant	None required
	Potentially Contaminated Lands	Excavations, disturbance of the road bed, asphalt removals and general ground disturbance.		●		Locations identified as medium and high environmental risks.	Potential disturbance of contaminants in the soil associated with construction works.	The medium and high environmental risks for the subject site are considered to be significant enough to warrant further investigation. It is recommended that a limited Phase II Environmental Site Assessment be carried out to investigate the potential presence of contaminants within the soil and groundwater.	✓		None anticipated	Insignificant	As per Phase II ESA
		Potential for underground storage tanks to relocation resulting from road widening.		●		2070 and 2076 Carp Road	Relocation of underground storage tanks may identify potentially contaminated lands.	Pre-construction survey's to determine location of underground storage tanks associated with existing gas bars. Relocation by City of any storage tanks found to conflict with proposed road works.	✓	✓	None anticipated	Insignificant	None required

6.11.3 Assessment Results Summary

During the construction phase, the overall corridor will be an active construction site. Traffic disruptions, noise, dust, business, and visual interruptions will be inevitable. Ongoing communications by the City of Ottawa with the affected public will go a long way in alleviating potential concerns and ensuring that timely information about the project is disseminated. Following the construction phase, there will be many positive effects such as a widened resurfaced roadway and a multi-use pathway for pedestrian and cycling use. The project will also improve the visual environment, enhance the whole user experience and make the corridor more livable and attractive for investment.

While the Carp Road project has the potential to have negative effects on the human and biophysical environments in the vicinity of the project during construction, these effects can be mitigated with prescribed design features, and sound environmental management practices where practical and possible. By incorporating the mitigation measures identified, no significant adverse environmental effects are expected to prevail after mitigation.

6.12 Impacts to the Carp/Hazeldean Intersection

Due to the potential implementation of a modified Carp/Hazeldean intersection (as described in section 5.8) it is important to also consider any additional impacts that maybe associated with the intersection modification so that property requirements can be protected for as part of this Environmental Assessment without the further amendments to the report. All construction and operational impacts and their associated mitigation listed in Table 6-3 (Assessment of Environmental Effects of the Recommended Plan) will also apply to the intersection modification. The following additional impacts and associated mitigation measures are noted below.

- Additional property acquisition is required south of Hazeldean Road, on the west side of Carp Road (1174 Carp Road).
- Residences located on Kyle Avenue, and that back onto Carp Road are currently above the City of Ottawa's Environmental Noise Control Guidelines of 60 dBA. This is an existing condition. With the intersection modifications and associated widening south of Hazeldean Road, future noise levels are expected to marginally increase by less than 1 dBA. This number in itself is not great enough to warrant a noise barrier to be installed as part of this modification. However, it is recommended that at the time of detailed design, that noise barriers be considered as illustrated in Figure 6-7 to provide a reduction in approximately 6 dBA.

6.13 Municipal Infrastructure Along the Corridor

The 2013 Infrastructure Master Plan (IMP) of City of Ottawa indicates that the area south of Rothbourne Road is within the public service area for both central water and wastewater servicing. However, the area north of Rothbourne Road is included in the water service area only. Although the IMP does not identify a timeline, the road widening project (2020-2025) presents an opportunity to coordinate the installation of planned piped services at the same time, thus benefitting from economies of scale. The IMP's planned services are funded separately and are not included in the Carp Road widening budget.

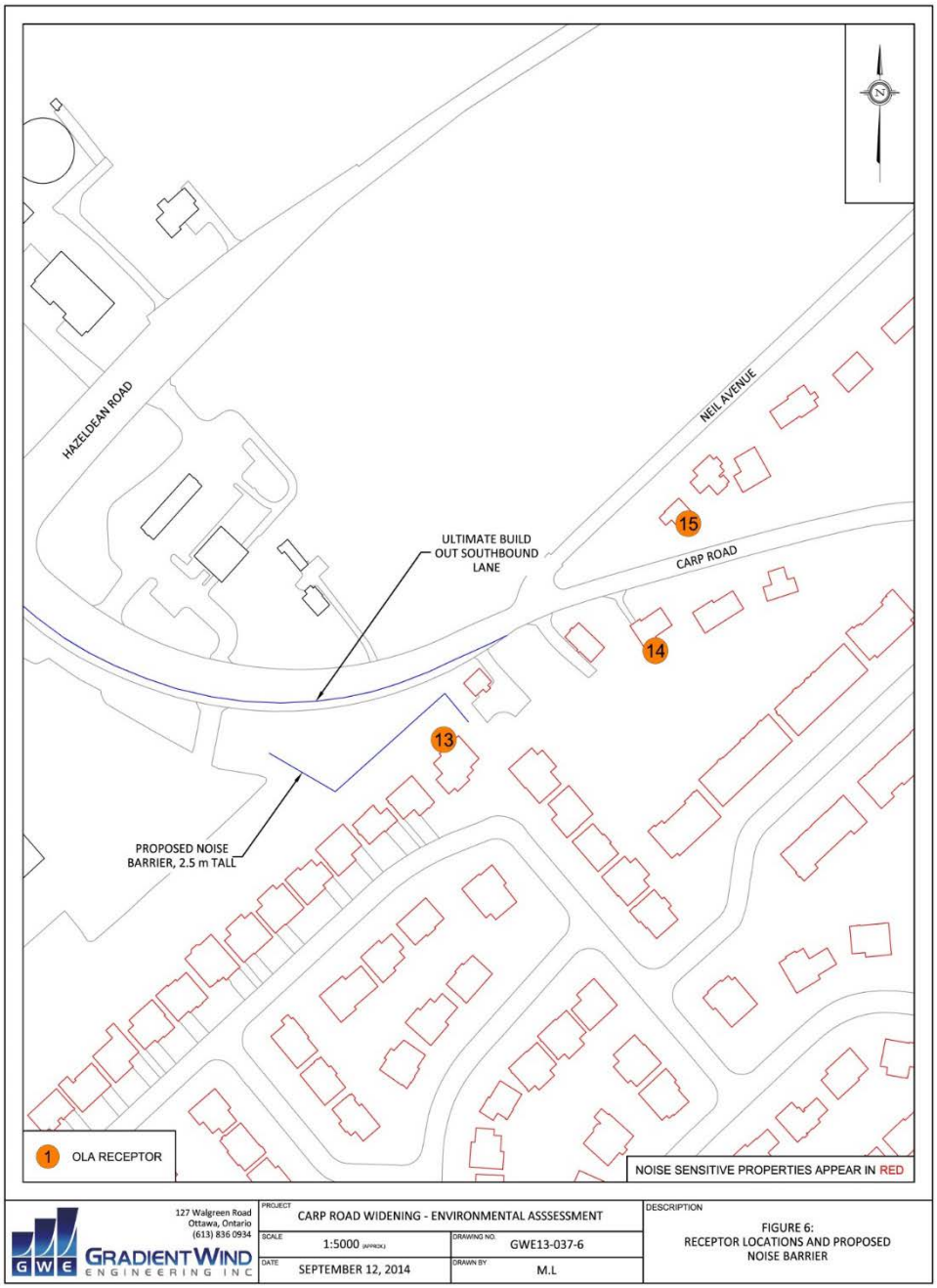


Figure 6-7: Recommended Location for Noise Barriers

7.0 Implementation and Approvals

The potential impacts, mitigation measures and the associated net impacts have been identified, evaluated and assessed as documented in the previous sections. The ensuing design and construction will need to be implemented in accordance with the conditions as noted in this ESR. In addition, there is additional work that will need to be undertaken during both preliminary design and detailed design. This section outlines the future commitments for the design and construction of the project.

7.1 Property Acquisition

The land requirement as shown on the Recommended Plan (Appendix E) and for the Long Term Operational modifications to the Hazeldean Road/Carp Road intersection (Appendix F) represents the minimum footprint needed to construct the Carp Road Corridor. Private land is required where existing right-of-way is insufficient to accommodate enhanced roadway elements and the associated widening at intersections. There may be opportunities during detail design to further minimize land acquisition and impact on residential properties. Private land may also be acquired through the land development process.

The City of Ottawa will confirm property requirements and limits early during the design phase and negotiate with affected property owners where property acquisition is required for the project. Necessary property will be acquired prior to the construction stages.

The City will proceed with the acquisition of temporary and permanent property needs, including temporary construction easements, as the design work proceeds and definitive property plans are developed. The process will include negotiation and expropriation for private properties as required. Where right-of-way requirements can be acquired through Planning Act approvals, the City will acquire them on the basis of the Recommended Plan.

7.2 Design Details

The detailed design will evaluate and assess construction methods and staging requirements necessary to undertake the project. The end result will be a tender package that includes:

Drawings:

- Implementation / Staging and Detours;
- Alignment;
- Removals;
- Grading and Drainage;
- Geometry and General Layout;
- Pavement Elevations;
- Services/Utility Relocations;
- Pavement Markings;
- Typical Sections;
- Non-Standard Details;
- Landscaping Plan; and
- Electrical (Illumination / Street Lighting).

Specifications:

- Tender;
- Form of Agreement;
- Modified OPS General Conditions;
- Quantity Sheets;
- Special Provisions; and
- Standard Drawings and Specification.

In support of the preparation of the detailed design several additional investigations have been recommended:

- Stage II Archaeological Assessment;
- Confirmation that there are no SAR's present in the construction area based on latest information;

- Limited Phase II ESA where identified; and
- Pre-construction survey to locate any potentially impacted underground storage tanks or individual septic systems.

7.3 Subsequent Approval Requirements

Completion of this ESR under the *Ontario Environmental Assessment Act* does not constitute approval under other legislation required to implement the project. Specific approvals will be required for many components of the project. The following is a list of customary approvals and permits that may be required during the design and construction of the project that will be the responsibility of the City of Ottawa as the proponent.

7.3.1 Provincial

7.3.1.1 Ontario Endangered Species Act

The Ontario Endangered Species Act, 2007 addresses the protection and recovery of SAR in Ontario. If a species is listed on the Species at Risk in Ontario list as an extirpated, endangered or threatened species, the Act protects the species and their habitat. The OESA 2007 includes flexibility tools that encourage good stewardship and benefit to species at risk. The Act also includes a permit process to authorize people to engage in an activity that may not otherwise be allowed under the OESA 2007.

Although no SAR have been confirmed within the study area to date, the Contractor will complete a site inspection for species at risk prior to the commencement of construction.

7.3.1.2 Ontario Ministry of Transportation Design Review

The Ministry of Transportation (MTO) is the landowner and regulatory authority for Highway 417 which is located in the study area's northern limit. The ministry's land extends down Carp Road approximately 200m south of the eastbound off ramp intersection with Carp Road. Road designs and decisions within their regulatory limits are subject to the Ministry's review. As such, the detailed design will be subject to design review and approval by the MTO.

7.3.2 Municipal

7.3.2.1 Road Cut Permits

The Road Activity By-law 2003-445, often referred to as the Road Cut by-law, was established to ensure that any road cut within the road allowance is undertaken safely, with minimal disruption, and that the reinstatement of the road allowance meets City standards. A road cut is defined as: "a surface or sub-surface cut in any part of the highway made by any means, including any excavation, reconstruction, cutting, saw-cutting, overlaying, crack sealing, breaking, boring, jacking or tunneling operations".

The by-law imposes the requirement to obtain a permit prior to undertaking any cut into a City road allowance: road surface; sidewalks; and *boulevards*. In order to obtain a permit a contractor must be bonded and insured and, where the work may impact traffic or pedestrian movement, must submit for the approval of a Construction and Traffic Management Plan. The by-law further establishes peak hour restrictions, establishes reinstatement standards and imposes a duty on the contractor to protect City owned trees when work is undertaken in close proximity.

7.3.2.2 Temporary Encroachment Permits

Temporary Encroachment Permits are required for activities, which temporarily encroach onto City of Ottawa rights-of-way. These permits ensure that all safety measures are taken, that the construction meets the City of Ottawa standards and, in turn, ensures that all area residents and passers-by are kept safe. Construction activities require temporary construction encroachment permits for construction related activities on City rights-of-way. Such encroachments include placement of containers, stockpiling materials, and vehicles used in the construction process including aerial, subsurface and surface types.

- Aerial encroachment is generally used to facilitate the use of tower cranes. When a crane permit (aerial encroachment) is issued, the securities must always be checked before releasing the permit.
- Sub-surface encroachment is usually used for a tie-back, rock anchor, or other type of support placed under a street or highway to support an excavation wall.
- Surface encroachment is generally used for vehicles, materials, equipment, covered sidewalks and hoarding.

7.4 Monitoring

Compliance with the mitigation measures identified in Chapter 6 will be monitored by the proponent. There are two distinct monitoring provisions that have been developed as part of this EA:

- Proposed monitoring to verify the effectiveness of the prescribed mitigation measures; and
- Complaints monitoring which will be carried out during construction.

Phase 5 of the Municipal Class EA process includes the completion of contract drawings and documents; construction; and the monitoring of construction for adherence to environmental provisions and commitments.

During the operational phase of the project, it will be necessary to monitor the effectiveness and safety of the two-way left-turn to determine the need for and timing for installation of a barrier median.

7.5 Modifying the Preferred Design

In discussing the process to change the Recommended Plan, it is important to distinguish between minor and major changes. A major design change would require the completion of an amendment to this EA, while a minor change would not. For either kind of modification, it is the responsibility of the City of Ottawa, as the proponent, to ensure that all possible concerns of the public and affected agencies are addressed.

Minor design changes may be defined as those which do not appreciably change the anticipated net impacts associated with the project. For example, a design change in lighting treatment, landscaping elements and road geometry that doesn't' change the purpose, use or capacity of the road. This includes any modifications that are required to the design as a result of design review and approval by the Ministry to Transportation. Such changes would be dealt with during the detailed design phase and would remain the responsibility of the City of Ottawa to ensure that all relevant issues are addressed.

Due to unforeseen circumstances, it may not be feasible to implement the project as described in this ESR. Accordingly, any significant modifications to the project or change in the environmental setting for the project which occurs after the filing of this environmental assessment shall be reviewed by the City of Ottawa and an addendum to the EA shall be prepared as appropriate.

8.0 Summary and Conclusions

A project such as the Carp Road Widening has the potential to change the surrounding environments. The purpose of this environmental assessment is to guide and predict these changes and suggest measures which may be taken to minimize the negative effects and enhance or broaden the positive environmental effects.

In this study, the purpose and need for the project was presented, the existing conditions were documented, alternative solutions were considered, alternative designs were identified and evaluated, and a Recommended Plan of the Preferred Design was developed. Throughout the process, the project benefited from extensive public and agency consultation including five meetings each with the Agency, Business, and Public Consultation Groups, four open houses, as well as individual stakeholder meetings. The project also was subject to a civic dialogue, including media reporting, which culminated in the City of Ottawa Transportation Committee recommendations and Council approval. Through these meetings, the Study Team was able to identify and mitigate, where possible, localized impacts for both users and residents/landowners immediately adjacent to the proposed project. This involvement also created public and agency confidence in selection of a preferred design, as well as the process that led to relevant decisions.

During the construction phase, the overall corridor will be an active construction site. Traffic disruptions, noise, dust, business, and visual interruptions will be inevitable. Ongoing communications by the City of Ottawa with the affected public will go a long way in alleviating potential concerns and ensuring that timely information about the project is disseminated. Following the construction phase, there will be many positive effects such as a resurfaced roadway, renewed underground infrastructure, a safer and more comfortable pedestrian space, and a superior cycling facility. The project will also improve the visual environment, enhance the whole user experience, and make the corridor more liveable and attractive for investment. While the Carp Road Widening project has the potential to have negative effects on the human and biophysical environments in the vicinity of the project, these effects can be mitigated with prescribed design features, sound environmental management practices where practical and possible. Upstream and downstream traffic effects are expected to be insignificant and over time diminish as users of the corridor adjust to changes in the corridor. By incorporating mitigation measures identified, no significant adverse environmental effects are expected to prevail.

In accordance with the provisions of the Class EA for Schedule “C” projects, the study results are documented in this Environmental Study Report (ESR) which is available for a 30-day public review period. During this period, there will be the opportunity for an individual to request a *Part II Order* which is a request for the project to be “Bumped-Up” to an Individual Environmental Assessment.

Once all approvals are in place, the project will proceed to the Detailed Design phase. This will result in detailed designs, specifications, and tender documents. The detailed project mitigation features and plans will be created during this phase. The project will then be tendered and constructed in accordance with the plans and designs.

9.0 References

City of Ottawa. 2011. Characterization of Ottawa's Watersheds: An Environmental Foundation Document with Supporting Information Base

City of Ottawa, 2004. Carp Road Corridor Community Design Plan

City of Ottawa, 2013. City of Ottawa Official Plan

City of Ottawa, 2011. Inventory of Vacant Industrial and Business Park Lands, 2008-2009 Update.

City of Ottawa, 2013 Vacant Urban Residential Land Survey.

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Gradient Microclimate Engineering Ltd. (GmE). 26 June 2013. Preliminary Existing Conditions for the Carp Road Widening EA. Ottawa, Ontario

Gradient Wind Engineering Inc. (GWE). August 14, 2014. Air Quality, Noise, and Vibration Impact Assessment, Carp Road Widening Environmental Assessment. Ottawa, Ontario

Houle Chevrier Engineering Ltd. August 2013. DRAFT: Phase I Environmental Site Assessment, Proposed Carp Road Widening, Ottawa, Ontario

Houle Chevrier Engineering Ltd. August 2013. DRAFT: Geotechnical Inventory – Carp Road Widening, City of Ottawa, Ontario

Kilgour & Associates Ltd. 22 July 2013. RE: Carp Road Widening Environmental Assessment Study & Baseline Conditions

Lashley & Associates. 2 August 2013. Carp Road Widening Assessment Study – Right of Way Characterization Study

Mississippi Valley Conservation. 2009. Poole Creek Macro Stream Assessment Report.

Municipal Engineers Association. 2000. Municipal Class Environmental Assessment, as amended in 2007 and 2011.

Natural Heritage Information Centre, Ontario Ministry of Natural Resources. Biodiversity Explorer. Accessed 3 June 2013. (http://nhic.mnr.gov.on.ca/)

Ontario Ministry of Environment. 2010. Provincial Groundwater Monitoring Network. (http://www.ene.gov.on.ca/environment/en/monitoring_and_reporting/provincial_groundwater_monitoring_network/). Accessed 27 May 2013.

Past Recovery Archaeological Services. 16 July 2013. DRAFT: Stage 1 Archaeological Assessment of the Proposed Carp Road Widening, Part Lots 1, 2, and 3, Concession 2, Part Lots 1, 2 and 3, Concession 3, Geographic Township of Huntley;

Part Lots 23 and 24, Concession 11, and Part Lots 22 and 23, Concession 12 Geographic Township of Goulbourn, Carleton County, Now in the City of Ottawa.

Appendix A: Consultation Record

- Communications Plan
- Notice of Commencement
- Aboriginal Consultation
- Consultation Group Meetings
- Open House #1
- Open House #2
- Open House #3
- Open House #4
- Transportation Committee
- Project Comment Tracking Tool (outside consultation events)
- Staff Report

Appendix B: Existing Corridor Conditions

Appendix C: Supporting Reports

- Geotechnical Inventory, Carp Road Widening, Houle Chevrier Engineering, August 2013
- Carp Road EA – Development Potential Analysis, Delcan Corporation , July 25, 2013
- Carp Road Widening Assessment Study – Right-of-Way Characterization Study, Lashley & Associates, August 2nd, 2013
- Phase I Environmental Site Assessment Proposed Carp Road Widening, Houle Chevrier Engineering, August 2013
- Carp Road Widening Environmental Assessment Study Baseline Conditions, Kilgour & Associates Ltd., September 2013
- Air Quality, Noise, and Vibration Impact Assessment Carp Road Widening Environmental Assessment Study, Gradient Wind Engineering, August 14, 2013
- Preliminary Existing Conditions for the Carp Road Widening EA, Gradient Microclimate Engineering Inc., November 4, 2013
- Carp Road Widening Environmental Assessment Study Evaluation of Alternative Designs, MTO Corridor Lands, Declan Corporation, June 23, 2014
- Stage 1 Archaeological Assessment of the Proposed Carp Road Widening, Past Recovery Archaeological Services Inc., July 16, 2013

Appendix D: Alternative Designs

Appendix E: Recommended Plan

Appendix F: Long-Term Operational Modifications to Hazeldean Road/ Carp Road Intersection