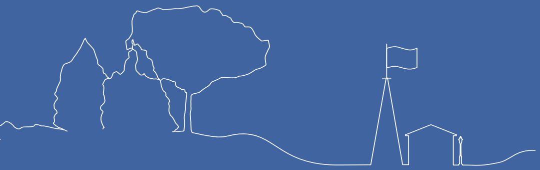
TOWN OF PELHAM
JANUARY, 2018

EAST FENWICK SECONDARY PLAN
BACKGROUND REPORT
FINAL



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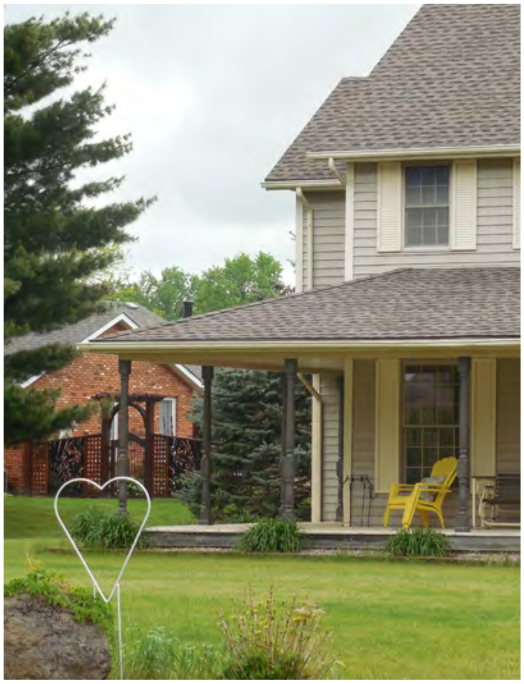

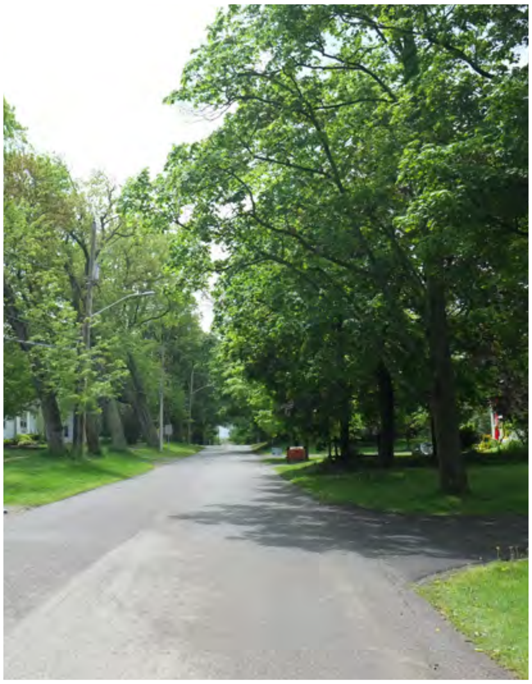

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Image Source: SGL Planning & Design
Photographed May 26, 2017

Report Prepared for the Town of Pelham
by SGL Planning & Design

EAST FENWICK SECONDARY PLAN

BACKGROUND REPORT

Town of Pelham

JANUARY 26, 2018 - FINAL

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TABLE OF CONTENTS

1

INTRODUCTION

2

BACKGROUND REVIEW

PART I

INTRODUCTION

PURPOSE

The Secondary Plan for East Fenwick, prepared by SGL Planning & Design in collaboration with Associated Engineers, Matrix Solutions, and Archaeological Services Inc. for the Town of Pelham, aims to establish the land use planning strategy for the future development of the East Fenwick area. This Background and Existing Conditions Report documents the Secondary Plan environmental, cultural heritage, land use policy, and surrounding Village character elements that shape and guide the development of an East Fenwick Secondary Plan strategy.

The East Fenwick Secondary Plan would seek to provide a long-term East Fenwick Vision accompanied by the land use policy and an urban design framework necessary for its implementation. The East Fenwick's Secondary Vision will focus on the strengthening of the area's connections and transition to the Village of Fenwick and surrounding agricultural landscapes as well as the development of new neighbourhoods with strong sense of place and Fenwick character.

STUDY PROCESS

The study area has a phased approach and is based on a collaborative engagement strategy involving landowners, residential property owners, local political representatives, and Town and Regional staff.

The engagement strategy consists of Visioning and Design Options workshop sessions and a Preferred Plan Open House. Additionally, the Town's web site as well as public input canvases posted to the public will be used to gather input from residents and raise awareness about this important study.

The project phases are:

Phase 1 – Data Collection and Analysis

During the study's initial phase our team will gain an understanding of the study area, including engaging with stakeholders and the public to introduce the study's purpose, process, and goals. During this phase, we will be identifying the study's opportunities and constraints so as to define the parameters and direction for advancing conceptual land use options in phase 2.

Phase 2 – Land Use Plan

During phase 2 our team will generate land use options, test these ideas, and arrive at a preferred land use option for the Secondary Plan area.

The outcome for this phase would be a clear understanding of the opportunities and challenges that would result from each scenario as a necessary step in the formulation of a preferred Secondary Plan for East Fenwick.

Phase 3 – Secondary Plan Policy Development

The third phase will focus primarily on the preparation of the land use policy and urban design strategy for the implementation of the preferred Secondary Plan for East Fenwick.

REPORT STRUCTURE

This document is organized into the following sections:

Part 1 – Introduction

This section provides background information on the study's purpose, location, process as well as the structure of this report.

Part 2 – Background Review

This section provides an overview of the initial findings for the study area with respect to the study area physical context and character, land use planning policy, the Natural Heritage system, and the site's cultural heritage. The section concludes with a summary of the area's opportunities and constrains to inform the development of land use concepts.

Appendices

This section includes a summary of the public's input received at the Saint Ann's Catholic School working session conducted June 21st and the public Visioning Workshop conducted June 22nd, 2017.

STUDY AREA

The Village of Fenwick is one of five villages within the Town of Pelham. It is located on the western quadrant of the Town of Pelham. The Secondary Plan Study area is bounded by Memorial Drive to the North, Cream Street to the East, Balfour Street to the West, and finally Welland Road to the South. The study area is approximately 98.4 hectares / 243.15 acres in size. (**Refer to Figure 1. Secondary Plan Study Area Location**).

To understand how the East Fenwick area should develop, our team conducted a physical context and character analysis of the existing Village's structure, built form, and streetscapes.

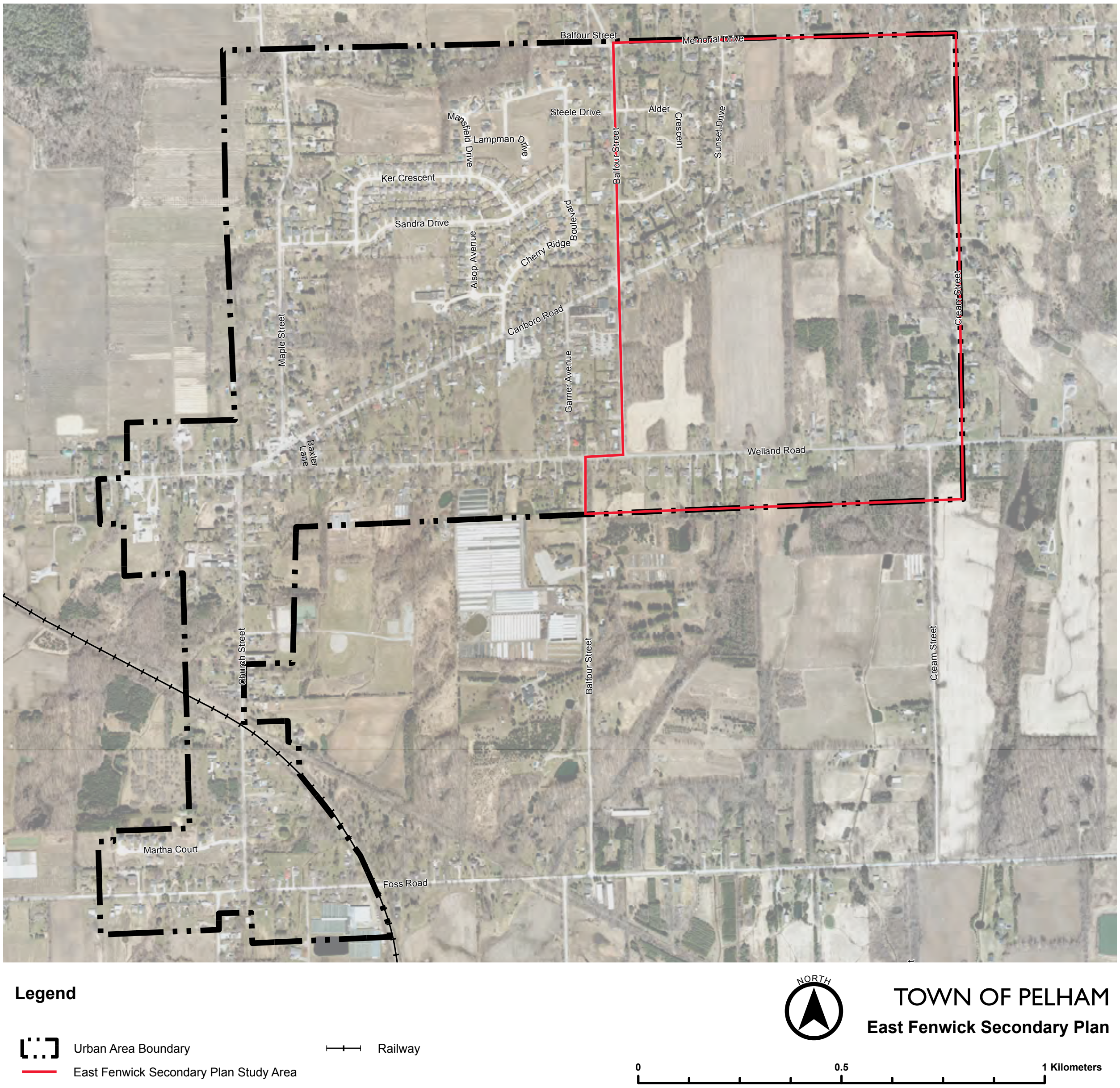


Figure 1. Secondary Plan Study Area Location


Image 1. East Fenwick Secondary Plan view north from Welland Road


Image 2. East Fenwick Secondary Plan view north from Welland Road


Image 3. East Fenwick Secondary Plan view north from Welland Road

Image 4. East Fenwick Secondary Plan view west from Welland Road


Image 5. East Fenwick Secondary Plan view north from Welland Road

Image 6. East Fenwick Secondary Plan view northwest from Welland Road

Image 7. East Fenwick Secondary Plan view south from Welland Road

PART 2

BACKGROUND

I. PHYSICAL CONTEXT & CHARACTER

1.1. VILLAGE STRUCTURE

The Village of Fenwick has a distinctive urban structure composed of clearly demarcated downtown and residential areas, focal areas or nodes, landmarks, gateways, a pedestrian network, edge conditions, and vistas. (**Refer to Figure 2. Village Urban Structure**).

A. VILLAGE CHARACTER DISTRICTS

Based on our observations, three distinctive character districts are identified based on particular built form and land use intensity. Character districts are defined as "character areas perceived to have common characteristics, a separate visual identity from the rest". The districts are described in the following section:

Image 8. Maple Street, Typical Built Form

Image 9. Maple Street, Streetscape

Image 10. Maple Street, Typical Built Form

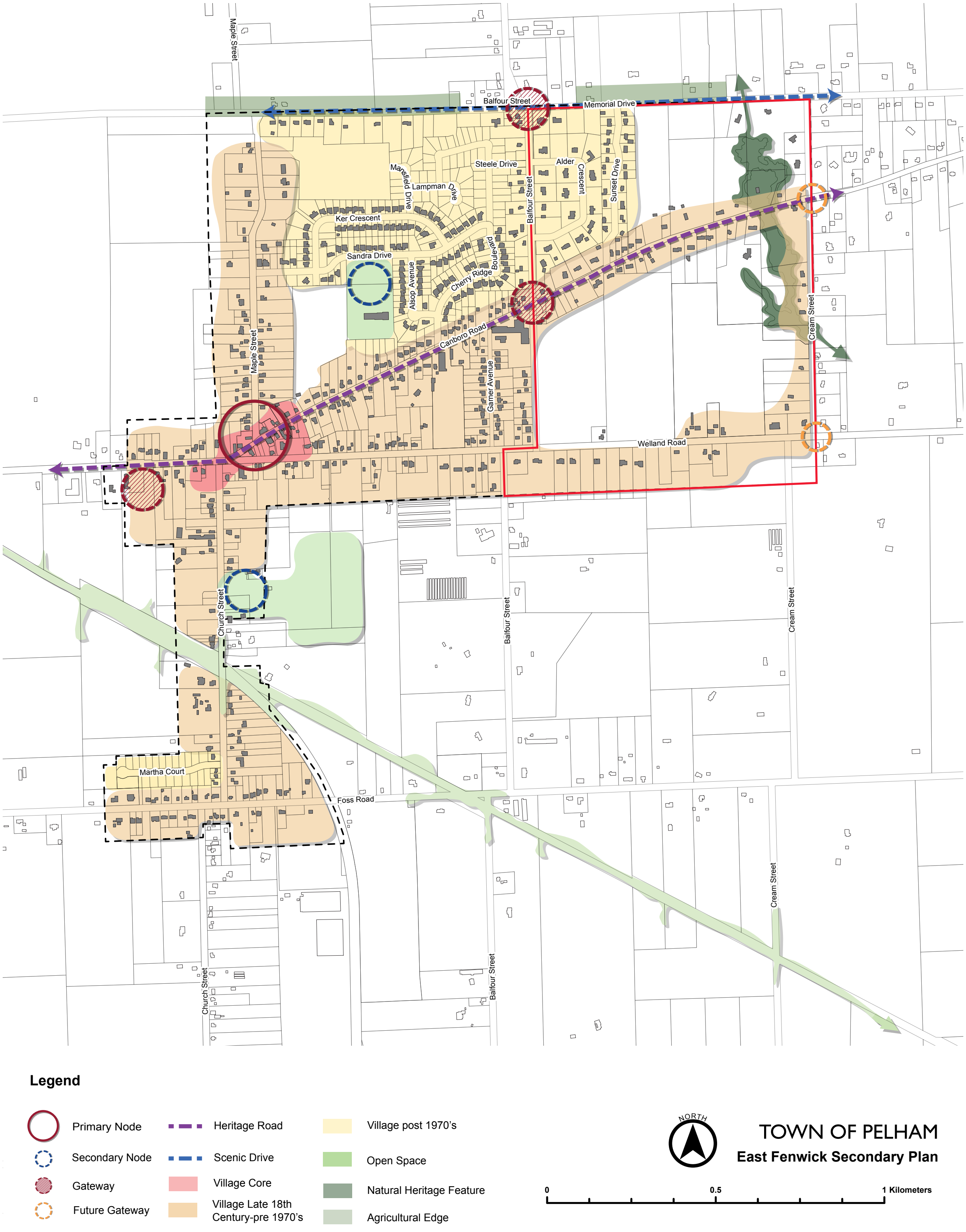


Figure 2. Village Urban Structure

The Village Core

Located at the intersection of Canboro and Welland Roads and Maple Street, the Village Core is characterized by one-to-two storey mixed use commercial or single use commercial and institutional buildings located right on the property line. The proximity and continuity of the district's building generate a classic Main Street setting encouraging pedestrian movement. The Village Core is bookended by the Fenwick United Church to the west, and the Pelham Public Library to the east.


Image 11. Fenwick United Church


Image 12. Pelham Public Library


Image 13. Canboro Road at Maple Street

The Village Residential – Late 18th century to pre-1970's

The Village's late 18th century to pre-1970's development surrounds the Village Core. This character district is roughly located at the intersection of Maple Street at Canboro and Welland Roads, extending on Maple Street to Memorial Drive, Canboro Road to Cream Street, and Church Street to the rail road line.

The early Village built form consists of single detached dwellings and a few walk-up apartments with mixed use commercial/residential, as well as single use commercial/service and institutional buildings associated with the commercial downtown.

Residential development of this period is generally characterized by homes with front porches or verandas with rear garage areas or setback garage buildings that do not dominate the streetscape. Homes have, in general, generous front lawns with mature street trees and landscaping.

One of the neighbourhood defining characteristics that has resulted from this form and pattern of building is the existing tree canopy.


Image 14. Typical Built Form


Image 15. Typical Built Form


Image 16. Typical Built Form

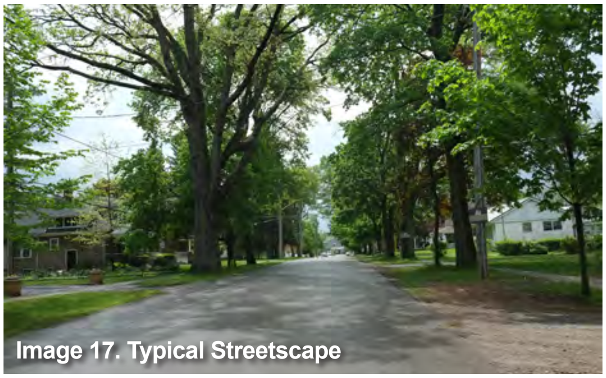


Image 17. Typical Streetscape


Image 18. Canboro Garden Apartments

The Village Residential – Post 1970's

The Village's post 1970's development is located in the Cherry Ridge development north of Canboro Road, south of Memorial Drive between Maple and Balfour Streets, Sunset Drive, as well as the Alder Crescent development located east of Balfour Street.

The development is residential in nature characterized by single or two storey buildings. Residential development of this period, with the exception of Sunset Drive, is characterized by a predominance of driveway and garage areas which dominate the streetscape.

Image 19. Sandra Drive, Typical Built Form

Image 20. Sandra Drive, Typical Built Form

Image 21. Sandra Drive, Typical Built Form

Image 22. Sandra Drive, Typical Built Form

Image 23. Post 1970's Streetscape

B. FOCUS AREAS OR NODES

Each character district has a distinctive focus area. A focus area is defined as "an area where associated activities take place and contribute to the overall experience of a space as a gathering place".

Through our direct observations the following focus areas were identified:

1. Downtown's Flag Pole Node

Downtown Fenwick's "Flag Pole Node" is located at the intersection of Canboro Road and Maple Street. This focal node is not only the Village's primary node but Fenwick's primary community landmark. As a community landmark, the Flag Pole acts as a reference point and an important element in the wayfinding process of residents and visitors alike. The grouping of the surrounding buildings in combination with the improved public realm intrinsically contributes to the downtown character of the node.


Image 24. Fenwick Flagpole Landmark


Image 25. Fenwick's Downtown Streetscape

2. Public School/Cherry Ridge Park

The recently renovated public school in relationship with Cherry Ridge Park form the central node of the Village's post 1950's residential development of Cherry Ridge. The park includes a children's play area and an informal active/passive field.

3. Fenwick's Lion's Club and Centennial Park

The Fenwick Lion's Club and Centennial Park node is a primary node to the entire Village and adjacent areas. As a community service club, the Lion's Club raises funds for a variety of community organizations including national and international causes. The Club hosts important local festivals such as the Annual Santa Claus Parade, Rib Fest, the Fenwick Lions Carnival, a Fish Fry every other Friday from Good Friday until the end of October and the Wheels and Waves Celebration.

Centennial Park provides a number of active and passive recreational facilities that include 3 baseball diamonds, two fields, five tennis courts, picnic tables, and washrooms.

Image 26. Cherry Ridge Park – by Town of Pelham

Image 27. Fenwick Lion's Club – by Google Maps

Image 28. Centennial Park

C. GATEWAYS

Gateways are locations where a significant number of people enter or exit the Village. Through our initial survey three distinctive gateways have been identified in the existing Village. They are:

The Northern Gateway at Balfour Street and Memorial Drive

This informal gateway, further highlighted by the slight road alignment and resulting triangular open space, welcomes southbound residents and visitors to the Village.

The East Gateway at Canboro Road and Balfour Street

This formal west approach gateway is clearly demarcated by the built form located on its four corners indicating arrival to the Village.

The West End Institutional Gateway

The West End Institutional Gateway is located on Canboro Road west of Church Street. The node is formalized by its built form and important social uses composed of Saint Ann Roman Catholic Church and Saint Ann Catholic elementary school.

Image 29. East Gateway, looking north at Balfour Street and Canboro Road

Image 30. Looking east from Canboro Road and Balfour Street

Image 31. North Gateway, looking north

Image 32. West Gateway – converted church

Image 33. Saint Ann Catholic School – by Google Maps


Image 34. Canboro Road sidewalk


Image 35. Maple Street sidewalk

D. PEDESTRIAN NETWORK

Fenwick's street network is based on the Village's existing concession structure with few direct north-south mid-concession connections between Memorial Drive and Welland Road. Future mid-block connections should be explored when identified intensification sites are developed and will be an important part of the development of the East Fenwick Secondary Plan options and land use development policy. (**Refer to Figure 3. Existing Pedestrian Network**)

Our initial survey as well as public input highlighted the need to enhance the Village's pedestrian network, through future Town initiatives in the existing Village area, as well as the Secondary Plan area. Pedestrian enhancement upgrades should be focused on enhancing the pedestrian experience through safe and comfortable streets.

Our initial survey indicates that few areas within the Village have sidewalks, which are limited to the following locations:

- A sidewalk on the north side of Canboro Road from Sunset Drive to the east to Saint Ann Roman Catholic Church to the west and a sidewalk on the south side of the road from Cherry Ridge Boulevard to the east to Saint Ann Roman Catholic Church to the west;
- A sidewalk on the south side of Welland Road from Canboro Road to the west to Balfour Street to the east;
- A sidewalk on the west side of Balfour Street from Memorial Drive to the north to Canboro Road to the south;
- A sidewalk on both sides of the Church Street from Canboro Road to the north to the Berkhout Trail to the south;
- East side of Baxter Lane;
- East side of Maple Street from Sandra Drive to the north to Canboro Road and west side from north of the Rail Road Museum to Canboro Road; and,
- Sidewalks on one side of streets within the Cherry Ridge neighbourhood.

Key to the liveability and walkability of the Village will be the future introduction of a mid-concession connection from the Cherry Ridge neighbourhood to Canboro Road and the downtown area. In addition, future, public realm enhancements to the Village should include opportunities to extend the sidewalk network to the rest of the community.

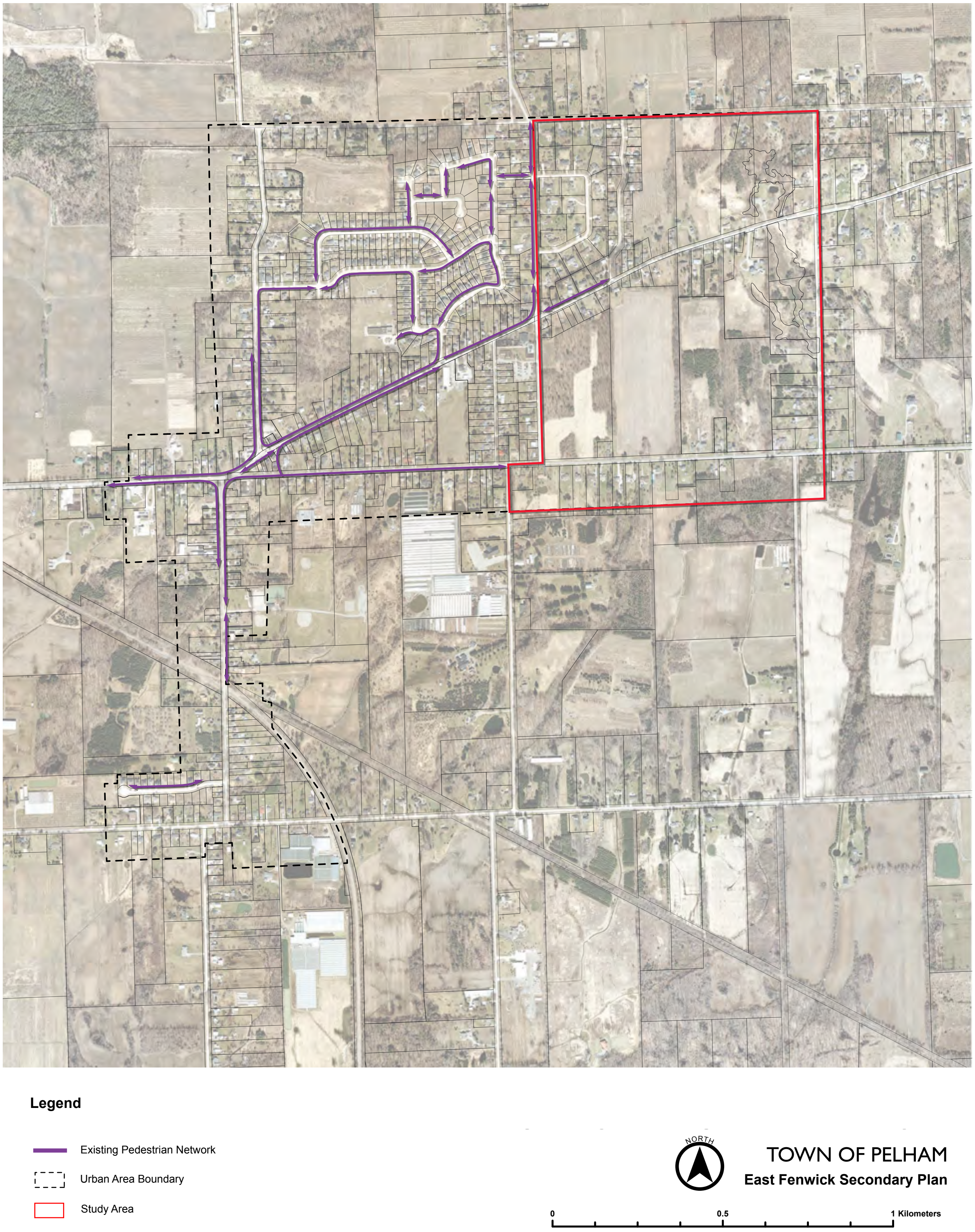


Figure 3. Existing Pedestrian Network

E. CYCLING NETWORK

The Village of Fenwick's location within the region and within proximity to several destination points has resulted in the development of a vast cycling network throughout the Village. The Town of Lincoln, Pelham, St. Catharines, and Thorold cycling networks incorporate routes within the Village. (**Refer to Figure 4. Cycling Network**)

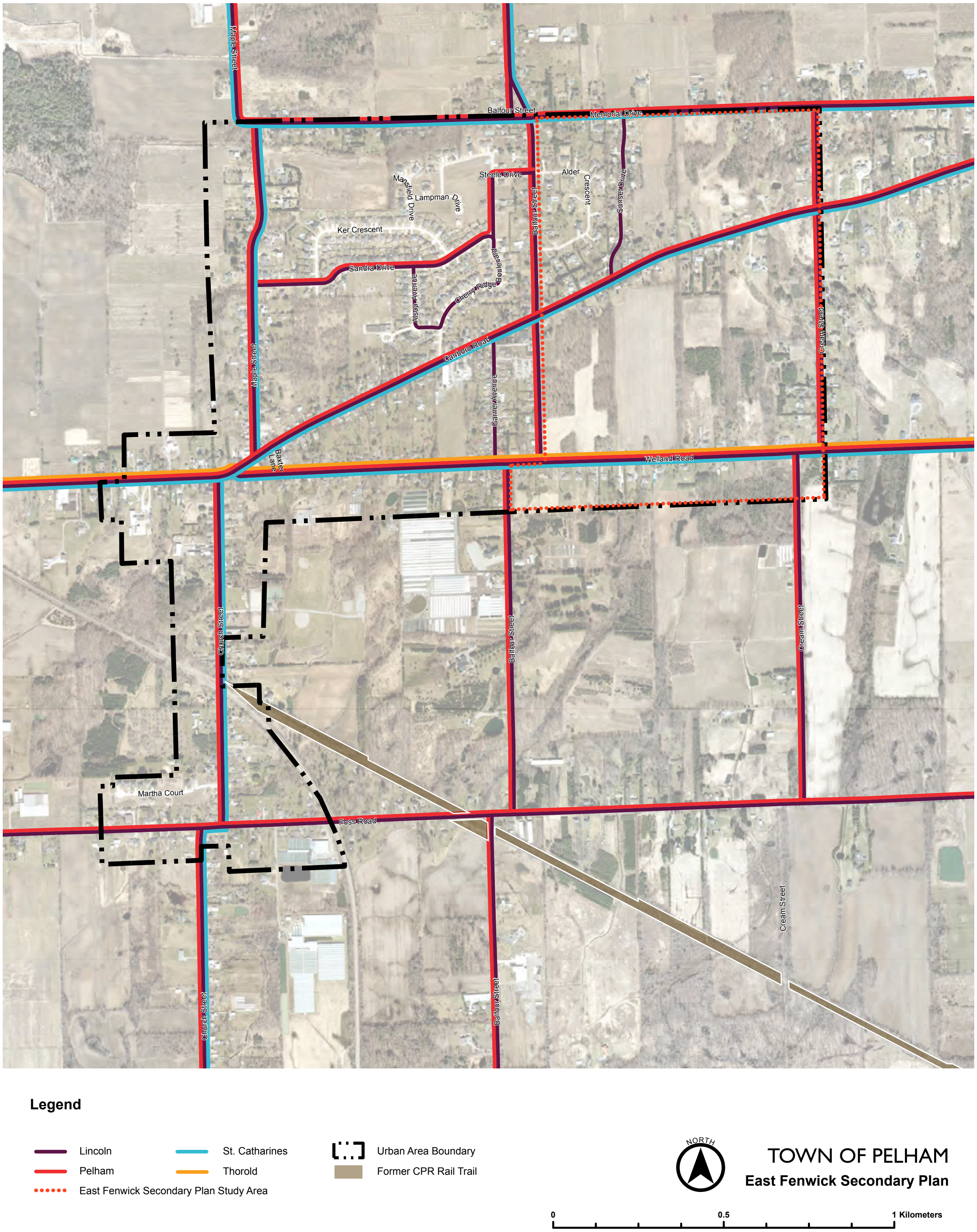


Figure 4. Cycling Network

F. TRANSIT NETWORK

The Town of Pelham has implemented a Transit Pilot that includes convenient routes, morning and evening schedules, is fully accessible, has busses equipped with bike racks. This Pilot also has direct connections to Niagara College Welland Campus, connection transfers to Brock University, connection to the Regional Transit System at Seaway Mall, and direct connections to Welland and St. Catharines. (**Refer to Figure 5. Town of Pelham Transit System**).

Within the Village, the principal transit routes are located on Canboro Road and Balfour Street. Four transit stops are located within the Village at Centennial Park, Fenwick Library, Canboro Road at Balfour Street, and Balfour Street at Alder Crescent. (**Refer to Figure 6. Transit Network**).

Figure 5. Town of Pelham Transit System

Pelham NIAGARA

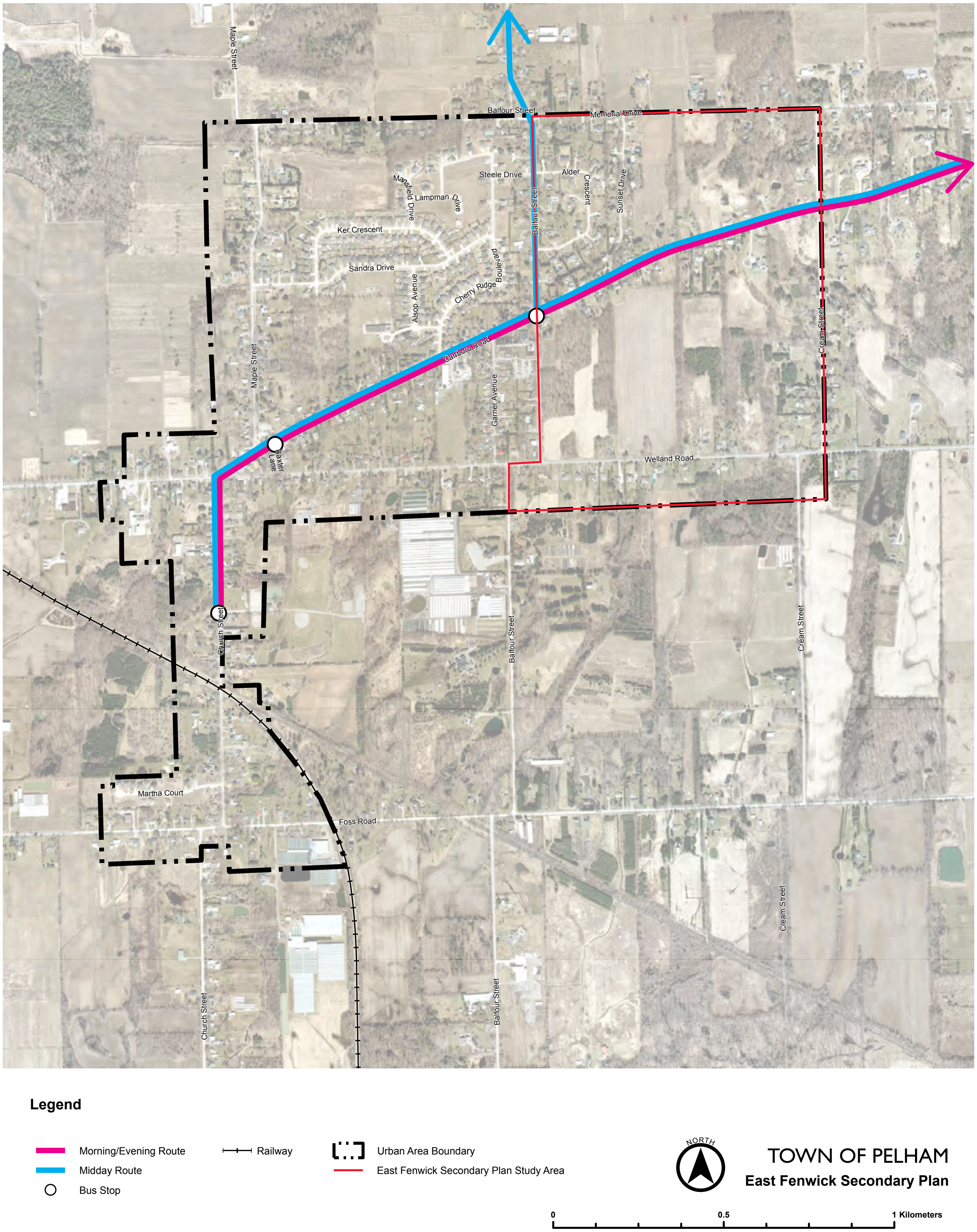


Figure 6. Transit Network

1.2. STREETSCAPES CHARACTER

In combination with Fenwick's built form, the Village streetscapes define the character of the community. The comfort and enjoyment of people's experience of their communities is closely related to how safe and comfortable their walks and drives are. In the case of the Village of Fenwick, visitors and residents alike feel that it is a special place with an unique history.

As the Village grows, it is important to recognize the Village's streetscape elements that should be maintained in the planning and development of future neighbourhoods and the streetscape elements that should be enhanced in the improvement of the existing Village. It is only through this strategy that places can continue to grow and evolve without losing their intrinsic sense of place.

Fenwick's rural streetscapes are generally characterized by generous vegetation and generous front lawns, with no sidewalks and no street curbs. A detailed description of the Secondary Plan area roads is provided in the next section.

Image 36. Memorial Drive, looking east

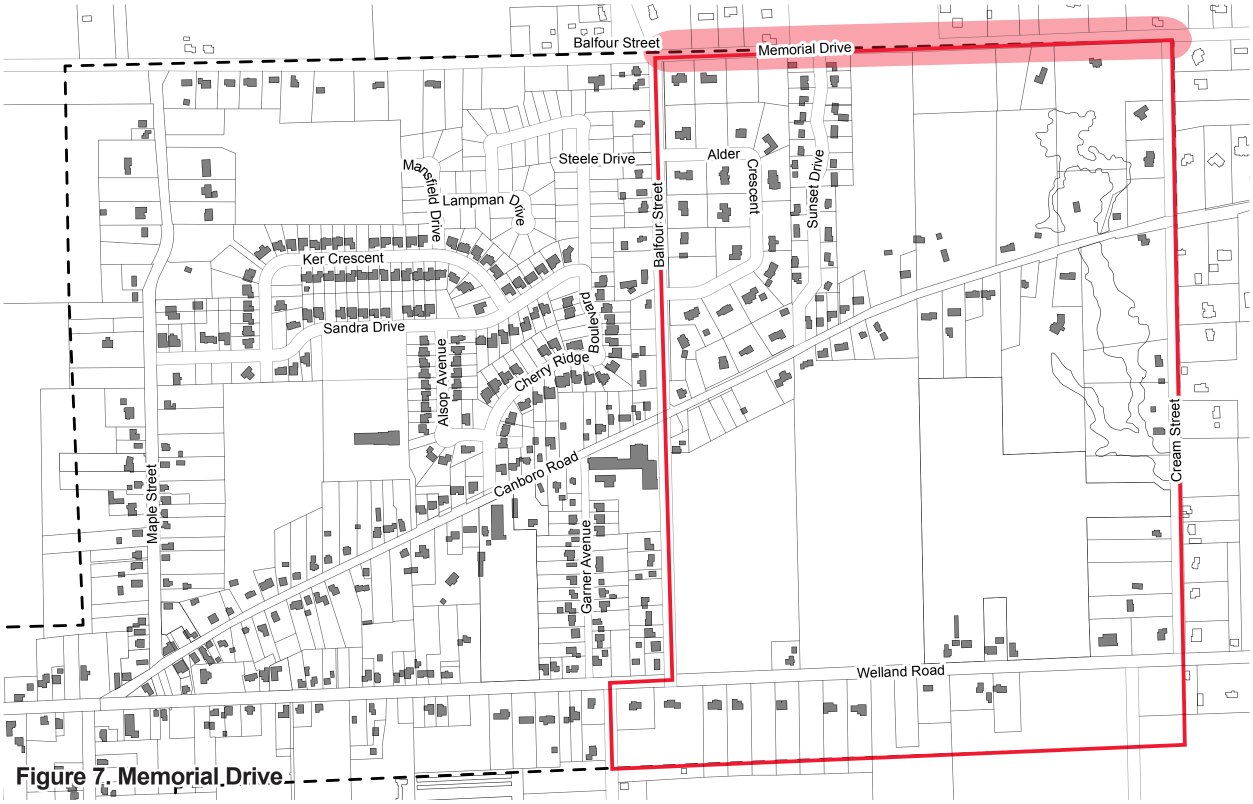


Figure 7. Memorial Drive

A. MEMORIAL DRIVE

Memorial Drive, located on the north boundary of the East Fenwick Secondary Plan area, is designated as a Local Road in the Official Plan. With its mature vegetation and mature tree canopy along with its rolling hills topography this road is considered to be one of the most scenic drives within the Town. (**Refer to Figure 7. Memorial Drive**). The road is characterized by:

- A typical rural cross section consisting of two vehicular traveling lanes, no curb, and significant mature street tree canopy along residential frontages;
- Being part of Pelham's, Lincoln's and St. Catharine's cycling network;
- A village edge land use condition transitioning from residential use areas to the south of the road to a mixed of agricultural and residential uses to the north of the road with a rich and densely vegetated natural heritage feature located at Cream Street;
- A built form that consists primarily of single detached one-storey and one-and-a-half storey split-level 'ranch style' dwellings. Many of the dwellings' exteriors are designed with a combination of masonry (brick or stone) and siding;
- Generally consistent building setbacks along the street with generous front yards with the only exception being the dwellings located within the natural heritage feature at Cream Street where buildings are located well within the property accessed through long winding driveways; and,

Image 37. Memorial Drive, looking east

- Front lawns with a significant number of mature street trees planted at a consistent interval between Balfour Street and Sunset Drive.

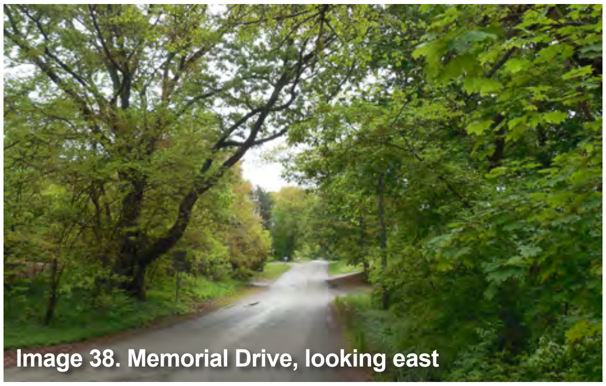


Image 38. Memorial Drive, looking east

Image 39. Typical Built Form

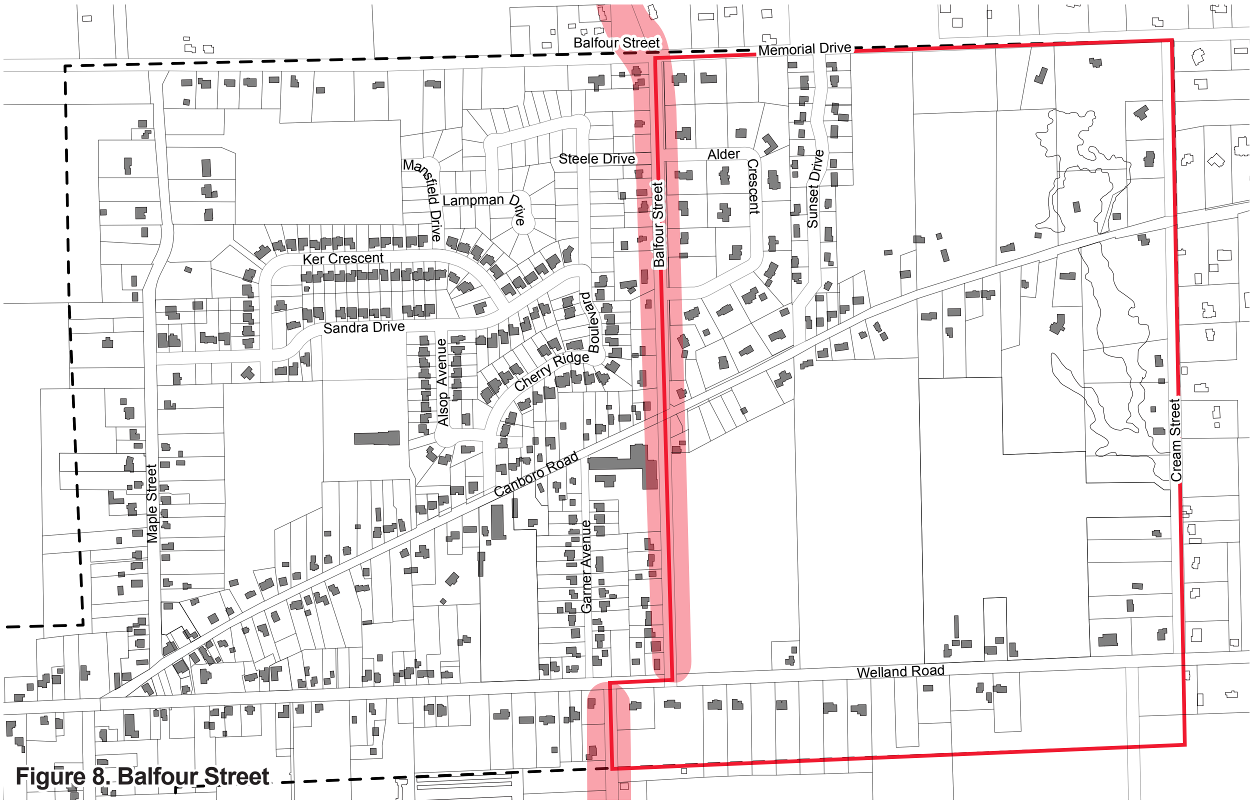


Figure 8. Balfour Street

B. BALFOUR STREET

Balfour Street, located on the west boundary of the East Fenwick Secondary Plan area, is designated as a Local Road in the Official Plan. (**Refer to Figure 8. Balfour Street**). The road is characterized by:

- A typical rural cross section consisting of two vehicular traveling lanes, no curb, a sidewalk on the west side of the road (from Memorial Drive to Canboro Road only), and some street trees;
- Being part of Pelham's cycling network;
- Being used as a midday transit route;
- Residential land uses with the exception of a service/commercial use located at the north-west corner at Canboro Road;
- A built form that consists primarily of single-detached one-storey, one-and-a-half storey split-level 'ranch style', or two-storey dwellings. Many of the dwellings' exteriors are designed with a combination of masonry (brick or stone) and siding;
- Being the Village's gateway furthest to the North (adjacent to the study area) for south-bound travelers at Memorial Drive, where the triangular 'round about' and change in the road alignment help to visually signal arrival to the Village;
- Terminating at Welland Road where it shifts to the west to continue further south;
- Generally consistent building setbacks along the street with generous landscaped front yards with the only exception being the side lotting of dwellings on the east side of the road at

Image 40. Balfour Street at Canboro Road

Image 41. Balfour Street, looking north

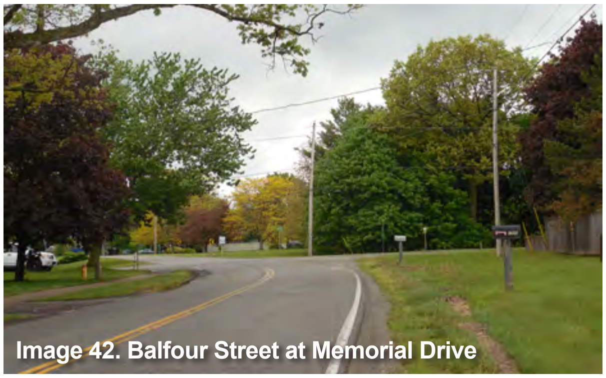


Image 42. Balfour Street at Memorial Drive

Memorial Drive where a wood privacy fence dominates the streetscape; and,

- Having front lawns with a significant number of mature street trees planted at a consistent interval between Balfour Street and Sunset Drive.

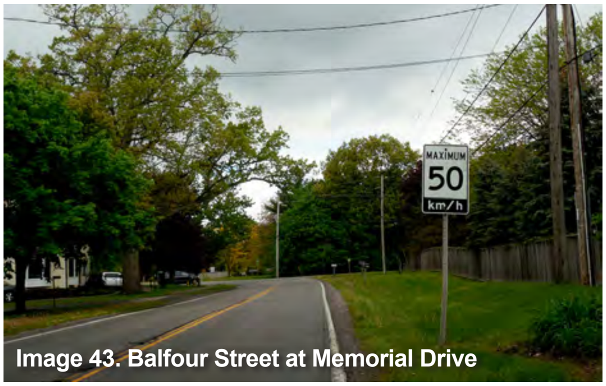


Image 43. Balfour Street at Memorial Drive

Image 44. Typical Built Form

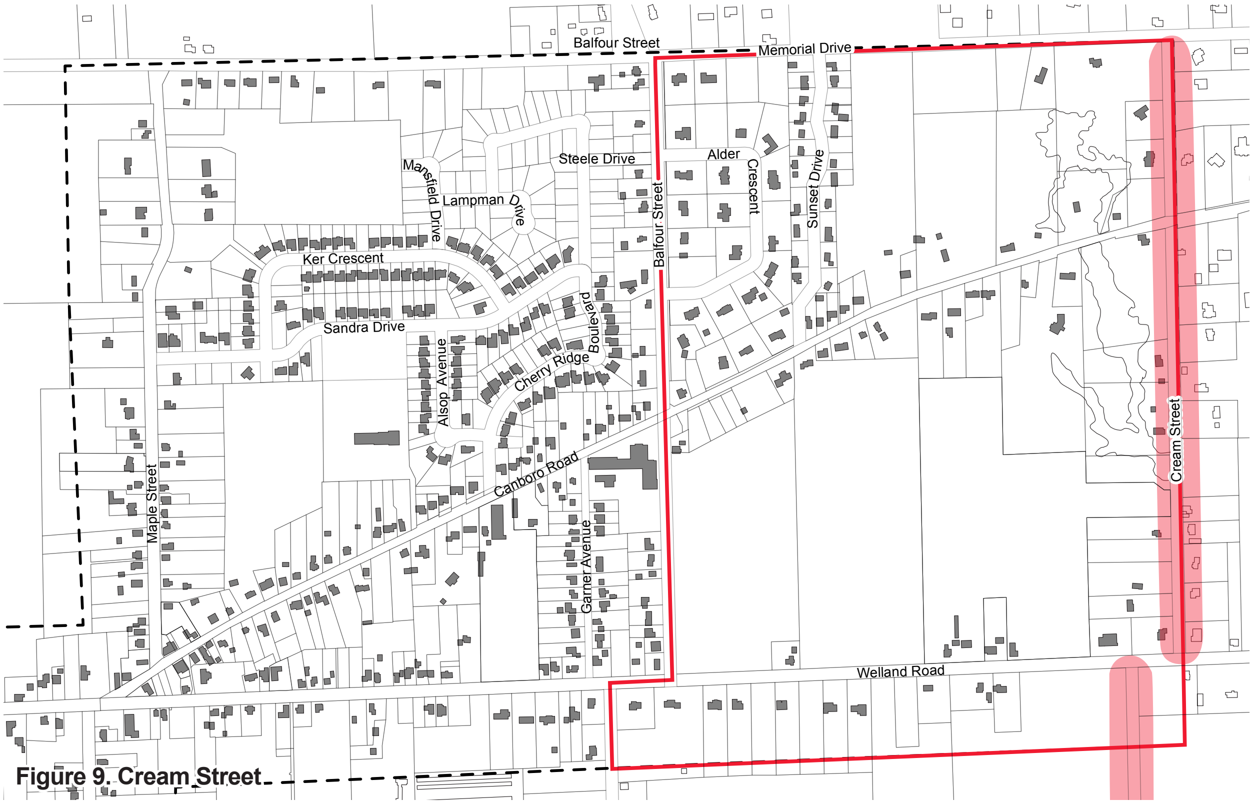


Figure 9. Cream Street

C. CREAM STREET

Cream Street, located on the east boundary of the East Fenwick Secondary Plan area, is designated as a Local Road in the Official Plan. Cream Street's combination of mature vegetation and rolling hills make for an scenic drive, especially at the north end at Memorial Drive. (**Refer to Figure 9. Cream Street**). The road is characterized by:

- A typical rural cross section consisting of two vehicular traveling lanes, no curb, and some street trees;
- Being part of Pelham's cycling network;
- Residential land uses;
- A built form that consist primarily of single detached one-storey, one-and-a-half storey split-level 'ranch style', or two-storey dwellings. Many of the dwellings' exteriors are designed with a combination of masonry (brick or stone) and siding;
- Terminating at Welland Road where it shifts to the west to continue further south
- Generally consistent building setbacks along the street with generous landscaped front yards; and,
- Front lawns with a significant number of mature street trees.

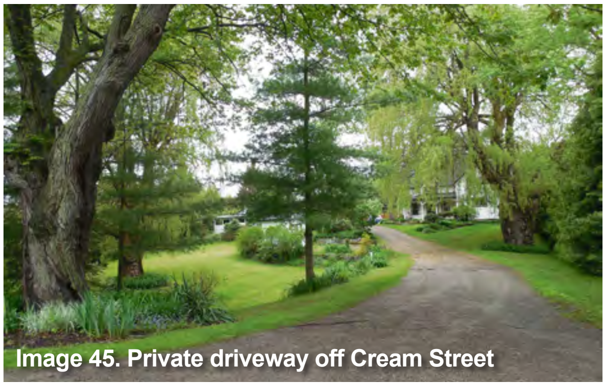


Image 45. Private driveway off Cream Street

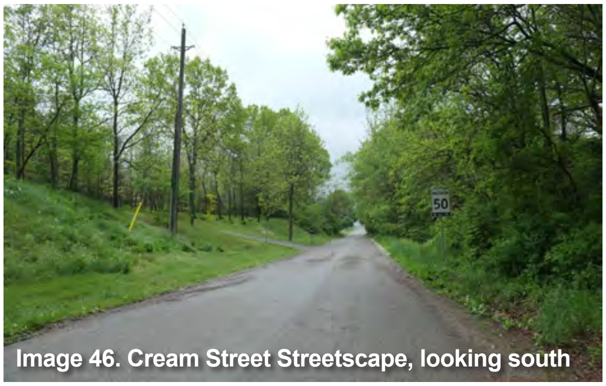


Image 46. Cream Street Streetscape, looking south

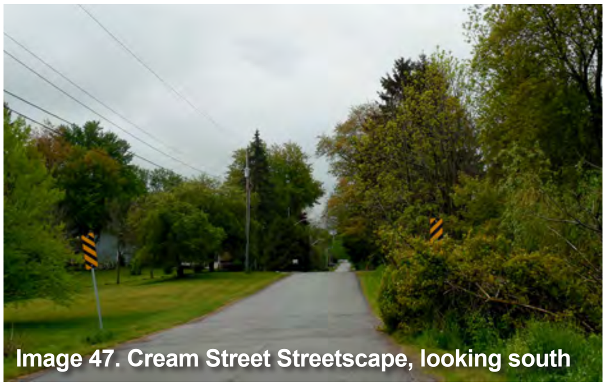


Image 47. Cream Street Streetscape, looking south

Image 48. Typical Built Form

Image 49. Typical Built Form

Image 50. Typical Built Form

Image 51. Typical Built Form

Image 52. Typical Built Form

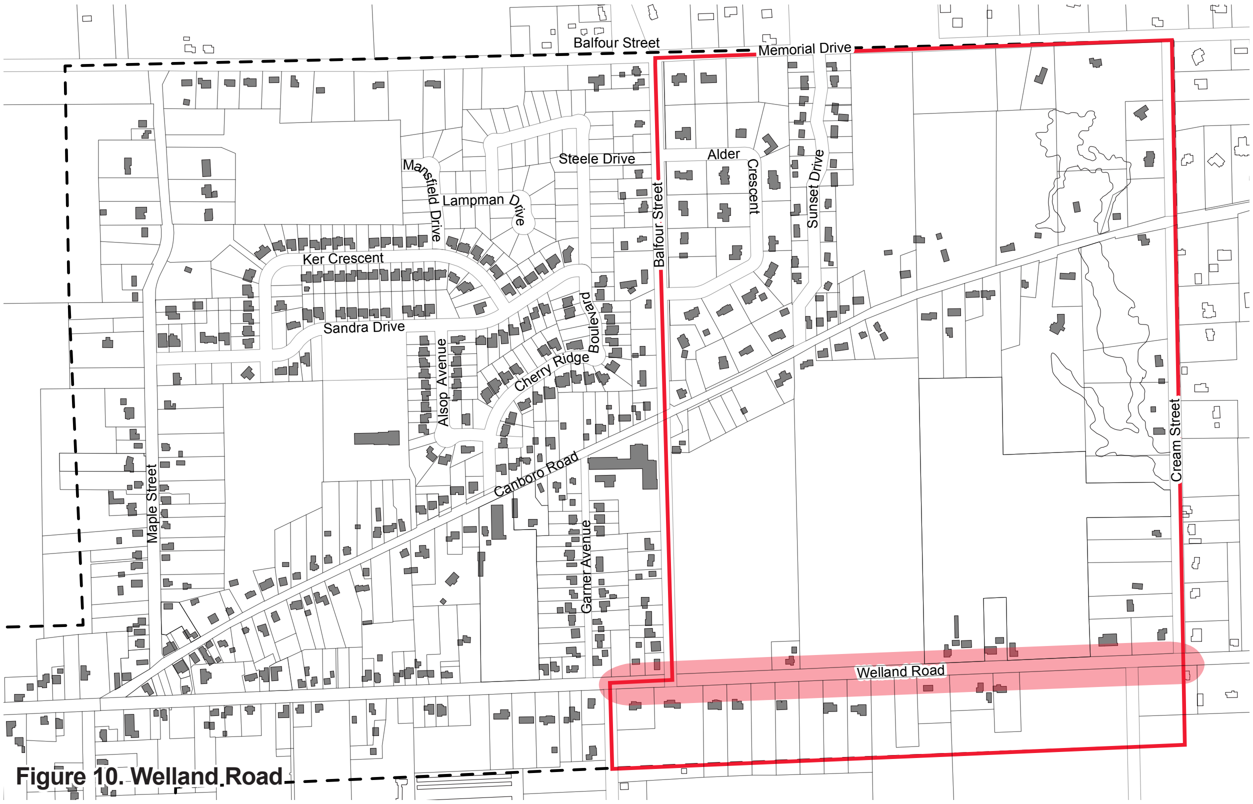


Figure 10. Welland Road

D. WELLAND ROAD

Welland Road, located within the East Fenwick Secondary Plan area, is designated as a Collector Road in the Official Plan. (**Refer to Figure 10. Welland Road**). The road is characterized by:

- A typical rural cross section consisting of two vehicular traveling lanes, no curb, a sidewalk (on the south side of the road for a small portion next to Balfour Street), generous water runoff trenches, and some street trees;
- Being part of Pelham, St. Catherines, Lincoln and Thorold's cycling network;
- Residential land uses with the exception of a large agriculture plot to the north of the road (east of Balfour Road) and a vegetated feature at the corner with Cream Street;
- Built form that consist primarily of single detached one-storey, one-and-a-half storey split-level 'ranch style', or two-storey dwellings. Many of the dwelling's exteriors are designed with a combination of masonry (brick or stone) and siding;
- Terminating at Fenwick's downtown area; and
- Generally consistent building setbacks along the street with generous landscaped front yards.

Image 53. Welland Road Streetscape, looking east

Image 54. Typical Built Form

Image 55. Typical Built Form

Image 56. Typical Built Form

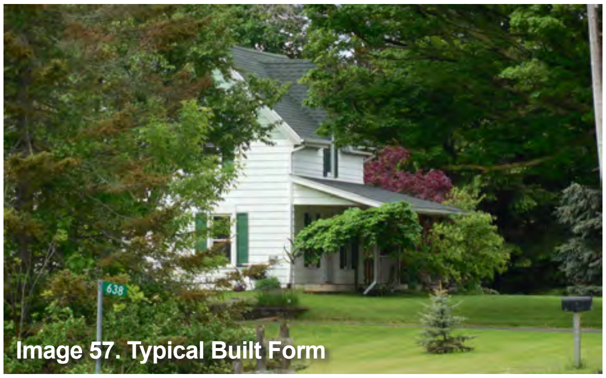


Image 57. Typical Built Form

Image 58. Welland Road Streetscape, looking west

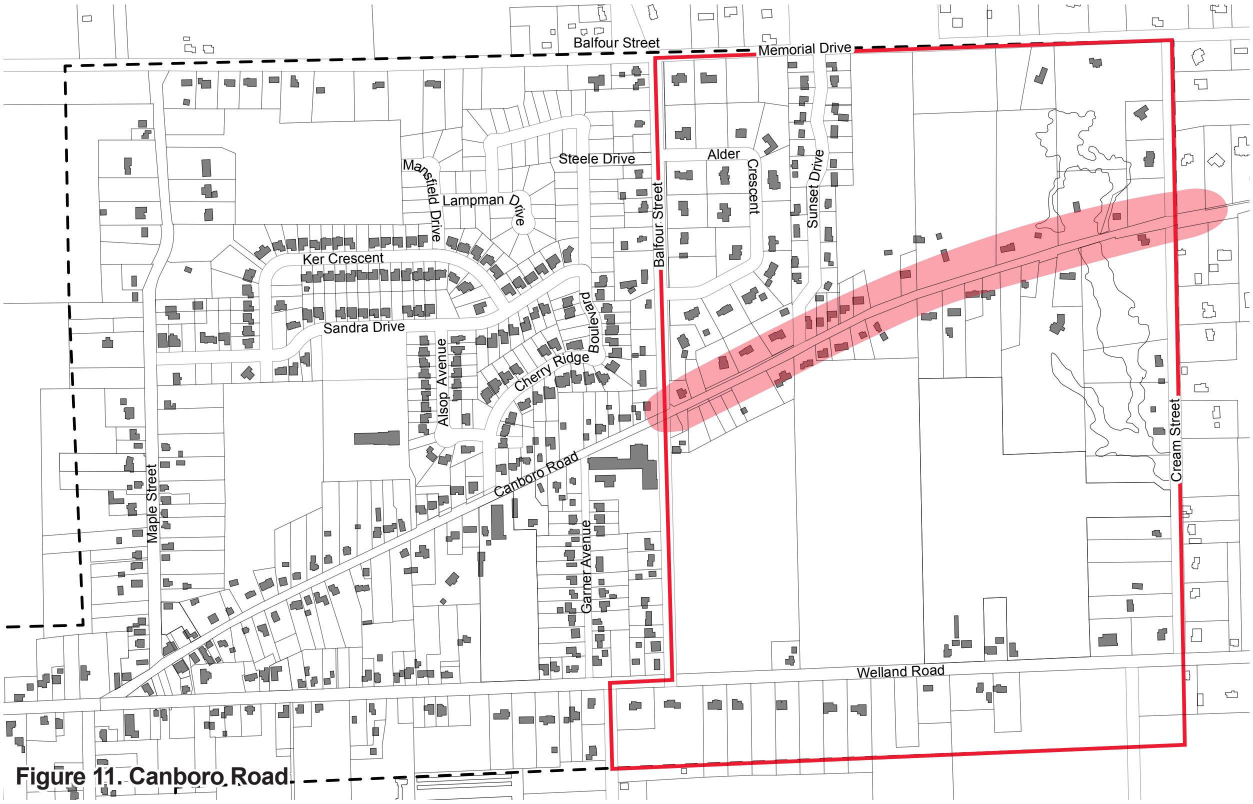


Figure 11. Canboro Road

E. CANBORO ROAD

Canboro Road, located at the centre of the East Fenwick Secondary Plan area, is designated as an Arterial Road in the Official Plan. Canboro Road is recognized as a scenic route forming a diagonal network with other historic corridors (refer to Cultural Heritage section of this report). (**Refer to Figure 11. Canboro Road**). The road is characterized by:

- A typical rural cross section consisting of two vehicular traveling lanes, no curb, a narrow sidewalk next to travelling lanes (located on the north side of the road for a small portion next to Balfour Street), and some large mature street trees;
- Diagonal built form alignment;
- Being part of Pelham's, Lincoln's and St. Catharine's cycling network;
- Being used as the morning and evening transit route;
- The Village's easterly most gateway (adjacent to the study area) for west bound travelers at the corner with Balfour Street, defined by a two-storey brick former school now the Canboro Gardens retirement residence. a one-storey service/commercial building, the Balfour Animal Hospital, and a church that has been retrofitted to residential use;
- Primarily residential land uses with the exception of a service/commercial use located at the north-west corner at Balfour Street;
- Built form that consist primarily of single detached one storey, one-and-a-half storey split-level 'ranch style', or two storey dwellings. Many of the dwellings' exteriors are designed with a

Image 59. Typical Built Form

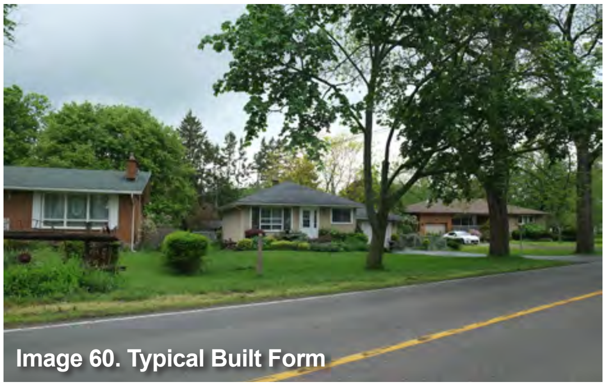


Image 60. Typical Built Form

Image 61. Canboro Road Streetscape

Image 62. Farm House

combination of masonry (brick or stone) and siding;

- Leading to Fenwick's downtown area to the west; and,
- Generally consistent building setbacks along the street with generous landscaped front yards and a mature street canopy by segments.

Image 63. Canboro Road Streetscape

Image 64. Typical Built Form

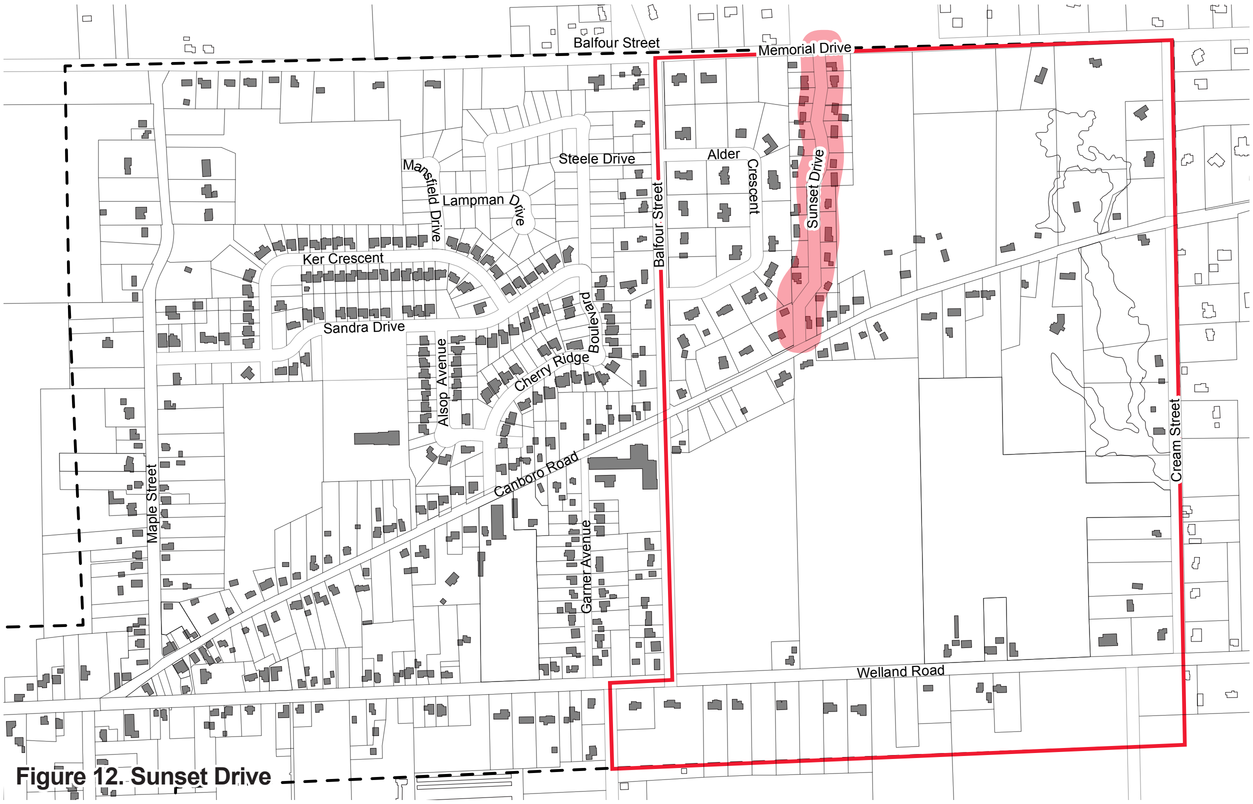


Figure 12. Sunset Drive

F. SUNSET DRIVE

Sunset Drive, located within the East Fenwick Secondary Plan area, is designated as a Local Road in the Official Plan. (**Refer to Figure 12. Sunset Drive**). The road is characterized by:

- A long rolling and winding road with a distinctive mature tree grouping at the halfway point between Memorial Drive and Canboro Road;
- A typical rural cross section consisting of two vehicular travel lanes, no curb, generous storm water trenches, and some street trees;
- Being part of Lincoln's cycling network;
- Residential land uses;
- A built form that consists primarily of single detached one storey or one-and-a-half storey split-level 'ranch style', dwellings. Many of the dwellings' exteriors are designed with a combination of masonry (brick or stone) and siding;
- Generally consistent building setbacks along the street with generous landscaped front yards; and,
- Front lawns with a significant number of mature street trees.

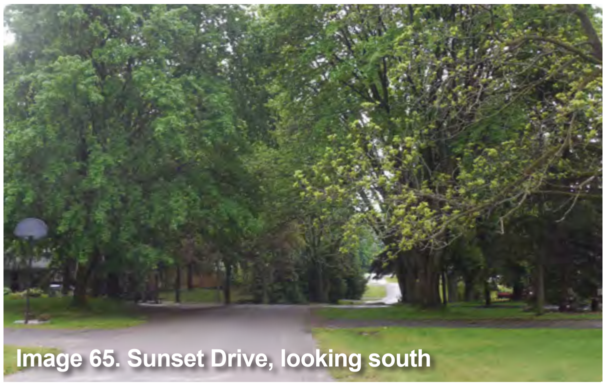


Image 65. Sunset Drive, looking south

Image 66. Typical Built Form

Image 67. Typical Built Form

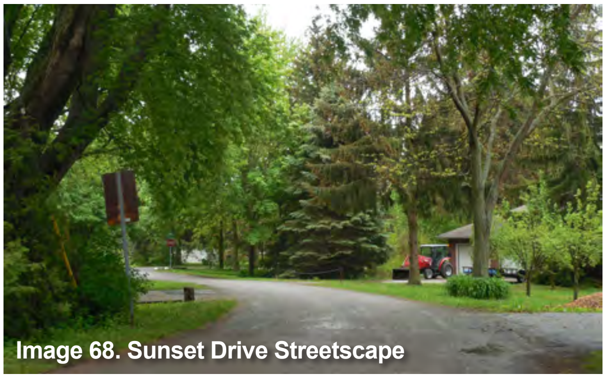


Image 68. Sunset Drive Streetscape

Image 69. Sunset Drive Streetscape, looking south

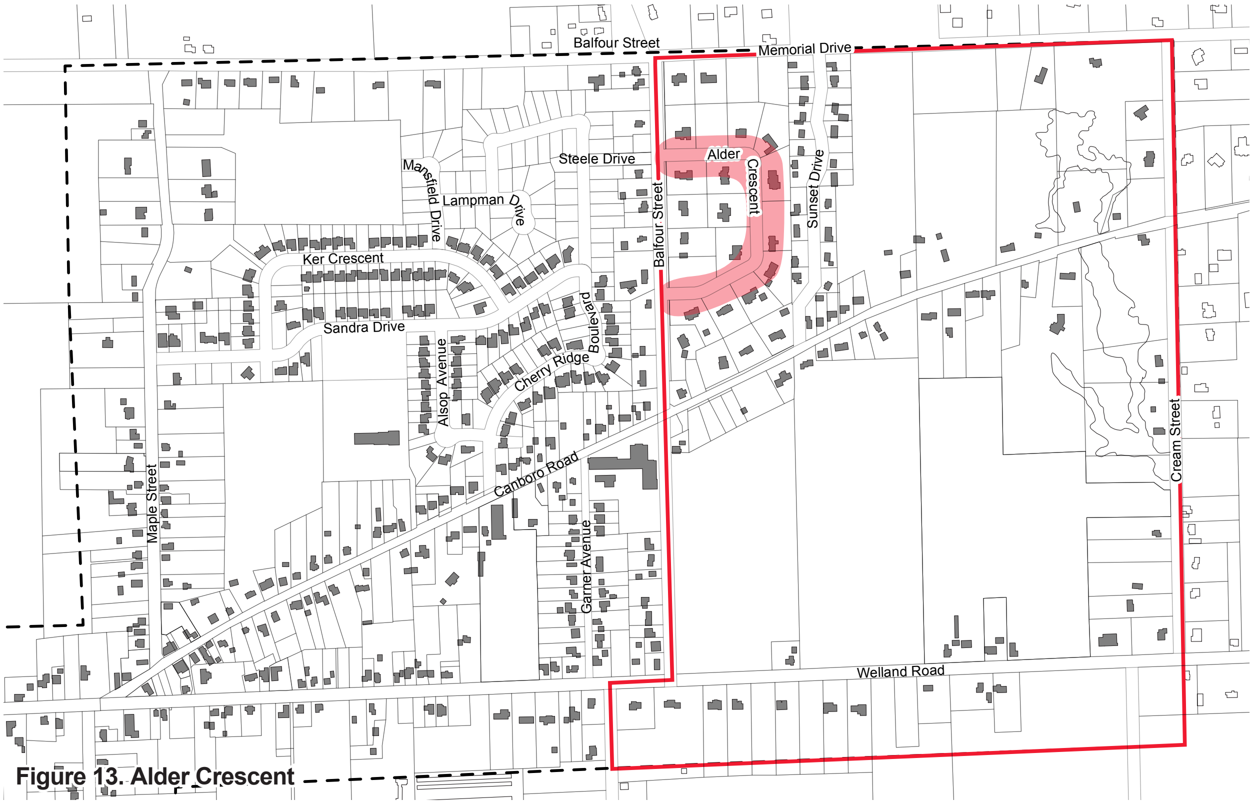


Figure 13. Alder Crescent

G. ALDER CRESCENT

Alder Crescent located within the East Fenwick Secondary Plan area, is designated as a Local Road in the Official Plan. (**Refer to Figure 13.Alder Crescent**). The road is characterized by:

- A typical rural cross section consistent of two vehicular travel lanes, no street curbs, generous storm water trenches, and some street trees;
- Being part of of Pelham's cycling network;
- Residential land uses on large lots;
- A built form that consists primarily of single detached one storey, one-and-a-half storey split-level 'ranch style', or two-storey dwellings. Many of the dwellings' exteriors are designed with a combination of masonry (brick or stone) and siding;
- Generally consistent large building setbacks; and
- Front lawns with few mature trees


Image 70. Alder Crescent Streetscape


Image 71. Alder Crescent Streetscape


Image 72. Typical Built Form

2. LAND USE PLANNING FRAMEWORK

2.1. PROVINCIAL POLICY STATEMENT, 2014

The Provincial Policy Statement (PPS) 2014 provides policy directions on matters of provincial interest related to land use planning and development with the objective of building and sustaining healthy, liveable, and safe communities. The PPS promotes development patterns to optimize the use of land, resources and public investment in infrastructure and public service facilities. This statement also directs that planning authorities identify "settlement areas" where future growth and development will occur, and as such the Pelham Official Plan identifies Fenwick as a settlement area. The PPS directs that settlement areas provide land use patterns that promote a mix of housing, employment, parks and open spaces, and transportation choices that facilitate pedestrian-friendly and transit supportive communities.

The PPS promotes environmentally sustainable communities that protect the natural heritage system for the long term and protect human life and property from natural hazards, such as flooding, while directing growth to consider the impacts of climate change, promote renewable energy systems, and maximize vegetation within settlement areas.

The PPS restricts development within and near significant wildlife habitat (2.1.4 e and 2.1.7) and sensitive groundwater features (2.2.2).

Key Policies of the PPS:

1. Seek to create and sustain healthy, liveable and safe communities;
2. Encourage development to optimize the use of land, resources and public investment in infrastructure and public service facilities; and
3. Require municipalities to identify areas where future growth and development will occur in a manner that promotes a mix of housing, employment, parks and open spaces, and transportation choices that facilitate pedestrian-friendly and transit-supportive communities.

2.2. GROWTH PLAN

The Growth Plan 2017 implements the province's initiative to support economic prosperity, protects the environment, and provides a high quality of life for communities. The Growth Plan provides growth management policy direction and population and employment forecasts for the Greater Golden Horseshoe area, including the Region of Niagara and the Town of Pelham. The Plan also identified portions of Fenwick as designated greenfield.

This Plan encourages intensification and the creation of compact, complete communities, whereby delineated built-up areas will contain 50 percent of the Region of Niagara's residential development and by 2031 and each year thereafter it must contain 60 percent.

Within designated greenfield areas, the Growth Plan encourages the development of complete communities with a diverse mix of land uses, a range and mix of employment and housing types, high quality public open space and convenient access to local stores and services by building more compact, transit-supportive communities. The Growth Plan promotes the development of complete communities which support active transportation and encourage transit services. The Growth Plan established a minimum density target for designated greenfield areas at no less than 80 residents and/or jobs per hectare. This density however is measured across the entire Region of Niagara.

Key Policies of the Growth Plan:

1. Support economic prosperity, protect the environment, and ensure a high quality of life for communities;
2. Encourage intensification and the creation of compact, complete communities; and
3. Encourage designated greenfield areas to develop as complete communities with a diverse mix of land uses, a range and mix of employment and housing types, high quality public open space, and convenient access to local stores and services by building more compact, transit-supportive communities.

2.3. GREENBELT PLAN

The Greenbelt Plan 2017 identifies where urbanization should not occur in order to provide permanent protection to the agricultural land base and the ecological features and functions occurring with the Greenbelt. The Greenbelt Plan supports a strong rural economy through the development of settlement areas by identifying communities such as Fenwick as Towns or Villages. As a Town/Village settlement area, the Greenbelt Plan encourages Fenwick to develop in a manner that maintains, intensifies and/or revitalizes the community, including modest growth.

Key Policies of the Greenbelt Plan:

1. Support a healthy environment and a strong rural economy;
2. Identify Towns/Villages where development can occur, such as Fenwick; and
3. Encourage Towns/Villages to develop in a manner that maintains, intensifies and/or revitalizes the community, including modest growth.

2.4. NIAGARA PENINSULA CONSERVATION AUTHORITY

The Niagara Peninsula Conservation Authority (NPCA), as per the Niagara Region's Official Plan, requires the following buffers:

- Watercourses: 30 metres from bankfull channel of Type 1 watercourses and 15 metres from bankfull channel of Type 2 or 3 watercourses (3.6);
- Wetlands: 30 metres from Provincial Significant Wetlands or wetlands greater than 2 hectares in size and 15 metres from wetlands less than 2 hectares in size;
- Provincially Significant Life Science Area of Natural and Scientific Interest: Development within 50 metres require an EIS
- Habitat of Threatened and Endangered Species: Development within 50 metres require an EIS

Key Policies of the NPCA:

1. Protect key environmental features and hydrological features;
2. Restrict development in hazardous areas; and
3. Require 15 metres to 30 metres vegetation buffers along streams from wetlands to protect fish habitat.

2.5. NIAGARA REGION OFFICIAL PLAN

SECTION 4. MANAGING GROWTH

The Region directs growth and development to Urban Areas (Objective 4.A.1.1), such as Fenwick. The Niagara Region Official Plan promotes economic and residential development through the development of complete communities (Objective 4.A.1.10).

The Niagara Region Official Plan establishes an intensification target for the Town of Pelham where 15 percent of new development will be within built-up areas (4.C.4.2).

The Niagara Region Official Plan directs designated greenfield areas to be planned as compact, compete communities that:

a. Provide a mix of uses, including residential, commercial, institutional, recreational, employment, and other uses;

b. Designed around a grid street pattern;

c. Support transit and active transportation;

d. Are developed in a manner that is sequential, orderly, and contiguous with existing built-up areas (4.C.5.1).

The Region establishes a target of 50 people and jobs per hectare across all designated greenfield areas in the Region, excluding Environmental Protection Areas, Environmental Conservation Areas, and other non-developable lands listed in the local Official Plan (4.C.6.1).

The Niagara Region Official Plan encourages development in an environmentally sustainable way, which reduces energy demands and optimizes passive solar energy gains, maximizes water conservation, provides appropriate stormwater infiltration, reduces runoff, protects groundwater resources, enhances active transportation, and enhances hydrological features and function (4.G.3.1).

SECTION 7. NATURAL ENVIRONMENT

Healthy Landscapes

The Region's Core Natural Heritage System is composed of Environmental Protection and Environmental Conservation Areas as well as Potential Natural Heritage Corridor designations.

Key natural heritage features within the Greenbelt Natural Heritage System are identified as Environmental Protection Areas. As per Policy 7.B.1.3, these areas include provincially significant Wetlands; provincially significant Life Science Areas of Natural and Scientific Interest (ANSIs); and significant habitat of endangered and threatened species. In addition, within the Greenbelt Natural Heritage System, Environmental Protection Areas also include wetlands; significant valleylands; significant woodlands; significant wildlife habitat; habitat of species of concern; publicly owned conservation lands; savannahs and tallgrass prairies; and alvars. Where such habitat is identified development and site alteration shall be subject to the policies for Environmental Protection Areas.

Please refer to the Natural Heritage Assessment section of this report for a complete overview of applicable Natural Environment policies.

SECTION 9. TRANSPORTATION

There is no Regional road associated with the Secondary Plan area.

The Region promotes the Niagara Region Bicycle Network which runs through the East Fenwick Secondary Plan area along Canboro Road and Welland Road.

SECTION 11: HOUSING AND COMMUNITY SERVICES

The Region encourages secondary suites (11.A.7).

SECTION 13.F SITE SPECIFIC POLICIES

There are no site-specific policies within the Secondary Plan area.

Key Policies of the Regional Official Plan:

1. Establish an intensification target for the Town of Pelham where 15 percent of new development will be within built-up areas, and 85 percent in greenfield areas;
2. Establish an average target of 50 people and jobs per hectare across all designated greenfield areas in the Niagara Region;
3. Allocate 3,000 residential units and 1,800 new jobs to Pelham by 2031; and
4. Support the environment by setting a target of 30 percent of the land area be forest or wetland, as well as establishing a 15 metre to 30 metre buffer from fish habitats.

2.6. PELHAM OFFICIAL PLAN

As the primary planning document in charge of directing and managing growth within the municipality, Pelham's 2014 Official Plan seeks to support and emphasize the Town's unique character, diversity, civic identity, rural lifestyle and heritage features.

Furthermore, as an important settlement area with significant environmental and topographical features as well as agricultural areas, Pelham's Official Plan seeks to maintain and enhance the quality of life of its current and future residents as the Town continues to grow.

A2.GOALS AND OBJECTIVES

The Plan's Goals and Objectives, as they pertain to the East Fenwick Secondary Plan study, include:

1. THE NATURAL ENVIRONMENT:
    - Conserve, protect and integrate existing natural features and cultural heritage landscapes.
2. GROWTH AND SETTLEMENT:
    - To encourage diversity in housing;
    - Maintain and enhance the Town of Fenwick community character;
    - Maintain and enhance the Town of Fenwick as a diverse, safe, liveable, accessible and attractive community;
    - Develop healthy and inclusive communities;
    - Incorporate sustainable design initiatives that enhance residents and local ecosystem's health.
3. URBAN CHARACTER:
    - Encourage compact, pedestrian friendly neighbourhoods;
    - Provide a mix of housing types, community facilities and public open spaces;
    - Design new communities with a distinct character, identity, and a sense of place;
    - Develop a continuous and connected open space and trails system that links the local neighbourhood to the broader town and encourages active transportation.
4. THE ECONOMY:
    - Promote active transportation and the use of open space to encourage tourism and to attract residents seeking an active recreational community as a lifestyle or retirement choice;
    - Reinforce the function of the downtown as the primary business, entertainment and commercial point of the community.
5. CULTURAL HERITAGE:
    - Protect and enhance the Town's cultural heritage resources.

A3. SETTLEMENT AREA STRATEGY

The Region has allocated 3,000 residential units to Pelham by 2031 (A3.2) and 1,800 new jobs (A3.3). The Town anticipates that a portion of those jobs will be located within greenfield developments (A3.3).

B1. URBAN LIVING AREA

B1.1.Urban Living Area

B1.1.3 Residential Intensification

Intensification will account for 15 percent of the growth in Fenwick (B1.1.3). However, Schedule A2 does not identify any Potential Intensification Areas within the Secondary Plan area, but other intensification sites may be permitted along arterial and collector roads, or on local roads located within 100 metres of an arterial or collector road (B1.1.3 a). On these sites, density may be increased up to 25 percent of the existing gross density within 300 metres of the site (B1.1.3 c). Infill through consent is permitted as long as it respects the surrounding community and the Zoning By-law (B1.1.3 d). Accessory apartments (secondary suites) are appropriate forms of infill (B1.1.3 e).

Permitted Uses

- Single detached, accessory apartments within single-detached dwellings;
- Semi-detached, townhouse, multiple and apartment dwellings (B1.1.2);
- Home occupations (B1.1.6);
- Bed and breakfasts (B1.1.7);
- Complementary uses such as residential care facilities, daycare centres, institutional uses, and convenience commercial uses (B1.1.8);
- Neighbourhood Commercial uses include retail (less than 100 metres squared), personal service uses, offices, daycares, private and commercial schools and studios, small-scale restaurants, and medical and dental clinics; and,
- Mixed-use, with commercial uses on the main floor and residential uses above is permitted (B1.1.8.4.1).

Fenwick Secondary Plan Requirements (B1.1.10)

Include the following policy sections in the Secondary plan:

- Water and Sanitary Sewer Servicing;
- Stormwater Management;
- Environmental Protection Area (Perhaps two designations like Fonthill and based on the Region's Environmental. Protection Area and Environmental. Conservation Area);
- Affordability;
- Phasing;
- Parkland;
- Schools and Community Facilities;
- Transportation, including:
    - » Pedestrian Connections – to trails and parkland; and
    - » Cycling – to support the Region's cycle network within the Secondary Plan, and,

- Urban Design Principles & Implementation Strategy for accessibility, active transportation, and quality building and site design.

Residential Intensification (B1.1.10.3)

Density targets:

- Built-up Area: Between 8-15 units per hectare (net density); and
    - » Current density:

Area	Size (ha)	Units	Density (units/ha)
Alder Crescent	5.11	14	2.740
	2.52	6	2.381
Sunset Drive	1.98	16	8.069
South of Welland Road	6.73	10	1.486
Canboro Road N.	1.64	6	3.659
Canboro Road S.	0.60	2	3.333
Cream/Canboro SW.	11.97	15	1.253
Cream/Canboro NW.	8.19	9	1.099
Total	**38.74**	**78**	**2.013**

Note: Calculations by SGL based on Town of Pelham GIS Data

- Greenfield Overlay Area: Minimum of 20 units per hectare (requires an average of 2.5 persons per unit to meet Growth Plan 2006 and Regional requirement of 50 people/jobs per hectare).

B3. NATURAL HERITAGE DESIGNATIONS

The Environmental Protection designations of the Plan reflect the natural heritage system in the Town and is composed of the following designations: Niagara Escarpment, Environmental Protection One, Environmental Protection Two and Environmental Protection Three. Please refer to the Natural Heritage Assessment section of this report for a complete overview of applicable Municipal policies.

D2. TRANSPORTATION

D2.2.2 Arterial Roads (Canboro Road)

No minimum distance between access is provided. Minimum Right of Way (ROW) is 20 metres for all new roads.

D2.2.3 Collector Roads (Welland Road)

No minimum distance between access is provided. Minimum ROW is 20 metres for all new roads.

D2.2.4 Local Roads

No minimum distance between access is provided. Minimum ROW is 20 metres for all new roads. Conveyance of land for road widening is permissible.

D2.6 Active Transportation

The Town will likely require policies regarding pedestrian and cycle connections and appropriate facilities for bicycle parking and storage.

D2.7 Public Transit

Arterial and collector roads will be designed to accommodate future transit network.

D5. SUBDIVISION OF LAND

D5.4 Public Parkland

The Town requires the dedication of 5 percent of residential Plan of Subdivisions and 2 percent of non-residential development, or cash-in-lieu (D5.4.2.2). Environmentally sensitive lands that are not permitted to be dedicated to satisfying parkland requirements are encouraged to be transferred to public ownership (D5.4.1).

Parks are to be sited with the most street frontage and open views on as many sides as possible, be accessible to active forms of transportation, incorporate natural heritage features wherever possible, be incorporated into the fabric of adjacent neighbourhoods, and be connected to trail systems and cycling routes (D5.4.3.1).

Key Policies of the local Official Plan:

1. Designate the Secondary Plan area as Living Area, which permits a range of residential uses as well as uses that are compatible with residential uses;
2. Establish issues that the East Fenwick Secondary Plan must address;
3. Establish target densities for 8-15 units per hectare (net density) in built-up areas and a minimum of 20 units per hectare in greenfield areas; and
4. Establish parkland dedication and siting requirements.

3. URBAN DESIGN POLICY CONTEXT

3.1. DOWNTOWN MASTER PLAN FOR FENWICK AND FONTHILL, 2014

The Downtown Master Plan for Fenwick and Fonthill, prepared by The Planning Partnership for the Town of Pelham, aims to establish Downtown Design Guidelines for Fenwick and Fonthill. The purpose of this document was to address the challenge of transforming Pelham from a point of transit with no clearly defined image to a destination place where existing residents and visitors could benefit as a better place to live, work, and shop.

The Downtown Master Plan provided a long-term urban design vision and guidance for Downtown Fenwick and Fonthill, and complements the Community Improvement Plan.

For the purpose of this report, principles regarding growth and development in Fenwick will be examined. Given the Provincial requirements for denser development, the Secondary Plan must consider land use and policy within the study area that seeks to integrate new development sensitively alongside existing development areas. New development should provide transition through built form and a number of urban design techniques such as setbacks, landscape buffering, building form, building height gradation, and others.

Section 2 of the Downtown Master Plan identifies several strategies for the design development of Fenwick's Downtown core:

Strategy #1: Strengthen the "village" character of Fenwick
Fenwick should maintain its small village characteristic by maintaining its smaller one- to two-storey "house-form" buildings, setback with ample room between buildings and the front yard. Large front yard setbacks should also be maintained and encouraged to permit patios and large landscaped areas. Lastly, localized businesses should be promoted to attract local residents and visitors.

Strategy #2: Design streets for people
Streets in Downtown Fenwick should be designed with the pedestrian in mind. To achieve streets with pedestrian orientated spaces, streets should be designed to:

- Narrow the roadway and widen sidewalks;
- Create on-street parking buffer zones;
- Provide trees and landscaping along boulevards; and,
- Design to human scale.

Strategy #4: Create a focal point for Fenwick
Fenwick should establish a focal point within its Downtown located in a central location. The focal point should act as a gathering place for residents.

Strategy #5: Strengthen cross-town and neighbourhood connections
Downtown areas should be designed as strong pedestrian and bike destinations, not just through routes. Open spaces should be connected with new linkages to enhance connectivity, established through consistent way finding signage.

Strategy #6: Rediscover the cultural heritage of Pelham

Cultural heritage in Downtown Fenwick should be preserved and enhanced through identifying key heritage assets, developing standards for building rehabilitation and site redevelopment, and developing a program for highlighting heritage resources.

Strategy #7: Promote a Pelham historic "promenade"

Canboro Road should be prioritized for promotion and development as a scenic route that connects Fenwick to Fonthill. Promotion of this route may include economic and tourism opportunities, public events, and/or the establishment of a historical interpretive trail.

Section 3 of the Downtown Master Plan establishes the public realm framework for both Downtown cores. This section identifies no new potential streets or lanes, no significant parks, no public squares, or no public plazas for Fenwick (3.2, 3.6). Opportunities for installing public art are identified for highly visible areas including open spaces, gateways, and the terminus of view corridors (3.7).

The public realm framework further identifies Canboro Road as an important link between various areas in Pelham. The framework identifies a tree planting strategy to further enhance the historic road, in order to improve the existing tree canopy and establish a 4-season landscape (3.12).

Section 4 of the Downtown Master Plan defines the built form framework for the development of Fenwick. Identified with an existing "Village Built Form", Downtown Fenwick is mostly made up of one- to two-storey commercial and office buildings, mixed-use buildings with retail at-grade, residences, and has a variety of setbacks.

New developments under the Village Built Form classification should have a minimum height of 2 storeys, and a maximum height of 3 storeys. Buildings may increase to 4 storeys when located at prominent visual sites (5.3). New developments should be setback generously from the street – between 1 metre to a maximum of 5 metres. No parking should be permitted at the front of buildings. Where possible, parking should be located on street or in rear parking lanes (4.4).

Fenwick is also primarily made up of stable residential neighbourhoods ranging from single-family detached to apartment housing types. Some infill that respects the character of the neighbourhood may occur within residential areas (4.6). New residential developments within these areas may range from 1 to 3 storeys (5.3).

Section 5 provides design guidelines for new developments in Fenwick. New buildings situated adjacent to historic buildings or within historic areas should avoid historical misrepresentation by avoiding emulation of older building styles. New buildings should be designed so that they do not appear to have been constructed earlier then they were. They should respect the pattern of façade division by ensuring the horizontal and vertical architectural orders are aligned with neighbouring buildings.

Overall, the Downtown Fenwick area is envisioned to establish a public plaza for community events and gatherings at the intersection of Canboro Road and Welland Road, with a clear focal point feature; create more comfortable streetscapes through widening sidewalks; and establishing special architectural features and public art at terminuses of view corridors (**Refer to Figure 14. Fenwick Demonstration Plan, Downtown Master Plan for Fenwick and Fonthill, 2014**).

Figure 14. Fenwick Demonstration Plan, Downtown Master Plan for Fenwick and Fonthill, 2014

3.2. NIAGARA REGION MODEL URBAN DESIGN GUIDELINES, 2005

Niagara Region's Model Urban Design Guidelines outline ten Smart Growth principles to encourage growth in the Region that balances economic, social, and environmental needs.

Section I of the Guidelines outline key principles as identified by Niagara Region:

1. Create a mix of land uses
   Low rise, single-use neighbourhoods should be balanced by a mix of single and multiple family housing forms. A mixture of housing forms and types can help ensure a more attractive and vibrant neighbourhood character.

2. Promote compact built form
   A more compact built form ensures a range of development types may be included within a small area. Innovative design solutions should be used to make use of odd-shaped lots, or less desirable sites like greyfield and brownfield sites.

3. Offer a range of housing opportunities and choices
   Housing diversity permits people of different generations to live closer together, which allow young families and seniors to stay in the neighbourhood they are familiar with. To foster this environment, townhouses and apartments should be designed as attractive, high-quality buildings. Garages should minimize their presence in the overall building form.

4. Produce walkable neighbourhoods and communities
   All streetscape designs should accommodate sidewalks on at least one side of the street, with regularly spaced trees. Streetscapes should also include access to dedicated off or on-road cycling lanes and trail connections.

5. Foster attractive communities and a sense of place
   Heritage preservation and architectural guidelines should address recommendations for the preservation and extension of existing heritage buildings. Any infill developments should respect the existing community fabric.

6. Preserve farmland and natural resources
   The Niagara Escarpment, Good Tender Fruit and Grape Lands, and Good General Agricultural and Rural Lands play a direct role in the Region's economy through goods production and tourism. The interfaces between developed, and farmland or open space areas should be designed to maintain views and access to natural areas, and minimize adverse impacts on sensitive areas. New development should be compact to maximize land use, and be designed sustainably.

7. Direct development into existing communities
   Secondary Plans should address and encourage infill development to reduce long-term infrastructure costs and create more compact and accessible built form. Additional guideline documents should ensure that new buildings fit into and contribute to the creation of walkable, visually attractive and vibrant neighbourhoods.

8. Provide a variety of transportation choices
More multi-use trails, paths, and storage facilities should be implemented to encourage cycling. Road cross-sections and block patterns should be designed to accommodate existing and future transit services.

9. Make development predictable and cost-effective
Design guidelines should be clear and objective, to encourage predictable development. Guidelines should also address alternative designs that result in long-term cost savings for municipalities and private landowners.

10. Encourage community stakeholder collaboration
Members of the community should be actively involved in the development process. Community feedback may be generated through community workshops.

Section 3 of the Guidelines present public realm design principles for the Neighbourhood Structure, Roads, Sidewalks and Streetscaping, Parks and Open Space, Natural Heritage, Multi-Use Trails, Storm water Management Facilities, and Environmental Sustainability.

The Neighbourhood Structure should promote a strong sense of place with a defined structure that includes a mixed-use centre that transitions to an edge approximately 400 metres away (walking distance) with positive interfaces and connections to adjacent areas. Neighbourhoods should be interconnected, compact and walkable, and contain a diversity of land uses and housing types (3a.1, 3a.2). Neighbourhood blocks should generally range between 200 and 250 metres in length. If longer than 250 metres, blocks should contain a through-block pedestrian walkway with a minimum width of 3.5 metres. Parkettes should be a minimum 12 metres in width (3a.3.a, 3a.3b). Wherever possible, 50 percent of the perimeter of parks and other public open spaces and natural areas should be bounded by the public road right-of-way and faced with single-loaded streets (3a.5.a).

Roads should provide adequate bicycle infrastructure located adjacent to the sidewalk, should be clearly identified with signage and/or pavement identifiers, and generally be between 0.75 – 1.5 metres wide (3b.3.c). For all road classifications, sidewalks 1.5 metres in width should be provided on both sides of the street (3b.5.e).

Sidewalks and Streetscapes should be designed to promote active use by residents and visitors (3c.1). Sidewalks in commercial areas should be a minimum 3.5 metre width, and be comprised of a 1.5 metre-wide walkway and 2 metre boulevard (3c.3.a).

Community Parks should generally be 1to 3 hectares in size, and located along Arterial and Collector roads (Sections 3d.3.a, 3d.3.b). Neighbourhood parkettes can be as small as one or two residential lots and generally located within 400m of most dwellings (3d.4.a).

Natural Heritage areas should be preserved to protect natural vegetation, ecological functions, and the cultural landscape (3e.1.1). For developments adjacent to valleylands and stream corridors, setback from valley slopes where bank height is less than 3 metres should be a minimum of 7.5 metres from the Authority-approved top of slope. The valley should be maintained in a natural state and there shall be no disturbance of grades or vegetation below the top of bank (3e.4.c). Existing trees and significant vegetation should be preserved whenever possible. Trees with a minimum 30 centimetres in diameter or more than 3.5 metres in height, or trees in groups of 10 or more with a minimum diameter of 15 centimetres measured 1.4 metres from the diameter breast height should be protected during construction (3e.6.a, 3e.6.b).

Section 4 of the Guidelines present private realm guidelines for Residential, "Main Street" & Street Commercial, Large Format Commercial, High Rise Buildings, Industrial, Off-Street Surface Parking, and Environmental Sustainability areas.

A full range of residential housing types should be provided to promote variety and diversity, and to address changes in market conditions. Identical house elevations should not be located on adjacent or opposite lots, including flanking lots. Identical elevations, either in design or color, should not comprise more than 25 percent of the same street. Residential density should be increased at appropriate locations to promote transit use. Target net densities for residential housing types are as follows:

- Single Detached - up to 10 units/acre
- Semi-Detached - up to 20 units/acre
- Townhouse - up to 40 units/acre
- Apartment - over 25 units/acre (Sections 4a.2.b, 4a.2.c, 4a.2.d). Next steps

4. NEXT STEPS

4.1. SUMMARY OF OPPORTUNITIES

Based on the team's research, visual survey, and public input, the following public realm and built form opportunities have been identified to be considered in the development of land use options for the study area.

Identified opportunities include:

A. PUBLIC REALM

- Opportunities to develop neighbourhoods with a linked pedestrian network that extends to the Village's existing and future pedestrian facilities;
- The introduction of local share-the-road opportunities and the formalization of existing cycling routes;
- The opportunity to further strengthen Pelham's transit ridership and potentially develop a Fenwick "loop";
- The provision of mid-concession connectors linking Memorial Drive to Welland Road;
- The provision of mid-concession connectors linking Cream Street to Balfour Street (south of Canboro Road);
- The implementation of formal pedestrian crossings along Canboro and Welland Roads;
- Development of two new gateway areas at Cream Street and Canboro Road and Cream Street and Welland Road;
- The enhancement of Canboro Road as a historic scenic road or historic "Promenade" through the development of a cross section that implements the recommendations put forward in the 2014 Downtown Master Plan such as the potential for historical interpretative trails extending from Fonthill to Fenwick;
- The opportunity to reduce future local road widths to address traffic calming considerations;
- The development of neighbourhood streetscapes that build on the Village's existing character of generous planted front lawns and reduced driveway presence;
- The development of an open space pedestrian network that connects the existing natural heritage resources to a new parks system;
- The integration of existing cultural heritage features to the overall neighbourhood design as key gateway, landmark and/or open space features; and,
- The integration of storm water management facilities to the overall open space system.

B. BUILT FORM

Based on our Village character assessment and in order to introduce built form typologies that are in keeping with the Village's existing residential character we have identified the following built form performance standards:

- Clear, direct, and unobstructed front entrances;
- Generous front lawns along existing bounding roads;
- Garages that are located at the back of buildings or set back from the buildings' front main entrances to minimize their impact on the streetscape; and,
- A two to four storey built form.


Image 73. Typical Built Form, with front porch


Image 74. Typical Built Form, with front porch


Image 75. Maple Street Streetscape

4.2. KEY BACKGROUND DIRECTION AND NEXT STEPS

This background report provides initial analysis of the East Fenwick Secondary Plan area. It has addressed key Municipal, Provincial and Regional policies that will guide the next steps of the Secondary Plan process; the development of land use options. It has also identified planning and urban design components such as keeping with the character of the existing town and conserving natural heritage. This has provided a framework from which the land use options and policy will be developed. This report is the initial step in the Secondary Plan process and will be supplemented with the following next steps:

1. Public Consultation – provide the public with background information regarding the Secondary Plan process, guide the public in developing a vision for development of the Secondary Plan area. The goal of these sessions is to gain public feedback and insight on future needs and wants of the town that will help shape the Secondary Plan. The public consultation process will be two fold; the first includes workshops and presentations to the general public. The second will be focused on youth in the community and will include presentations and workshop to Elementary and High school students in Pelham.
2. Council Meetings – Ute Maya-Giabattista will provide Councilors in the Town of Pelham with an update on the Secondary Plan process and receive feedback on the progress and direction of the plan.
3. Steering Committee – SGL Planning & Design will meet with the steering committee, which is made up of Town Staff, a representative from the Region, NPCA and land owners. The Steering Committee will provide feedback and insight on the development of land use options and policy for the Secondary Plan.
4. Land Use Options Report – this report will include demographics, density, population and job overview for Pelham and the settlement of Fenwick. The report will also include an analysis and evaluation of land use options based on the study's design principles and development criteria, followed by the preferred land use plan and urban design guidelines.
5. East Fenwick Secondary Plan – the final Secondary Plan will provide the Town with policy, which will guide and govern the development that will take place in East Fenwick. The Secondary Plan will provide land use policy and urban design guidelines from the type of allowable use to proposed green spaces and road ways for future development.


ENVIRONMENTAL AREAS
RESTROOM
EAST FENWICK SECONDARY PLAN STUDY AREA
EXISTING BIKE PATH MAP

APPENDIX A

PUBLIC INPUT

JUNE 22ND, 2017 VISIONING WORKSHOP

On June 22nd, 2017, Town staff members and the consulting team assembled at the Village of Fenwick's Fire Station 2 to conduct a Visioning Workshop regarding the East Fenwick Secondary Plan.

The evening session commenced with an introductory presentation of the project's purpose, design principles identified for maintaining the Village's character, the project's process and estimated timeline, and an analysis of existing background studies and character analysis of the study area. Please refer to the end of this appendix to view the Visioning Workshop presentation.

The workshop aimed to obtain public input regarding the type of development most appropriate for the Village, and the types of community features most desired by the residents. Residents were provided with 3 questionnaires to fill.

In general, members of the public were concerned with the implications of the Secondary Plan with regards to development in the community. Key points raised during the presentation included:

- Concern for environmental preservation of trees, wildlife, etc;
- The need for maintaining Fenwick's small-town feel; and,
- Impacts of projected traffic counts based on Provincial minimum density requirements, and forecasted population growth resulting from development in the Secondary Plan study area.

A. VISIONING SURVEY QUESTIONS

The first questionnaire presented to members of the public was a Visioning Survey. The survey was presented as two parts: Fenwick Today, which gathered information on the existing amenities and characteristics most valued by residents and East Fenwick Tomorrow, which aimed to envision the most desired community infrastructure and amenity features.

Fenwick Today

What attracts people to East Fenwick? What part of the culture, history or natural environment of East Fenwick makes it a livable community? Why?

Overall, the most attractive aspect of Fenwick as identified by respondents is the open spaces, mature trees, and diversity in housing styles. Other attractive features of the community include:

- Rural atmosphere and lifestyle;
- Cheap land and large housing lots;
- Small town or village feel;
- Low traffic; and,
- Abundance of wildlife.

What scenic roads, historic buildings or landscapes are important to the character of East Fenwick? Why?

Respondents identified most major roads within the Secondary Plan study area as scenic roads (Cream Street, Canboro Road, Welland Road, Memorial Drive, and Sunset Drive). In addition, respondents identified the historic core and local shops as important characteristic features of Fenwick.

What events, activities, organizations, or businesses in East Fenwick celebrate or help promote an understanding of the area's history and culture? Why?

Respondents identified the following as key events, businesses, and features that promote East Fenwick:

- Lion's Club, and Lion's Club parade;
- Fenwick carnival;
- DeVires Farm;
- Sports;
- The Parade;
- Timeless markets;
- Roadside fruit and vegetable stands; and,
- Agricultural nature of the area.

East Fenwick Tomorrow

The following presents the most desired community infrastructure and amenities desired by respondents:

1. Respondents identified the most desired Community Design Principle as planning for people and places, not cars and traffic;
2. Respondents identified aligning trees along the street as the most important aspect in designing active transportation connections within the Secondary Plan area;
3. Respondents preferred for development to occur along specific Secondary Plan area streets (such as Canboro or Welland Road);
4. The most desired housing type was identified as semi-detached units;
5. The most desired park type was identified as parks for walking, sitting and children's play; and,
6. The most important strategy for connecting people with the natural environment within and surrounding the Secondary Plan area was identified as preserving mature trees neighbourhoods.

B. VISUAL SURVEY

The second questionnaire presented to members of the public was a Visual Survey, where respondents had the opportunity to "vote" on images representing their most preferred Housing, Open Space, and Streetscape design features.

Housing

The most preferred housing options were low-density, single-family detached housing on large lots. Respondents indicated that these housing types maintained Fenwick's village or town feel. One respondent indicated mid-rise apartment or condominium buildings are best suited for senior housing.

Open Space

The most preferred open space design feature was walking trails connecting natural feature areas. The second most preferred open space design feature was painted and/or separated bike lanes on roadways.

Streetscapes

The most preferred streetscape typology was rural road streetscapes, with large front yard setbacks and large, overhanging tree canopies. One respondent indicated the streetscape should not follow the setbacks and streetscape features present in the Cherry Ridge Estate developments.

Apart from some obscured names, attendants to this event included:

Fenwick Residents

K. and S. Jeffs
Bobby Kozjan
Vanessa Baran
Brian Moores
Jordan Vanderhaeven
Tom Burger
Cynthia Nauta
David Stremraw
Tim Casson
Lauren Gibson
Mike Young
Reid Turner
Marianne Stewart
Mike Rhore
Chris Beal
Keith Gurr
Johnna Hope
Lynn, David, Abigail, Weston, and Harrison Shatford

Development Stakeholders

Rob Lucchetta – Lucchetta Homes, Partner

Jack Dekorte – Hert Inc. Land Developers, General Manager

Town of Pelham

Darren Ottaway – Chief Administrative Office

Barbara Wiens – Town of Pelham, Director of Planning & Development

Julie Hannah – Town of Pelham, Planner

Consultant Team

Ute Maya-Giambattista – SGL Planning & Design, Principal Planner and Urban Designer

Shikha Jagwani – SGL Planning & Design, Urban Designer and Planner

Natasha Crombie – SGL Planning & Design, Political Science summer student

Rick Goertz – Associated Engineering, Senior Project Manager

Shaun Toner – Matrix Solutions, Senior Environmental Scientist

Diane Relyea – Matrix Solutions, Landscape Architect

JUNE 21ST, 2017 ELEMENTARY SCHOOL SESSION

On June 21st, 2017, SGL, led by Ute Maya-Giambattista, conducted a presentation and workshop at St. Ann Catholic Elementary School regarding the East Fenwick Secondary Plan.

The aim of the workshop was to obtain student input regarding the key features that make Fenwick a great community and the desired development features for Fenwick's growth.

The session began with a presentation from Ute Maya-Giambattista regarding the project, and what makes a community thrive, illustrated through the design principles of: connectivity, safety and comfort, diversity, community amenities and natural heritage.

The presentation was followed by a visual and written survey. The survey was presented as two parts: Existing Fenwick, which gathered information on the existing amenities and characteristics most valued by residents and Future Fenwick, which aimed to envision the most desired community infrastructure and amenity features.

Students had the ability to highlight Fenwick's key community amenities (school, library, park and church) as well as the retail and service amenities (pie shop, restaurants, Clarence Service Centre and Convenience Store).

The students then illustrated their home, daily route to school and their method of transportation, whether it be by bus, car, cycling or walking. Most students used car transportation as well as the school bus to and from school. Most of students traveled from outside the town limits within Pelham. Students only illustrated cycling or walking to school if their home was within a five-minute walk.

The students favoured the school, church, library, restaurants, parks, trails and green spaces within their community. They disliked the current subdivision, the lack of bike paths and the pollution/garbage within the community.

The students envisioned community parks, trails, bike trails/paths, hiking trails, greenspace, a community pool and an ice skating rink. Most of students envisioned streets that are quiet, paved, with safe sidewalks and bike paths, designed with flowerpots, light fixtures and with tree canopies. Students envisioned retirement homes, apartments, accessible housing and medium size country-style homes with gardens, large yards and trees. The students generally believed that accessible schools, parks, trees, bike trails, community activities and safer roads would make the community better for young people.

In summary, key points included:

- Preserving the community's greenspaces, wildlife and trail-system;
- Maintaining the community's small-town and agricultural feel;
- Creating safe sidewalks and bike paths; and
- Creating more parks for the community.

The following presents a summary of respondent answers.

Existing Fenwick

I think the best place in my community is the:

- School
- Church
- Library
- Restaurants
- Mechanic shop
- Centennial Park
- Forest & Trails
- Soccer Fields
- Green Space
- Avondale
- Downtown Fenwick

The worst place in my community is:

- The Broken Gavel
- Cambro Grill
- The subdivision (present and proposed)
- Cherry Ridge
- Canboro with no ledge for biking
- No safe bike paths
- Downtown
- The pollution at the park

My favourite place in my community is:

- St. Ann School
- Church
- Library
- Mechanic shop
- Restaurants
- Bike trails
- Trails
- Parks
- Centennial Park (swings)
- Library
- Rail Trail
- The Broken Gavel
- Open Space

Future Fenwick

As Fenwick grows, what types of parks would you like to have?

- Pool/Water park
- Ice skating rink
- Sports park
- Equestrian park / riding ring with barrels
- Natural park (with trees and wildlife)
- Picnic tables at parks
- Bike/skate park
- Dog park
- Parks with swings
- Hiking trails
- Duck pond

How should streets be designed?

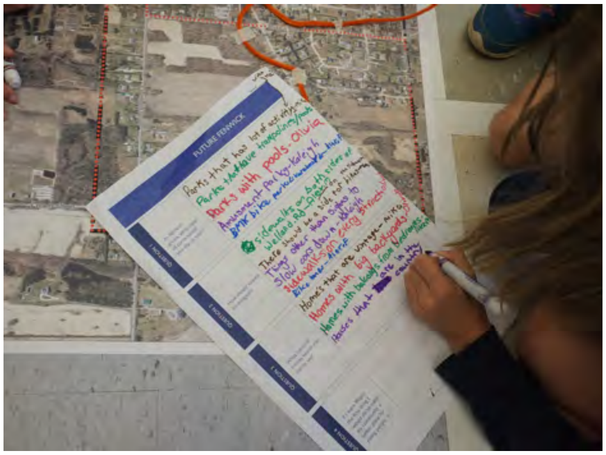
- Paved streets (no potholes)
- Not busy
- Lighting Fixtures
- Designed with flowers and lamps
- Sidewalks
- Storm-drains
- Two-way streets
- Similar to current streets
- Safe bike lanes
- Tree canopy
- No streetlights
- Sidewalks on both sides of Welland

What type of homes would you like to see?

- Apartments
- Accessible housing
- With gardens, trees, grass
- Country style homes
- Not modern
- Homes with tree canopies
- Homes on large lots spread apart
- Small and medium sized
- "Cozy" homes
- Large yards
- Retirement Homes

If I were Mayor; the first thing I would do to make my community better for young people is:

- Accessible schools (for the blind and/or deaf)
- Parks for younger children
- Parks and outdoor places
- Plant trees
- Bike trails
- Activity trails
- Greenhouses
- Use solar panels
- Safer roads
- Movie theater/arcade/community amenities
- More picnic tables at parks
- Goodwill or Salvation Army (donation centre)



PART 3

MATRIX SOLUTIONS: NATURAL HERITAGE AND HYDROGEOLOGY EXISTING CONDITIONS REPORT

NATURAL HERITAGE AND HYDROGEOLOGY EXISTING CONDITIONS REPORT
EAST FENWICK
TOWN OF PELHAM

Report Prepared for:
SGL PLANNING & DESIGN LTD.

Prepared by:
MATRIX SOLUTIONS INC.

August, 2017
Guelph, Ontario

Unit 7b 650 Woodlawn Rd. W.
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T 519.772.3777 F 519.648.3169
www.matrix-solutions.com

NATURAL HERITAGE EXISTING CONDITIONS

EAST FENWICK

TOWN OF PELHAM

Report prepared for SGL Planning & Design Ltd., August 2017

	reviewed by
Shaun Toner, B.Sc., P.Biol., PMP **Senior Environmental Scientist**	**Arnie Fausto, M.Sc.** **Senior Ecologist**

CONTRIBUTORS

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Scott Miller, P.Geo.	**Hydrogeologist**
Sam Bellamy, P.Eng.	**Principal Water Resources Engineer**
Bill Blackport, M.Sc., P.Geo.	**Senior Hydrogeologist**

DISCLAIMER

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

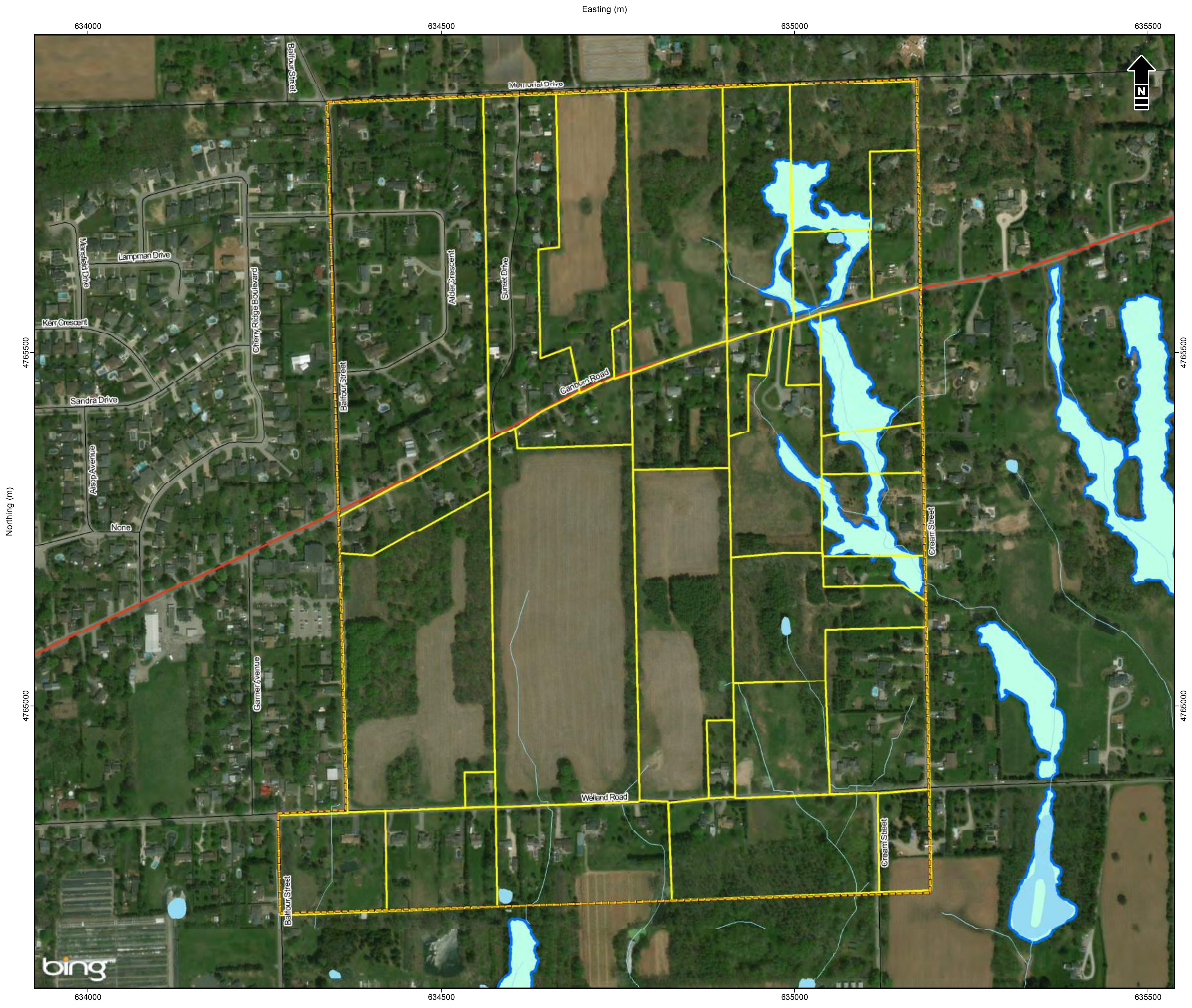
APPENDICES

1 INTRODUCTION

SGL Planning & Design Ltd. retained Matrix Solutions Inc. to complete a natural heritage study to support the preparation of the East Fenwick Community Secondary Plan (EFCSP) in the Town of Pelham, Ontario. The purpose of the EFCSP is to guide future growth and development in East Fenwick, including the Greenfield area, in accordance with the Provincial Growth Plan (Government of Ontario, 2017) that is complimentary to the current village of Fenwick (Town of Pelham, 2014). In support of the EFCSP, Matrix has undertaken a natural heritage and hydrogeology characterization study of the subject lands to provide an opportunities/constraints framework.

1.1 Study Area

The Study Area is located on the east side of the urban boundary of Fenwick, encompassing approximately 95 hectares (235 acres) bounded by Memorial Drive to the north, Cream Street to the east, properties fronting Welland Road to the south, and Balfour Street to the west as shown on Figure 1.1. The Study Area is bisected by Canboro Road, with land uses that include a mix of residential properties, agricultural fields, as well as a fragmented woodlot, a Provincially Significant Wetland (PSW), permanent and intermittent streams, and semi-natural areas such as fallow fields. The Study Area is located along the drainage divide between the Fifteen Mile Creek subwatershed and the Coyle Creek subwatershed.



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Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

Niagara Region
East Fenwick Secondary Plan

Study Area

Date:	Project:	Submitter:	Reviewer:
July, 2017	24850	D. Relyea	S. Toner

Figure
1.1

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1.2 Study Objectives

The purpose of this study is to provide an environmental characterization of the Study Area through a review and confirmation of existing natural heritage and hydrogeologic features. The information presented in this report will be used to do the following:

- develop recommended natural heritage opportunities and constraints mapping to help guide land use planning for the EFCSP; and
- provide guidance and recommendations for more detailed environmental studies required to support development planning

The following sections summarize background research and observed existing conditions within the Study Area, development opportunities, and constraints based on relevant legislation, as well as recommendations and future detailed studies required to meet legislative requirements.

2 GROUNDWATER

2.1 Background Review

To characterize the existing groundwater resources in the Study Area, a background review of existing data and documentation was completed. This review included sources on a regional and local scale.

The following regional geological maps and reports were reviewed:

- Physiography of Southern Ontario (Chapman and Putnam, 1984)
- Quaternary Geology and Industrial Minerals of the Niagara-Welland Area, Southern Ontario. (Feenstra, 1981)
- Bedrock Geology of Southern Ontario (OGS 1993; Johnston et al., 1992)
- Pleistocene Glacial Fan Deltas in Southern Ontario, Canada. (Martini, 1990)
- The Soils of the Regional Municipality of Niagara. (Kingston and Presant, 1989)

In addition, the following regional hydrogeological studies were reviewed:

Niagara Peninsula Conservation Authority Groundwater Study (WHI, 2005)

This report documents the regional groundwater characterization, an evaluation of the hydrogeological sensitivity and an inventory of potential contaminant sources.

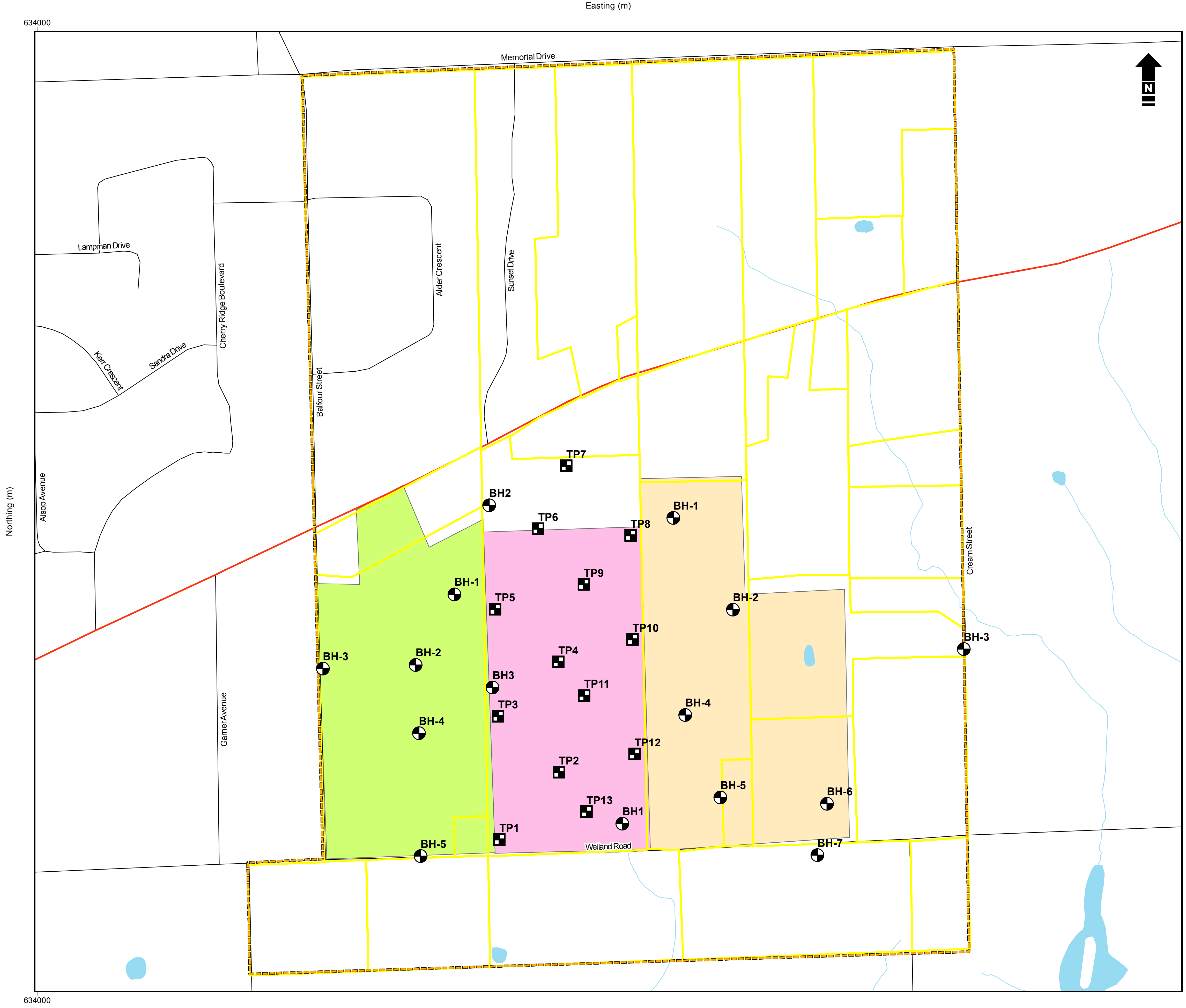
Updated Assessment Report Niagara Peninsula Source Protection Area (NPCA, 2013)

This report documents the regional groundwater characterization, a water budget and water quantity threats assessment, groundwater vulnerability and threats analysis, and a surface water vulnerability and threats analysis.

Hydrogeologic Assessment of the Fonthill Kame-Delta Complex (Blackport, 2005)

This intermediate scale groundwater study was completed as a technical appendix to the NPCA Groundwater Study (WHI, 2005). This study was focused on the entire Fonthill Kame (the Kame) and the potential groundwater surface water interactions with the adjacent water courses. A detailed field program including the installation of multi-level wells and spot baseflow measurements was more focused north of the Study Area but included a number of spot baseflow measurements along Foss Road.

In addition to the regional sources, a series of studies previously completed within the Study Area were reviewed. Local studies containing data relevant to groundwater conditions within the Study Area are described in the following subsection. The approximate boundaries and locations of test pits and boreholes related to the site-specific study for each report are shown on Figure 2.1.



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Niagara Region
East Fenwick Secondary Plan

Local Hydrogeological Studies

Date:	Project:	Submitter:	Reviewer:
July, 2017	24850	S. Miller	B. Blackport

Figure
2.1

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Onsite Sewage Evaluation, 678 Canboro Road, Fenwick, Ontario (AMEC, 2002)

Lucchetta Construction retained AMEC Earth and Environmental Limited to perform an environmental impact analysis relating to the sewage disposal aspects of a proposed subdivision within the Study Area. The report includes a very brief description of the local soils and groundwater system including the Fonthill Kame complex. This study included three new boreholes drilled to depths between 6.3 and 9.8 m below ground surface (bgs). The boreholes were subsequently completed as monitoring wells. In addition, 13 test pits were dug to depths between 2.4 and 2.7 m bgs. The encountered soils were consistently described as silty fine sand and fine sand with silt layers to the deepest extent of each borehole and test pit. Static water levels ranged from 1.4 to 8.2 m bgs with the greatest depth to water in the north and lowest in the south.

Arber Property, Welland Road, Town of Pelham, Ontario (AMEC, 2006a) and Woodland Subdivision, Balfour Street, Town of Pelham, Ontario (AMEC, 2006b)

Upper Canada Consultants Ltd. retained AMEC Earth and Environmental to complete geotechnical investigations for the Arber Property (AMEC, 2006a) and the Woodland Subdivision (AMEC, 2006b), located within the Study Area. The field investigations consisted of a total of 12 boreholes that were subsequently backfilled with bentonite grout. Eight boreholes were completed within the Arber Property and Woodland Subdivisions and four were completed on the existing streets: Cream Street, Balfour Street, and Welland Road. Boreholes were terminated between 7.9 and 8.1 m bgs and encountered silty fine sand to the termination depth at each borehole. The studies conclude that the saturated soil levels in the boreholes are believed to represent the presence of a permanent shallow water table ranging from 7.6 m bgs toward the north to 2.1 m bgs in the south.

2.2 Geology

2.2.1 Bedrock Geology and Topography

The bedrock units of the Niagara Peninsula are sedimentary and consist mainly of carbonate rocks of Ordovician (oldest) to Devonian (youngest) age (WHI, 2005). North of the Niagara Escarpment to Lake Ontario, the subcropping bedrock unit is shale of the Queenston Formation. Above the Escarpment and moving south toward the Study Area, the subcropping bedrock units are of the Clinton Group and the Lockport Formation and directly below the Study Area is Dolostone of the Guelph Formation.

The Study Area is located on the terrace of the Erigan buried bedrock channel representing a local topographic bedrock low to the southeast of the Study Area. The Erigan Channel runs from Lowbanks on Lake Erie to Fonthill, to the Niagara Escarpment near the Town of St. John's west. The channel is estimated to be 400 m wide and 25 to 50 m deep relative to surrounding bedrock, which within the Study Area is located at depths on the order of 60 to 80 m. The bedrock rises to the north-northwest toward the Niagara Escarpment.

2.2.2 Regional Surficial Geology and Stratigraphy

The regional physiography related to the Study Area includes the Fonthill Kame and the Haldimand Clay Plain immediately to the south. This physiographic setting gives rise to the surficial geology presented on Figure 2.2. The Study Area surficial geology consists of the glaciolacustrine sand and silt. The coarser glaciolacustrine sand and gravel can be found northeast of the Study Area and the glaciolacustrine clay and silt related to the Haldimand Clay Plain can be found adjacent to the Fonthill Kame.

Water well records within the Study Area show overburden thickness of 60 to 80 m onsite, which is consistent with the NPCA Groundwater Study (WHI, 2005). A schematic cross-section showing the stratigraphy of the region is shown on Figure 2.3. Stratigraphically overlying the dolostone bedrock of the Guelph formation are the Quaternary deposits of the Late Wisconsinan Substage represented by the lower tills (Catfish Creek, Port Stanley and Wentworth Till), lower glaciolacustrine deposits, Halton Till, and upper glaciolacustrine deposits. Modern alluvium and organic deposits overlie the sequence in some areas of the Niagara Peninsula. (Feenstra, 1981; WHI, 2005)

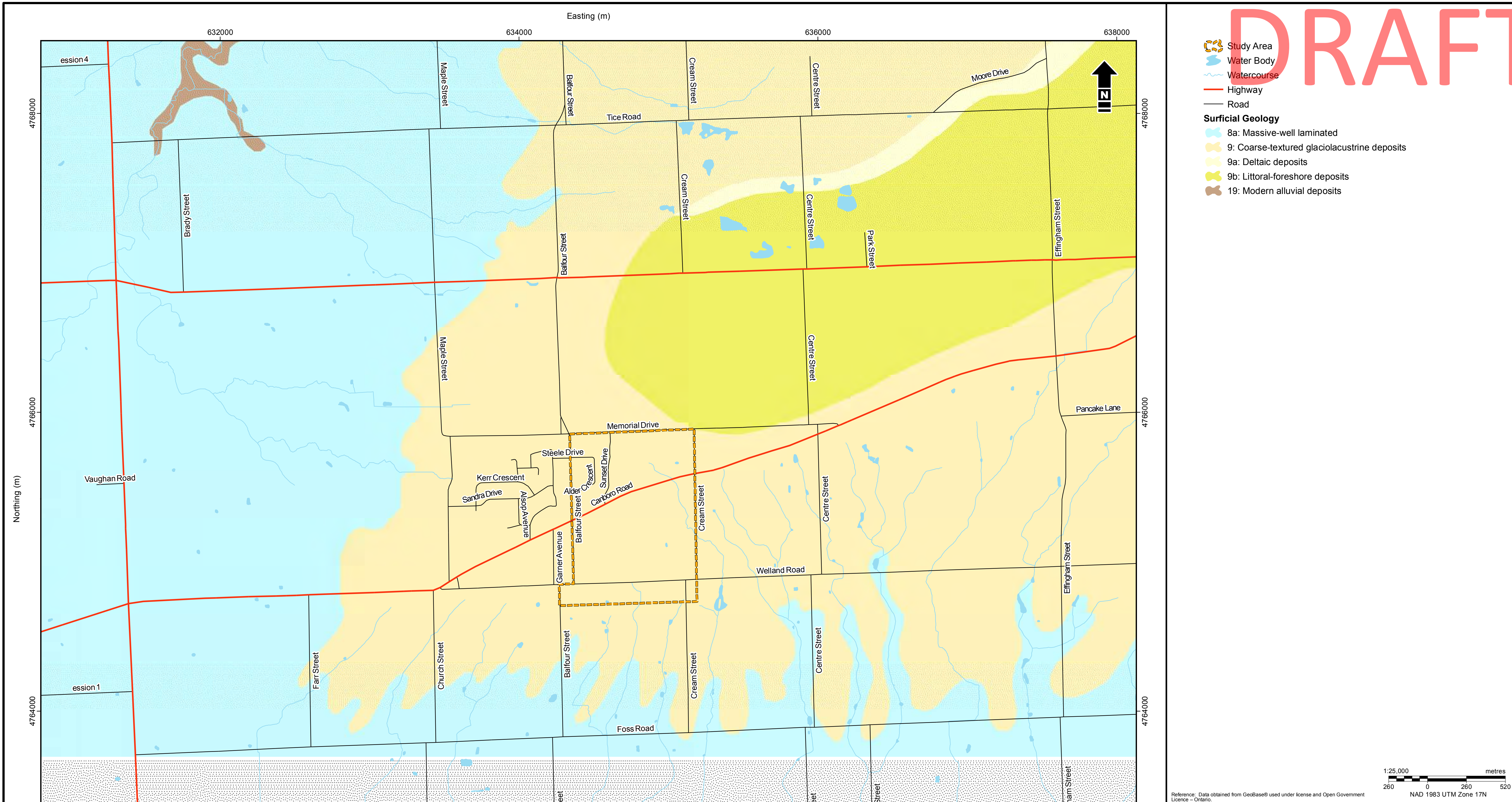
The lower tills were laid during the Port Bruce Stadial when a series of small ice lobes moved outwards from the centre of the Great Lake's basins into Southern Ontairo. The lower tils are generally compact and gravelly with silt to sandy matrix. Lower tills are found both above (south) and below (north) the Niagara Escarpment but are typically grey with dolostone fragments where they overlie the Silurian bedrock (i.e., south of the Niagara Escarpment).

Lake bottom deposits overlie the lower tills and represent an interstadial period when the Port Bruce ice retreated and a large proglacial lake formed in the Erie basin (Lake Maumee; WHI 2005). These lower glaciolacustrine deposits are mainly reddish-brown and consist mostly of sand and silt in the upper part and of clay and silt in the lower part (Feenstra, 1981).

The cooling climate of the Post Huron Stadial saw the Ontario-Erie ice lobes again advance across the Niagara Peninsula incorporating fine grained lake-bottom sediments and then depositing a sheet of silty and clayey till with interbedded sandy layers of the Halton Till complex across the Niagara Peninsula (WHI, 2005; Feenstra, 1981).

The warming period of the Two Creeks Interstadial led to the inundation of the Niagara Peninsula by proglacial lake waters depositing the upper glaciolacustrine deposits including the Haldimand Clay Plain and the Fonthill Kame-Delta Complex. Feenstra (1981) and the NPCA Groundwater Study (2005) including a Hydrogeological Assessment of the Fonthill Kame-Delta Complex as a Technical Apppendix (Blackport, 2005) go into great detail of the geology of the Kame geology. In general, the Kame is located on the Haldimand Clay Plain in the centre of the Town of Pelham, with the topographic high located approximately 4 km northeast of the Study Area. From this topographic high, three ridges extend several kilometers with one extending 5 km southwest through the Study Area to Fenwick (Blackport, 2005). The Kame complex rises roughly 40 to 75 m above the surrounding lake plain (Feenstra, 1981). It is generally accepted that the Kame formed when a tongue of glacial ice flowed into the Twelve Mile

Creek re-entrant of the Niagara Escarpment and into glacial Lake Warren, which occupied much of the Niagara Peninsula, and deposited ice contact gravels, and deltaic sediments into glacial Lake Warren (Martini, 1991; WHI, 2005).



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Niagara Region
East Fenwick Secondary Plan

Surficial Geology

Date:	Project:	Submitter:	Reviewer:
July, 2017	24850	S. Miller	B. Blackport

Figure
2.2

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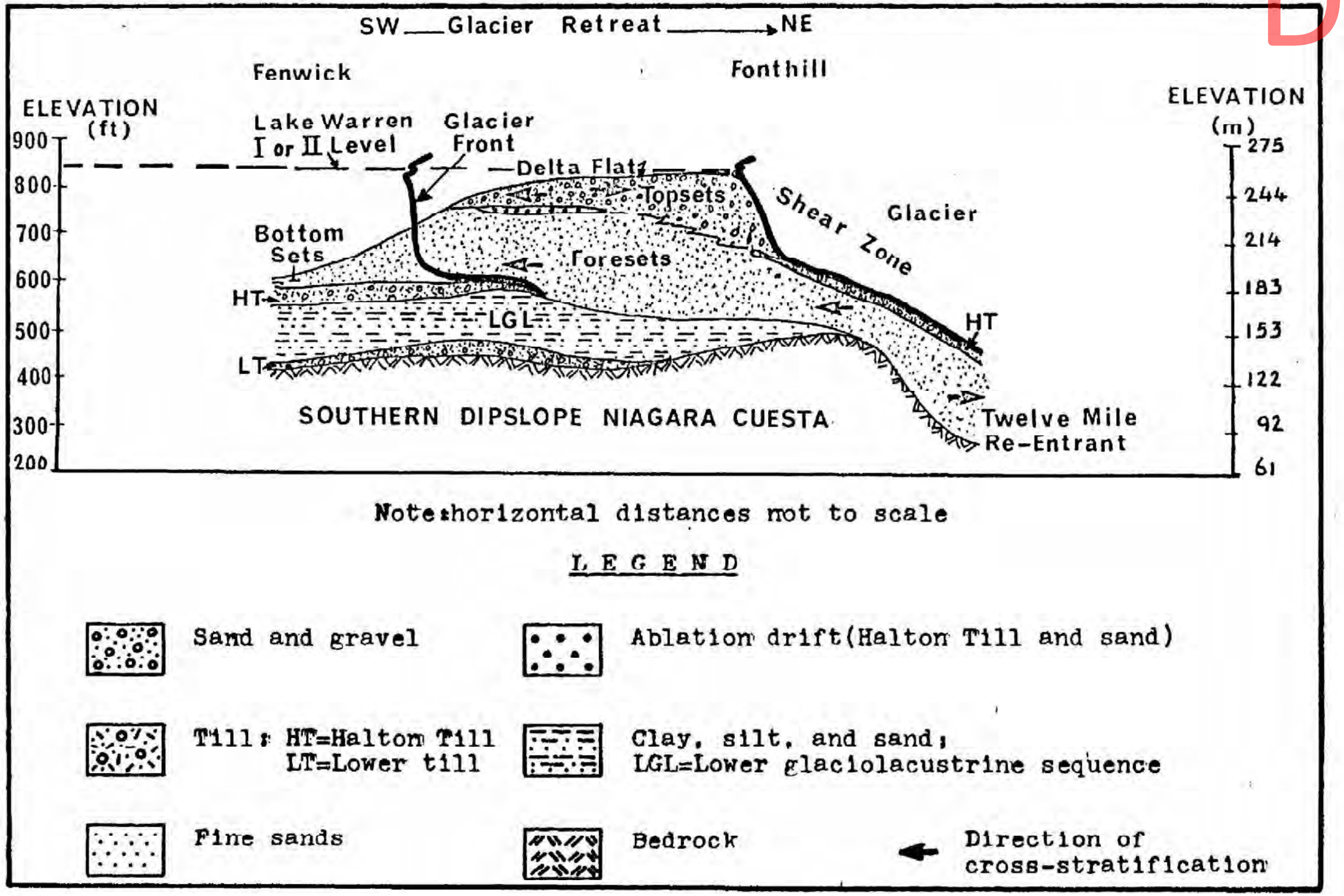
2.2.3 Local Stratigraphy

Local investigations by AMEC (2002, 2006a, 2006b) included the drilling of geotechnical boreholes and the installation of some monitoring wells (Figure 2.1). Boreholes were all completed within the southern half of the Study Area and showed consistent stratigraphy within the depth of investigation between each location. Consultant's borehole logs (Appendix A) indicate sand and silty fine sand with some bedding extending from surface to the greatest depth of investigation of 8.2 m bgs. These silty fine sands are interpreted to be of the deltaic deposits of the Kame complex. Additionally, 22 local water well records (Appendix A), mostly located around the periphery of the Study Area (Figure 2.4) are consistent with the description of the shallow materials logged in the consultant's borehole logs and the documented regional surficial geology.

A number of water well records show the fine sand Kame deposits to depths of up to 20 m bgs. Additionally a number of records show interbedded sand and clay beds from roughly 20 to 60 m bgs. A number of well records also reported "quick" sand conditions ranging from thickness of 5 m bgs to 70 m bgs making it challenging to assess the stratigraphic characteristics. It is felt that the record of thick quick sand conditions does not necessarily reflect possible inclusions of the finer grained units. The quick conditions will be discussed further in Section 2.3.2. Where records extend to the bedrock, many note a distinct hardpan material of red or grey clay with sand and boulders overlying bedrock with a thickness of 5 to 30 m.

In summary, local overburden stratigraphy is interpreted to consist of a varying thickness of fine sand to silty sand at surface. In a number of locations, this unit is underlain by fine-grained material usually documented as clay, which likely represents the Halton Till on Figure 2.3. Underlying this unit is the interbedded fine- and coarse-grained beds, which represent the lower glaciolacustrine sequence on Figure 2.3. Overlying bedrock of the Guelph Formation is the fine grained glaciolacustrine deposits or glacial till of the Lower Till (Figure 2.3). Thickness of overburden ranges from over 80 m bgs in the northeast to 60 m bgs in the south.



Reference: Ontario Geological Survey (OGS), 1981. Quaternary Geology and Industrial Minerals of the Niagara-Welland Area, Southern Ontario. OFR 5361

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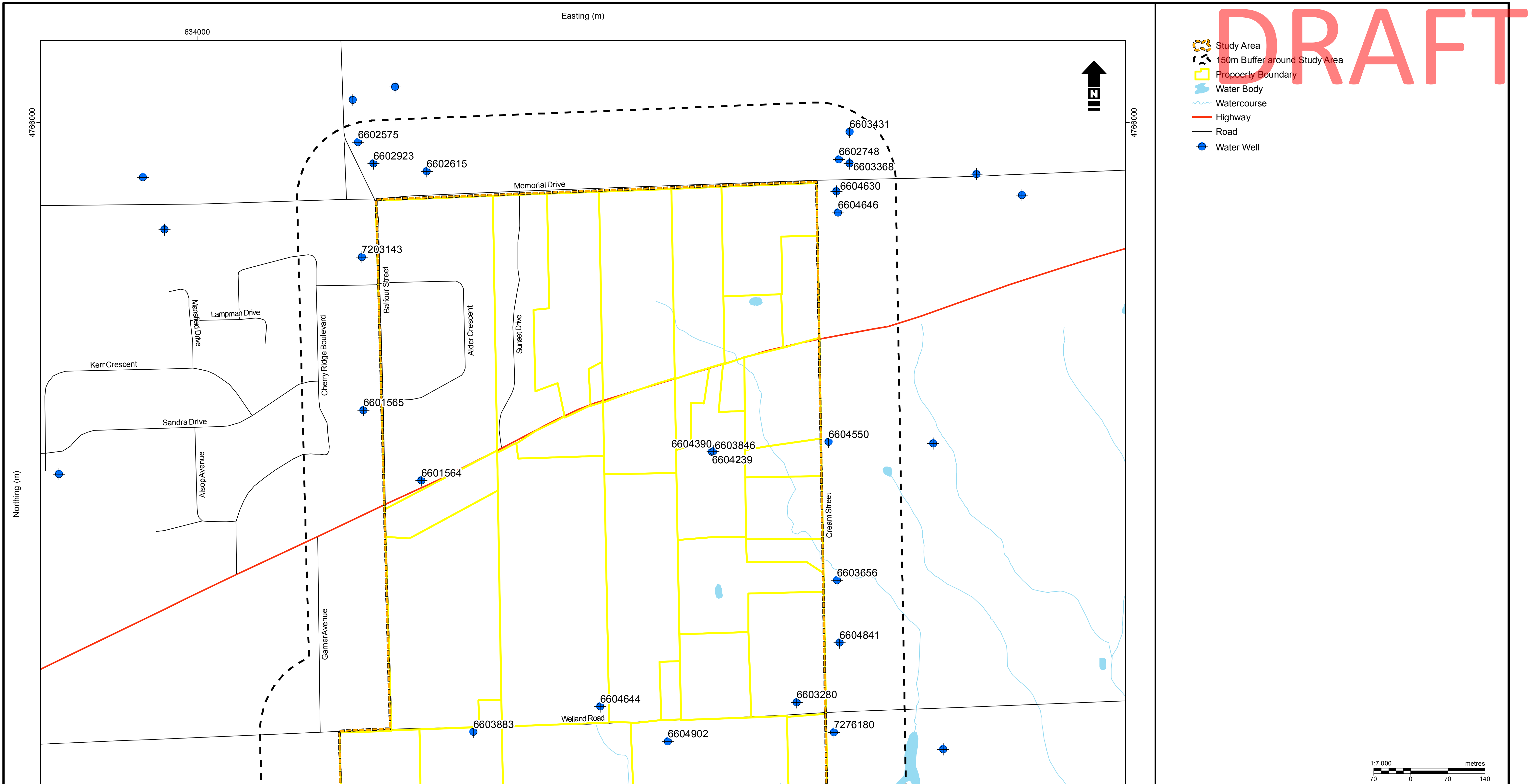
Niagara Region
East Fenwick Secondary Plan

Regional Cross Section

Date:	Project:	Submitter:	Reviewer:
July, 2017	24850	S. Miller	B. Blackport

Figure
2.3



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Niagara Region
East Fenwick Secondary Plan

Water Wells Records in a 150m Buffer Around Study Area

Date:	Project:	Submitter:	Reviewer:
July, 2017	24850	S. Miller	B. Blackport

Figure
2.4

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2.2.4 Soils

Kingston and Presant (1989) describe the Fonthill Soils as a sandy loam to gravelly loam with a reddish hue. They generally have low water holding capacities leading to problems during dry periods. Along the steeply sloping edges of the Kame, Fonthill Soils are often associated with Grimsby Soils. Similarly, Grimsby Soils are well-drained and very permeable. Grimsby Soils have a very fine sandy loam or loamy fine sand texture.

Test pit logs (Appendix A) from AMEC (2002) describe a topsoil horizon extending from surface to as shallow as 0.23 m bgs and to as deep as 0.43 m bgs. Below the top soil, test pits consistently showed brown fine sand with trace to some silt to the total test pit depths of up to 2.7 m bgs. Borehole logs from AMEC (2006a, 2006b) described shallow soils as brown and reddish brown silty fine sand.

2.3 Hydrogeology

Water from precipitation percolates or infiltrates into the ground until it reaches the water table. Areas where water moves downward from the water table are known as recharge areas. These areas are generally in areas of topographically high relief. Areas where groundwater moves upward to the water table are known as discharge areas. These generally occur in areas of topographically low relief, such as stream valleys. Groundwater that discharges to streams is the water that maintains the baseflow of the stream. Wetlands may be fed by groundwater discharge.

There are different types and rates of recharge and discharge. Water percolating into the ground at a specific location may discharge to a small stream a short distance away. This is considered local recharge and discharge. Some water may recharge in a certain area and discharge to a larger river basin a long way from the source of recharge. This is known as regional recharge and discharge.

Permeable geologic materials through which groundwater moves are known as aquifers. Aquifers are "water bearing" formations, meaning that water can be easily extracted from these units. The less permeable units are known as aquitards, and although water can move through these units, it moves slowly and it is difficult to extract water from these units. How these aquifers are connected within a hydrogeologic setting is what controls much of the movement of groundwater.

A delineation of the flow system(s) in this way will identify where groundwater originates, where it discharges and the most prominent paths it travels between these points (e.g., the aquifer pathways or more permeable hydrostratigraphic units). Having done this, one can assess the relative sensitivity of the linkage from the groundwater system to the aquatic or terrestrial systems. Knowing the level of sensitivity of the receptor, the impacts of particular types and scales of land uses or land use changes on the groundwater flow system and other linked ecosystem components can be assessed. Best management practices can then be developed to prevent unacceptable impacts from occurring.

2.3.1 Regional Hydrogeological Setting

As discussed above in Section 2.2.2, the regional overburden is primarily comprised of thick beds of coarse-grained material overlying clay-rich glacial tills and glaciolacustrine clays. The beds of fine-grained till and clay may provide a semi-confining layer between the bedrock aquifer system and the shallow groundwater originating in the Kame. Shallow groundwater flow follows topography, flowing away from the topographic high of the Kame. The Study Area is located across the end of a southwest trending ridge extending from the Kame high point near Fonthill. As such, the shallow groundwater within the Kame flows horizontally out from ridge of the Kame. To the north of the Study Area, shallow groundwater is interpreted to flow north toward Fifteen Mile Creek basin. South of the Study Area, shallow groundwater is interpreted to flow south to the Central Welland basin (WHI, 2005).

The Kame acts as a regional groundwater recharge zone as shown by the potentiometric mapping of the NPCA Groundwater Study (WHI, 2005). A local groundwater high is observed in the area of the Kame. Groundwater in the bedrock is interpreted to move in a radial direction outward from the groundwater high toward the Twelve Mile Creek (northeast), Fifteen Mile Creek (northwest) and Central Welland River (south) basins (Blackport, 2005).

Groundwater flow within the upper fractured bedrock will tend to follow the bedrock topography and on an intermediate scale will likely flow from the north-northwest toward the Erigan Channel southeast of the Study Area.

2.3.2 Local Hydrogeological Setting

AMEC (2006a) reports saturated conditions at depths of 6 to 7 m bgs in the centre of the Study Area (on the south slope of the Kame), corresponding to an elevation of 199 to 201 m asl, and although groundwater levels slope from north to south across the site, topographic relief to the south is greater. As a result, wet to saturated soils were encountered at progressively shallower depths toward the south. AMEC (2002, 2006a, 2006b) reports saturated subsurface conditions near grade in the southern extent of the Study Area. The most southern test pit completed by AMEC (2002) was saturated with water up to 1.85 m bgs while all other test pits to the north were dry.

Local domestic water well records completed in the overburden provide static water levels ranging from 13 m bgs in the northeastern extent of the Study Area to 2 m bgs in the south. Domestic water well records completed in the dolostone bedrock contact aquifer provide static water levels ranging from approximately 8 to 56 m bgs. Based on the available static water level data, there are upward gradients from the bedrock into the deeper overburden but there does not appear to be any continuous upward hydraulic connection from the bedrock or deeper overburden to ground surface. This observation is consistent with the NPCA Groundwater Study mapping for upward gradients as well the Source Protection potential discharge mapping. The recorded “quick” conditions in a number of the well records would appear to indicate that there is a significant hydraulic connection within the overburden to provide for the necessary hydraulic pressures. Whether this is occurring from depth or laterally off the Kame is not known based on the available information. The existence of perched water tables are likely within the Study Area given the stratigraphy described previously including the overall thickness of overburden, the existence of coarse-grained units overlying fine grained units and the observed static water levels. It is likely that a shallow perched groundwater flow system exists within the surficial silty sand unit and generally follows the topography. The Study Area is located across the southwest ridge of the Kame and as such shallow groundwater flow is interpreted to be north and south following topography outwards from the ridge. The lateral flow within this unit may not be continuous where the underlying clay layer is discontinuous. Recharge within the study is not expected to provide significant flux to the lower bedrock aquifer due to the prevalence of fine grained material in the overburden, the till layer at the bedrock contact and the deeper upward gradients and quick conditions described above.

This shallow groundwater flow system likely provides groundwater discharge to the creek reach at Cream Street within the Study Area and to the creek reaches originating south of Welland Road. Spot baseflows were carried out for the Hydrogeologic Assessment of the Fonthill Kame-Delta Complex (Blackport, 2005) in 2003 and 2004 at three culverts along Foss Road south of the Study Area. Spring baseflow ranged from 1.4 l/s to 5.9 l /s and summer baseflows ranged from 0.1 l/s to 1 l/s. During a site visit on July 8, 2017, there was trace flow at the creek crossing at Cream Street and no flow at the three culverts along Foss Road.

The characterization and assessment presented in the Updated Assessment Report Niagara Peninsula Source Protection Area (NPCA, 2013) has prepared thematic mapping on a regional scale. The assessment includes the following with respect to the Study Area:

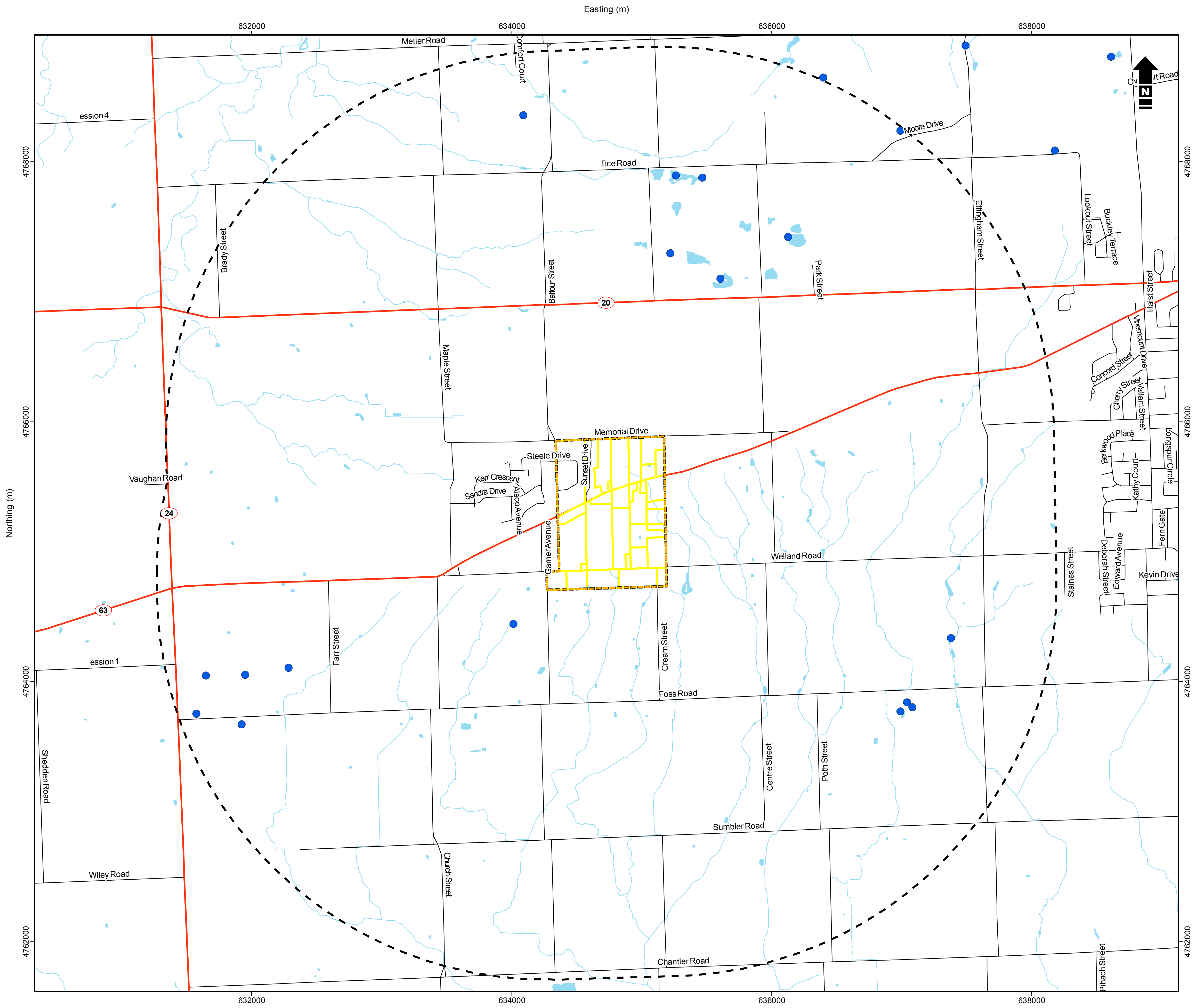
- The Study Area is not considered a potential groundwater discharge area, although the site-specific discussion presented above gives observations and an interpretation that suggests there is a limited local groundwater discharge function.
- Recharge rates on the order of 200 mm/year.
- The Study Area has a high Groundwater Vulnerability associated with a medium to high Intrinsic Susceptibility Index and high Aquifer Vulnerability index all of which are related to the shallow permeable aquifer.

The Niagara Peninsula Conservation Authority (NPCA) Groundwater Study (WHI, 2005) carried out an inventory of potential contaminant sources and there were no sources found within the Study Area.

2.3.3 Water Use

Figure 2.5 shows the 17 active Permits to Take Water (PTTW; MOECC 2017a) within a 3 km buffer area around the Study Area. Of these, 15 permits are for groundwater, one is for surface water, and one is for combined surface water and groundwater sources. In all, 11 of the permits are for agriculture, three are for commercial purposes, two are for water supply, and one is for dewatering.

There are no active municipal supply wells in the Town of Pelham since water is sourced by the Regional Municipality of Niagara from the Welland Recreational Waterway, treated and transported to the Town by watermain. However, as presented above, there are 22 water well records located within a 150 m buffer area around the Study Area (MOECC, 2017b). Copies of the water well records (where available) are provided in Appendix A. 16 of these records are completed in bedrock with six completed in the overburden sands of the Kame. Two records contained incomplete construction details. Bedrock well records show recommended pumping rates ranging from 3 to 10 Imperial gallons per minute (Igpm). Open hole intervals within the bedrock are typically 2 to 7 m and recovery following testing is generally 15 to 45 minutes indicating the presence of a highly transmissive bedrock contact aquifer. Within the Study Area, the overburden wells are constructed as 36 inch diameter bored wells. Large diameter wells are necessary due to the low permeability of the fine silty sand unit. Pumping rates are in the range of 1 to 3 Igpm.



- Study Area
- 3km Buffer around Study Area
- Propoerty Boundary
- Water Body
- Watercourse
- Highway
- Road
- ● PTTW Location

1:30,000 metres
310 0 310 620
NAD 1983 UTM Zone 17N

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Active PTTWs in 3 km Buffer Around Study Area

Date:	Project:	Submitter:	Reviewer:
July, 2017	24850	S. Miller	B. Blackport

Figure
2.5

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2.4 Opportunities and Constraints

Urban development of an area affects the natural water balance. The most significant difference is typically the addition of impervious surfaces as a type of surface cover (i.e., roads, parking lots, driveways, and rooftops). Impervious surfaces prevent infiltration of water into the soils and the removal of the vegetation removes the evapotranspiration component of the natural water balance. The reduction of infiltration and subsequent change in recharge can reduce groundwater levels and related lateral flow in the shallow system locally. The potential decrease in infiltration and increased runoff conditions are expected to be addressed through the onsite stormwater management plans for any proposed development.

Future water management plans must consider the variations in water table elevations across the site. The shallow water table elevations in the southern portion of the Study Area may not be practical for stormwater infiltration techniques. Future water management must have regard for not increasing groundwater levels in high water table areas so as to impact existing terrestrial features and infrastructure. The water management plan should also consider the additional recharge resulting from the importation of municipal water and any subsequent infrastructure (pipe) leakage and irrigation.

Water table lowering has the potential to impact potential groundwater discharge and available water for shallow wells. Lowering of the water table in developed areas can be related to the construction of servicing and utility trenches below the high water table elevation as well as basement foundation drains and sump pump usage. In the case of trenches, temporary lowering may be caused by construction dewatering activities. Over the longer term, water table lowering and the redirection of shallow groundwater flow can be caused by preferential groundwater flow into and along the permeable backfill materials typically placed in the base of service trenches. Best management practices may involve the use of anti-seepage collars or clay plugs surrounding the pipes to provide barriers to prevent groundwater flow along granular bedding material.

Future site-specific hydrogeological and geotechnical studies related to potential design and site servicing should take into account the groundwater quantity management issues presented above. A pre-development and post-development water balance is expected to be carried out for any proposed future development. Any changes to the water balance are expected to be addressed through the water management strategy with regard to the groundwater receptors.

3 TERRESTRIAL ECOLOGY

3.1 Background Review

The following secondary source information relating to the Study Area was reviewed:

- Natural Heritage Information Centre database (Government of Ontario, 2015)
- Niagara Peninsula Conservation Authority Watershed Explorer
- Town of Pelham Official Plan (Town of Pelham, 2014)
- Niagara Region Official Plan (Niagara Region, 2014)
- Central Welland River Watershed Plan (NPCA, 2010)
- Fifteen-Sixteen-Eighteen Mile Creek Watershed Plan (NPCA, 2008)
- Significant Wildlife Habitat Technical Guide (MNRF, 2000)
- Natural Areas of the Niagara Region Preliminary Survey (Region of Niagara, 1985)
- Environmentally Sensitive Areas (Regional Municipality of Niagara, 1980)

Historical data formed the basis to identifying natural features in the Study Area and was used for scoping the field investigation efforts. GIS information and recent aerial photographs were used to complete preliminary mapping of natural heritage features within the Study Area and to prioritize key areas for detailed investigation during the field assessment.

3.2 Agency Consultation

3.2.1 Ministry of Natural Resources and Forestry

The Natural Heritage Information Centre (NHIC) database maintains records relating to observations of species receiving legislative protection under the federal *Species at Risk Act* (SARA) and the provincial *Endangered Species Act*. Based on a database query on June 25, 2017 a summary of NHIC records for Species at Risk (SAR) within 1 km of the Study Area can be found in Table 3.1.

TABLE 3.1 Species at Risk with the Potential to Occur Within the Study Area (NHIC)

Species Common Name	Species Scientific Name	Species at Risk Act Federal Status	Endangered Species Act Provincial Status
American Chestnut	*Castanea dentata*	Endangered	Endangered
American Columbo	*Frasera caroliniensis*	Endangered	Endangered
Cucumber Tree	*Magnolia acuminata*	Endangered	Endangered
Woodland Vole	*Microtus pinetorum*	Special Concern	Special Concern

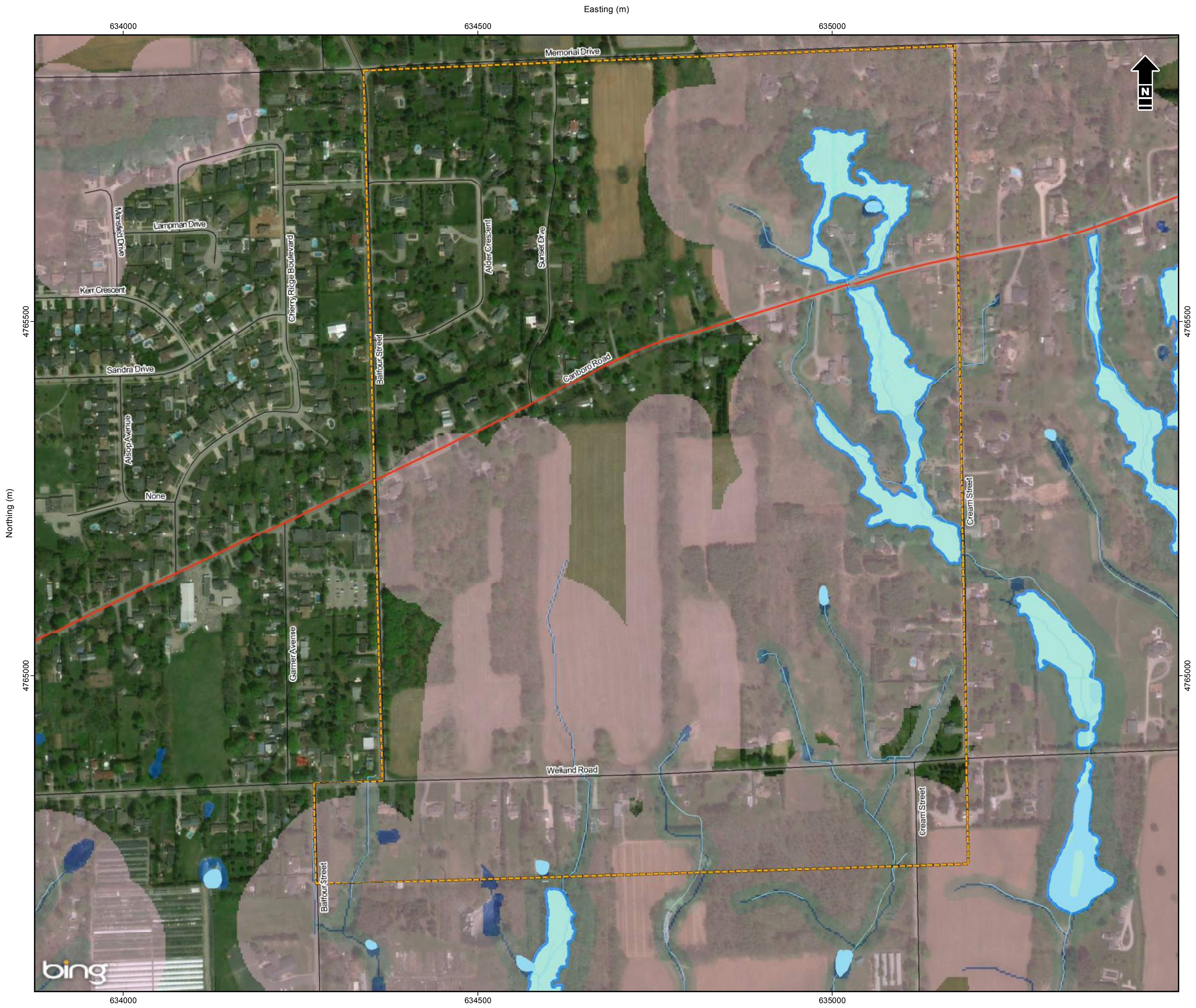
Due to the sensitivity of SAR records and location, information relating to more recent records and known locations of SAR is held in confidentiality by the Ministry of Natural Resources and Forestry (MNRF) to protect individual flora or fauna species, or their habitat from human interference. This screening information is available by request from MNRF to further characterize SAR found in the Study Area. On May 24, 2017, Matrix submitted a SAR screening request to the MNRF district office in Guelph, Ontario. As of the date of this report, a response to the request has not yet been received from the MNRF, but SAR information will be updated upon receipt.

3.2.2 Niagara Peninsula Conservation Authority

In addition to SAR documented by NHIC, NPCA provided a list of SAR species that are known to occur in Niagara Region. Although no detailed studies were conducted to specifically target the species listed in Table 3.2, Matrix considered the possible presence of these species indirectly during the field investigation by noting the presence of potential SAR habitat. Further discussion relating the need for targeted investigations is detailed in Section 4.2.3. of this report. The extent of NPCA planning review and regulatory areas within the Study Area is presented on Figure 3.1.

TABLE 3.2 Species at Risk with the Potential to Occur Within the Study Area (NPCA)

Species Common Name	Species Scientific Name	*Species at Risk Act* Federal Status	*Endangered Species Act* Provincial Status
American Chestnut	*Castanea dentata*	Endangered	Endangered
Eastern Flowering Dogwood	*Cornus florida*	Endangered	Endangered
White Wood Aster	*Eurybia divaricata*	Threatened	Threatened
American Columbo	*Frasera caroliniensis*	Endangered	Endangered
Butternut	*Juglans cinerea*	Endangered	Endangered
Cucumber Tree	*Magnolia acuminata*	Endangered	Endangered
Woodland Vole	*Microtus pinetorum*	Special Concern	Special Concern
Eastern Small-footed Myotis	*Myotis leibii*	Endangered	Endangered
Little Brown Bat	*Myotis lucifugus*	Endangered	Endangered
Northern Myotis	*Myotis septentrionalis*	Endangered	Endangered
Tri-colored Bat	*Perimyotis subflavus*	Endangered	Endangered
Bobolink	*Dolichonyx oryzivorus*	Threatened	Threatened
Barn swallow	*Hirundo rustica*	Threatened	Threatened
Red-headed Woodpecker	*Melanerpes erythrocephalus*	Threatened	Special Concern
Eastern Meadowlark	*Sturnella magna*	Threatened	Threatened
Barn Owl (Eastern Population)	*Tyto alba*	Endangered	Endangered
Eastern Milksnake	*Lampropeltis triangulum*	Special Concern	Not at Risk
Eastern Foxsnake	*Pantherophis gloydi*	Endangered	Endangered
Common Five-lined Skink	*Plestiodon fasciatus*	Endangered	Endangered
Rusty-patched Bumble Bee	*Bombus affinis*	Endangered	Endangered
Monarch Butterfly	*Danaus plexippus*	Special Concern	Special Concern



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Niagara Region
East Fenwick Secondary Plan

NPCA Planning Review and Regulatory Areas

Date:	Project:	Submitter:	Reviewer:
July, 2017	24850	D. Reylea	S. Toner

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Figure
3.1

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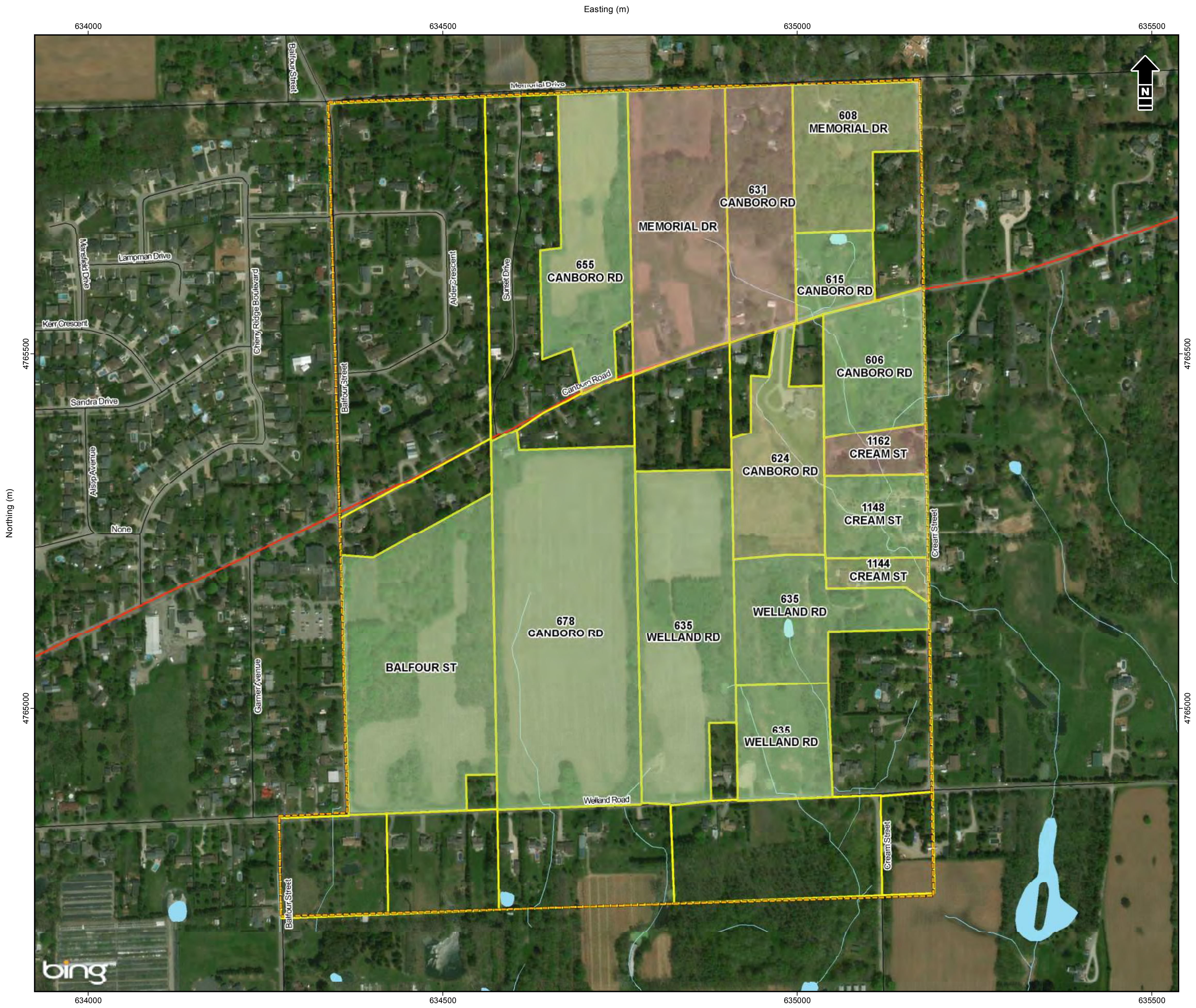
3.3 Field Methodology

A field program was completed on June 8 and 9, 2017, which included the following:

- verification of high habitat sensitivity through the targeted verification of existing Ecological Land Classification (ELC) mapping, confirmation of boundaries of ecological features such as wetlands, and observation of potential SAR habitat
- completion of a high level inventory of low habitat sensitivity (i.e., agricultural areas, residential areas) to confirm previously documented ELC mapping, if applicable, and identify any incidental significant habitat features or boundary discrepancies
- inventory of mature trees (i.e., individuals with a diameter at breast height (DBH) exceeding 40 cm), documenting species, tree health, and drip line of the largest specimens
- completion of a visual aquatic habitat survey for habitat quality outside of the wetland area, including determination of the presence of high value fish habitat
- incidental wildlife and SAR habitat observations

Field investigations were conducted only on properties for which permission to access had been previously granted by the landowner. For properties where access was not granted or there was no response from the owner, observations were made from the edge of the road or from adjacent lands (Figure 3.2).



Study Area
Propoerty Boundary
Water Body
Watercourse
Highway
Road

Permission
No
Not received
Yes

1:5,500 metres
50 0 50 100
NAD 1983 UTM Zone 17N

Reference: Data obtained from GeoBase® used under license and Open Government Licence – Ontario.
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Property Boundary Access

Date:	Project:	Submitter:	Reviewer:
July, 2017	24850	E. Wilkinson	S. Toner

Figure
3.2

I:\NiagaraRegion\24850\FiguresandTables\SWM\2017\Report\Figure-3-2-Property_Boundary_Access.mxd - Tabloid_L - 13-Jul-17, 03:23 PM - ccurry - TID005

A PSW measuring 3.3 ha in size (LIO, 2013), is located within the Study Area (Appendix B, photograph 2). However no further wetland evaluation was conducted in this area as part of this scope of work. The Provincial Policy Statement (PPS) states that development and site alteration is prohibited within PSWs and adjacent vegetative buffers; therefore evaluation of this area for development purposes was not deemed necessary. A detailed summary of applicable legislation is provided in Section 4.

3.4 Flora

3.4.1 Woodland Units

Woodlands support different plant and animal species based on habitats which differ between the edge (first 100 m from the limit of the forest) and interior of the forest. To provide high value habitat by maximizing biodiversity, woodlands should include both edge and interior habitat types, with the area of the interior habitat being larger than that of the total edge habitat area.

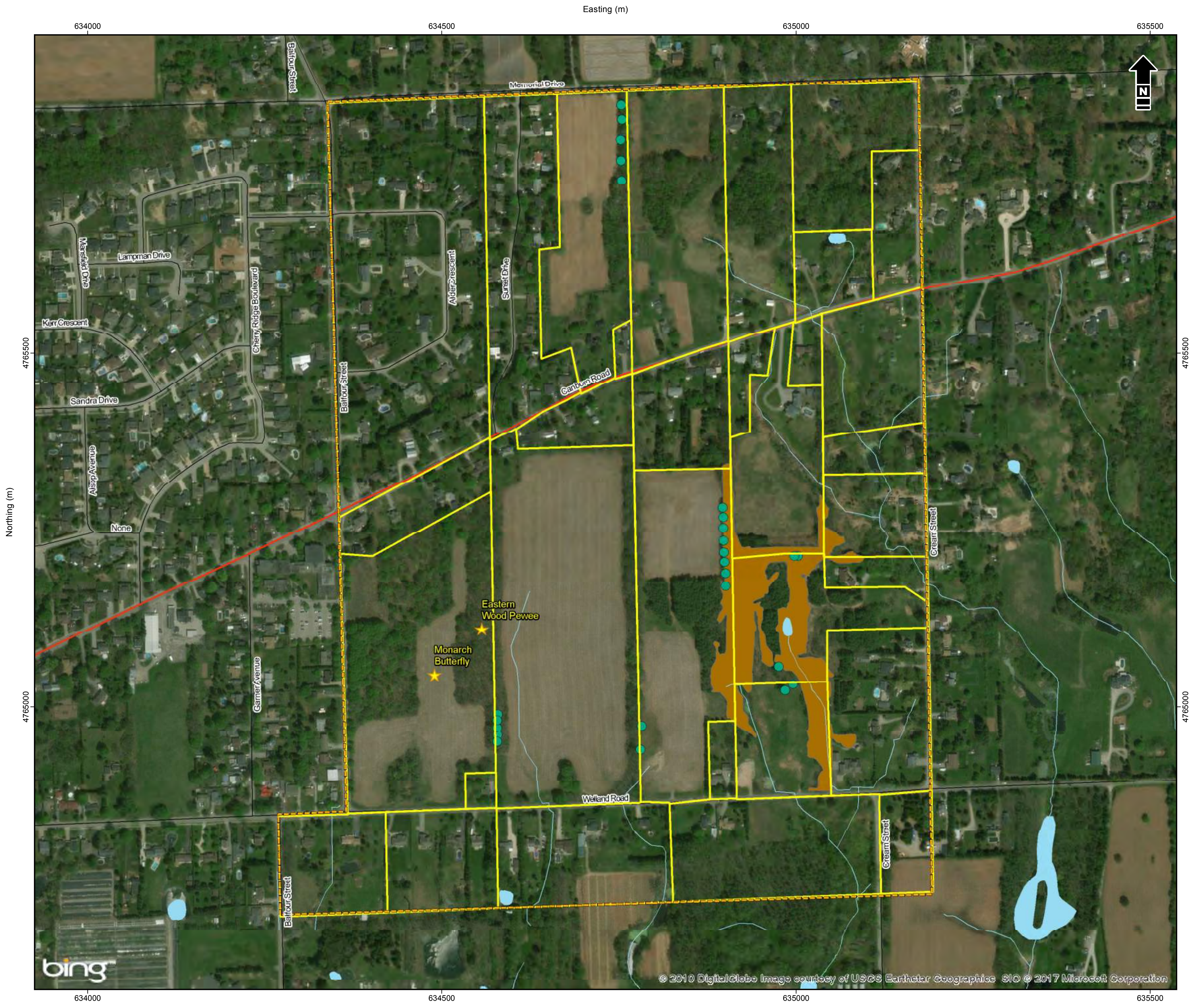
The size of woodland units in the Study Area range from 0.1 ha to 3.0 ha in size, with the average area of each being less than 0.5 ha. The majority of these woodlands are rectangular or linear in configuration (some being hedgerows rather than woodlands), and are less than 200 m in length on all sides. Due to their configuration and overall small size, there are no woodland units in the Study Area that would support interior forest habitat. Interior forest habitat will not be considered a constraint within the current Study Area.

3.4.2 Mature Trees

Several individual and groupings of naturally occurring mature trees were observed throughout the Study Area. Trees in the Study Area that are considered ‘mature’ include:

- individual trees with a DBH of 60 cm or greater
- groupings of trees greater than ten individuals with a DBH greater than 50 cm
- woodland units with a minimum 30% composition of trees having a DBH of 40 cm or greater

The largest mature trees were located in hedgerows and on the edge of woodland units in proximity to existing agricultural fields and cleared land (Appendix B, photograph 1). Species recorded reaching mature size include Northern Red Oak (*Quercus rubra*), White Pine (*Pinus strobus*), Sugar Maple (*Acer saccharum*), Black Cherry (*Prunus serotina*) and Hickory (*Carya sp.*; Appendix B, photographs 7 and 8). Clusters or groves of mature trees were also found within the larger woodland units. These groupings displayed a greater diversity in age range (individuals of several species present from seedlings in the understory through to mature canopy) compared to the remainder of the woodland. Mature trees (individuals and clusters) observed in the Study Area are presented on Figure 3.3



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Niagara Region
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Wildlife Observations and Mature Trees

Date:	Project:	Submitter:	Reviewer:
July, 2017	24850	D. Reylea	S. Toner

Figure
3.3

I:\NiagaraRegion\24850\FiguresandTables\SWM\2017\Report\Figure-3-4-Wildlife_Observations_and_Trees.mxd - Tabloid_L - 18-Jul-17, 11:07 AM - gisguest - TID005

3.4.3 Ecological Land Classification

To gain a better understanding of the forest composition within the Study Area, ELC data was reviewed and verified, and additional detailed data was collected in the field from two prominent woodland units. Corrections and adjustments to the extent and community code of previously assessed polygons were made. Additionally, detailed information on vegetation, soils, and tree density was recorded using ELC data collection cards to help determine the ecosite classification of the two woodland units (Figure 3.4).

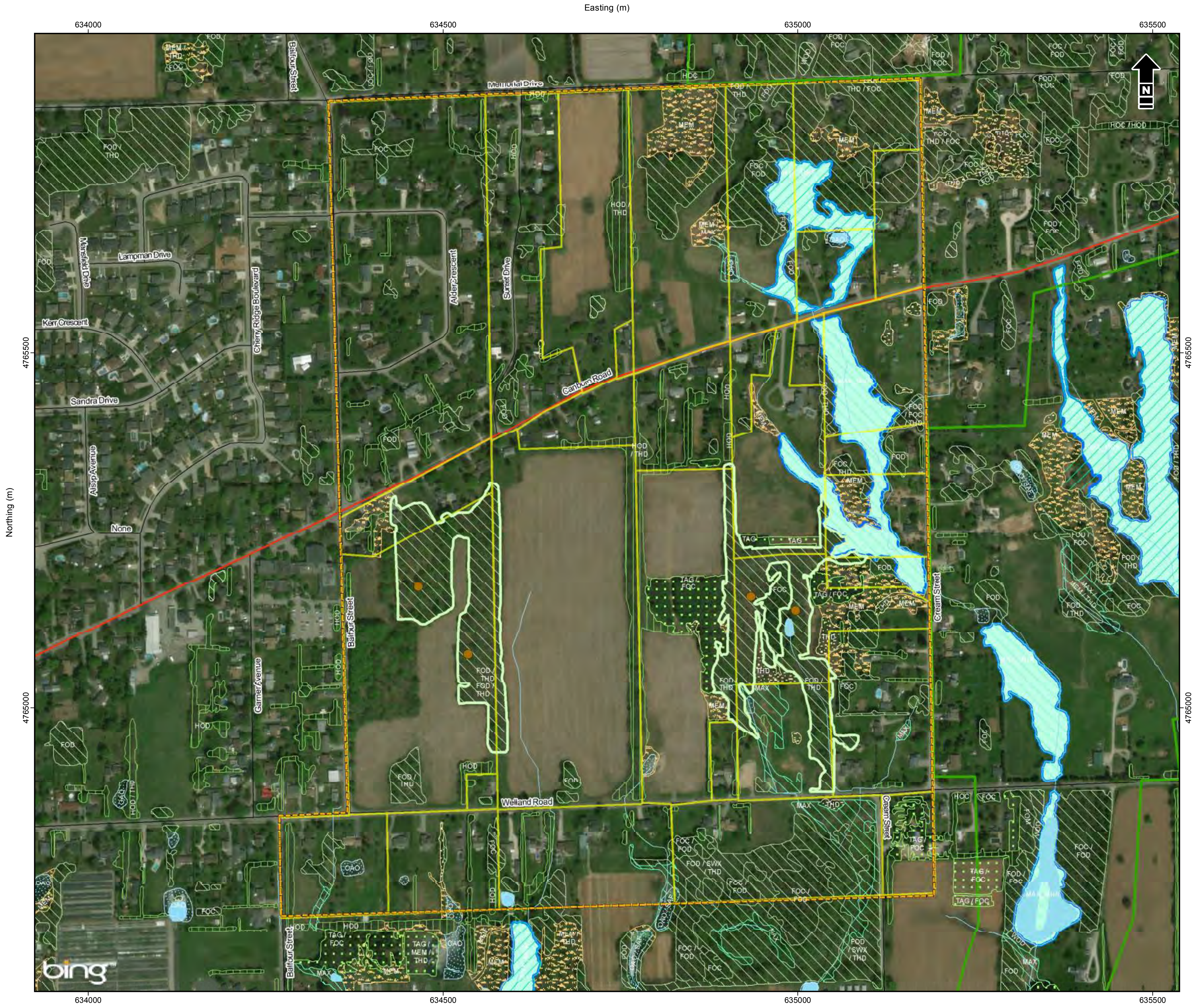
Woodland unit 1 was evaluated and has the potential to be a Fresh-Moist Walnut Lowland Deciduous Forest Type (FOD7-4). This woodland unit was relatively large in size (approximately 2.0 ha) and had a native forest species dominated understorey layer. A native species dominated understorey can be indicative of a natural forest undisturbed by humans and would therefore receive a natural forest classification. However, this unit is in close proximity to a coniferous plantation therefore it is possible this woodland unit is not naturally occurring, and would therefore receive a cultural classification. Woodland unit 2 was evaluated and has the potential to be a Dry Red Oak Cultural Woodland (CUW1-2). Large openings in the canopy were noted as well as the presence of non-native species in the understorey and ground layer, suggesting ongoing anthropogenic disturbance. Descriptions for the potential ecosite designations are described below.

3.4.3.1 FOD7-4 Fresh-Moist Black Walnut Lowland Deciduous Forest Type

This forest type is dominated by Black Walnut (*Juglans nigra*) and Sugar Maple (*Acer saccharum*) in the canopy and sub canopy. The understorey layer is dominated by Raspberry (*Rubus sp.*), Gray Dogwood (*Cornus racemosa*) and Fescue grasses (*Festuca sp.*). The ground cover has a high percentage (approx. >80% area coverage) of Virginia Creeper (*Parthenocissus quinquefolia*), Stinging Nettle (*Urtica dioica*), Sensitive Fern (*Onoclea sensibilis*), Jack-in-the-Pulpit (*Arisaema triphyllum*), and Mayapple (*Podophyllum peltatum*). This unit has been given a provincial S-rank of S2S3, indicating that this forest type ranges from vulnerable to imperiled throughout the province. According to Appendix M of the Significant Wildlife Habitat Technical Guide, the FOD7-4 designation is a known rare vegetation community within the upper-tier municipality of Niagara. Based on the Significant Wildlife Habitat Criteria Schedules for Ecoregion 7E (2015), any ELC ecosite that has a provincially rare vegetation type is deemed a Significant Wildlife Habitat. As such, the PPS (2014) states that “development and site alteration shall not be permitted in Significant Wildlife Habitat;” therefore, providing habitat protection to this woodland unit.

3.4.3.2 CUW1-2 Dry Red Oak Cultural Woodland Type

This forest types is dominated by Red Oak, Sugar Maple, and White Birch (*Betula papyrifera*) in the canopy, with just Red Oak and Sugar Maple in the sub canopy. The understorey layer is predominantly Red Oak, Sugar Maple and Sassafras (*Sassafras albidum*) saplings, as well as Raspberry, and Honeysuckle (*Lonicera* sp.). The ground cover is composed of Virginia Creeper, Garlic Mustard (*Alliaria petiolata*), Rose (*Rosa* sp.), and Raspberry in sparse densities (approx. <10% area coverage). This woodland unit has likely been impacted by human disturbance due to the gaps in the canopy and presence of non-native species. Because of the cultural designation of this woodland unit, it does not receive an S-rank or legislative protection.



🟧 Study Area
🟩 NHS Area (Undifferentiated)
🟨 Proporty Boundary
🟦 Provincially Significant Wetland
▨ Water Body
〰 Watercourse
— Highway
— Road
● ELC Location

ELC Community Class

▨ Swamp
▨ Marsh
▨ Meadow
▨ Thicket
▨ Woodland
▨ Forest
▨ Hedgerow
▨ Treed Agriculture
▨ Open Water

1:5,500 metres
50 0 50 100
NAD 1983 UTM Zone 17N

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East Fenwick Secondary Plan

Ecological Land Classification

Date:	Project:	Submitter:	Reviewer:
July, 2017	24850	D. Reylea	S. Toner

Figure
3.4

3.5 Fauna

3.5.1 Incidental Wildlife Observations

Incidental evidence of wildlife includes vocalizations, tracks, scat, carcasses, or visual confirmations that are recorded as part of general observations collected during an in-field assessment (Table 3.3). Incidental observations are those which occur by chance, and are not part of a specialized species monitoring or tracking field program.

TABLE 3.3 Incidental Wildlife Observations in the Study Area

Date	Species (Common Name)	Species (Scientific Name)	Type	Observation
June 8 2017	Common Yellowthroat	*Geothlypis trichas*	Bird	Audibly heard using hedgerow adjacent to agricultural field
June 8 & 9 2017	Red-winged Blackbird	*Agelaius phoeniceus*	Bird	Visually seen using wetland and marsh areas throughout wetland
June 8 & 9 2017	Black-capped Chickadee	*Poecile atricapillus*	Bird	Audibly heard using multiple woodland areas within Study Area
June 8 & 9 2017	Northern Cardinal	*Cardinalis cardinalis*	Bird	Audibly heard using multiple woodland areas within Study Area
June 8 & 9 2017	Eastern Wood Pewee	*Contopus virens*	Bird (SAR)	Audibly heard in woodland along east side of Study Area
June 8 & 9 2017	Blue Jay	*Cyanocitta cristata*	Bird	Audibly heard using multiple woodland areas within Study Area
June 8 2017	Nuthatch Sp.	*Sitta sp.*	Bird	Audibly heard using woodland area within Study Area
June 8 2017	Gray Catbird	*Dumetella carolinensis*	Bird	Audibly heard using hedgerow within Study Area
June 8 & 9 2017	American Crow	*Corvus brachyrhynchos*	Bird	Audibly heard flying overhead throughout Study Area
June 8 & 9 2017	Song Sparrow	*Melospiza melodia*	Bird	Audibly heard using multiple woodland areas within Study Area
June 8 2017	Common Ringlet	*Coenonympha tullia*	Butterfly	Flying over agricultural field and through meadow
June 8 2017	Monarch Butterfly	*Danaus plexippus*	Butterfly (SAR)	Flying over inactive agricultural field
June 8 2017	Mouse	*Mus sp.*	Mammal	Using meadow area in south portion of Study Area
June 8 2017	Green Frog	*Lithobates clamitans*	Amphibian	Audibly heard in wetland unit north of Canboro Road

In addition to incidental wildlife observations, SAR was also observed in the Study Area. Further details of SAR observations are presented in Sections 3.5.2 and 3.5.3.

3.5.2 Eastern Wood Peewee

An Eastern Wood Pewee (*Contopus virens*) was observed in the Study Area on June 8, 2017 (Figure 3.3). Species identification was confirmed through visual confirmation of field markings, plumage patterns and audibly through song vocalization. Eastern Wood Pewee is a forest dwelling, migratory passerine species that overwinters in northern South America and breeds throughout the eastern United States and Canada. Southern Ontario, Alberta and Manitoba represent the northern limit of the eastern wood pewee's range (Cornell Lab of Ornithology, 2015). Eastern Wood Pewee are listed in Ontario as "Special Concern" (Government of Ontario, 2014), meaning they could become threatened, endangered, or extirpated if measures are not taken to protect individuals and their habitat. Under the Town of Pelham Official Plan, significant habitat of special concern species may only be altered by new development if it can be proven that there will be no negative impact on the ecological function of the feature.

At this time, it is not known if this species is breeding in the area or simply passing through as part of migration patterns. Future detailed studies would be required to confirm breeding status as discussed in Section 4.2.3 of this report.

3.5.3 Monarch Butterfly

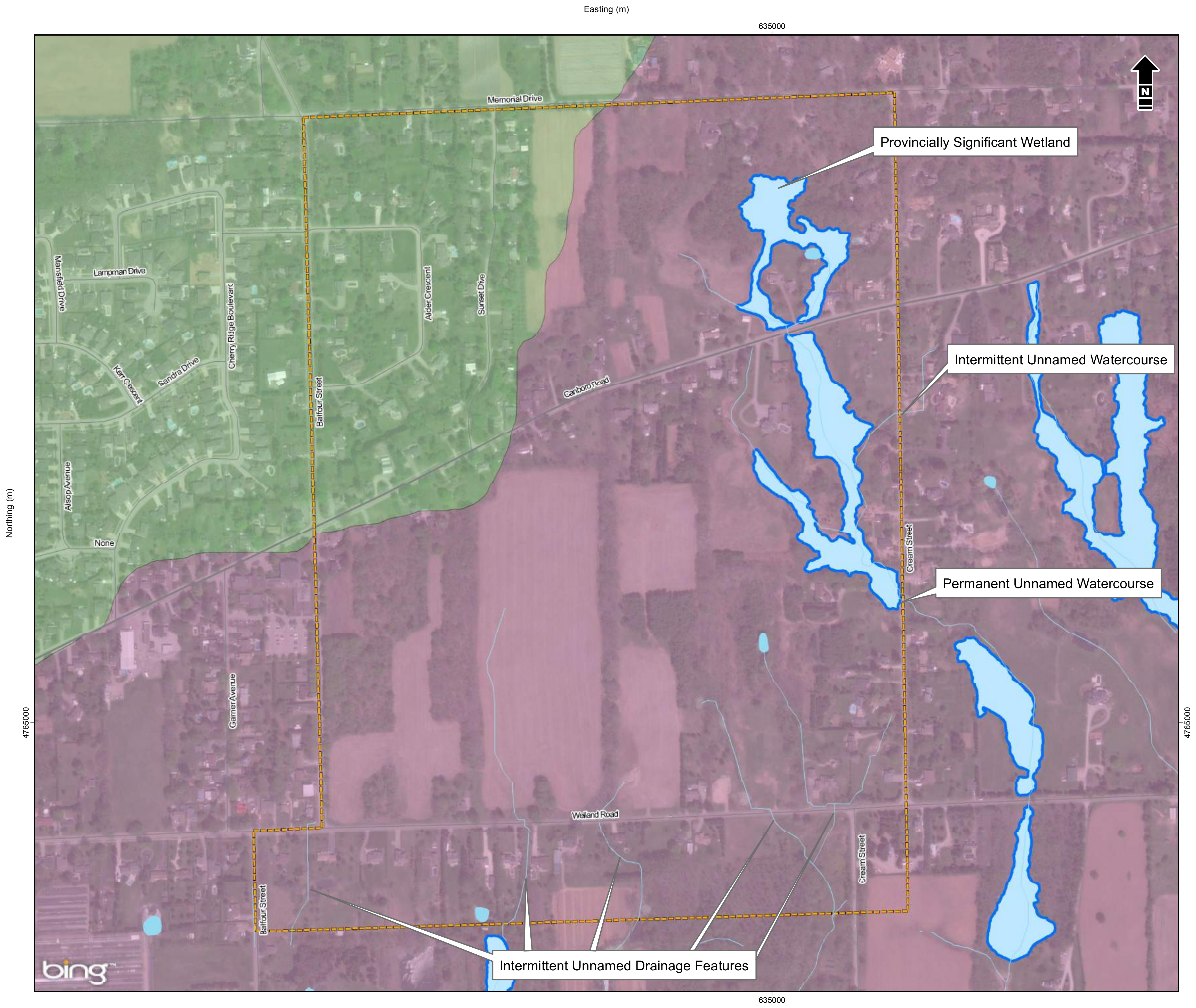
Two Monarch Butterflies (*Danaus plexippus*) were observed in the Study Area on June 8 and June 9, 2017 (Figure 3.3). Species identification was confirmed through visual identification of colour and wing patterning. Monarch Butterfly is a migratory butterfly that overwinters in Mexico and completes a multi-generational breeding lifecycle from the southern United States to Canada over the course of the summer. Monarch Butterflies are listed in Ontario as "Special Concern," meaning they could become threatened, endangered, or extirpated if measures are not taken to protect individuals and their habitat. In December 2016, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) made the recommendation that the Monarch Butterfly status be changed to "Endangered." Accordingly, the federal and provincial governments are currently undergoing a review of the Monarch Butterfly status.

Given the observation of the Monarch Butterfly, the field crew paid close attention to locating milkweed (*Asclepias sp*.) patches, which are the source of food for this species within the Study Area. No milkweed plants were observed within the Study Area; therefore, the Monarch Butterfly were likely foraging and not residing in the Study Area.

3.6 Surface Water and Aquatics

The Study Area is located on the drainage divide between the Fifteen Mile Creek watershed to the north and the Coyle Creek subwatershed (Central Welland River watershed) to the south (Figure 3.5). The portion of the Fifteen Mile Creek watershed within the Study Area is largely developed as a residential area, with surface water being managed by roadside ditches and culvert crossings. The majority of the Study Area falls within the boundaries of the Coyle Creek subwatershed, and drains to the south and east. This portion of the watershed consists primarily of agricultural and natural areas (including woodlots and a PSW) with low density residential lots adjacent to roads. Five culvert crossings for intermittent surface drainage are spaced along Welland Road and two culverts cross under Cream Street, including one intermittent watercourse (dry at time of assessment) and an unnamed watercourse originating in the PSW complex. A detailed analysis of the unnamed watercourse is presented in Section 3.6.2.

All intermittent drainage features within the Study Area have a low gradient channel profile(less than 1%), with most being dry at the time of the in-field assessment or containing less than 5 cm of stagnant water or mud. Ditches along the north side of Welland Road that contained stagnant water also contained dense populations of cattails (*Typha sp.*), bulrushes (*Scirpus sp.*) and skunk cabbage (*Symplocarpus foetidus*), suggesting a consistent source of water in these areas.



- Study Area
- Provincially Significant Wetland
- Fifteen Mile Creek Subwatershed
- Coyle Creek Subwatershed
- Water Body
- ELC_Watercourses
- Highway

1:5,500 metres
50 0 50 100
NAD 1983 UTM Zone 17N

Reference: Data obtained from GeoBase® used under license and Open Government Licence – Ontario.
Imagery obtained from ® 2008 Microsoft Coporation and its data suppliers.

Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

Niagara Region
East Fenwick Secondary Plan

Hydrologic Features

Date: July, 2017
Project: 24850
Submitter: D. Relyea
Reviewer: S. Toner

Figure
3.5

3.6.1 Geomorphic Assessment

A geomorphic assessment was conducted on the only accessible flowing watercourse in the Study Area, following the Rapid Stream Assessment Technique (RSAT) and Rapid Geomorphic Assessment (RGA) protocols. The unnamed watercourse crossing Cream Street was divided into two reaches based on distinct changes in the physical characteristics of the channel. The limits of each reach (upstream and downstream) are shown on Figure 3.6.

FIGURE 3.6 Reach Breaks for RGA/RSAT Assessment

The RSAT scores watercourses from a biological and water quality perspective, while the RGA is qualitative technique that documents indicators of channel instability. These assessments are completed together based on the assumption that the types of physical features that are found in a stable, naturally functioning watercourse are also representative of high quality fish habitat.

The RSAT provides a broad, qualitative assessment of the overall health and functions of a reach. This system integrates visual estimates of channel conditions and numerical scoring of stream parameters using six categories: Channel Stability, Erosion and Deposition, In-stream Habitat, Water Quality, Riparian Conditions, and Biological Indicators These categories are scored to produce an overall rating of low (<20 points), moderate (20-35 points) or high (>35 points) level of channel function.

The RGA observations are quantified using an index that identifies channel sensitivity based on the presence or absence of evidence of aggradation, degradation, channel widening, and planform adjustment. Overall, the index produces values that indicate whether the channel is stable/in regime, stressed/transitional or adjusting (Table 3.4).

TABLE 3.4 RGA Assessment Summary

Factor Value	Classification	Interpretation
≤0.20	In Regime or Stable (Least Sensitive)	The channel morphology is within a range of variance for streams of similar hydrographic characteristics - evidence of instability is isolated or associated with normal river meander propagation processes
0.21 to 0.40	Transitional or Stressed (Moderately Sensitive)	Channel morphology is within the range of variance for streams of similar hydrographic characteristics but the evidence of instability is frequent
≥0.41	In Adjustment (Most Sensitive)	Channel morphology is not within the range of variance and evidence of instability is wide spread

3.6.1.1 RGA/RSAT Results

The downstream reach (Reach 1; Appendix B, photograph 3) runs from just upstream of the small wooden pedestrian bridge, along the west side of Cream Street and ends at the culvert crossing under the road. The bankfull width range for this reach is 1.30 m to 2.70 m, with a bankfull depth of 0.32 m to 0.50 m. The wetted width is 0.40 m to 1.30 m and the average wetted depth is 0.20 m. The bed substrate is a soft sediment layer of silts and clay about 0.30 m thick. This reach has been channelized to run between two properties and adjacent to the road, with no natural sinuosity. There is a lack of instream vegetation, riffle/pool sequences, or any fish habitat characteristics as the banks are manicured sod to below bankfull level. During the assessment, this reach contained a significant amount of fresh grass clippings in the water that were interfering with flow and causing small areas of backwatering. This reach was found to be stable, despite the lack of riparian vegetation. Numeric results for the RGA/RSAT assessment for the downstream reach are presented in Tables 3.5 and 3.6.

TABLE 3.5 Downstream Reach RGA Results

Factor Value				Stability Index	Condition
Aggradation	Degradation	Widening	Planimetric Adjustment		
0	0.14	0	0.14	0.07	In Regime

TABLE 3.6 Downstream Reach RSAT Results

Factor Value						Overall Score	Condition
Channel Stability	Scour/Deposition	In-stream Habitat	Water Quality	Riparian Condition	Biological Indicators		
9	6	2	4	0	2	23	Moderate

The upstream reach (Reach 2; Appendix B, photograph 4) runs from the start of the defined channel at the wetland complex to just upstream of the small wooden pedestrian bridge between two residential properties. The bankfull width for this reach is 1.80 m, with a bankfull depth of 0.45 m. The wetted width is 0.60 m with an average wetted depth of 0.10 m. Although this reach lacks distinct riffle/pool sequences, there is gravel mixed in with the majority sand substrate and there is a 0.05 m to 0.10 m variability in water depths throughout the reach. Notable observations in this reach include the natural sinuosity, no signs of active erosion, minor woody debris, sparse aquatic vegetation, and exposed roots along the banks that have the potential to provide aquatic habitat. The riparian buffer consists of native dogwood and willow shrubs (*Cornus sp*. and *Salix sp*. respectively) and wildflowers. Numeric results for the RGA/RSAT assessment for the downstream reach are presented in Tables 3.7 and 3.8.

TABLE 3.7 Upstream Reach RGA Results

Factor Value				Stability Index	Condition
Aggradation	Degradation	Widening	Planimetric Adjustment		
0.11	0.14	0.25	0	0.125	In Regime

TABLE 3.8 Upstream Reach RSAT Results

Factor Value						Overall Score	Condition
Channel Stability	Scour/Deposition	In-stream Habitat	Water Quality	Riparian Condition	Biological Indicators		
8	5	6	5	3	5	32	Moderate

3.6.2 Aquatic Habitat Assessment

Characteristics of high quality aquatic habitat include natural sinuosity with riffle/pool sequence, variability in water depth and bed substrate, naturally occurring woody debris, overhanging vegetation undercut banks, and natural riparian vegetation that provide food and shelter for a variety of aquatic organisms. Water should be clear with a low percentage of suspended sediment that can negatively impact aquatic fauna with gills as well as visual predators. A qualitative assessment of habitat potential based on a modified approach to the Ontario Stream Assessment Protocol (OSAP) was completed on permanent and intermittent watercourses at road crossings within the Study Area, with the exception of the wetland complex bordering Canboro Road. The modified qualitative OSAP approach included documentation and assessment of the following watercourse conditions within 150 m of the road crossing:

- general watercourse characteristics (i.e., stream pattern, confinement, and gradient)

- channel characteristics (i.e., wetted width, cross sectional depth, velocity profile and depth of pools/riffles/runs)
- substrate and bank materials
- other pertinent habitat features (i.e., fish habitat potential, barriers to fish movement, and macrophytic growth)

Based on the presence or absence of preferred habitat features, the watercourse is given a qualitative ranking of low, medium, or high. The greater the quantity of preferred habitat features present the higher the potential aquatic habitat ranking will be.

The most notable permanent watercourse in the Study Area is the slow moving unnamed channel crossing Cream Street. Reach 1 lacked instream habitat variety due to the absence of riffles and pools, woody debris, undercut banks, and appropriate instream vegetation. There was no riparian vegetation providing shade or food sources for aquatic animals. At the time of the assessment there was a large quantity of fresh lawn clippings in the water. Based on the results of the assessment, Reach 1 has been deemed as having low habitat potential for use by aquatic species. Reach 2 provided small variations in depth as well as overhanging vegetation providing shade and a potential food source for aquatic animals. This area also had small clusters of natural woody debris that provide areas of refuge. Reach 2 has been deemed as having medium habitat potential for use by aquatic species. No fish were observed in this channel during the assessment.

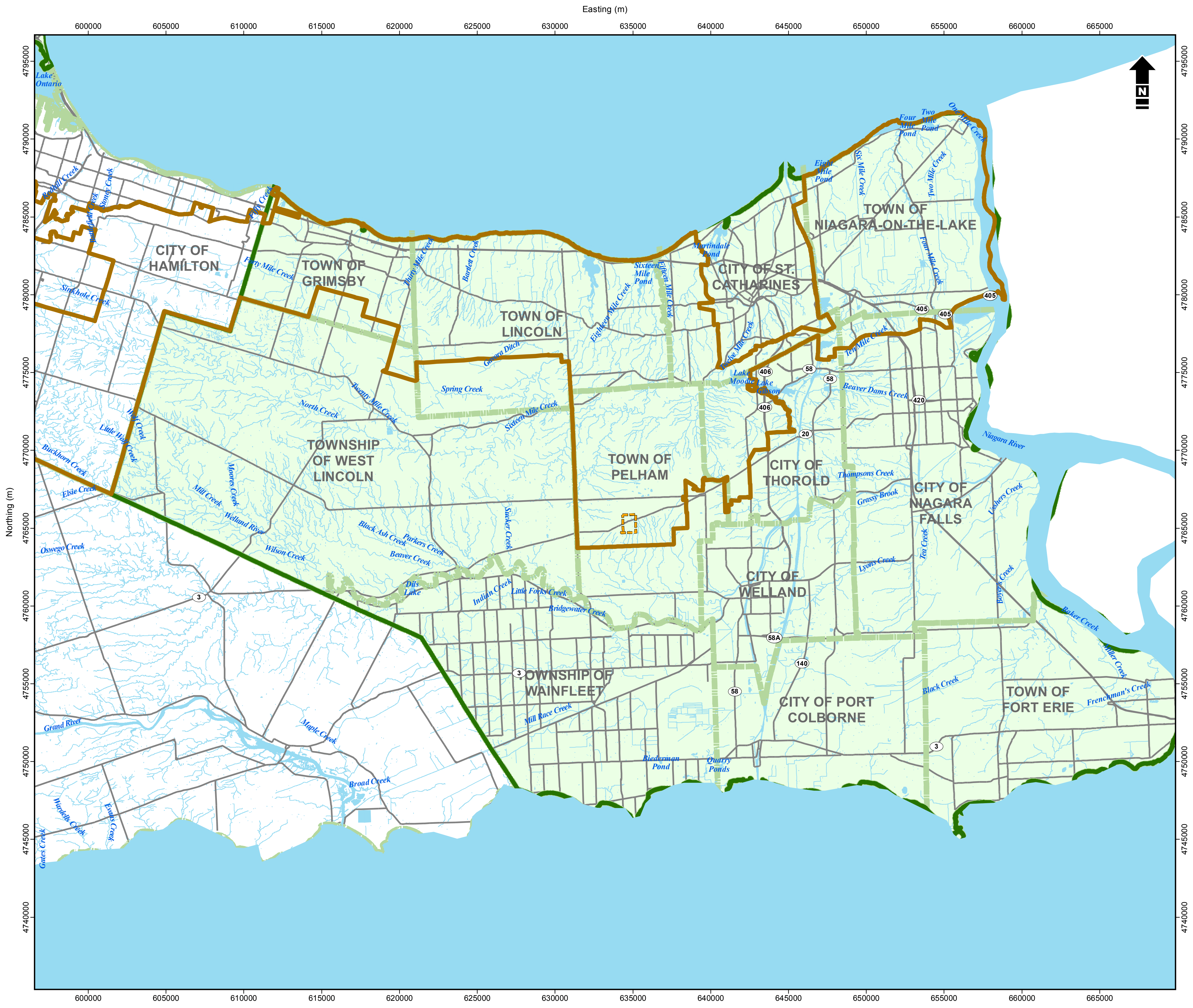
Five aquatic habitat assessments were completed on intermittent drainage features crossing Welland Road. Two drainage features originated from agricultural fields (Appendix B, photograph 6), two originated from residential lots, and one originated from a woodland unit. Four were dry swales (originating from a residential lot and agricultural fields; Appendix B, photograph 5) lined with mowed grass and lacked riparian vegetation, variable substrate composition, woody debris, or signs of possible depth variability when water is present. These features have a low aquatic habitat potential. The most easterly drainage feature along Welland Road (originating from both a residential and a woodland unit) did contain approximately 8 cm of standing water. This feature was undefined, highly vegetated, and quickly merged with a marshy area after exiting the culvert crossing. This drainage feature is considered to have low habitat potential.

4 DEVELOPMENT OPPORTUNITIES AND CONSTRAINTS

All development must comply with environmental legislation, regulations, permits, approvals and exemptions at the federal, provincial, and municipal levels. This section identifies the anticipated permits, approvals, and exemptions that might apply to future development within the Study Area and how these opportunities and constraints should guide the development of the EFCSP from an environmental perspective. Acts and regulations that are applicable to the Study Area are summarized in Table 4.1 below, with a visual representation of these boundaries presented on Figure 4.1. A detailed explanation of the general application of these acts and regulations to the Study Area is provided in Appendix C.

TABLE 4.1 Summary of Environmental Acts and Regulations Applicable to the Study Area

Acts and Regulations	Summary of Contents
Fisheries Act	Sets out provisions to protect fish and fish habitat, including prohibiting harm to fisheries and the deposition of deleterious substances into watercourses.
Migratory Bird Convention Act	Ensures the conservation of migratory bird populations by regulating potentially harmful human activities.
Species at Risk Act	Intended to help prevent the decline in wildlife populations due to human activity.
Endangered Species Act	Provides for the conservation and protection of species in Ontario classified under the Act.
Conservation Authorities Act	Empowers Conservation Authorities to regulate activities that may have an impact on watercourses within their watershed jurisdiction.
Provincial Policy Statement	Policy direction from the Provincial government relating to land use planning.
Greenbelt Plan	Provides permanent protection to natural heritage features by directing development planning within the 'Golden Horseshoe' area.
Niagara Region Official Plan	Long-range, community planning document used to guide development in the Regional Municipality of Niagara.
Town of Pelham Official Plan	Long-range, community planning document used to guide development in the Town of Pelham.



Legend

- Study Area
- Greenbelt Boundary
- Regional Municipality of Niagara
- Municipal Boundary - Lower Tier
- Water Body
- Watercourse
- Highway

1:250,000 metres
2,500 0 2,500 5,000
NAD 1983 UTM Zone 17N

Reference: Data obtained from GeoBase® used under license and Open Government Licence – Ontario.
Imagery obtained from ® 2008 Microsoft Coporation and its data suppliers.

Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

Niagara Region
East Fenwick Secondary Plan

Environmental Regulatory Boundaries

Date:	Project:	Submitter:	Reviewer:
July, 2017	24850	D. Relyea	S. Toner

Figure 4.1

I:\NiagaraRegion\24850\FiguresandTables\SWM\2017\Report\Figure-4-1-Environmental_Boundaries.mxd - Tabloid_L - 18-Jul-17, 11:17 AM - gisguest - TID005

4.1 Development Opportunity Areas

For the purpose of this study, "development opportunity areas" can be defined as areas within the Study Area that are not subject to any natural environment legislative limitations. Additionally, development opportunity areas are typically free of high quality natural heritage features/functions or have limited habitat potential at this time. Examples of areas representing development opportunities include existing agricultural fields (actively farmed or fallow), existing developed areas, and early succession and edge habitats. These areas are illustrated in green on Figure 4.2.

4.2 Development Constraint Areas

For the purpose of this study, "development constraint areas" can be defined as areas within the Study Area that are subject or potentially subject to natural environment legislative limitations. Portions of Acts and legislation that apply directly to natural heritage features in the Study Area have been consolidated in Table 4.2. Setbacks from development adjacent to these features, both required and potentially required based on further supporting field studies and negotiations with the NPCA, are discussed in Tables 4.3 to 4.5.

TABLE 4.2 Potential Development Setbacks and Constraints Relating to Acts and Regulations

Type of Natural Heritage Feature	Acts and Regulations	Potential Setbacks and Constraints
Wetlands	Provincial Policy Statement (2014)	Development and site alteration shall not be permitted in: (a) significant wetlands in Ecoregions 5E, 6E, and 7E1 (2.1.4) Development or site alteration will not be permitted within adjacent lands unless the ecological function of the adjacent lands has been evaluated, and it has been demonstrated that there will be no negative impacts on the natural features or on their ecological functions. This critical evaluation of the adjacent lands is one of the most important parts of an EIS (6.4). The province of Ontario recommends adjacent lands be considered the area within 120 m of individual significant wetlands.
	Greenbelt Plan (2017)	A proposal for new development or site alteration within 120 m of a key natural heritage feature within the Natural Heritage System or a key hydrologic feature anywhere within the Protected Countryside requires a natural heritage evaluation or a hydrological evaluation that identifies a vegetation protection zone which (a) Is of sufficient width to protect the key natural heritage feature or key hydrologic feature and its functions from the impacts of the proposed change and associated activities that may occur before, during, and after construction and, where possible, restore or enhance the feature and/or its function (b) Is established to achieve and be maintained as natural self-sustaining vegetation (3.2.5.5).
	Niagara Region Official Plan (2014)	The vegetation protection zone required under Policy 7.B.1.21 shall be a minimum 30 m wide in the case of wetlands, seepage areas and springs, fish habitat, permanent and intermittent streams, lakes, and significant woodlands (7.B.1.22).
	NPCA Land Use Planning Policy Document (2010)	Development prohibited 2. (1) Subject to section 3, no person shall undertake development or permit another person to undertake development in or on the areas within the jurisdiction of the Authority that are, (c) hazardous lands; (d) wetlands; or (e) other areas where development could interfere with the hydrologic function of a wetland, including areas up to 120 metres of all provincially significant wetlands and wetlands greater than 2 hectares in size, and areas within 30 metres of wetlands less than 2 hectares in size. O. Reg. 155/06, s. 2 (1); O. Reg. 71/13, s.1 (1-3). If, in the opinion of the Authority, any development and/or site alteration proposed within 120 m of a PSW or wetland greater than 2 hectares in size may have an impact on the hydrological function, hydrological regime or ecological function of a wetland, the NPCA will require a Permit pursuant to O. Reg. 155/06 be obtained prior to the commencement of any works. Any development or site alteration deemed by the Authority to require a Permit must be supported by an EIS or similar study and/or a hydrological assessment, prepared by qualified professionals, that identifies whether the proposed development and/or site alteration will cause a negative hydrologic or ecological impact to the wetland features/functions (3.24.1 d).

Type of Natural Heritage Feature	Acts and Regulations	Potential Setbacks and Constraints
	Town of Pelham Official Plan (2014)	Any proposal for development or site alteration on lands within 120 m of any (protected feature) shall prepare an EIS, the primary purpose of which is to identify a self-sustaining vegetation protection zone. The vegetation protection zone shall be determined at the time of a planning approval. However, in the case of wetlands, seepage areas and springs, fish habitat, permanent and intermittent streams, lakes, and significant woodlands, the minimum width of the vegetation protection zone shall be 30 m (B3.4.4.1).
Permanent and Intermittent Streams	Greenbelt Plan (2017)	In the case of wetlands, seepage areas and springs, fish habitat, permanent and intermittent streams, lakes, and significant woodlands, the minimum vegetation protection zone shall be a minimum of 30 m measured from the outside boundary of the key natural heritage feature or key hydrologic feature (3.2.5.4).
	Niagara Region Official Plan (2014)	The vegetation protection zone required under Policy 7.B.1.21 shall be a minimum 30 m wide in the case of wetlands, seepage areas and springs, fish habitat, permanent and intermittent streams, lakes, and significant woodlands (7.B.1.22).
	Town of Pelham Official Plan (2014)	Any proposal for development or site alteration on lands within 120 m of any (protected feature) shall prepare an EIS, the primary purpose of which is to identify a self-sustaining vegetation protection zone. The vegetation protection zone shall be determined at the time of a planning approval. However, in the case of wetlands, seepage areas and springs, fish habitat, permanent and intermittent streams, lakes, and significant woodlands, the minimum width of the vegetation protection zone shall be 30 m (B3.4.4.1).
Groundwater	Niagara Region Official Plan (2014)	Development and site alteration shall not have significant adverse impacts on ground water quality or quantity. In areas where development and site alteration could significantly affect ground water quality or quantity the Region shall require further review of potential impacts (7.A.2.9).
Fish Habitat	NPCA Land Use Planning Policy Document (2010)	Any development will maintain a minimum setback of 30 m from the bankfull channel of any Type 1 watercourse and 15 m from the bankfull channel of any Type 2 or Type 3 watercourse (3.6).
	Town of Pelham Official Plan (2014)	To protect fish habitat adjacent to rivers and streams, development and site alteration may be subject to Site Plan Control. This natural vegetated buffer zone is recommended to be the following distance from the stable top of bank for features located outside of the Specialty Agricultural designation: (a) 30 m for critical fish habitat (b) 15 m for important or marginal fish habitat (C2.1.1).

Type of Natural Heritage Feature	Acts and Regulations	Potential Setbacks and Constraints
Woodlands	Provincial Policy Statement (2014)	Development and site alteration shall not be permitted in: b) significant woodlands in Ecoregions 6E and 7E (excluding islands in Lake Huron and the St. Marys River); unless it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions (2.1.5).
	Greenbelt Plan (2017)	The removal of other natural features not identified as key natural heritage features and key hydrologic features should be avoided. Such features should be incorporated into the planning and design of the proposed use wherever possible (3.2.2 c).
	Niagara Region Official Plan (2014)	To be identified as significant a woodland must meet one or more of the following criteria: (a) Contain threatened or endangered species or species of concern.
	Significant Wildlife Habitat Technical Guide (2000)	Loss or degradation of rare habitats will lead to an increase in the numbers of species that are rare, vulnerable, threatened, and endangered and, over time, to a decrease in biodiversity within the planning area and province (5.2.1). Three known occurrences of FOD7-4 in Niagara (Appendix M).
SAR - Special Concern	Town of Pelham Official Plan (2014)	The expansion of agricultural buildings or structures and residential dwellings may be permitted on lands in the Environmental Protection Three designation provided the existing buildings or the proposed expansion does not occur in a PSW or Life Science ANSI, or the significant habitat of endangered species, threatened species, and special concern species. Where such development is proposed, the following policy shall apply: (a) The proposal demonstrates that there is no reasonable alternative and the expansion, alteration or establishment is directed away from the feature to the maximum extent possible; (b) The impact of the expansion or alteration on the feature and its function is minimized to the maximum extent possible (B3.4.4.3).

4.2.1 Required Development Setbacks

Permanent setbacks to development occur in areas that have restrictions on development due to existing legislation or official plans. A summary of setback and other site level restrictions that are applicable within the Study Area are listed in Table 4.3. These constraints are illustrated in darker shading tone around PSWs, where NPCA regulations prohibit development within 30 m from these features, shown in Figure 4.2.

TABLE 4.3 Required Development Setbacks

Required Setback or Protection	Reasoning	Recommendation
Limits on permitted development within PSW*	Development within PSW not permitted stated in the PPS (2014), NPCA Land Use Planning Policy Document (2010), O.Reg. 155/06	Comply with planning documents

* The limits of the PSW as shown in this report are sourced from MNRF and NPCA databases and are suitable for the high level planning requirements of the EFCSP. Secondary plan and site plan development may require the further refinement and field staking of the wetland boundaries by a certified NPCA staff member prior to permit approval.

4.2.2 Potential Development Setbacks

Potential development setbacks occur in areas that may be subject to development restrictions due to existing legislation or official plans. The extent of setback requirements for these features will be subject to approval by a regulatory agency and additionally will be determined as part of the Environmental Impact Study (EIS) triggered by proposed development within 120 m of the natural heritage features outlined in Table 4.4. These constraints are illustrated in yellow shading on Figure 4.2.

TABLE 4.4 Potential Development Setbacks

Plan Review Triggers	Reasoning	Recommendation
Appropriate vegetative buffer adjacent to PSW	Requirement of Greenbelt Plan (2017), Significant Wildlife Habitat Technical Guide (2000), NPCA Land Use Planning Policy Document (2010), Town of Pelham Official Plan (2014)	Subject to approval from regulatory agency (i.e., NPCA and the Town of Pelham)
120 m from PSW	Requirement of Greenbelt Plan (2017), Significant Wildlife Habitat Technical Guide (2000), NPCA Land Use Planning Policy Document (2010), Town of Pelham Official Plan (2014)	Conduct EIS to determine appropriate development setback based on potential impacts to natural features and functions
120 m from Significant Wildlife Habitat	Requirement of PPS (2014), Greenbelt Plan (2017), Niagara Region Official Plan (2014), Significant Wildlife Habitat Technical Guide (2000)	Conduct EIS to determine appropriate development setback based on potential impacts to natural features and functions

4.2.3 Potential Development Constraints

Potential development constraints occur when further studies are required to determine if legislated protection applies to a natural heritage feature (Table 4.5). This potential development constraint is applied to a cultural woodland unit where Eastern Wood Peewee has been observed. To determine if Eastern Wood Peewee is actively using the area for potential breeding habitat, a breeding bird survey should be conducted as per the Ontario Breeding Bird Survey protocol. If no SAR breeding is confirmed in the area, this area could be considered for development, provided trees are removed in compliance with timing requirements set out in the Migratory Birds Convention Act and in accordance with development permits obtained from the Town. This constraint is illustrated in brown shading on Figure 4.2.

TABLE 4.5 Potential Development Constraints

Possible Setback or Protection	Reasoning	Recommendation
Protection of woodland being used as habitat by SAR (Eastern Wood Pewee)	Outlined in Town of Pelham Official Plan (2014)	Conduct further field investigations - Breeding Bird Survey; 10 m drip line buffer recommended if habitat protection is required

4.2.4 Development Considerations

Development considerations are natural heritage features that do not receive any specific legislative protections, but are of high value in terms of providing significant surface or groundwater management functions, providing habitat to a variety of species, being irreplaceable (as in the case of mature trees) or have high importance to the community as a recreational or character feature. These considerations are provided in Table 4.6 and illustrated in blue on Figure 4.2

TABLE 4.6 Development Considerations

Development Considerations	Reasoning	Recommendation
Permanent and intermittent watercourses	Requirement for 30 m setback stated in the Greenbelt Plan (2017), Niagara Region Official Plan (2014), Town of Pelham Official Plan (2014)	Apply setbacks to permanent and intermittent watercourses; Consult with NPCA for any required channel realignments or modifications to drainage features
Mature Trees	Irreplaceable, high ecological value, high importance to residential community	Include mature tree protections in EFCSP; Conduct tree inventories as part of site plan development
Vulnerable groundwater recharge areas	Entirety of Study Area is within vulnerable groundwater recharge area	Ensure the creation of appropriate and effective stormwater plans in development plans
Unevaluated woodlands	Permission to enter some privately held lands was not granted	Include mature tree protections in EFCSP; Conduct tree inventories as part of site plan development; Complete detailed ELC and/or tree inventory if access is granted

4.3 Draft Opportunity and Constraint Mapping

Based on the opportunities and constraints presented in Section 4 of this report, the following recommendations are suggested for consideration when developing the EFCSP. A visual representation of these opportunities and constraints is presented on Figure 4.2. All recommendations for applying setbacks and meeting legislative requirements are to be confirmed and approved based on the experience of planning staff at the Town of Pelham and the NPCA.

4.4 Agency Site Walk

On August 11, 2017, a site walk was conducted in the potentially significant woodland area (i.e., FOD7-4 ecosite) by representatives of the Town of Pelham, the NPCA and Matrix Solutions to discuss the draft natural heritage opportunities and constraints mapping. Due to the complexity of the site, the site walk helped to provide the framework for plan review and expectations for further field studies where gaps in information remain. Based on this meeting, Figure 4.2 was updated to reflect the outcome of the site meeting. The following provides a summary of discussion points raised during the site meeting:

- Further delineation was clarified in the field on what is considered a hedgerow feature or an extension of the woodland to be included in the size calculation of the woodland polygon. It was determined that the hedgerow area connecting to Welland Ave (south east corner of the potentially significant forest polygon) can be divided at the location where the tree line widens north of the canopy gap (i.e., <35% canopy cover).

- There is a thicket inclusion with a gap in the canopy near the three identified large diameter tree cluster on Figure 4.2 that may be excluded from the size calculation of the woodland (determined by dripline). However, an EIS will need to be completed to determine the dripline and determine the area that can likely be developed around the edge of the woodland.

- A large abundance of sassafrass trees (ranging from saplings to mature specimens) was observed along the west side of the woodland. These trees have been included in as part of the woodland on Figure 4.2.

- The black walnut inclusion within the woodland unit (FOD7-4) appears to be unusual in terms of its diversity within the Niagara area due to the size of tree specimens, secondary growth, and understory composition.

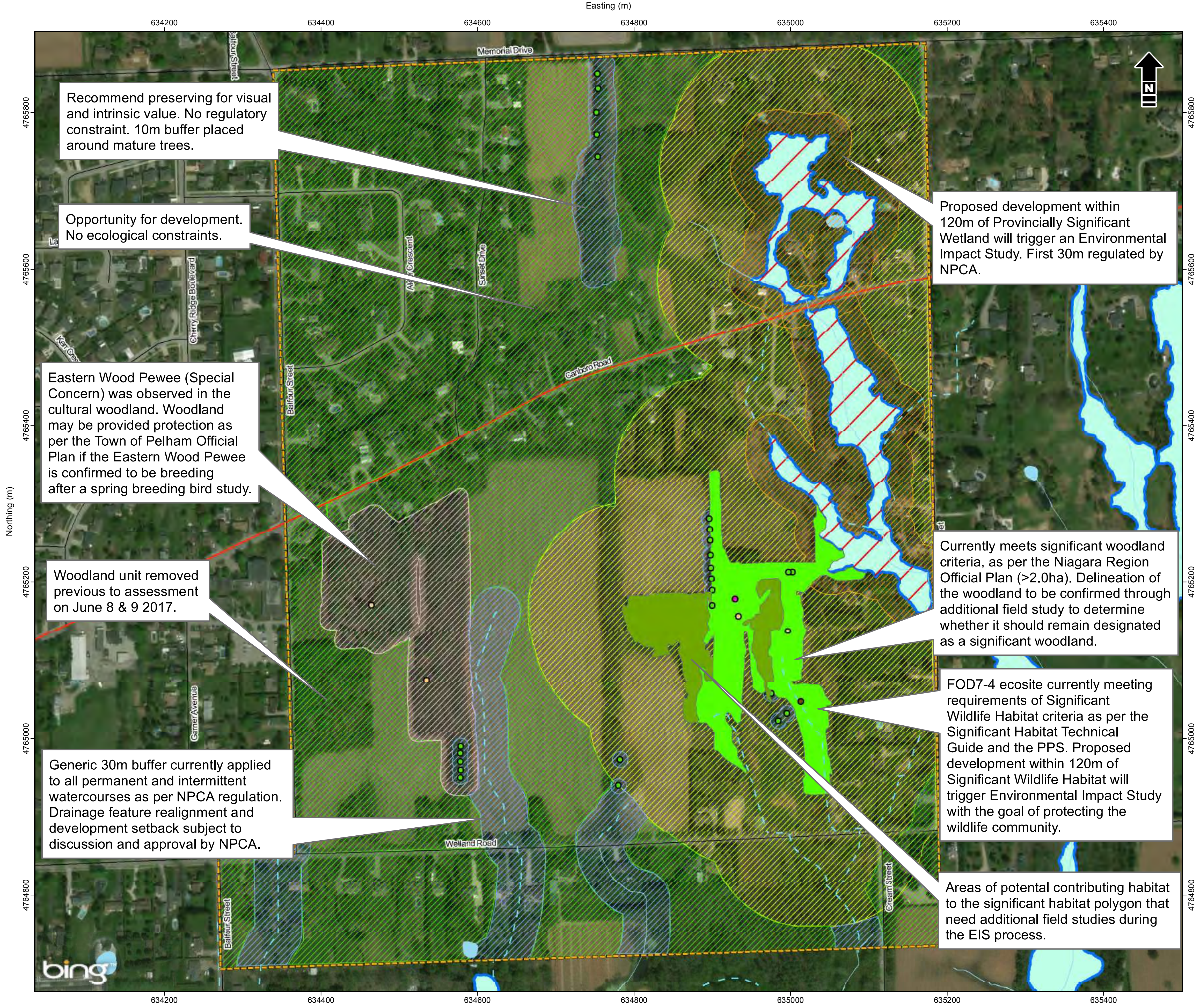
- The coniferous plantation contiguous to the east of the woodland has become naturalized and might provide good contributing habitat to the woodland. NPCA may require further assessment of owl use within the conifer habitat as part of the EIS work, as there are few representations of such mature coniferous forests within the Niagara Region.

- The hedgerow that forms the northeastern arm of the potentially significant forest polygon consists of more than one layer of trees and has a width that is greater than 20 m. Depending on the outcome of the EIS, this area may provide a habitat and linkage function that warrants preservation from development.

- The woodland could potentially support common five-lined skink habitat given the sandy nature of the soil. If development is planned within this forest, a skink survey may be requested by the NPCA and this type of survey can take up to three field seasons to complete.

- In addition to skink surveys, a bat survey may be requested by the NPCA should any part of the wooded area be considered for removal.

- All headwater drainage features identified by the NPCA along Welland Ave. will remain presented on the map as regulated watercourses. A further assessment will need to be completed and approved by the NPCA should development be planned within 30 m of regulated watercourse areas.



Recommend preserving for visual and intrinsic value. No regulatory constraint. 10m buffer placed around mature trees.

Opportunity for development. No ecological constraints.

Eastern Wood Pewee (Special Concern) was observed in the cultural woodland. Woodland may be provided protection as per the Town of Pelham Official Plan if the Eastern Wood Pewee is confirmed to be breeding after a spring breeding bird study.

Woodland unit removed previous to assessment on June 8 & 9 2017.

Generic 30m buffer currently applied to all permanent and intermittent watercourses as per NPCA regulation. Drainage feature realignment and development setback subject to discussion and approval by NPCA.

Proposed development within 120m of Provincially Significant Wetland will trigger an Environmental Impact Study. First 30m regulated by NPCA.

Currently meets significant woodland criteria, as per the Niagara Region Official Plan (>2.0ha). Delineation of the woodland to be confirmed through additional field study to determine whether it should remain designated as a significant woodland.

FOD7-4 ecosite currently meeting requirements of Significant Wildlife Habitat criteria as per the Significant Habitat Technical Guide and the PPS. Proposed development within 120m of Significant Wildlife Habitat will trigger Environmental Impact Study with the goal of protecting the wildlife community.

Areas of potental contributing habitat to the significant habitat polygon that need additional field studies during the EIS process.

- Study Area
- Water Body
- Provincially Significant Wetland
- Potentially Significant Woodland Unit (FOD7-4)
- Potential Contributing Habitat
- Development Opportunity
- Development Consideration
- Potential Development Constraint
- Potential Development Setback
- Regulated PSW Area (30m)
- Required Protection
- Ontario Base Mapping Watercourse
- NPCA Watercourse
- Highway
- Road
- Detailed ELC Location
- Mature Tree Location
- Sassafras Stand Location
- Approximate Thicket Location

1:5,000 metres
50 0 50 100
NAD 1983 UTM Zone 17N

Reference: Data obtained from GeoBase® used under license and Open Government Licence – Ontario.
Imagery obtained from ® 2008 Microsoft Coporation and its data suppliers.

Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

Niagara Region
East Fenwick Secondary Plan

Opportunities and Constraints

Date: August, 2017
Project: 24850
Submitter: D. Reylea
Reviewer: S. Toner

Figure
4.2

5 CONCLUSIONS

Review and analysis of the background hydrogeological information for the Study Area currently indicates that the southern portion of the Study Area has relatively high groundwater levels (approximately 2 m bgs) that may affect potential types of development and infrastructure. It is expected that future site-specific assessment and the implementation of appropriate water management measures will address these issues as discussed in Section 2.4.

Review and analysis of the natural heritage background information for the Study Area indicated that the PSW is not suitable for development, and is subject to a 30 m required setback in accordance with NPCA regulations. Development within 120 m of this feature, as well as features meeting Significant Wildlife Habitat criteria, will be subject to an EIS.

Additional possible development constraints include setbacks on intermittent watercourses, protection for SAR habitat, and protection for Significant Wildlife Habitat. These possible constraints will require further detailed verification prior to being confirmed, as well as ongoing consultation with the Town of Pelham when parcels within the EFCSP area are developed. While they do not receive any legislated protection, high value features should be considered for protection when developing the EFCSP in order to preserve the unique environmental characteristics of the Study Area.

Based on the possible constraints and possible setbacks described above the following future studies are recommended for completion in order to determine their suitability for development:

- breeding bird survey to determine breeding habitat of Eastern Wood Pewee (special concern) in woodland unit 2
- additional ELC and three season botanical survey to determine significance of woodland unit 1
- EIS to determine appropriate additional setback to the PSW and Significant Wildlife Habitat.

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APPENDIX A

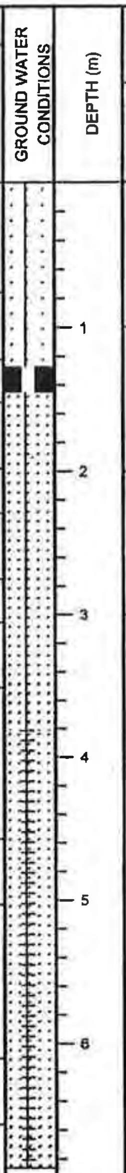
Borehole Logs, Water Well Records, and Test Pit Logs

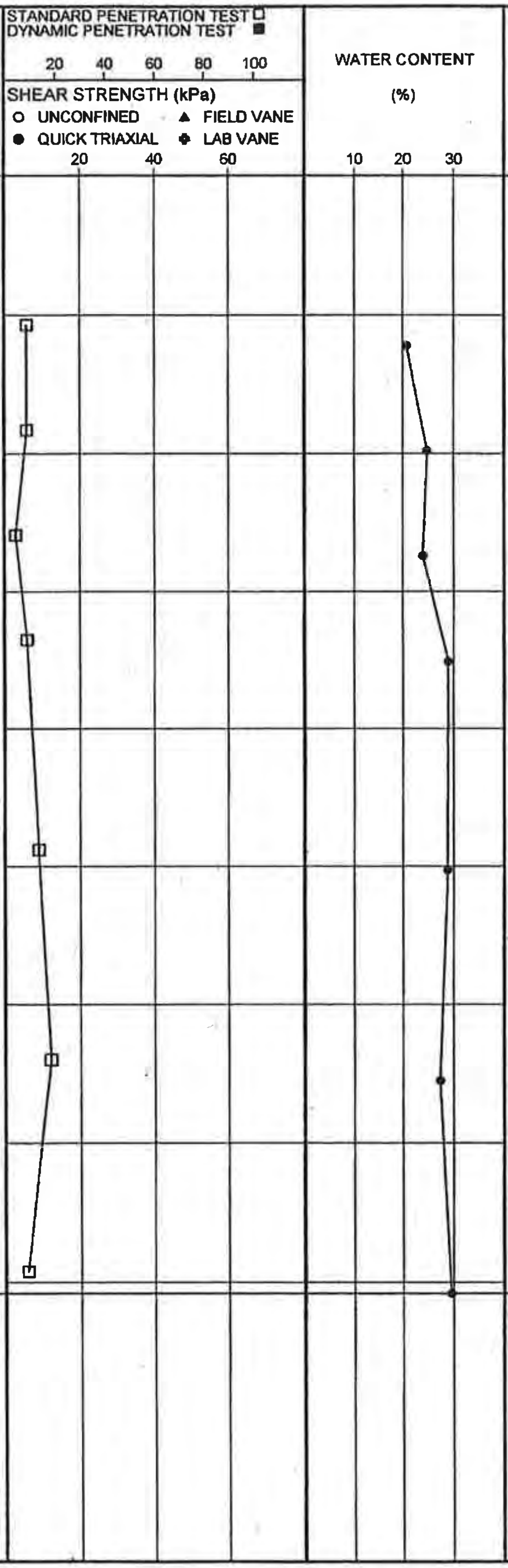
RECORD OF BOREHOLE No 1

1 OF 1

PROJECT Hydrogeological Investigation, 678 Canboro Rd.
LOCATION See borehole location plan
ORIGINATED BY RS
CLIENT Luchetta Construction
COMPILED BY GR
JOB NO. TG22285
DATE July 23 2002
CHECKED BY RS

ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" VALUES	OBSERVATIONS & REMARKS
196.0					
195.8 0.2	17 cm of **TOPSOIL** over Brown **SILTY FINE SAND** wet to saturated, loose.				
		1	SS	6	
		2	SS	6	
		3	SS	3	
		4	SS	6	After 1 day, water level @ 1.35 mbgl.
		5	SS	9	After 6 days, water level @ 1.37 mbgl.
		6	SS	12	
		7	SS	6	
187.9 8.1	Borehole Terminated.				





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DRAFT

A-14

RECORD OF BOREHOLE No 2

1 OF 1

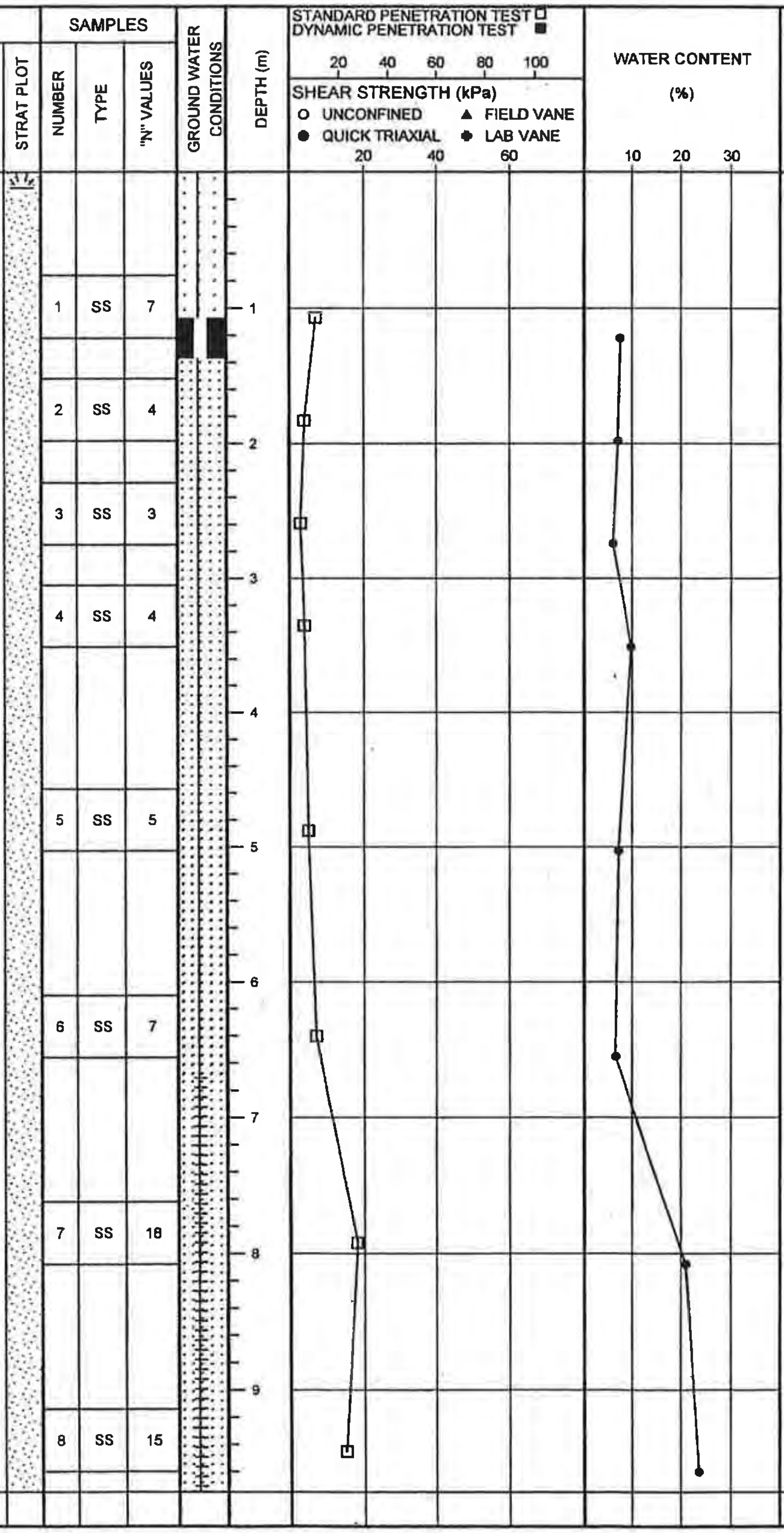
PROJECT Hydrogeological Investigation, 678 Canboro Rd.
LOCATION See borehole location plan
ORIGINATED BY RS
CLIENT Luchetta Construction
COMPILED BY GR
JOB NO. TG22285
DATE July 23 2002
CHECKED BY RS

SOIL PROFILE

ELEV DEPTH	DESCRIPTION
208.0	
0.0 207.8 0.2	20 cm of **TOPSOIL** over Brown **FINE SAND** moist to saturated, loose to compact.
198.3 9.8	Borehole Terminated.

SAMPLES

NUMBER	TYPE	"N" VALUES
1	SS	7
2	SS	4
3	SS	3
4	SS	4
5	SS	5
6	SS	7
7	SS	18
8	SS	15



OBSERVATIONS & REMARKS

After 1 day, water level @ 8.20 mbgl.

After 6 days, water level @ 8.20 mbgl.

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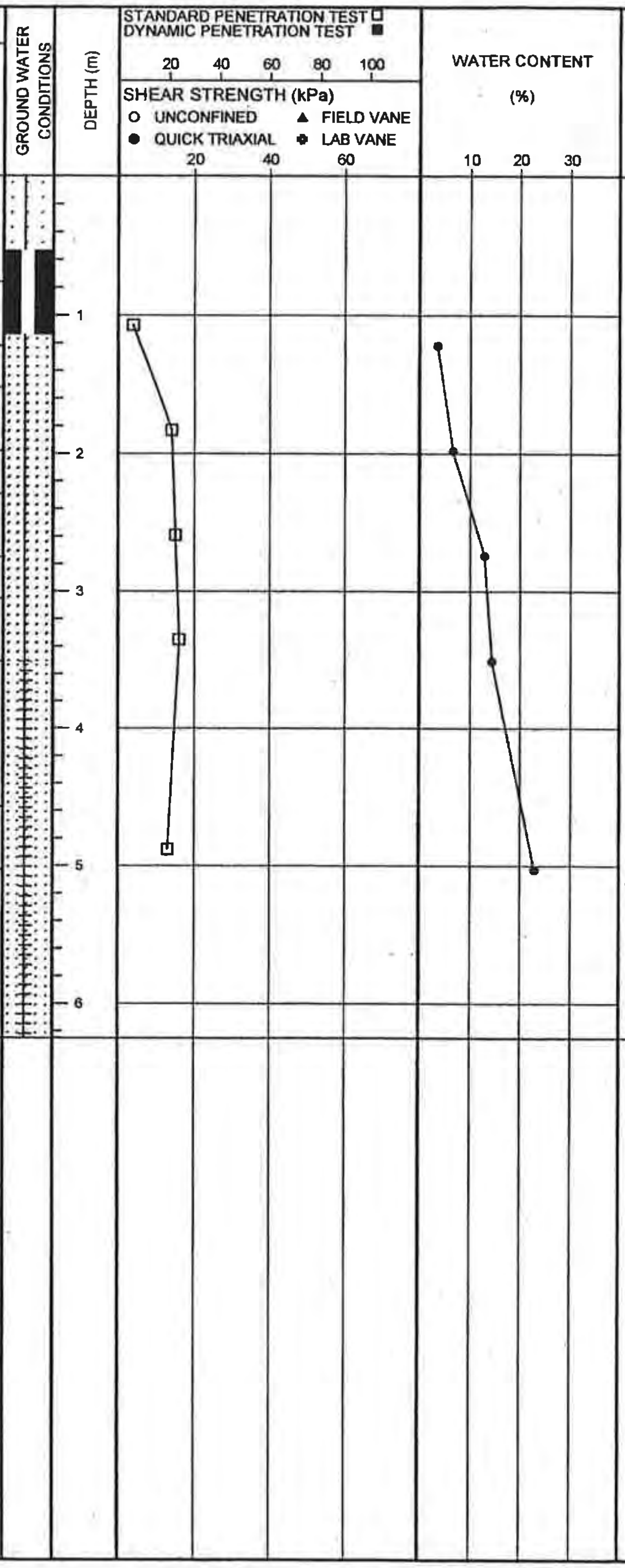
RECORD OF BOREHOLE No 3

1 OF 1

PROJECT Hydrogeological Investigation, 678 Canboro Rd.
LOCATION See borehole location plan
CLIENT Luchetta Construction
JOB NO. TG22285
DATE July 23 2002
ORIGINATED BY RS
COMPILED BY GR
CHECKED BY RS

SOIL PROFILE		SAMPLES		
ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" VALUES
202.0 0.0	35 cm of **TOPSOIL** over Brown **FINE SAND** moist to saturated, loose to compact.			
201.7 0.4				
		1	SS	4
		2	SS	14
		3	SS	15
		4	SS	16
		5	SS	13
195.8 6.3	Borehole Terminated.			



OBSERVATIONS & REMARKS

After 1 day, water level @ 5.58 mbgl.

After 6 days, water level @4.48 mbgl.

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RECORD OF BOREHOLE No 1

1 OF 1

PROJECT Arber Property
CLIENT HERT INC.
JOB NO. TG63047
DATE July 25, 2006
LOCATION (see borehole location plan)
ORIGINATED BY lw
COMPILED BY ma
CHECKED BY jdo

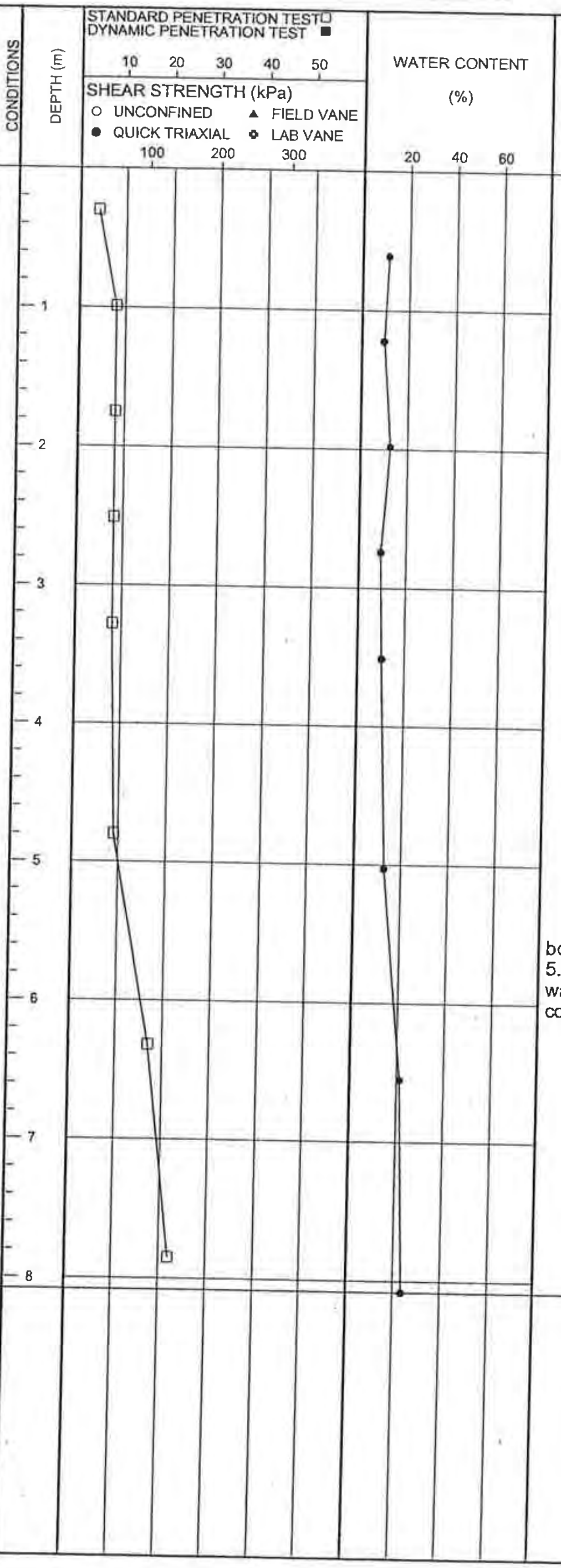
SOIL PROFILE

ELEV DEPTH	DESCRIPTION
206.4 0.0	Brown and reddish brown **SILTY FINE SAND**, trace rootlets, some bedding, moist, becomes wet to saturated below 5.6 m (±), very loose to compact.
198.3 8.1	**BOREHOLE TERMINATED**

SAMPLES

NUMBER	TYPE	"N" VALUES
1	SS	4
2	SS	8
3	SS	8
4	SS	8
5	SS	8
6	SS	9
7	SS	17
8	SS	22

GROUND WATER CONDITIONS



OBSERVATIONS & REMARKS

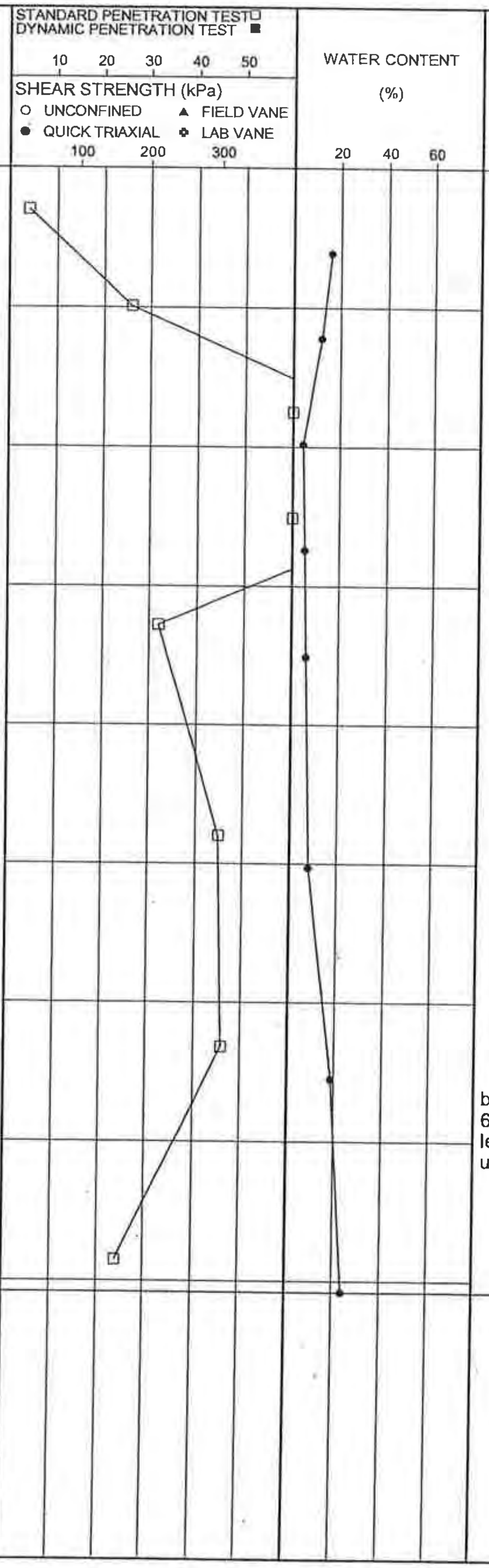
borehole caved at 5.5 m (±), no free water upon completion

RECORD OF BOREHOLE No 2

1 OF 1

PROJECT Arber Property
LOCATION (see borehole location plan)
ORIGINATED BY lw
CLIENT HERT INC.
COMPILED BY ma
JOB NO. TG63047
DATE July 25, 2006
CHECKED BY jdo

SOIL PROFILE			SAMPLES				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	DEPTH (m)
205.7 0.0	Brown to reddish brown **SILTY FINE SAND**, trace organic staining to 1.2 m (±), few rootlets, some bedding, moist, becomes wet to saturated below 7.1 m (±), very loose to very dense.		1	SS	4		
			2	SS	26		1
			3	SS	76		2
			4	SS	85		
			5	SS	32		3
			6	SS	45		4 5
			7	SS	46	▽	6
			8	SS	24		7 8
197.6 8.1	**BOREHOLE TERMINATED**						



OBSERVATIONS & REMARKS

borehole caved at 6.6 m (±), water level at 6.4 m (±) upon completion

RECORD OF BOREHOLE No 3

1 OF 1

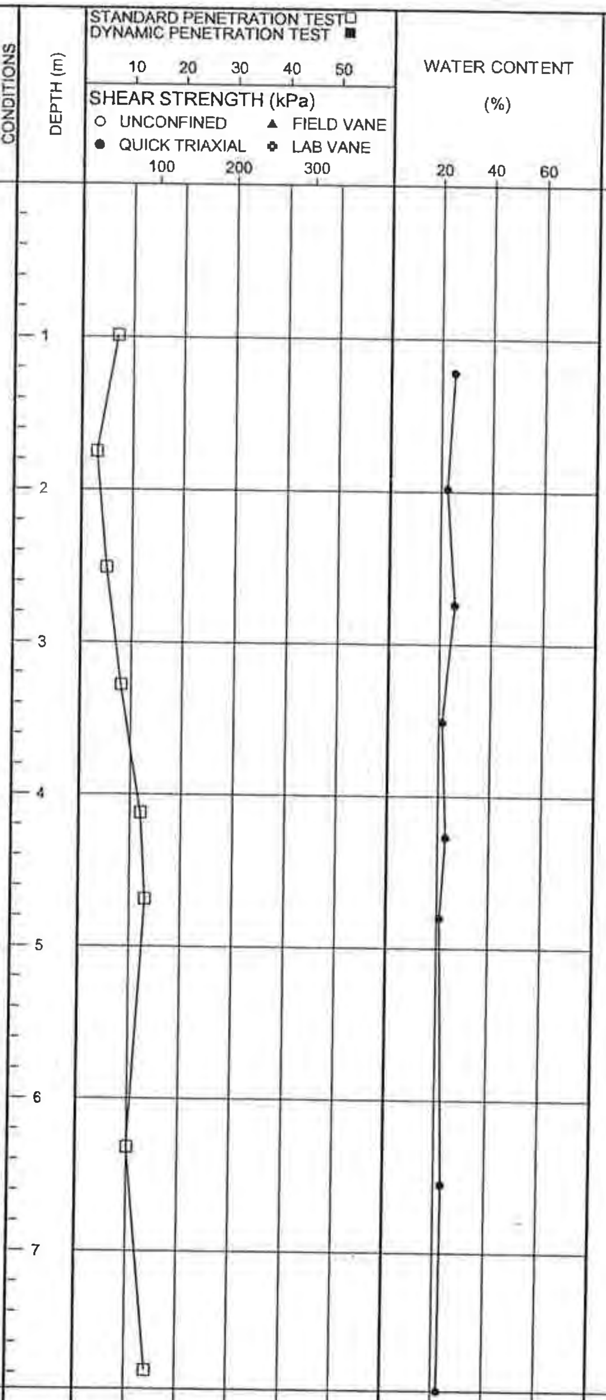
PROJECT Arber Property
LOCATION (see borehole location plan)
CLIENT HERT INC.
JOB NO. TG63047
DATE July 25, 2006
ORIGINATED BY ks
COMPILED BY rd
CHECKED BY jdo

SOIL PROFILE

ELEV DEPTH	DESCRIPTION
201.7	
201.6 0.1	10 cm **ASPHALT**
	51 cm **GRANULAR FILL**, crushed limestone
201.1 0.6	Red-brown fine **SILTY SAND**, wet to saturated, becoming coarser at 7.6 m(±), very loose to compact.
193.8 7.9	**BOREHOLE TERMINATED**

SAMPLES

NUMBER	TYPE	"N" VALUES
1	SS	7
2	SS	3
3	SS	5
4	SS	8
5	SS	12
6	SS	13
7	SS	10
8	SS	14



OBSERVATIONS & REMARKS

Split Spoon wet upon retrieval of Sample 2 and 3.

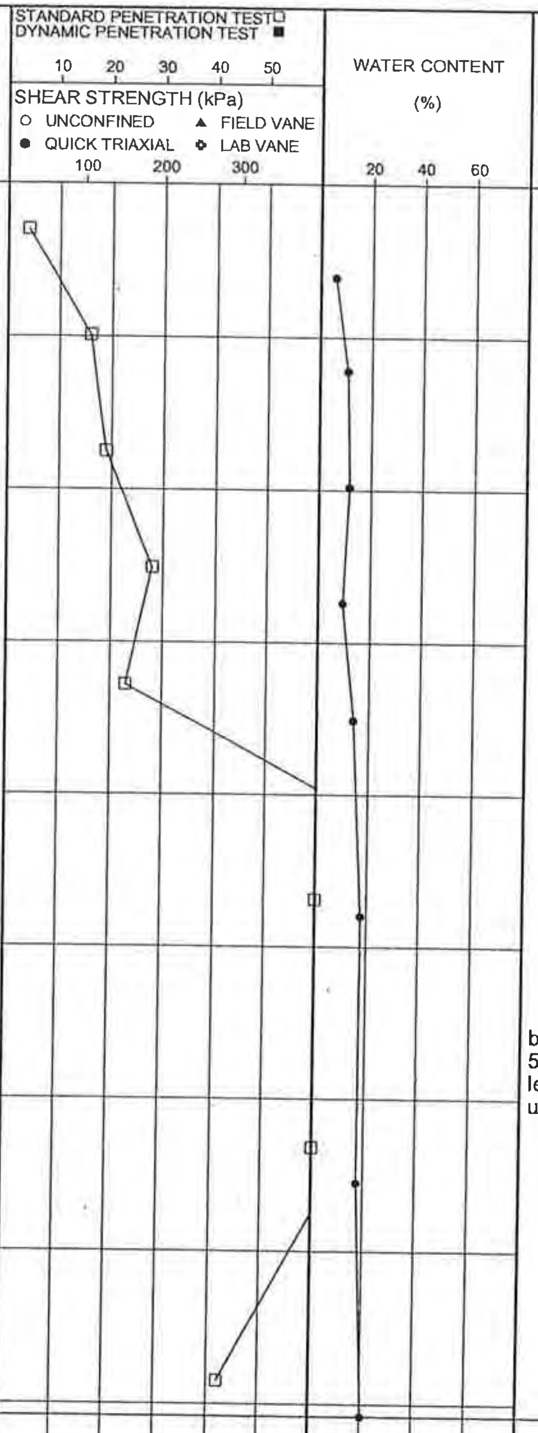
Upon Completion: Borehole caved & wet at 1.8 m

RECORD OF BOREHOLE No 4

1 OF 1

PROJECT Arber Property
CLIENT HERT INC.
JOB NO. TG63047
DATE July 25, 2006
LOCATION (see borehole location plan)
ORIGINATED BY lw
COMPILED BY ma
CHECKED BY jdo

SOIL PROFILE			SAMPLES					
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	DEPTH (m)	OBSERVATIONS & REMARKS
202.6 0.0	Brown to reddish brown **SILTY FINE SAND**, trace organics to 0.6 m (±), few rootlets, some bedding, moist, becoming wet to saturated below 3.0 m (±), very loose to very dense.		1	SS	4			
			2	SS	16		1	
			3	SS	19	∇		
							2	
			4	SS	28			
							3	
			5	SS	23			
							4	
	few thin light grey Silt and Clay seams/lenses		6	SS	50/8cm			
							5	
								borehole caved at 5.5 m (±), water level at 1.8 m (±) upon completion.
							6	
			7	SS	67			
							7	
			8	SS	42			
194.5 8.1	**BOREHOLE TERMINATED**						8	



RECORD OF BOREHOLE No 5

1 OF 1

PROJECT Arber Property

LOCATION (see borehole location plan)

ORIGINATED BY lw

CLIENT HERT INC.

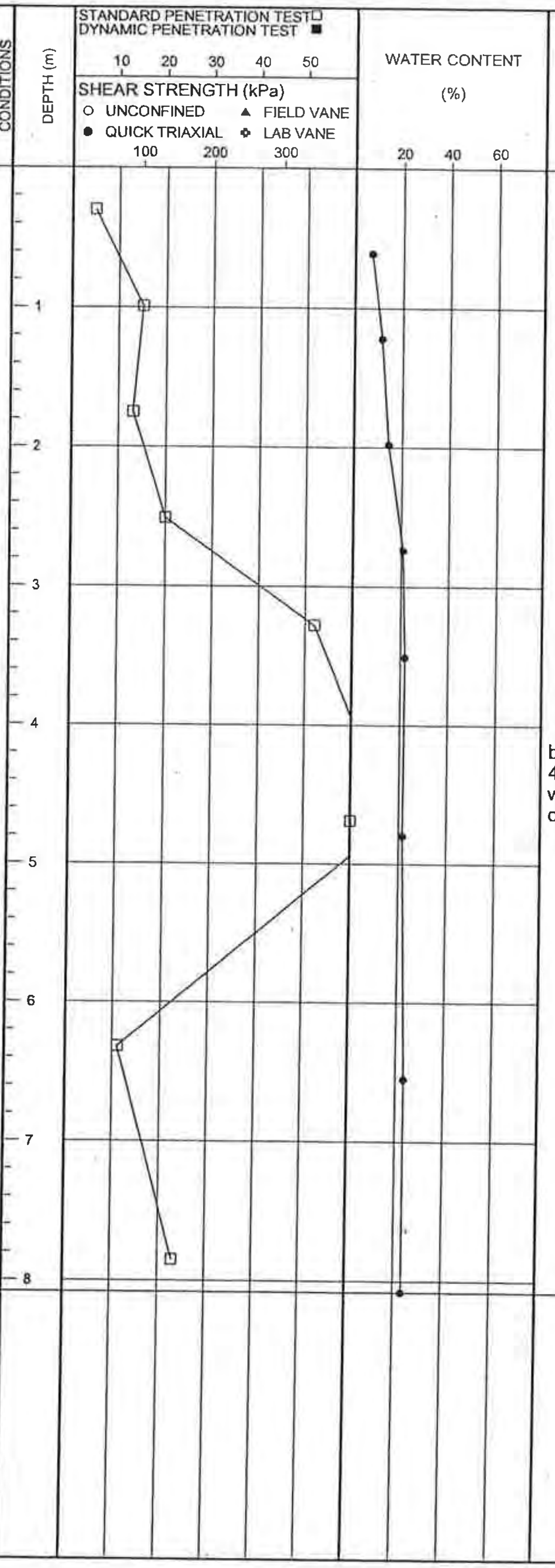
COMPILED BY ma

JOB NO. TG63047

DATE July 25, 2006

CHECKED BY jdo

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	
199.9 0.0	Brown to reddish brown **SILTY FINE SAND**, trace organics to 1.2 m (±), trace rootlets to 0.6 m (±), trace of gravel, some bedding, moist, becoming wet below 3 m (±), loose to very dense.		1	SS	5	
			2	SS	15	
			3	SS	13	
			4	SS	20	
			5	SS	52	
			6	SS	69	
			7	SS	11	
			8	SS	23	
191.8 8.1	**BOREHOLE TERMINATED**					



OBSERVATIONS & REMARKS

borehole caved at 4.1 m (±), no free water upon completion.

RECORD OF BOREHOLE No 6

1 OF 1

PROJECT Arber Property

CLIENT HERT INC.

JOB NO. TG63047 DATE July 26, 2006

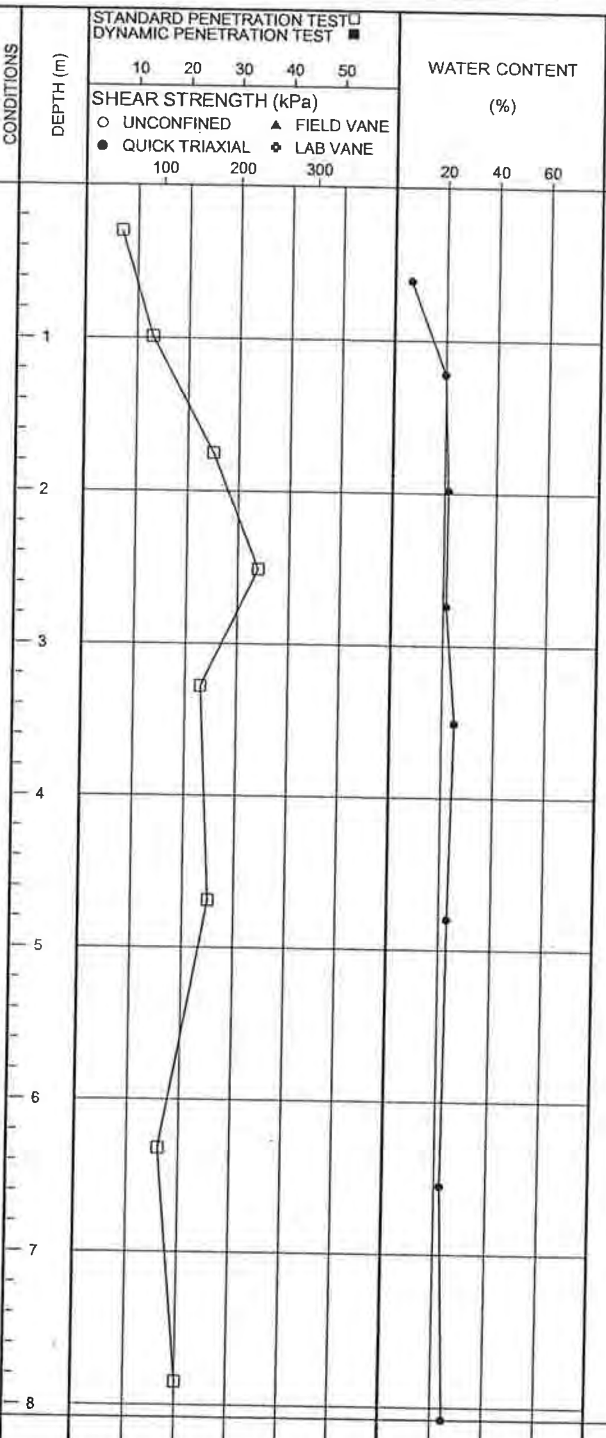
LOCATION (see borehole location plan)

ORIGINATED BY lw

COMPILED BY ma

CHECKED BY jdo

ELEV DEPTH	SOIL PROFILE DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS
197.1 0.0	Brown to reddish brown **SILTY FINE SAND**, trace rootlets to 1.2 m (±), some bedding, moist, becoming wet below 2.1 m (±), loose to dense.		1	SS	7	
			2	SS	13	
			3	SS	25	
			4	SS	34	
			5	SS	23	
			6	SS	25	
			7	SS	16	
189.0 8.1			8	SS	20	
	BOREHOLE TERMINATED					



OBSERVATIONS & REMARKS

borehole caved at 1.8 m, no free water upon completion.

RECORD OF BOREHOLE No 7

1 OF 1

PROJECT Arber Property

CLIENT HERT INC.

JOB NO. TG63047

DATE August 01, 2006

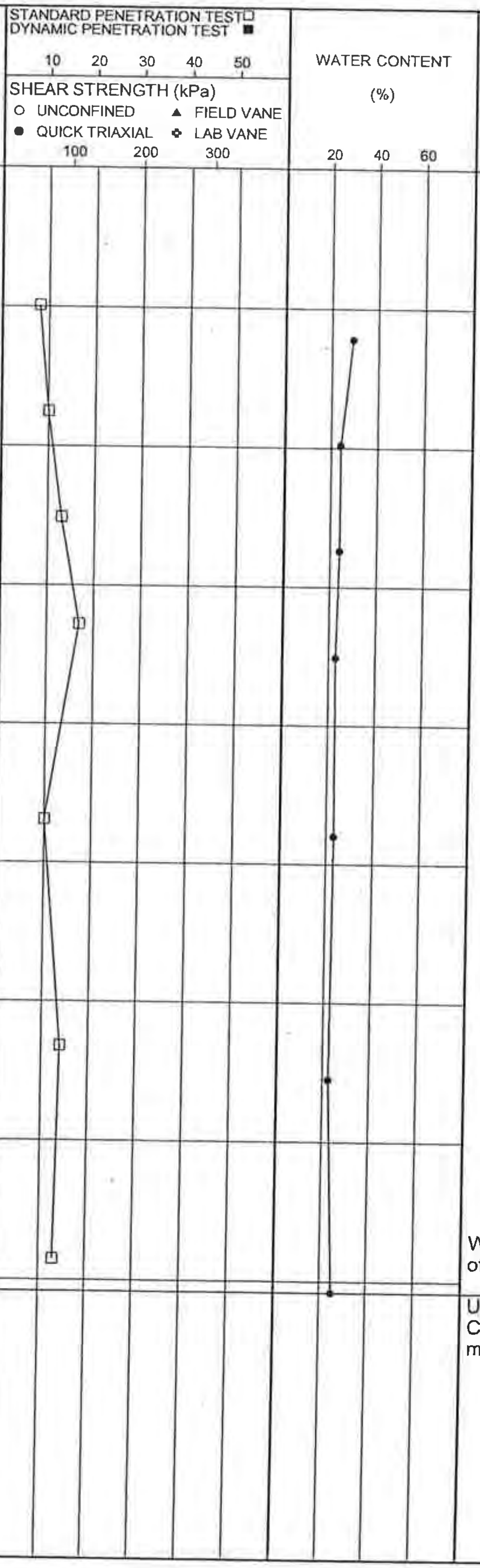
LOCATION (see borehole location plan)

ORIGINATED BY ks

COMPILED BY rd

CHECKED BY jdo

ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	DEPTH (m)	OBSERVATIONS & REMARKS
195.0							
198.0 0.1	10 cm **ASPHALT**						
194.7 0.3	22 cm **GRANULAR FILL**, crushed limestone.						
	FILL - Brown Fine Sand, trace of gravel, some burnt wood, 15cm peat layer, some clay at 2.3 m±, possibly native below 2.1m±, wet to saturated, loose.	1	SS	8		1	
		2	SS	10		2	Split Spoon wet upon retrieval of Sample #2.
192.6 2.4	Brown to red-brown **SILTY FINE SAND**, trace of fine gravel, wet to saturated, compact.	3	SS	13		3	
		4	SS	17		4	
		5	SS	10		5	
		6	SS	14		6, 7	
		7	SS	13		8	Water pouring out of spoon
186.9 8.1	**BOREHOLE TERMINATED**						Upon Completion: Caved & wet at 2.1 m.



RECORD OF BOREHOLE No 1

1 OF 1

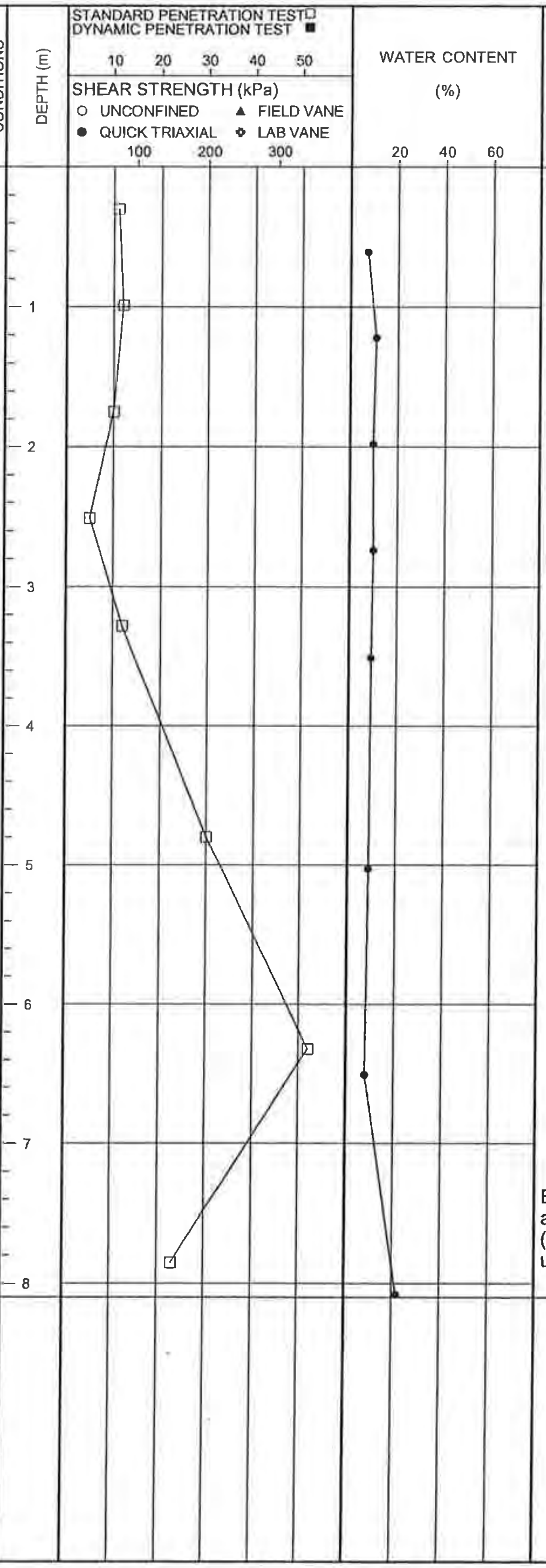
PROJECT Woodland Subdivision
LOCATION (see borehole location plan)
ORIGINATED BY lw
CLIENT T.R Hinan Contractors Inc.
COMPILED BY ma
JOB NO. TG63046
DATE July 25, 2006
CHECKED BY jd

SOIL PROFILE

ELEV DEPTH	DESCRIPTION
207.5 0.0	Brown, light brown and reddish brown **SILTY FINE SAND**, few rootlets to 1.2 m (±), some bedding, moist, becoming wet to saturated below 7.3 m (±), compact to very dense. loose zone between 2 and 3 metres.
199.4 8.1	**BOREHOLE TERMINATED**

SAMPLES

NUMBER	TYPE	"N" VALUES
1	SS	11
2	SS	12
3	SS	10
4	SS	5
5	SS	12
6	SS	30
7	SS	52
8	SS	23



OBSERVATIONS & REMARKS

Borehole caved and wet at 7.3 m (±), no free water upon completion.

RECORD OF BOREHOLE No 2

1 OF 1

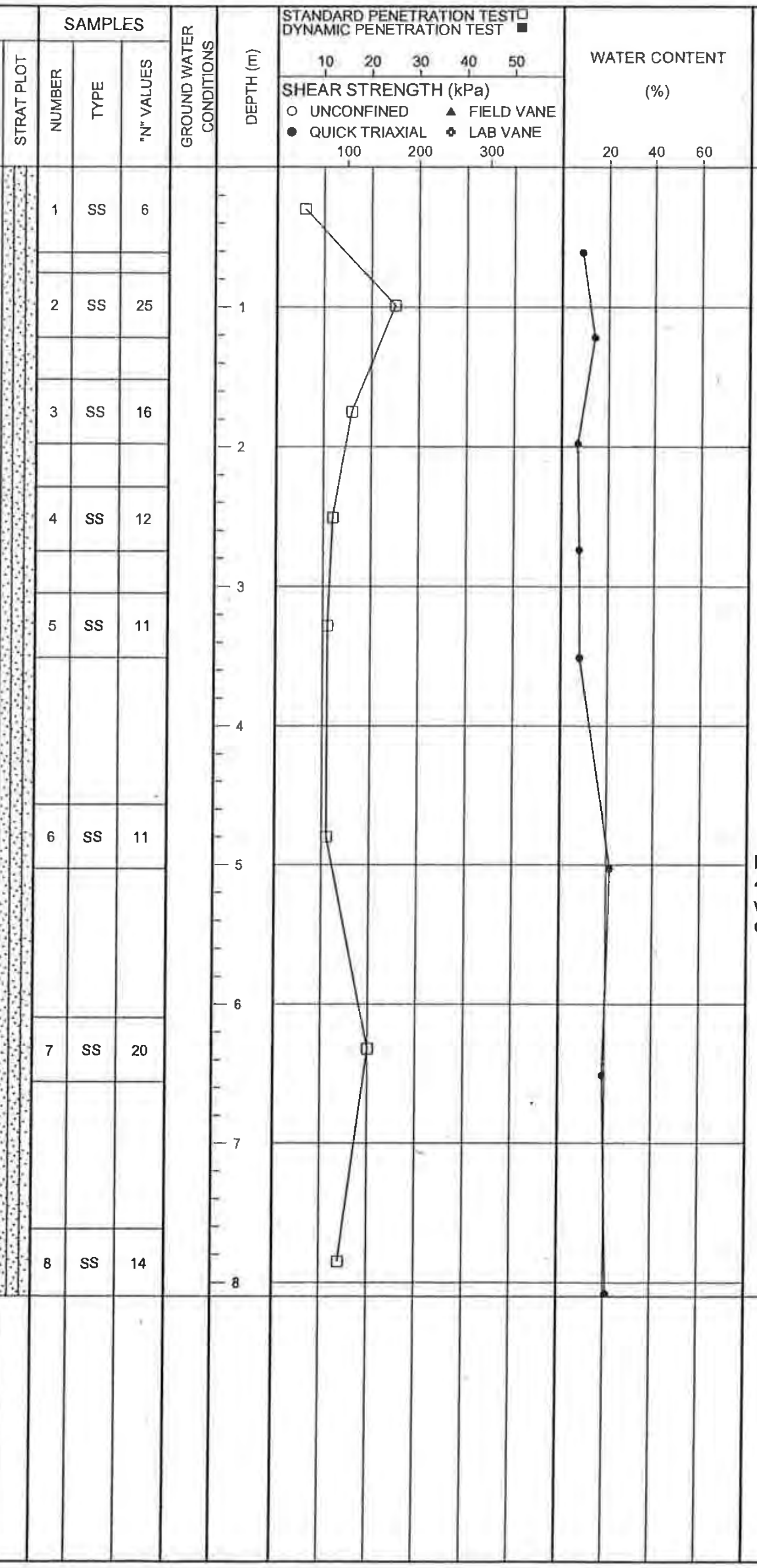
PROJECT Woodland Subdivision
LOCATION (see borehole location plan)
ORIGINATED BY lw
CLIENT T.R Hinan Contractors Inc.
COMPILED BY ma
JOB NO. TG63046
DATE July 25, 2006
CHECKED BY jd

SOIL PROFILE

ELEV DEPTH	DESCRIPTION
204.4 0.0	Brown to reddish brown **SILTY FINE SAND**, trace rootlets to 0.6 m (±), trace organics to 1.2 m (±), moist, becoming wet to saturated below 4.6 m (±), occasional Silt seams, trace of rounded gravel, loose to compact.
196.3 8.1	**BOREHOLE TERMINATED**

SAMPLES

NUMBER	TYPE	"N" VALUES
1	SS	6
2	SS	25
3	SS	16
4	SS	12
5	SS	11
6	SS	11
7	SS	20
8	SS	14



OBSERVATIONS & REMARKS

borehole caved at 4.9 m (±); no free water upon completion.

RECORD OF BOREHOLE No 3

1 OF 1

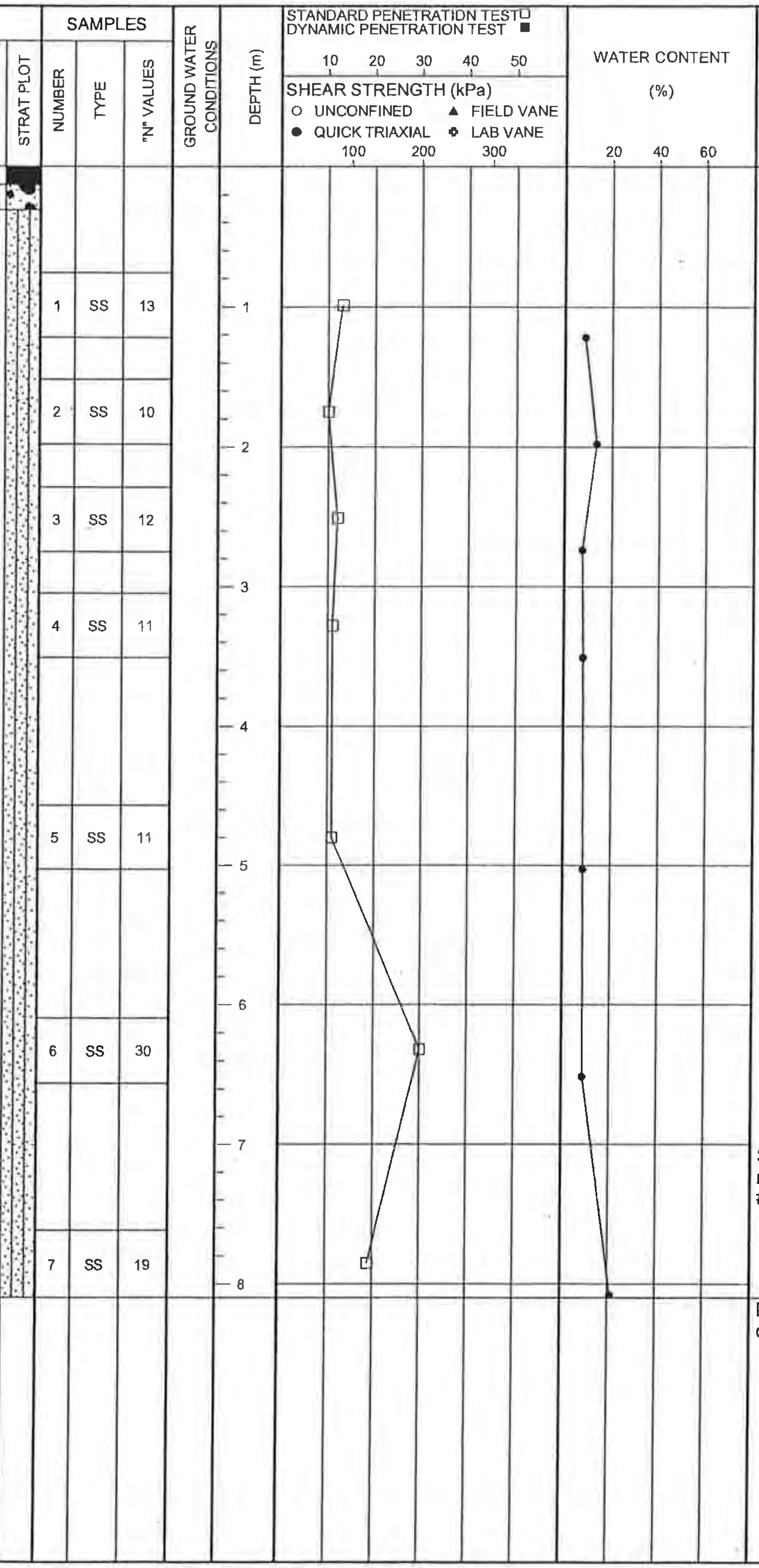
PROJECT Woodland Subdivision
LOCATION (see borehole location plan)
ORIGINATED BY ks
CLIENT T.R Hinan Contractors Inc.
COMPILED BY rd
JOB NO. TG63046
DATE August 01, 2006
CHECKED BY jd

SOIL PROFILE

ELEV DEPTH	DESCRIPTION
206.9	
206.8 0.1	13 cm **ASPHALT**
206.6 0.3	18 cm **GRANULAR FILL**, crushed limestone
	Red-brown to brown **SILTY FINE SAND**, moist, layered at 6.1 m(±), wet at 7.6 m(±), compact.
198.8 8.1	**BOREHOLE TERMINATED**

SAMPLES

NUMBER	TYPE	"N" VALUES
1	SS	13
2	SS	10
3	SS	12
4	SS	11
5	SS	11
6	SS	30
7	SS	19



OBSERVATIONS & REMARKS

Sampler wet upon retrieval of Sample #7.

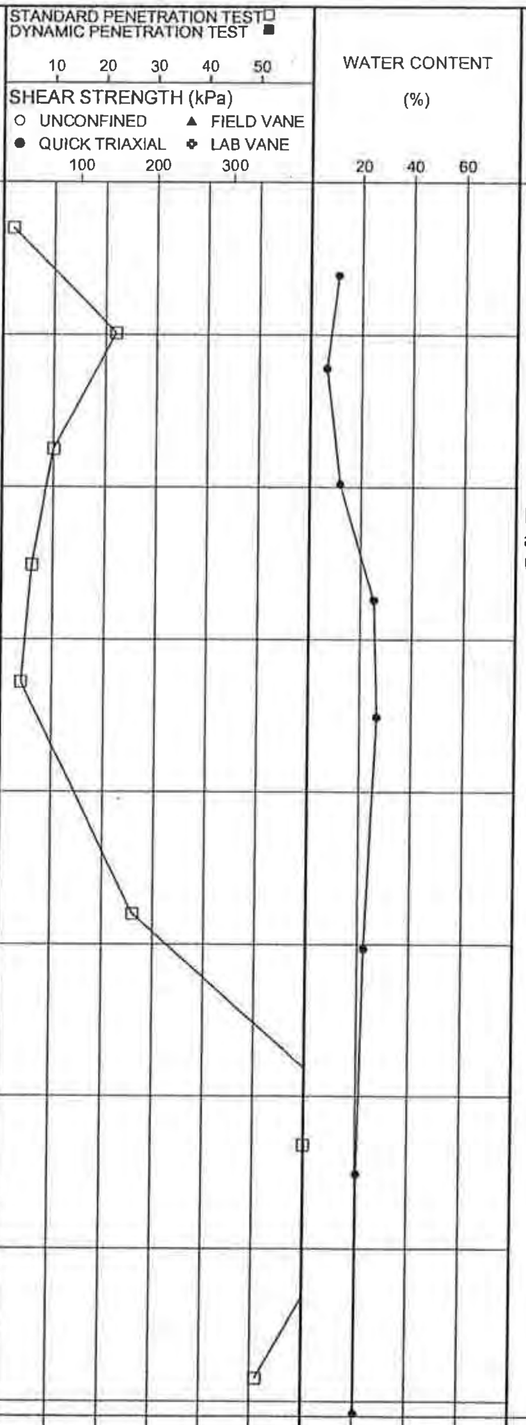
Dry and open upon completion.

RECORD OF BOREHOLE No 4

1 OF 1

PROJECT Woodland Subdivision
LOCATION (see borehole location plan)
ORIGINATED BY lw
CLIENT T.R Hinan Contractors Inc.
COMPILED BY ma
JOB NO. TG63046
DATE July 25, 2006
CHECKED BY jd

ELEV DEPTH	SOIL PROFILE DESCRIPTION	SAMPLES NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	OBSERVATIONS & REMARKS
201.3 0.0	Brown to reddish brown **SILTY FINE SAND**, trace rootlets, some bedding, moist, becoming wet to saturated below 2.1 m (±), very loose to very dense.	1	SS	2		
		2	SS	22		
		3	SS	10	▽	borehole caved and wet at 2.1 m (±).
		4	SS	6		
		5	SS	4		
		6	SS	26		
	few pieces weakly cemented sand	7	SS	77		
		8	SS	51		
193.2 8.1	**BOREHOLE TERMINATED**					

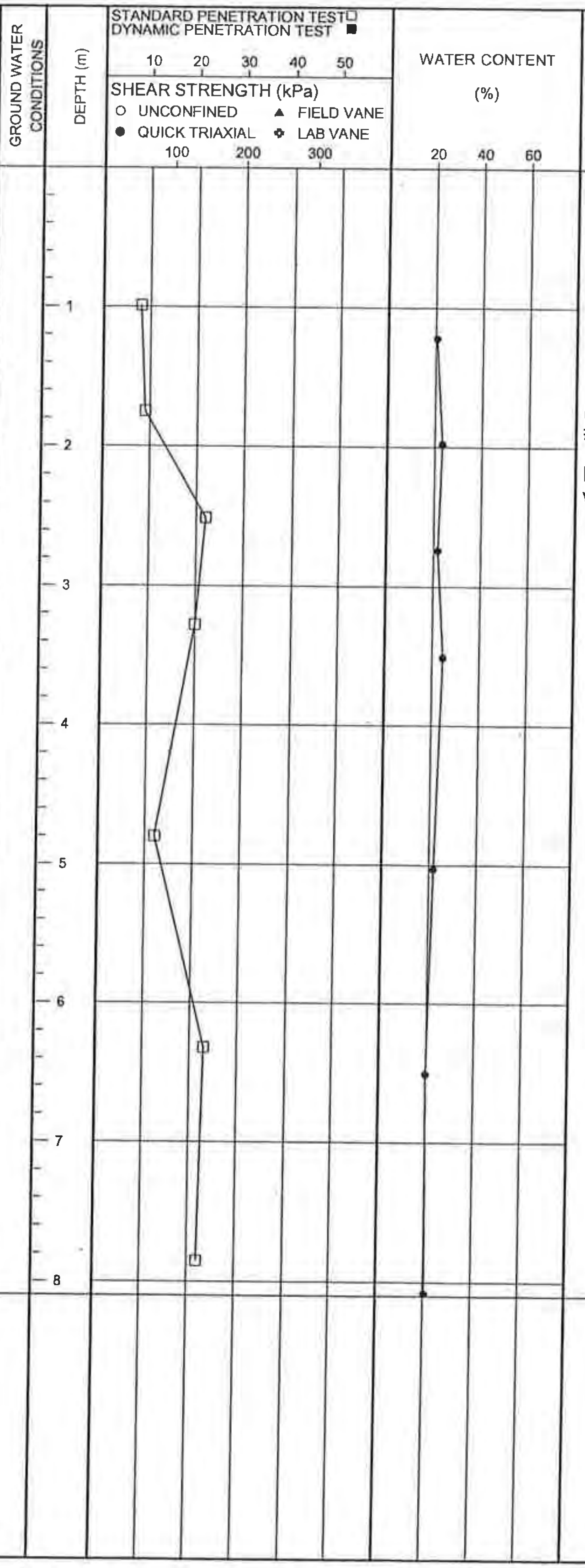


RECORD OF BOREHOLE No 5

1 OF 1

PROJECT Woodland Subdivision
LOCATION (see borehole location plan)
CLIENT T.R Hinan Contractors Inc.
JOB NO. TG63046
DATE August 01, 2006
ORIGINATED BY ks
COMPILED BY rd
CHECKED BY jd

ELEV DEPTH	DESCRIPTION (SOIL PROFILE)	NUMBER	TYPE	"N" VALUES
197.8				
199.9	15 cm **ASPHALT.**			
0.2 197.3	38 cm **GRANULAR FILL,** crushed limestone			
0.5	Red-brown **SILTY FINE SAND**, wet to saturated, trace of rounded fine gravel below 6.1 m(±),loose to compact.	1	SS	8
		2	SS	9
		3	SS	22
		4	SS	20
		5	SS	12
		6	SS	23
		7	SS	22
189.7 8.1	**BOREHOLE TERMINATED**			



OBSERVATIONS & REMARKS

sampler wet upon retrieval of Sample #2.

borehole caved & wet at 2.1 m±.

UTM | | Z | | E

5 | R | | N

Elev | R | 0690

Basin 24

The Ontario Water Resources Commission Act

WATER WELL RECORD

WATER RESOURCES DIVISION
AUG - 4 1964
ONTARIO WATER RESOURCES COMMISSION

66 No 1564

County or District Welland
Township, Village, [✓ Town] or City Pelham
Con. 9 Lot 13
Date completed 6 (day) July (month) 64 (year)

[redacted]ss R.R. # 5 Fenwick.

Casing and Screen Record

Inside diameter of casing 5 in.
Total length of casing 214
Type of screen
Length of screen
Depth to top of screen
Diameter of finished hole 5 in.

Pumping Test

Static level 40 ft
Test-pumping rate 12 G.P.M.
Pumping level 105 ft
Duration of test pumping 1 1/2 hours
Water clear or cloudy at end of test clearing
Recommended pumping rate 8-10 G.P.M.
with pump setting of 140-160 feet below ground surface

Well Log

Overburden and Bedrock Record	From ft.	To ft.
Sand.	0	20
Sand & water	20	- 40
Quick sand	40	180
Sand & clay	180	212
Niagara Rock.	212	218

Water Record

Depth(s) at which water(s) found	Kind of water (fresh, salty, sulphur)
216	Fresh

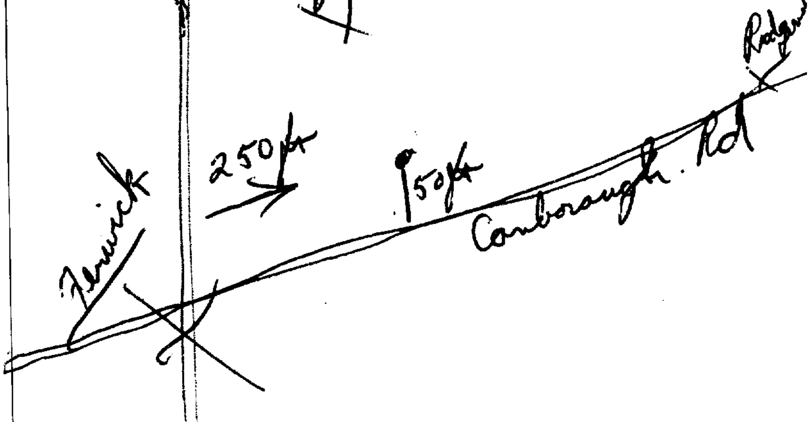
For what purpose(s) is the water to be used? Domestic & Barn
Is well on upland, in valley, or on hillside? Upland.
Drilling or Boring Firm S W Merritt
Address R.R. 1 Smithville
Licence Number 1003
Name of Driller or Borer ~~1003~~ Same
Address
Date July 10
Sidney Merritt
(Signature of Licensed Drilling or Boring Contractor)

Form 7 15M-60-4138

OWRC COPY

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



CSS.S8

UTM | | Z | 170 | E

R | | N

Elev. C 9 ~~24~~ Tx 0690

Basin 24 Lot 14

ONTARIO

The Water-well Drillers Act, 1954
Department of Mines

~~60~~ No. 1565

RECEIVED
DEC 12 1956
GEOLOGICAL BRANCH
DEPARTMENT of MINES

Water-Well Record

Now RAY YOUNG

Welland

[redacted]

ip, Village, [✓ Town] or City Pelham

Village, Town or City)

ddress Fenwick

Date completed July 8 56
(day) (month) (year)

Pipe and Casing Record

Casing diameter(s) 5 in new
Length(s) 195
Type of screen
Length of screen

Pumping Test

Static level 75'
Pumping rate 1000 gal hour
Pumping level 75'
Duration of test July 8

Well Log

Water Record

Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	No. of feet water rises	Kind of water (fresh, salty, or sulphur)
quick sand	0	195			
Niagara Rock	195	202	202'	127'	Fresh

For what purpose(s) is the water to be used? Domestic

Is water clear or cloudy? Clear

Is well on upland, in valley, or on hillside? Upland

Drilling firm S. W. Merritt

Address R.R.1 Smithville Ont

Name of Driller Frank Merritt

Address R.R.1 Smithville

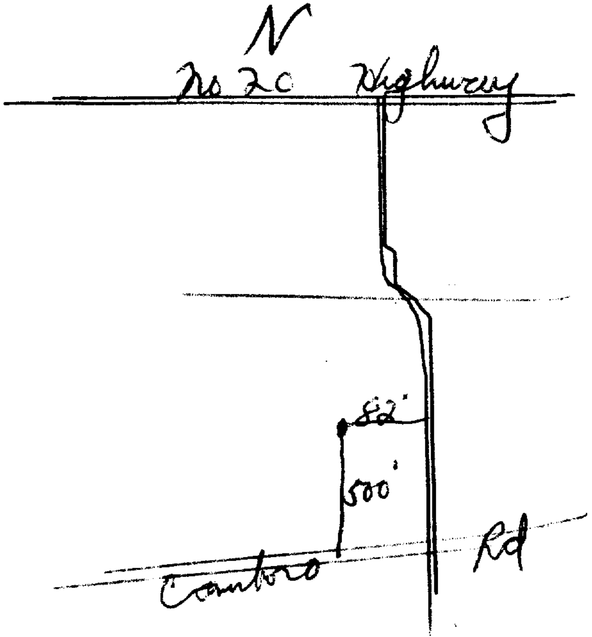
Licence Number 172

I certify that the foregoing statements of fact are true.

Date Dec 10 Sidney Merritt
Signature of Licensee

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



Form 5

CSS.S8

The Ontario Water Resources Commission Act

WATER WELL RECORD

30M/3c

Water management in Ontario

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11

6602575

MUNICIP. 66004

CON. CON 08

COUNTY OR DISTRICT: **WELLAND**

TOWNSHIP, BOROUGH, CITY, [✓ TOWN] VILLAGE: **PELHAM**

CON., BLOCK, TRACT, SURVEY, ETC.: ~~6~~ 8

LOT 013

[redacted] 153, Fenwick, Ont.

DATE COMPLETED: DAY ~~35~~ 15 MO. 12 YR. 70

765740 | RC. 4 | ELEVATION 0700 | RC. 54 | BASIN CODE 24

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH – FEET FROM	DEPTH – FEET TO
RED			Hard Sand	0	100
Dark			Quick sand	100	140
Brown			Clay	140	200
Gray			Corse Gravel	200	208

31 | 0100709 | 0140 07 | 0200695 | 0208211

32

41 WATER RECORD

WATER FOUND AT – FEET	KIND OF WATER
0200	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH – FEET FROM	DEPTH – FEET TO
~~5~~ 06	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	231	0	~~207~~ 0207
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.):
DIAMETER: INCHES
LENGTH: FEET
MATERIAL AND TYPE:
DEPTH TO TOP OF SCREEN: FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT – FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☐ PUMP 2 ☒ BAILER

PUMPING RATE: ~~10~~ 0010 GPM.

DURATION OF PUMPING: 04 HOURS 00 MINS.

STATIC LEVEL: 090 FEET

WATER LEVEL END OF PUMPING: FEET

WATER LEVELS DURING: 1 ☒ PUMPING 2 ☐ RECOVERY

15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
FEET	FEET	150 FEET	FEET

IF FLOWING, GIVE RATE: GPM.

PUMP INTAKE SET AT: FEET

WATER AT END OF TEST: 1 ☒ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP

RECOMMENDED PUMP SETTING: 178 FEET

RECOMMENDED PUMPING RATE: 0010 GPM.

______ GPM./FT. SPECIFIC CAPACITY

FINAL STATUS OF WELL

1 ☒ WATER SUPPLY
2 ☐ OBSERVATION WELL
3 ☐ TEST HOLE
4 ☐ RECHARGE WELL
5 ☐ ABANDONED, INSUFFICIENT SUPPLY
6 ☐ ABANDONED, POOR QUALITY
7 ☐ UNFINISHED

WATER USE 1 2

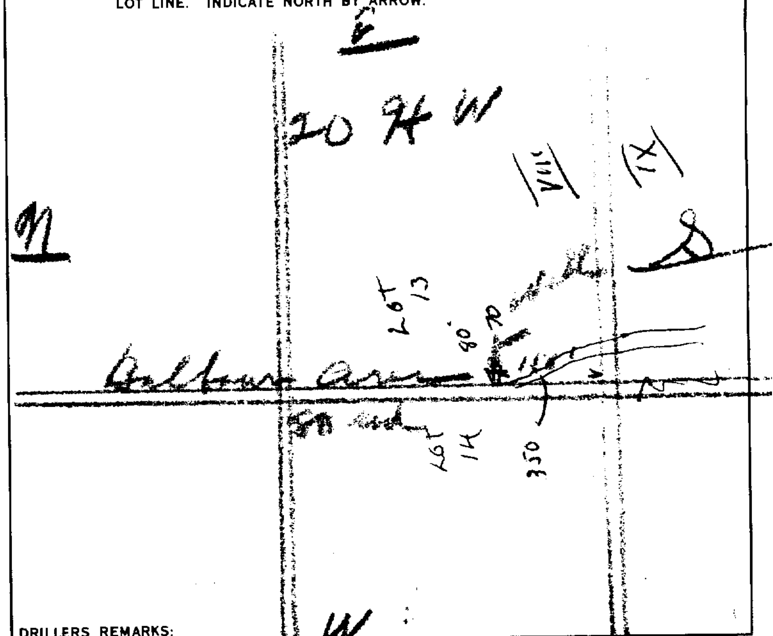
1 ☒ DOMESTIC
2 ☒ STOCK
3 ☐ IRRIGATION
4 ☐ INDUSTRIAL
☐ OTHER **FARM**
5 ☐ COMMERCIAL
6 ☐ MUNICIPAL
7 ☐ PUBLIC SUPPLY
8 ☐ COOLING OR AIR CONDITIONING
9 ☐ NOT USED

METHOD OF DRILLING

1 ☒ CABLE TOOL
2 ☐ ROTARY (CONVENTIONAL)
3 ☐ ROTARY (REVERSE)
4 ☐ ROTARY (AIR)
5 ☐ AIR PERCUSSION
6 ☐ BORING
7 ☐ DIAMOND
8 ☐ JETTING
9 ☐ DRIVING

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS:

CONTRACTOR

NAME OF WELL CONTRACTOR: **W.L.Field & SON**

LICENCE NUMBER: 2102

ADDRESS: **R.R.# 1, Vineland,Ont.**

NAME OF DRILLER OR BORER: Ray Field

LICENCE NUMBER: 2102

SIGNATURE OF CONTRACTOR: W L Field

SUBMISSION DATE: DAY 10 MO. 1 YR. 71

OFFICE USE ONLY

DATA SOURCE: 1

CONTRACTOR: 2102

DATE RECEIVED: 190171

DATE OF INSPECTION: 6, 5, 71

INSPECTOR: 7/p

S.C.-7

REMARKS:

CSS.S8

OWRC COPY

30M/3C

DRAFT

The Ontario Water Resources Commission Act

WATER WELL RECORD

Water management in Ontario

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11

6602615

MUNICIP. 66004 CON. CON 08

COUNTY OR DISTRICT: Welland

TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: Pelham

CON., BLOCK, TRACT, SURVEY, ETC.: 8

LOT: 013

[redacted]

wick Ontario

DATE COMPLETED: DAY 07 MO 07 YR. 71

NG 765685 RC. 4 ELEVATION 06700 RC. 4 BASIN CODE 24

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH – FEET FROM	TO
Brown	Sand			0	100
		Quick Sand	Hard and soft spots	100	150
Brown		Clay		150	200
gray	sand	stones		200	208
		corse stone		208	212
		Rock		212	216

31 | 0100609 | 0150 07 | 0200605 | 0208209 12 | 0212 12 | 0216 26

32

41 WATER RECORD

WATER FOUND AT – FEET	KIND OF WATER
0215	1 ☒ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH – FEET FROM	TO
~~6~~ 06	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	231	0	~~212~~ 0212
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☒ OPEN HOLE		212	0216 ~~216~~
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.):
DIAMETER: INCHES
LENGTH: FEET
MATERIAL AND TYPE:
DEPTH TO TOP OF SCREEN: FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT – FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☐ PUMP 2 ☒ BAILER

PUMPING RATE: 0010 GPM.

DURATION OF PUMPING: 02 HOURS 00 MINS.

STATIC LEVEL: 125 FEET

WATER LEVEL END OF PUMPING: 125 FEET

WATER LEVELS DURING 1 ☒ ~~PUMPING~~ 2 ☐ RECOVERY

15 MINUTES: FEET | 30 MINUTES: FEET | 45 MINUTES: FEET | 60 MINUTES: FEET

IF FLOWING, GIVE RATE: GPM.

PUMP INTAKE SET AT: 180 FEET

WATER AT END OF TEST: 1 ☒ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP

RECOMMENDED PUMP SETTING: FEET

RECOMMENDED PUMPING RATE: 0010 GPM.

020.0 GPM./FT. SPECIFIC CAPACITY

FINAL STATUS OF WELL

1 ☒ WATER SUPPLY
2 ☐ OBSERVATION WELL
3 ☐ TEST HOLE
4 ☐ RECHARGE WELL
5 ☐ ABANDONED, INSUFFICIENT SUPPLY
6 ☐ ABANDONED, POOR QUALITY
7 ☐ UNFINISHED

WATER USE 12

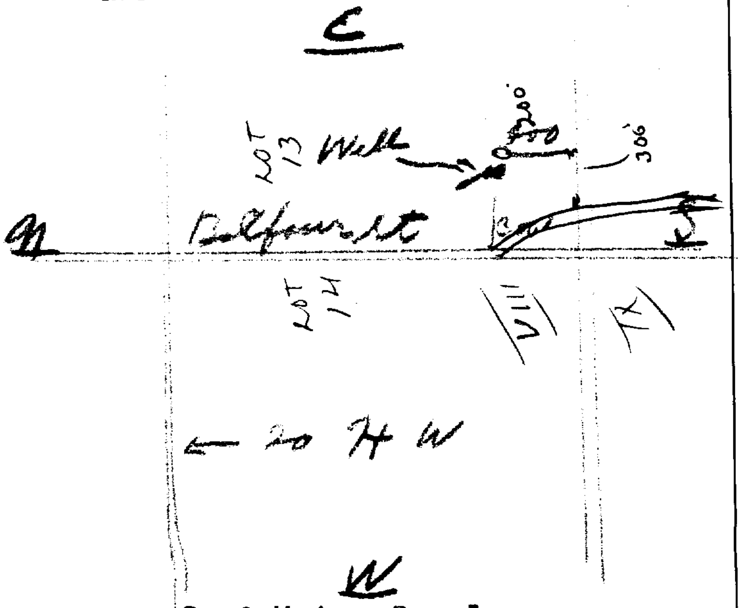
1 ☒ DOMESTIC
2 ☒ STOCK
3 ☐ IRRIGATION
4 ☐ INDUSTRIAL
☐ OTHER Farm
5 ☐ COMMERCIAL
6 ☐ MUNICIPAL
7 ☐ PUBLIC SUPPLY
8 ☐ COOLING OR AIR CONDITIONING
9 ☐ NOT USED

METHOD OF DRILLING

1 ☒ CABLE TOOL
2 ☐ ROTARY (CONVENTIONAL)
3 ☐ ROTARY (REVERSE)
4 ☐ ROTARY (AIR)
5 ☐ AIR PERCUSSION
6 ☐ BORING
7 ☐ DIAMOND
8 ☐ JETTING
9 ☐ DRIVING

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS: Good Water Supply

CONTRACTOR

NAME OF WELL CONTRACTOR: W.L.Field & SON
LICENCE NUMBER: 2102
ADDRESS: RLRL# 1, Vineland, Ont.
NAME OF DRILLER OR BORER: Ray Field
LICENCE NUMBER: 2102
SIGNATURE OF CONTRACTOR: W L Field
SUBMISSION DATE: DAY 29 MO. 9 YR. 71

OFFICE USE ONLY

DATA SOURCE: 1
CONTRACTOR: 2102
DATE RECEIVED: 041071
DATE OF INSPECTION: 25, 5, 72
INSPECTOR:
REMARKS: CSS.S8
P
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OWRC COPY

ONTARIO

MINISTRY OF THE ENVIRONMENT

The Ontario Water Resources Act

WATER WELL RECORD

30m 3c-

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11

6602748 MUNICIP. 66004 CON. CON 08

COUNTY OR DISTRICT

[redacted]

TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: Town of Pelham.

CON. BLOCK, TRACT, SURVEY, ETC.: 8

LOT

~~Box~~ R.R3 Fenwick.

DATE COMPLETED: DAY 02 MO. 05 YR. 73

6602748 17 635200 4765708 4 740 4 24 JUN 15, 1977 284

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	TO
Yellow	Sand.			0	32
	Quick Sand.			32	204
grey	clay &	Sand.		204	264
Niagara	Rock			264	267

31 0032528 0204 07 0264 20528 0267 26

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
0267	1 ☑ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	TO
~~6~~ 6 06	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	188	0	~~210~~ 0210
5 05	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	188	80	0264 ~~264~~
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☑ OPEN HOLE		264	0267 ~~267~~

SCREEN

SIZE(S) OF OPENING (SLOT NO.)

DIAMETER INCHES

LENGTH FEET

MATERIAL AND TYPE

DEPTH TO TOP OF SCREEN FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☐ PUMP 2 ☐ BAILER

PUMPING RATE: 0015 GPM.

DURATION OF PUMPING: 03 HOURS 00 MINS

STATIC LEVEL: 185 FEET

WATER LEVEL END OF PUMPING: 205 ~~205~~ FEET

WATER LEVELS DURING: 1 ☑ PUMPING 2 ☐ RECOVERY

15 MINUTES: FEET

30 MINUTES: 205 FEET

45 MINUTES: FEET

60 MINUTES: FEET

IF FLOWING, GIVE RATE: GPM.

PUMP INTAKE SET AT: FEET

WATER AT END OF TEST: 1 ☑ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE: ☐ SHALLOW ☑ DEEP

RECOMMENDED PUMP SETTING: 080 ~~80 240~~ FEET

RECOMMENDED PUMPING RATE: 0010 GPM.

GPM./FT. SPECIFIC CAPACITY

FINAL STATUS OF WELL 1

1 ☐ WATER SUPPLY
2 ☐ OBSERVATION WELL
3 ☐ TEST HOLE
4 ☐ RECHARGE WELL
5 ☐ ABANDONED, INSUFFICIENT SUPPLY
6 ☐ ABANDONED, POOR QUALITY
7 ☐ UNFINISHED

WATER USE 18

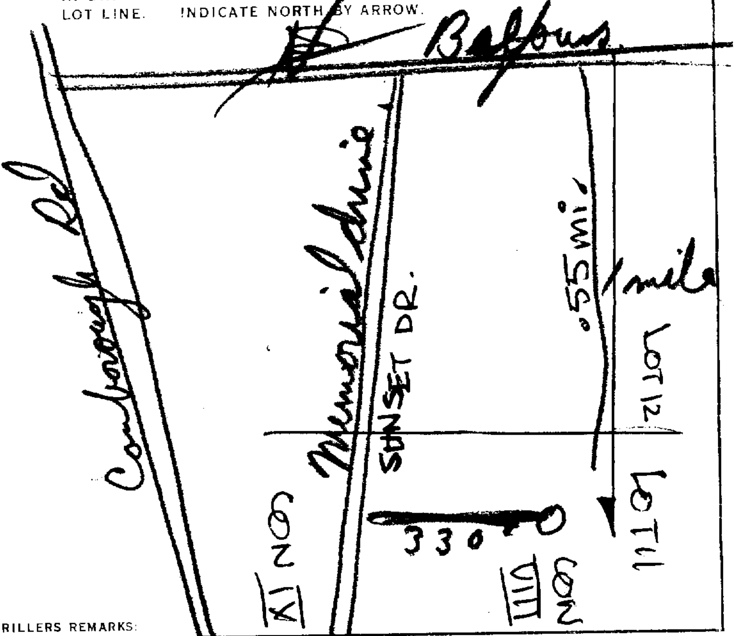
1 ☑ DOMESTIC
2 ☐ STOCK
3 ☐ IRRIGATION
4 ☐ INDUSTRIAL
☐ OTHER Cooling cherries & Spraying
5 ☐ COMMERCIAL
6 ☐ MUNICIPAL
7 ☐ PUBLIC SUPPLY
8 ☐ COOLING OR AIR CONDITIONING
9 ☐ NOT USED

METHOD OF DRILLING 1

1 ☑ CABLE TOOL
2 ☐ ROTARY (CONVENTIONAL)
3 ☐ ROTARY (REVERSE)
4 ☐ ROTARY (AIR)
5 ☐ AIR PERCUSSION
6 ☐ BORING
7 ☐ DIAMOND
8 ☐ JETTING
9 ☐ DRIVING

LOCATION OF WELL 3565

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS:

CONTRACTOR

NAME OF WELL CONTRACTOR: S W Merritt

LICENCE NUMBER: 3609

ADDRESS: R.R. 1 Smithville

NAME OF DRILLER OR BORER: Sidney Merritt.

LICENCE NUMBER: 3609

SIGNATURE OF CONTRACTOR: S. Merritt.

SUBMISSION DATE: DAY 2 MO. May YR. 73

OFFICE USE ONLY

DATA SOURCE: 1

CONTRACTOR: 3609

DATE RECEIVED: 290573

DATE OF INSPECTION

INSPECTOR: 7

REMARKS: CSS.S8

P 15.

WI

FORM 7 07-091

MINISTRY OF THE ENVIRONMENT COPY

MINISTRY OF THE ENVIRONMENT

The Ontario Water Resources Act

WATER WELL RECORD

DRAFT

30m 3c

Ont [redacted] ES PROVIDED / BOX WHERE APPLICABLE

11	6602923	MUNICIP. 66004	CON. CON	08

COUNTY OR DISTRICT: WELLAND	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: Niagara Region Town Pelham	CON., BLOCK, TRACT, SURVEY, ETC.: ~~Con~~ 8	LOT: 013
OWNER (SURNAME FIRST): [redacted]		ADDRESS: Fenwick.	DATE COMPLETED: DAY 5 MO Dec YR 73

			NORTHING	RC.	ELEVATION	RC.	BASIN CODE		
2	6602923	17	634319	4765700	4	698	2	24	JUN 15, 1977	284

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
Yellow	sand.			0	42
Yellow	Quicksand.			42	148
gray	clay & some gravel.			148	204
	Hard Pan. shale.			204	265

CODED

31

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
205	1 ☑ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
6 1/4	1 ☑ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	188	0	204
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☒ OPEN HOLE		204	205
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET
MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN FEET	

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT LEAD PACKER, ETC.)

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☐ PUMP 2 ☑ BAILER

PUMPING RATE: 16 GPM

DURATION OF PUMPING: 2 HOURS MINS

STATIC LEVEL: 120 FEET

WATER LEVEL END OF PUMPING: 135 FEET

WATER LEVELS DURING: 1 ☑ PUMPING 2 ☐ RECOVERY

15 MINUTES FEET; 30 MINUTES FEET; 45 MINUTES FEET; 60 MINUTES FEET

IF FLOWING GIVE RATE: GPM

PUMP INTAKE SET AT: 175 FEET

WATER AT END OF TEST: 1 ☑ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE: ☐ SHALLOW ☑ DEEP

RECOMMENDED PUMP SETTING: 175 180 FEET

RECOMMENDED PUMPING RATE: 10 GPM

FINAL STATUS OF WELL

1 ☑ WATER SUPPLY
2 ☐ OBSERVATION WELL
3 ☐ TEST HOLE
4 ☐ RECHARGE WELL
5 ☐ ABANDONED, INSUFFICIENT SUPPLY
6 ☐ ABANDONED, POOR QUALITY
7 ☐ UNFINISHED

WATER USE

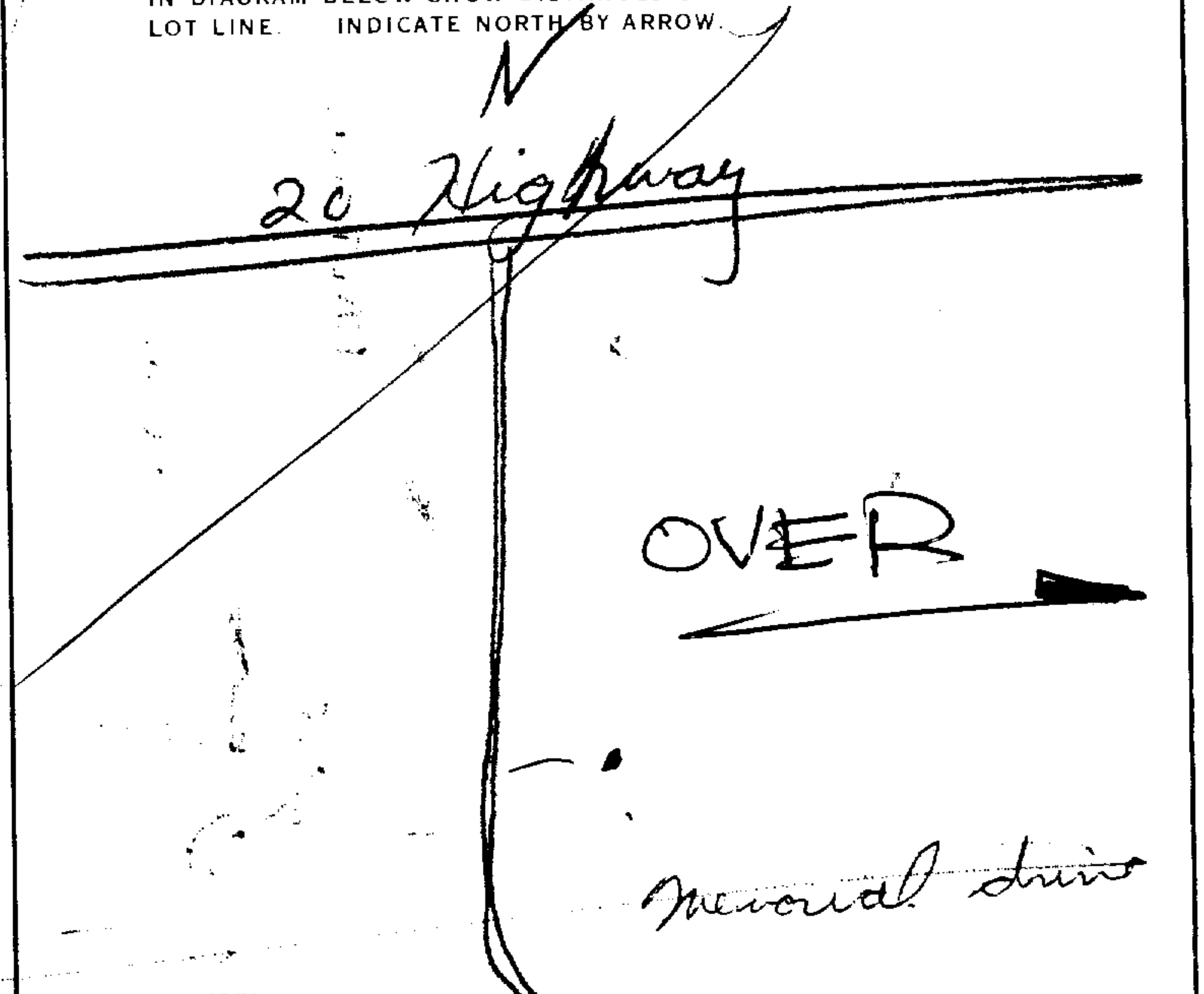
1 ☑ DOMESTIC
2 ☐ STOCK
3 ☐ IRRIGATION
4 ☐ INDUSTRIAL
☐ OTHER
5 ☐ COMMERCIAL
6 ☐ MUNICIPAL
7 ☐ PUBLIC SUPPLY
8 ☐ COOLING OR AIR CONDITIONING
9 ☐ NOT USED

METHOD OF DRILLING

1 ☑ CABLE TOOL
2 ☐ ROTARY (CONVENTIONAL)
3 ☐ ROTARY (REVERSE)
4 ☐ ROTARY (AIR)
5 ☐ AIR PERCUSSION
6 ☐ BORING
7 ☐ DIAMOND
8 ☐ JETTING
9 ☐ DRIVING

LOCATION OF WELL 3465

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS:

CONTRACTOR

NAME OF WELL CONTRACTOR: S.W. Merritt — LICENCE NUMBER: 3609

ADDRESS: ~~Sid Merritt~~ RR1 Smithville

NAME OF DRILLER OR BORER: S Merritt — LICENCE NUMBER: 3609

SIGNATURE OF CONTRACTOR: Sidney Merritt — SUBMISSION DATE: DAY 5 MO Dec YR 73

OFFICE USE ONLY

DATA SOURCE — CONTRACTOR — DATE RECEIVED: 18 02 74

DATE OF INSPECTION — INSPECTOR

REMARKS: static level and pumping level may be unreliable - driller filled in levels from memory in 1976. S/P

MINISTRY OF THE ENVIRONMENT COPY

CSS.S8 FORM 7 07-091

MINISTRY OF THE ENVIRONMENT

The Ontario Water Resources Act

WATER WELL RECORD

DRAFT

Ontario

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11 6603280 MUNICIP. 66004 CON. CON 09

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	
[redacted]	PELHAM	~~12~~ IX	912

DATE COMPLETED 48-53 DAY 21 MO. 08 ~~Aug~~ YR. 78

64680 R.C. 4 ELEVATION 0630 R.C. 4 BASIN CODE 24

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
Yellow Brown sand,				0	12
Quick SAND				12	174
clay & gravel.				174	193
NIAGARA Rock				193	210

31 0012528 0174 07 0193 05 11 0210 26

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
10-13 0210	14 1 ☐ ~~FRESH~~ 3 ☒ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
15-18	19 1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
20-23	24 1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
25-28	29 1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
30-33	34 80 1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
10-11 05	12 1 ☑ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	188	0	13-16 0193
17-18	19 1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			20-23
24-25	26 1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			27-30

SCREEN

SIZE(S) OF OPENING (SLOT NO.) 31-33

DIAMETER 34-36 INCHES

LENGTH 39-40 FEET

MATERIAL AND TYPE

DEPTH TO TOP OF SCREEN 41-44 FEET 30

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	DEPTH SET AT - FEET TO	MATERIAL AND TYPE (CEMENT GROUT LEAD PACKER, ETC.)
10-13	14-17	
18-21	22-25	
26-29	30-33	80

71 PUMPING TEST

PUMPING TEST METHOD 10 ☑ PUMP ~~☐ BAILER~~

PUMPING RATE 11-14 0016 GPM

DURATION OF PUMPING 15-16 02 HOURS 17-18 00 MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING 1 ☐ PUMPING 2 ☐ RECOVERY 15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
19-21 082 FEET	22-24 100 FEET	26-28 FEET	29-31 FEET	32-34 FEET	35-37 FEET

IF FLOWING, GIVE RATE 36-41 GPM

PUMP INTAKE SET AT FEET

WATER AT END OF TEST 42 1 ☑ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE ☐ SHALLOW ☑ DEEP

RECOMMENDED PUMP SETTING 43-45 FEET

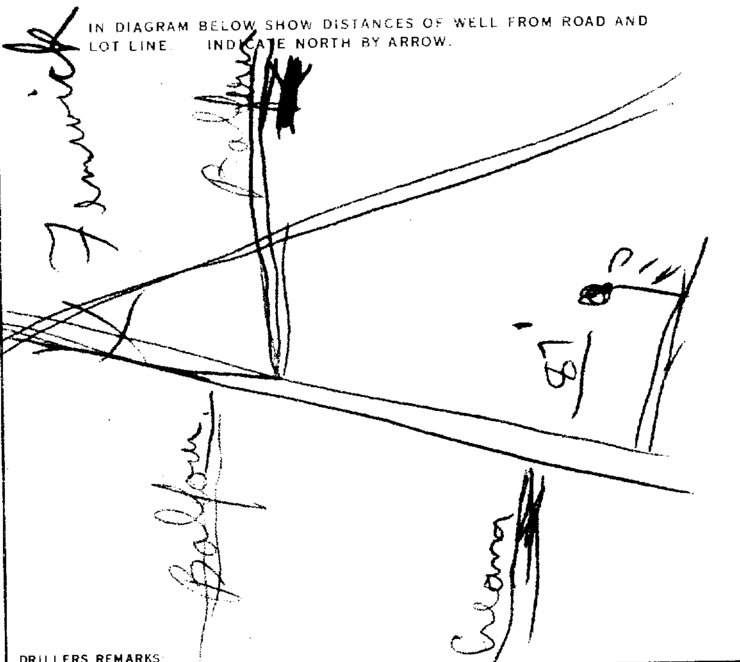
RECOMMENDED PUMPING RATE 46-49 GPM

50-53 GPM./FT. SPECIFIC CAPACITY

FINAL STATUS OF WELL 54 1	1 ☐ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL	5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED
WATER USE 55-56 12	1 ☑ DOMESTIC 2 ☑ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL ☐ OTHER	5 ☐ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING 9 ☐ NOT USED
METHOD OF DRILLING 57 1	1 ☑ CABLE TOOL 2 ☐ ROTARY (CONVENTIONAL) 3 ☐ ROTARY (REVERSE) 4 ☐ ROTARY (AIR) 5 ☐ AIR PERCUSSION	6 ☐ BORING 7 ☐ DIAMOND 8 ☐ JETTING 9 ☐ DRIVING

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS

CONTRACTOR

NAME OF WELL CONTRACTOR S.W. Merritt

LICENCE NUMBER 3609

ADDRESS R.R.1 Smithville

NAME OF DRILLER OR BORER Sid Merritt

LICENCE NUMBER 3609

SIGNATURE OF CONTRACTOR Sidney Merritt

SUBMISSION DATE DAY 21 MO. Aug YR. 78

OFFICE USE ONLY

DATA SOURCE 58 1

CONTRACTOR 59-62 3609

DATE RECEIVED 63-68 180978 80

DATE OF INSPECTION May 16/79

INSPECTOR

REMARKS

CSS.S8

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Ministry of the Environment
Ontario

The Ontario Water Resources Act
WATER WELL RECORD

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11 | 6603368 | MUNICIP. 66004 | CON. CON 08

TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: Pelham

CON., BLOCK, TRACT, SURVEY, ETC: 8

LOT: 011

COUNTY OR DISTRICT: [redacted] Fonwick 543 Memorial Dr.

DATE COMPLETED: DAY 31 MO May YR 79

21 | [redacted] | NORTHING 765700 | RC. 4 | ELEVATION 0740 | RC. 4 | BASIN CODE 24

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	TO
Brown	Sandy loam			0	20
Brown	Sand		muddy	20	60
Brown	Clay			60	195
Brown	Cemented Sand and Hardpan			195	245
Grey	Clay		soft sandy	245	273
Grey	Limestone			273	280

31

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
277	☒ FRESH ☐ SULPHUR ☐ SALTY ☐ MINERAL
	☐ FRESH ☐ SULPHUR ☐ SALTY ☐ MINERAL
	☐ FRESH ☐ SULPHUR ☐ SALTY ☐ MINERAL
	☐ FRESH ☐ SULPHUR ☐ SALTY ☐ MINERAL
	☐ FRESH ☐ SULPHUR ☐ SALTY ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	TO
6 1/4	☒ STEEL ☐ GALVANIZED ☐ CONCRETE ☐ OPEN HOLE	188	0	273
	☐ STEEL ☐ GALVANIZED ☐ CONCRETE ☐ OPEN HOLE			
	☐ STEEL ☐ GALVANIZED ☐ CONCRETE ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.):
DIAMETER: INCHES
LENGTH: FEET
MATERIAL AND TYPE:
DEPTH TO TOP OF SCREEN: FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

71 PUMPING TEST

PUMPING TEST METHOD: ☒ PUMP ☐ BAILER
PUMPING RATE: 50 GPM
DURATION OF PUMPING: 1 HOURS 30 MINS
STATIC LEVEL: 180 FEET
WATER LEVEL END OF PUMPING: 280 FEET
WATER LEVELS DURING: ☐ PUMPING ☒ RECOVERY
15 MINUTES: 180 FEET
30 MINUTES: 180 FEET
45 MINUTES: 180 FEET
60 MINUTES: 180 FEET
IF FLOWING, GIVE RATE: GPM
PUMP INTAKE SET AT: FEET
WATER AT END OF TEST: ☒ CLEAR ☐ CLOUDY
RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP
RECOMMENDED PUMP SETTING: 270 FEET
RECOMMENDED PUMPING RATE: 50 GPM

FINAL STATUS OF WELL

☒ WATER SUPPLY
☐ OBSERVATION WELL
☐ TEST HOLE
☐ RECHARGE WELL
☐ ABANDONED, INSUFFICIENT SUPPLY
☐ ABANDONED, POOR QUALITY
☐ UNFINISHED

WATER USE

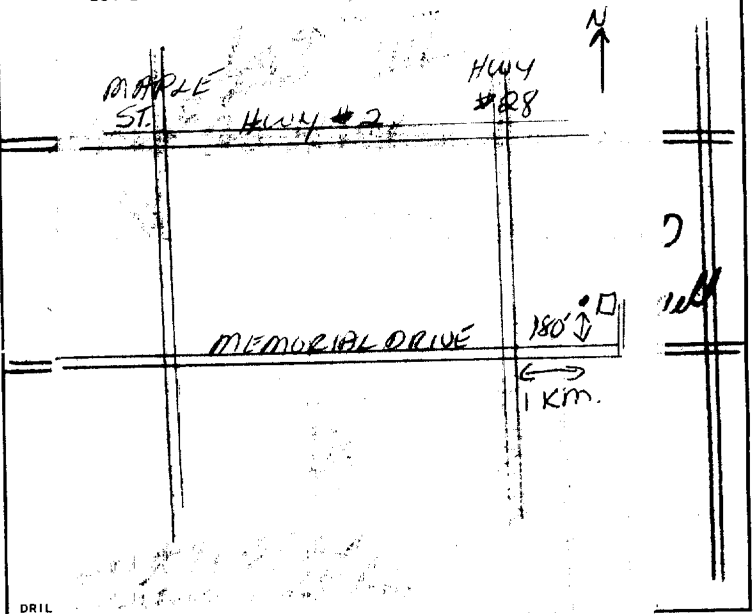
☐ DOMESTIC
☐ STOCK
☐ IRRIGATION
☐ INDUSTRIAL
☐ OTHER Farm & coal Chemis
☐ COMMERCIAL
☐ MUNICIPAL
☐ PUBLIC SUPPLY
☐ COOLING OR AIR CONDITIONING
☐ NOT USED

METHOD OF DRILLING

☐ CABLE TOOL
☒ ROTARY (CONVENTIONAL)
☐ ROTARY (REVERSE)
☐ ROTARY (AIR)
☐ AIR PERCUSSION
☐ BORING
☐ DIAMOND
☐ JETTING
☐ DRIVING

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



CONTRACTOR

NAME OF WELL CONTRACTOR: Wesley Peckham
LICENCE NUMBER: 4208
ADDRESS: RR2 Ancaster
NAME OF DRILLER OR BORER: Mervyn Peckham
LICENCE NUMBER: 4208
SIGNATURE OF CONTRACTOR: Wesley Peckham
SUBMISSION DATE: DAY 31 MO May YR 79

OFFICE USE ONLY

DATA SOURCE:
CONTRACTOR:
DATE RECEIVED: 160180
DATE OF INSPECTION: May 27, 1980
INSPECTOR:
REMARKS: APL

P-GW
CSS.S8

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FORM NO. 0506-4-77

Ministry of the Environment
Ontario

The Ontario Water Resources Act 30M3C

WATER WELL RECORD

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11 6603431 MUNICIP 66004 CON. CON 08

COUNTY OR DISTRICT [redacted]	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE Pelham	CON., BLOCK, TRACT, SURVEY, ETC 8	LOT 011
	R3 Fenwick		DATE COMPLETED DAY 12 MO ~~9~~ July YR 80
21	…HING 765760	RC 4 ELEVATION 0750 RC 4 BASIN CODE 24	

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	TO
Brown	Sandy clay			0	60
Grey	Sandy clay			60	260
Grey	Limestone			260	277

JUN 24 1986

31 006060581 026020581 0277215

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
0274	1 ☒ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	TO
07 ~~6~~ 1/4	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	188	0	0260
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET
MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN FEET	

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT LEAD PACKER, ETC.)

71 PUMPING TEST

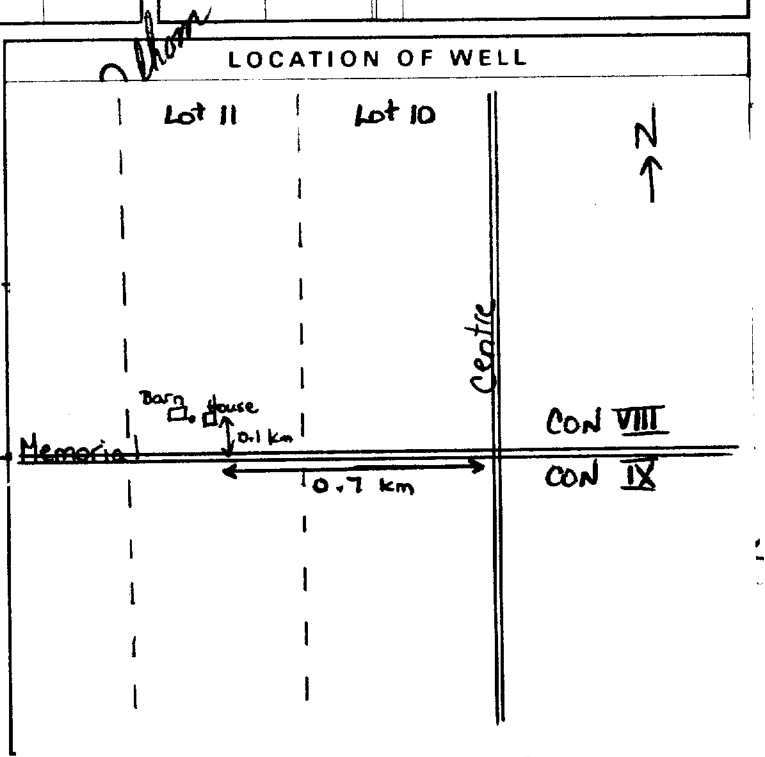
PUMPING TEST METHOD 1 ☒ PUMP 2 ☐ BAILER	PUMPING RATE 0020 GPM	DURATION OF PUMPING 02 HOURS 00 MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING 1 ☐ PUMPING 2 ☒ RECOVERY 15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
185 FEET	250 FEET	185 FEET	185 FEET	185 FEET	185 FEET

IF FLOWING, GIVE RATE GPM	PUMP INTAKE SET AT FEET	WATER AT END OF TEST 1 ☒ CLEAR 2 ☐ CLOUDY
RECOMMENDED PUMP TYPE ☐ SHALLOW ☒ DEEP	RECOMMENDED PUMP SETTING 024 FEET	RECOMMENDED PUMPING RATE 0020 GPM

FINAL STATUS OF WELL 1	1 ☒ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED
WATER USE 02	1 ☐ DOMESTIC 2 ☒ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL ☐ OTHER 5 ☐ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING 9 ☐ NOT USED
METHOD OF DRILLING 4	1 ☐ CABLE TOOL 2 ☐ ROTARY (CONVENTIONAL) 3 ☐ ROTARY (REVERSE) 4 ☒ ROTARY (AIR) 5 ☐ AIR PERCUSSION 6 ☐ BORING 7 ☐ DIAMOND 8 ☐ JETTING 9 ☐ DRIVING

LOCATION OF WELL



NAME OF WELL CONTRACTOR Wesley Pockhom	LICENCE NUMBER 4208
ADDRESS RR2 Ancaster	
…DRILLER OR BORER …sley Pockhom	LICENCE NUMBER 4208
…OF CONTRACTOR …sley Pockhom	SUBMISSION DATE DAY 12 MO July YR 80

…TRY OF THE ENVIRONMENT COPY

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DATA SOURCE 1	CONTRACTOR 4208	DATE RECEIVED 050281
DATE OF INSPECTION June 26/85	INSPECTOR KW	
REMARKS	CSS.S8	

FORM NO. 0506-4-77

Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

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11 6603656

MUNICIP
CON.

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT 25-27
[redacted]	PELHAM	9	11

P.O. BOX 29 FONTHILL

DATE COMPLETED 48-53 DAY 16 MO. 8 YR. 85

NG RC. ELEVATION RC. BASIN CODE II III IV

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
BROWN	TOP-SOIL			0	1
BROWN	SAND			1	8
BROWN	SAND		MOIST	8	22½

31
32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
10-13 8-22½	1 ☑ FRESH 3 ☐ SULPHUR 14 2 ☐ SALTY 4 ☐ MINERAL
15-18	1 ☐ FRESH 3 ☐ SULPHUR 19 2 ☐ SALTY 4 ☐ MINERAL
20-23	1 ☐ FRESH 3 ☐ SULPHUR 24 2 ☐ SALTY 4 ☐ MINERAL
25-28	1 ☐ FRESH 3 ☐ SULPHUR 29 2 ☐ SALTY 4 ☐ MINERAL
30-33	1 ☐ FRESH 3 ☐ SULPHUR 34 2 ☐ SALTY 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
10-11 36	12 1 ☐ STEEL 2 ☐ GALVANIZED 3 ☑ CONCRETE 4 ☐ OPEN HOLE	3"	0	13-16 22½
17-18	19 1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			20-23
24-25	28 1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			27-30

SCREEN

SIZE(S) OF OPENING (SLOT NO.) 31-33	DIAMETER 34-38 INCHES	LENGTH 38-40 FEET

MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN 41-44 FEET	30
SAND		

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	DEPTH SET AT - FEET TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
10-13	14-17	
18-21	22-25	
26-29	30-33	80

71 PUMPING TEST

PUMPING TEST METHOD 10: 1 ☐ PUMP 2 ☐ BAILER

PUMPING RATE 11-14 GPM

DURATION OF PUMPING 15-18 HOURS 17-18 MINS

STATIC LEVEL 18-21	WATER LEVEL END OF PUMPING 22-24	15 MINUTES 26-28	30 MINUTES 29-31	45 MINUTES 32-34	60 MINUTES 35-37
8 FEET	FEET	FEET	FEET	FEET	FEET

25 WATER LEVELS DURING 1 ☐ PUMPING 2 ☐ RECOVERY

IF FLOWING, GIVE RATE 38-41 GPM

PUMP INTAKE SET AT FEET

WATER AT END OF TEST 42: 1 ☐ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE: ☑ SHALLOW ☐ DEEP

RECOMMENDED PUMP SETTING 43-45: 20 FEET

RECOMMENDED PUMPING RATE 46-49: 1½ GPM

50-53

FINAL STATUS OF WELL

54
1 ☑ WATER SUPPLY
2 ☐ OBSERVATION WELL
3 ☐ TEST HOLE
4 ☐ RECHARGE WELL
5 ☐ ABANDONED, INSUFFICIENT SUPPLY
6 ☐ ABANDONED, POOR QUALITY
7 ☐ UNFINISHED

WATER USE

55-56
1 ☑ DOMESTIC
2 ☐ STOCK
3 ☐ IRRIGATION
4 ☐ INDUSTRIAL
☐ OTHER
5 ☐ COMMERCIAL
6 ☐ MUNICIPAL
7 ☐ PUBLIC SUPPLY
8 ☐ COOLING OR AIR CONDITIONING
9 ☐ NOT USED

METHOD OF DRILLING

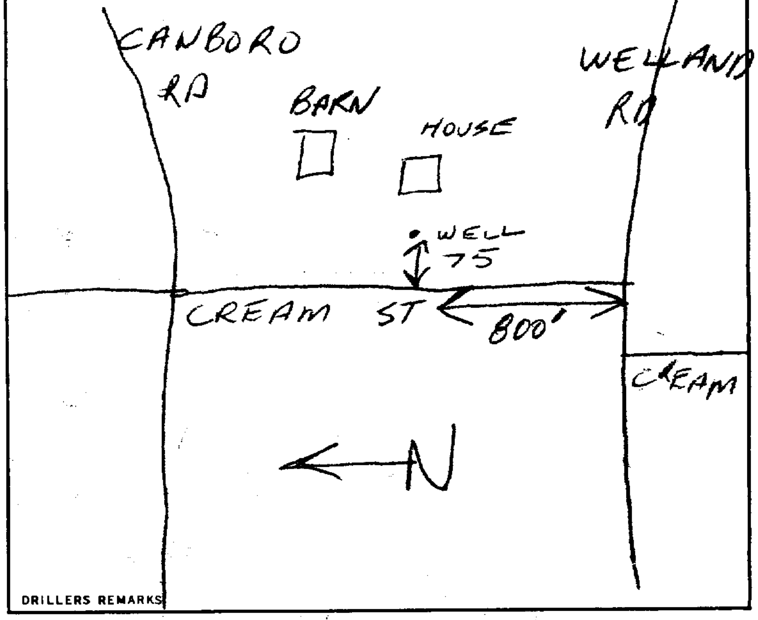
57
1 ☐ CABLE TOOL
2 ☐ ROTARY (CONVENTIONAL)
3 ☐ ROTARY (REVERSE)
4 ☐ ROTARY (AIR)
5 ☐ AIR PERCUSSION
6 ☑ BORING
7 ☐ DIAMOND
8 ☐ JETTING
9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: Johnson & Baetz
LICENCE NUMBER: 3030
ADDRESS: ~~J. Baetz~~ RR#1, Mt Pleasant
NAME OF DRILLER OR BORER: J. Baetz
LICENCE NUMBER:
SIGNATURE OF CONTRACTOR: J. Baetz
SUBMISSION DATE DAY ___ MO. ___ YR. ___

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS

OFFICE USE ONLY

DATA SOURCE 58	CONTRACTOR 59-62	DATE RECEIVED 63-68	40
		19 09 85	

DATE OF INSPECTION
INSPECTOR
REMARKS

CSS.ES

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Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

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11

6603846

MUNICIP 66004

CON. CON 09

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CDN., BLOCK, TRACT, SURVEY, ETC	LOT
[redacted]	HAM	9	12

[redacted] 2 CREAM Street

DATE COMPLETED DAY 23 MO Aug YR 88

ING | RC. | ELEVATION | RC | BASIN CODE

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
BROWN	sand	G H11		0	12
GREY	clay			12	118
GREY	sand			118	130
GREY	clay	boulders		130	156
RED	clay	sand		156	192
BEDROCK				192	215

31

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
212	1 ☒ FRESH 2 ☐ SALTY 3 ☒ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
6¼	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC	188	~~2~~ 192	215
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC			
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)
DIAMETER INCHES
LENGTH FEET
MATERIAL AND TYPE
DEPTH TO TOP OF SCREEN FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☐ PUMP 2 ☒ BAILER

PUMPING RATE: 5 GPM

DURATION OF PUMPING: 2 HOURS ____ MINS

STATIC LEVEL: 87 FEET

WATER LEVEL END OF PUMPING: FEET

WATER LEVELS DURING 1 ☐ PUMPING 2 ☐ RECOVERY

15 MINUTES FEET | 30 MINUTES FEET | 45 MINUTES FEET | 60 MINUTES FEET

IF FLOWING, GIVE RATE: GPM

PUMP INTAKE SET AT: FEET

WATER AT END OF TEST: 1 ☐ CLEAR 2 ☒ CLOUDY

RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP

RECOMMENDED PUMP SETTING: 130 FEET

RECOMMENDED PUMPING RATE: 4 GPM

FINAL STATUS OF WELL

1 ☐ WATER SUPPLY
2 ☐ OBSERVATION WELL
3 ☒ TEST HOLE
4 ☐ RECHARGE WELL
5 ☐ ABANDONED, INSUFFICIENT SUPPLY
6 ☐ ABANDONED POOR QUALITY
7 ☐ UNFINISHED
9 ☐ DEWATERING

WATER USE

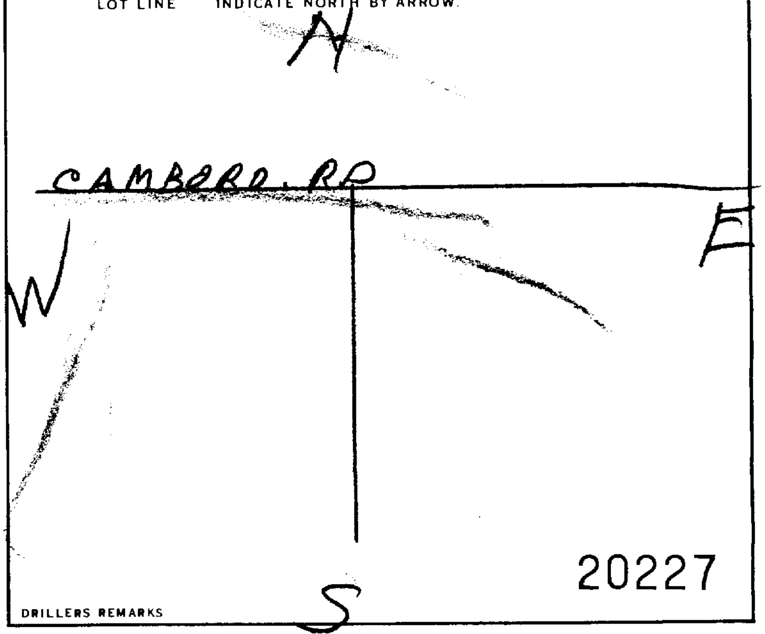
1 ☑ DOMESTIC
2 ☐ STOCK
3 ☐ IRRIGATION
4 ☐ INDUSTRIAL
☐ OTHER
5 ☐ COMMERCIAL
6 ☐ MUNICIPAL
7 ☐ PUBLIC SUPPLY
8 ☐ COOLING OR AIR CONDITIONING
9 ☐ NOT USED

METHOD OF CONSTRUCTION

1 ☐ CABLE TOOL
2 ☐ ROTARY (CONVENTIONAL)
3 ☐ ROTARY (REVERSE)
4 ☑ ROTARY (AIR)
5 ☐ AIR PERCUSSION
6 ☐ BORING
7 ☐ DIAMOND
8 ☐ JETTING
9 ☐ DRIVING
☐ DIGGING
☐ OTHER

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



20227

DRILLERS REMARKS

CONTRACTOR

NAME OF WELL CONTRACTOR: FIELD WELL DRILLING
WELL CONTRACTOR'S LICENCE NUMBER: 2103
ADDRESS: RR1 VINELAND
NAME OF WELL TECHNICIAN: MARSHALL FIELD
WELL TECHNICIAN'S LICENCE NUMBER: 0365
SIGNATURE OF TECHNICIAN/CONTRACTOR
SUBMISSION DATE DAY ____ MO ____ YR ____

OFFICE USE ONLY

DATA SOURCE
CONTRACTOR 2123
DATE RECEIVED MAR 14 1989
DATE OF INSPECTION
INSPECTOR
REMARKS

CSS.ES

MINISTRY OF THE ENVIRONMENT COPY

FORM NO. 0506 (11/86) FORM 9

Ministry of the Environment
Ontario

WELLAND

The Ontario Water Resources Act

WATER WELL RECORD

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 6603883

MUNICIP. 66004

CON. CON 10

COUNTY OR DISTRICT: [redacted]

TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: FE WICK. Pelham.

CON., BLOCK, TRACT, SURVEY ETC: CON 10

LOT: LOT 13 - PART 4 13

664 WELLAND RD

DATE COMPLETED: DAY 13 MO 07 YR 89

RC. | ELEVATION | RC | BASIN CODE | II | III | IV

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
TOP	SOIL			0	1
BROWN	SAND	REDISH SAND		1	7
BROWN	SAND		WET	7	27½

31

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
10-13 7-27½	14 1 ☑ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
15-18	18 1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
20-23	24 1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
25-28	28 1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
30-33	34 80 1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
10-11 36	12 1 ☐ STEEL 2 ☐ GALVANIZED 3 ☑ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC	3"	0	13-16 27½
17-18	19 1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC			20-23
24-25	26 1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC			27-30

SCREEN

SIZE(S) OF OPENING (SLOT NO.) 31-33

DIAMETER 34-38 INCHES

LENGTH 39-40 FEET

MATERIAL AND TYPE: GRAVEL

DEPTH TO TOP OF SCREEN 41-44 FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
10-13	14-17	
18-21	22-25	
26-29	30-33	80

71 PUMPING TEST

PUMPING TEST METHOD 10: 1 ☐ PUMP 2 ☐ BAILER

PUMPING RATE 11-14 GPM

DURATION OF PUMPING 15-16 HOURS 17-18 MINS

STATIC LEVEL 18-21: 7½ FEET

WATER LEVEL END OF PUMPING 22-24 FEET

25 WATER LEVELS DURING 1 ☐ PUMPING 2 ☐ RECOVERY

15 MINUTES 26-28 FEET | 30 MINUTES 29-31 FEET | 45 MINUTES 32-34 FEET | 60 MINUTES 35-37 FEET

IF FLOWING, GIVE RATE 38-41 GPM

PUMP INTAKE SET AT FEET

WATER AT END OF TEST 42: 1 ☐ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE: ☑ SHALLOW ☐ DEEP

RECOMMENDED PUMP SETTING 43-45: 22 FEET

RECOMMENDED PUMPING RATE 46-49: 1 GPM

50-53

FINAL STATUS OF WELL

54
1 ☑ WATER SUPPLY
2 ☐ OBSERVATION WELL
3 ☐ TEST HOLE
4 ☐ RECHARGE WELL
5 ☐ ABANDONED, INSUFFICIENT SUPPLY
6 ☐ ABANDONED, POOR QUALITY
7 ☐ UNFINISHED
☐ DEWATERING

WATER USE

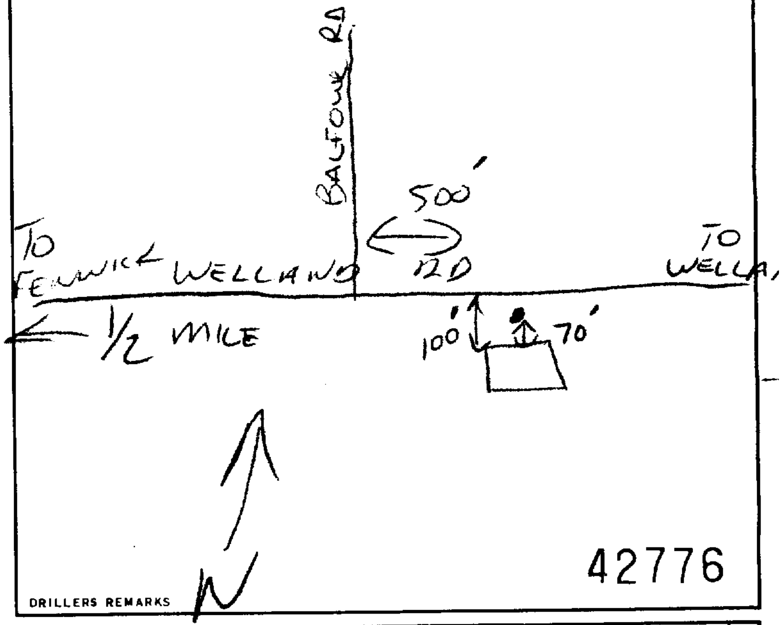
55-56
1 ☑ DOMESTIC
2 ☐ STOCK
3 ☐ IRRIGATION
4 ☐ INDUSTRIAL
☐ OTHER
5 ☐ COMMERCIAL
6 ☐ MUNICIPAL
7 ☐ PUBLIC SUPPLY
8 ☐ COOLING OR AIR CONDITIONING
9 ☐ NOT USED

METHOD OF CONSTRUCTION

57
1 ☐ CABLE TOOL
2 ☐ ROTARY (CONVENTIONAL)
3 ☐ ROTARY (REVERSE)
4 ☐ ROTARY (AIR)
5 ☐ AIR PERCUSSION
6 ☑ BORING
7 ☐ DIAMOND
8 ☐ JETTING
9 ☐ DRIVING
☐ DIGGING
☐ OTHER

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW



42776

DRILLERS REMARKS

CONTRACTOR

NAME OF WELL CONTRACTOR: JOHNSON & BAETZ

WELL CONTRACTOR'S LICENCE NUMBER: 3030

ADDRESS: RR #1 MT. PLEASANT

NAME OF WELL TECHNICIAN: DON BAETZ

WELL TECHNICIAN'S LICENCE NUMBER: T0338

SIGNATURE OF TECHNICIAN/CONTRACTOR

SUBMISSION DATE DAY MO. YR.

OFFICE USE ONLY

DATA SOURCE 58

CONTRACTOR 59-62: 3030

DATE RECEIVED 63-68: AUG 21 1989

80

DATE OF INSPECTION

INSPECTOR

REMARKS

CSS.ES

MINISTRY OF THE ENVIRONMENT COPY

FORM NO. 0506 (11/86) FORM 9

Ministry of Environment and Energy
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

Print only in spaces provided.
Mark correct box with a checkmark, where applicable.

11

6604239

Municipality: 66004 | Con.: CON 09

WELLAND

County or District: [redacted]

Township/Borough/City/Town/Village: Pelham

Con block tract survey, etc.: 9

Lot: 12

Address: 608 Memorial Drive

Date completed: 26 day 06 month 96 year

21 | UTM | Zone | Easting | Northing | RC | Elevation | RC | Basin Code | ii | iii | iv

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)

General colour	Most common material	Other materials	General description	Depth – feet From	To
BROWN	sand			0	47
GREY	clay			47	86
Red	clay		soft	86	95
Red	sand			95	128
Red	clay boulders			128	131
Red	clay sand boulders			131	231
Bedrock.				231	242

31

32

41 WATER RECORD

Water found at – feet	Kind of water	
238	☒ Fresh ☐ Salty	☐ Sulphur ☐ Minerals ☐ Gas
	☐ Fresh ☐ Salty	☐ Sulphur ☐ Minerals ☐ Gas
	☐ Fresh ☐ Salty	☐ Sulphur ☐ Minerals ☐ Gas
	☐ Fresh ☐ Salty	☐ Sulphur ☐ Minerals ☐ Gas
	☐ Fresh ☐ Salty	☐ Sulphur ☐ Minerals ☐ Gas

51 CASING & OPEN HOLE RECORD

Inside diam inches	Material	Wall thickness inches	Depth – feet From	To
6"	☑ Steel ☐ Galvanized ☐ Concrete ☐ Open hole ☐ Plastic	188	231	242
	☐ Steel ☐ Galvanized ☐ Concrete ☐ Open hole ☐ Plastic			
	☐ Steel ☐ Galvanized ☐ Concrete ☐ Open hole ☐ Plastic			

SCREEN

Sizes of opening (Slot No.): | Diameter: inches | Length: feet

Material and type: | Depth at top of screen: feet

61 PLUGGING & SEALING RECORD

☐ Annular space ☐ Abandonment

Depth set at – feet From	To	Material and type (Cement grout, bentonite, etc.)

PUMPING TEST

71 Pumping test method: ☐ Pump ☐ Bailer

Pumping rate: 40 GPM

Duration of pumping: 1 Hours 0 Mins

Static level	Water level end of pumping	Water levels during ☐ Pumping ☐ Recovery: 15 minutes	30 minutes	45 minutes	60 minutes
160 feet	feet	feet	feet	feet	feet

If flowing give rate: GPM

Pump intake set at: feet

Water at end of test: ☐ Clear ☒ Cloudy

Recommended pump type: ☐ Shallow ☒ Deep

Recommended pump setting: feet

Recommended pump rate: 10 GPM

FINAL STATUS OF WELL

- ☒ Water supply
- ☐ Observation well
- ☐ Test hole
- ☐ Recharge well
- ☐ Abandoned, insufficient supply
- ☐ Abandoned, poor quality
- ☐ Abandoned (Other)
- ☐ Dewatering
- ☐ Unfinished
- ☐ Replacement well

WATER USE

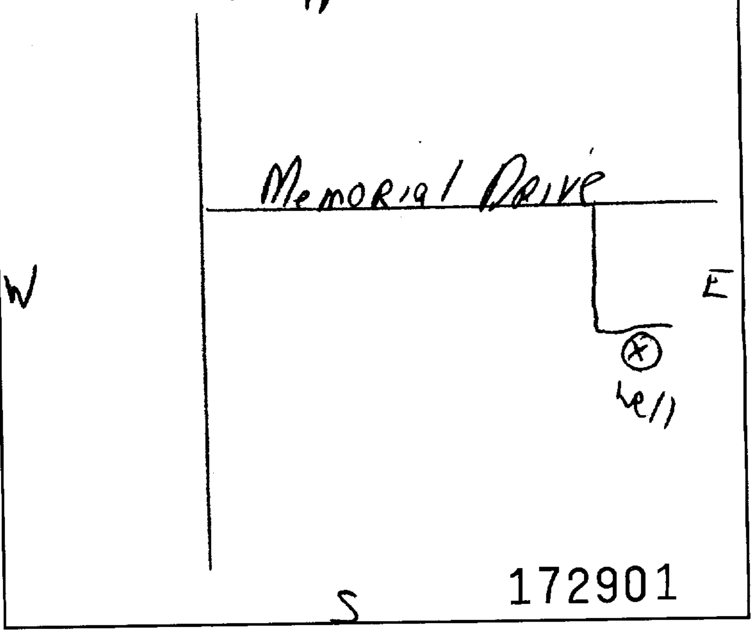
- ☒ Domestic
- ☐ Stock
- ☐ Irrigation
- ☐ Industrial
- ☐ Commercial
- ☐ Municipal
- ☐ Public supply
- ☐ Cooling & air conditioning
- ☐ Not used
- ☐ Other ....

METHOD OF CONSTRUCTION

- ☐ Cable tool
- ☐ Rotary (conventional)
- ☐ Rotary (reverse)
- ☒ Rotary (air)
- ☐ Air percussion
- ☐ Boring
- ☐ Diamond
- ☐ Jetting
- ☐ Driving
- ☐ Digging
- ☐ Other ....

LOCATION OF WELL

In diagram below show distances of well from road and lot line. Indicate north by arrow. N



172901

Name of Well Contractor: FIELD Well DRILLING

Well Contractor's Licence No.:

Address: RR#1 VINELAND

Name of Well Technician: Marshall R. Field

Well Technician's Licence No.:

Signature of Technician/Contractor:

Submission date: day mo yr

MINISTRY USE ONLY

Data source: | Contractor: 2123 | Date received: AUG 01 1996

Date of inspection: | Inspector:

Remarks:

CSS.ES

0506 (07/94) Front Form 9

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Ontario Ministry of the Environment

The Ontario Water Resources Act
WATER WELL RECORD

Print only in spaces provided.
Mark correct box with a checkmark, where applicable.

WELLAND

11 6604390

Municipality 66004 Con. CON 09

County or District	Township/Borough/City/Town/Village	Con block tract survey, etc.	Lot
Niagara Region	Pelham	09	12

[redacted]

Address 1284 CREAM street

Date completed 19 day 11 month 99 year

21 Northing RC Elevation RC Basin Code

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)

General colour	Most common material	Other materials	General description	Depth - feet From	Depth - feet To
BROWN	Sand			0	3
Red	sand			3	60
Red	clay			60	95
Red	sand			95	112
GREY	clay			112	160
GREY	sand			160	180
Red	clay			180	186
Red	clay	gravel boulders		186	196
Bedrock		limestone		196	213

31

32

41 WATER RECORD

Water found at - feet	Kind of water
210	☒ Fresh ☐ Salty ☐ Sulphur ☐ Minerals ☐ Gas
	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals ☐ Gas
	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals ☐ Gas
	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals ☐ Gas
	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals ☐ Gas

51 CASING & OPEN HOLE RECORD

Inside diam inches	Material	Wall thickness inches	Depth - feet From	Depth - feet To
6"	☒ Steel ☐ Galvanized ☐ Concrete ☐ Open hole ☐ Plastic	188	196	213
	☐ Steel ☐ Galvanized ☐ Concrete ☐ Open hole ☐ Plastic			
	☐ Steel ☐ Galvanized ☐ Concrete ☐ Open hole ☐ Plastic			

SCREEN

Sizes of opening (Slot No.)	Diameter inches	Length feet

Material and type	Depth at top of screen feet

61 PLUGGING & SEALING RECORD

☐ Annular space ☐ Abandonment

Depth set at - feet From	Depth set at - feet To	Material and type (Cement grout, bentonite, etc.)

PUMPING TEST

71 Pumping test method ☐ Pump ☐ Bailer

Pumping rate 30 GPM

Duration of pumping 1 Hours 0 Mins

Static level	Water level end of pumping	Water levels during ☐ Pumping ☐ Recovery 15 minutes	30 minutes	45 minutes	60 minutes
55 feet	feet	feet	feet	feet	feet

If flowing give rate GPM

Pump intake set at feet

Water at end of test ☒ Clear ☐ Cloudy

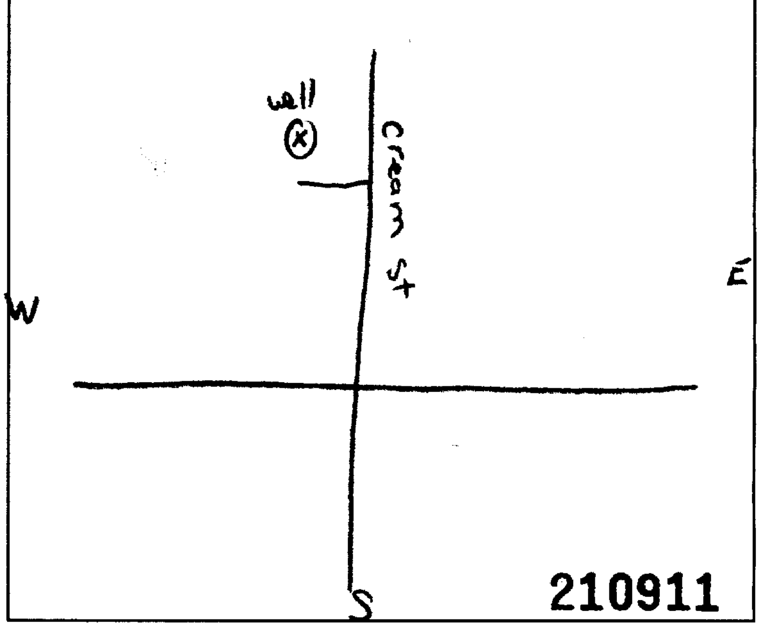
Recommended pump type ☐ Shallow ☒ Deep

Recommended pump setting feet

Recommended pump rate 10 GPM

LOCATION OF WELL

In diagram below show distances of well from road and lot line. Indicate north by arrow N



210911

FINAL STATUS OF WELL

- ☒ Water supply
- ☐ Observation well
- ☐ Test hole
- ☐ Recharge well
- ☐ Abandoned, insufficient supply
- ☐ Abandoned, poor quality
- ☐ Abandoned (Other)
- ☐ Dewatering
- ☐ Unfinished
- ☐ Replacement well

WATER USE

- ☒ Domestic
- ☐ Stock
- ☐ Irrigation
- ☐ Industrial
- ☐ Commercial
- ☐ Municipal
- ☐ Public supply
- ☐ Cooling & air conditioning
- ☐ Not use
- ☐ Other

METHOD OF CONSTRUCTION

- ☐ Cable tool
- ☐ Rotary (conventional)
- ☐ Rotary (reverse)
- ☒ Rotary (air)
- ☐ Air percussion
- ☐ Boring
- ☐ Diamond
- ☐ Jetting
- ☐ Driving
- ☐ Digging
- ☐ Other

Name of Well Contractor: FIELD WELL DRILLING

Well Contractor's Licence No.: 2123

Address: RR#1 Vineland

Name of Well Technician: Marshall R. FIELD

Well Technician's Licence No.: T0365

Signature of Technician/Contractor

Submission date day mo yr

MINISTRY USE ONLY

Data source

Contractor 2123

Date received FEB 16 2000

Date of inspection

Inspector

Remarks CSS.ES0

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0506 (11/98) Front Form 9

Ontario Ministry of the Environment

The Ontario Water Resources Act

WATER WELL RECORD

Print only in spaces provided.
Mark correct box with a checkmark, where applicable.

WELLAND

11 6604550

Municipality: 66004 Con.: CON 09

County or District	Township/Borough/City/Town/Village	Con block tract survey, etc.	Lot
Niagara Region	Pelham		11

[redacted]

Address: 1285 CREAM St Fenwick.

Date completed: 24 day 05 month 01 year

21 Northing RC Elevation RC Basin Code

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)

General colour	Most common material	Other materials	General description	Depth - feet From	Depth - feet To
BROWN	sand			0	28
GREY	clay			28	75
Red	clay	boulders		75	82
GREY	sand			82	115
GREY	clay			115	159
GREY	clay	boulders		159	197
Bedrock				197	206

31

32

41 WATER RECORD

Water found at - feet	Kind of water
201	☒ Fresh ☐ Salty ☐ Sulphur ☐ Minerals ☐ Gas
	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals ☐ Gas
	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals ☐ Gas
	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals ☐ Gas
	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals ☐ Gas

51 CASING & OPEN HOLE RECORD

Inside diam inches	Material	Wall thickness inches	Depth - feet From	Depth - feet To
6"	☒ Steel ☐ Galvanized ☐ Concrete ☐ Open hole ☐ Plastic	188	197	206
	☐ Steel ☐ Galvanized ☐ Concrete ☐ Open hole ☐ Plastic			
	☐ Steel ☐ Galvanized ☐ Concrete ☐ Open hole ☐ Plastic			

SCREEN

Sizes of opening (Slot No.)	Diameter inches	Length feet

Material and type	Depth at top of screen feet

61 PLUGGING & SEALING RECORD

☐ Annular space ☐ Abandonment

Depth set at - feet From	To	Material and type (Cement grout, bentonite, etc.)

71 PUMPING TEST

Pumping test method: ☐ Pump ☐ Bailer

Pumping rate: 35 GPM

Duration of pumping: 1 Hours 0 Mins

Static level	Water level end of pumping	Water levels during ☐ Pumping ☐ Recovery: 15 minutes	30 minutes	45 minutes	60 minutes
feet	feet	feet	feet	feet	feet

If flowing give rate: GPM

Pump intake set at: feet

Water at end of test: ☐ Clear ☒ Cloudy

Recommended pump type: ☐ Shallow ☒ Deep

Recommended pump setting: feet

Recommended pump rate: 05 GPM

FINAL STATUS OF WELL

- ☒ Water supply
- ☐ Observation well
- ☐ Test hole
- ☐ Recharge well
- ☐ Abandoned, insufficient supply
- ☐ Abandoned, poor quality
- ☐ Abandoned (Other)
- ☐ Dewatering
- ☐ Unfinished
- ☐ Replacement well

WATER USE

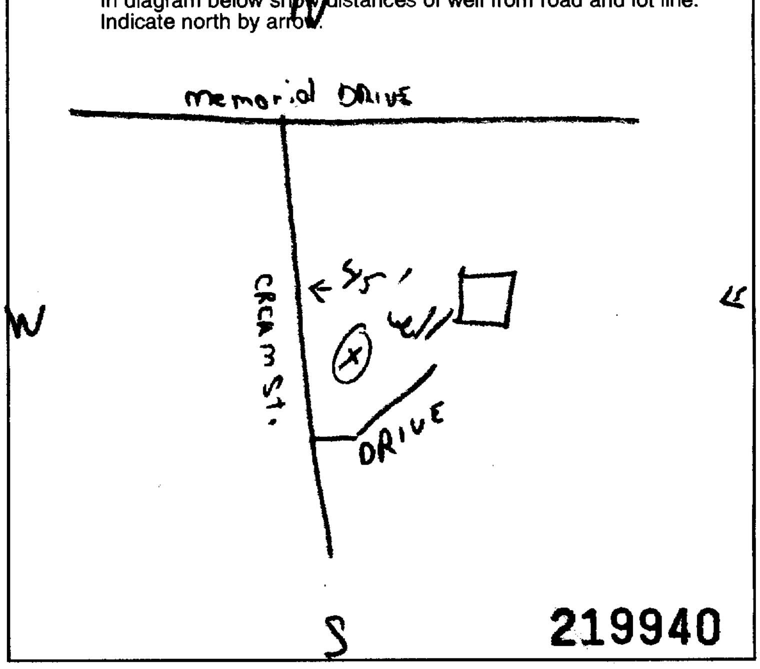
- ☒ Domestic
- ☐ Stock
- ☐ Irrigation
- ☐ Industrial
- ☐ Commercial
- ☐ Municipal
- ☐ Public supply
- ☐ Cooling & air conditioning
- ☐ Not use
- ☐ Other

METHOD OF CONSTRUCTION

- ☐ Cable tool
- ☐ Rotary (conventional)
- ☐ Rotary (reverse)
- ☒ Rotary (air)
- ☐ Air percussion
- ☐ Boring
- ☐ Diamond
- ☐ Jetting
- ☐ Driving
- ☐ Digging
- ☐ Other

LOCATION OF WELL

In diagram below show distances of well from road and lot line. Indicate north by arrow.



219940

Name of Well Contractor: FIELD WELL DRILLING

Well Contractor's Licence No.: 2123

Address: RR#1 Vineland

Name of Well Technician: Marshall R. FIELD

Well Technician's Licence No.: T0365

Signature of Technician/Contractor:

Submission date: day mo yr

MINISTRY USE ONLY

Data source	Contractor	Date received
	2123	JUN 08 2001

Date of inspection:

Inspector:

Remarks:

CSS.ES1

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0506 (11/98) Front Form 9

Ontario **Ministry of the Environment**

The Ontario Water Resources Act
WATER WELL RECORD

Print only in spaces provided.
Mark correct box with a checkmark, where applicable.

WELLAND

11 | 6604630 | Municipality 66004 | Con. CON 09

County or District	Township/Borough/City/Town/Village	Con block tract survey, etc.	Lot 25-27
NIAGARA	PELHAM	9	11

[redacted]

Address 566 MEMORIAL

Date completed 2 day 10 month 01 year (48-53)

21 | UTM 10 12 17 | Northing 18 24 | RC 25 | Elevation 26 | RC 30 | Basin Code 31 ii iii iv 47

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)

General colour	Most common material	Other materials	General description	Depth - feet From	Depth - feet To
BROWN	TOP-SOIL		ROOTS	0	1
BROWN	SAND		ROOTS	1	5
BROWN	SAND		LOOSE	5	28
BROWN	SAND		TIGHT	28	44
BROWN	SAND		FINE	44	60

31
32

41 WATER RECORD

Water found at - feet	Kind of water
10-13 44-60	1 ☑ Frash 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas 14
15-18	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas 19
20-23	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minarals 6 ☐ Gas 24
25-28	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas 29
30-33	1 ☐ Frash 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minarals 6 ☐ Gas 34 60

51 CASING & OPEN HOLE RECORD

Insida diam inchas	Matarial	Wall thickness inches	Depth - feet From	Depth - feet To
10-11 36	1 ☐ Steel 2 ☐ Galvanizad 3 ☑ Concreta 4 ☐ Opan hola 5 ☐ Plastic 12	3	0	13-16 60
17-18	1 ☐ Steel 2 ☐ Galvanizad 3 ☐ Concrata 4 ☐ Open hola 5 ☐ Plastic 19			20-23
24-25	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concreta 4 ☐ Open hola 5 ☐ Plastic 26			27-30

SCREEN

Sizas of opaning (Slot No.) 31-33	Diamatar 34-38 inchas	Length 39-40 feet
Matarial and type: PEA STONE	Depth at top of screen 41-44 feet	30

61 PLUGGING & SEALING RECORD

☐ Annular space ☐ Abandonmant

Depth set at - feet From	To	Matarial and type (Camant grout, bentonita, etc.)
10-13 0	14-17 8	BEN SEAL &
18-21	22-25	SAKRITE JOINTS
26-29	30-33	80

71 PUMPING TEST

Pumping test mathod 10: 1 ☐ Pump 2 ☑ Bailar

Pumping rate 45 GPM (11-14)

Duration of pumping 15-16 Hours 15 Mins 17-18

Static level 19-21: 44 feet

Water level and of pumping 22-24: 54 feet

Water levels during 25: 1 ☐ Pumping 2 ☑ Recovery

15 minutes 26-28	30 minutas 29-31	45 minutas 32-34	60 minutes 35-37
53 4/ feet	feet	49 feet	feet

If flowing giva rata 38-41 GPM

Pump intaka set at feet

Watar at and of test 42: ☐ Clear ☐ Cloudy

Recommended pump type: ☐ Shallow ☑ Deep

Recommended pump setting 43-45: 56 feet

Recommanded pump rata 46-49: 3-4 GPM

50-53

FINAL STATUS OF WELL 54

1 ☑ Water supply
2 ☐ Obsarvation well
3 ☐ Test hola
4 ☐ Recharge well
5 ☐ Abandoned, insufficient supply
6 ☐ Abandoned, poor quality
7 ☐ Abandoned (Other)
8 ☐ Dewataring
9 ☐ Unfinished
10 ☐ Raplacement well

WATER USE 55-56

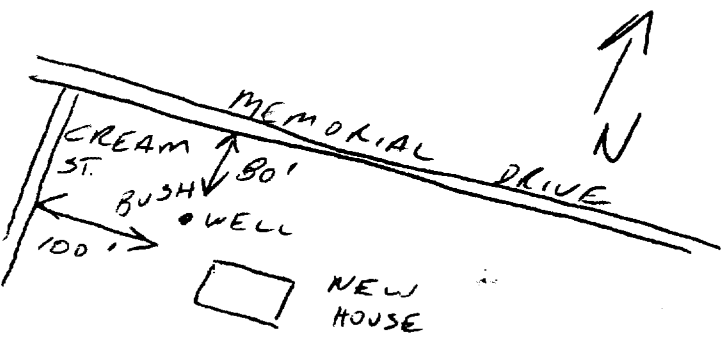
1 ☑ Domestic
2 ☐ Stock
3 ☐ Irrigation
4 ☐ Industrial
5 ☐ Commercial
6 ☐ Municipal
7 ☐ Public supply
8 ☐ Cooling & air conditioning
9 ☐ Not use
10 ☐ Other

METHOD OF CONSTRUCTION 57

1 ☐ Cabla tool
2 ☐ Rotary (convantional)
3 ☐ Rotary (ravarse)
4 ☐ Rotary (air)
5 ☐ Air percussion
6 ☑ Boring
7 ☐ Diamond
8 ☐ Jetting
9 ☐ Driving
10 ☐ Digging
11 ☐ Othar

LOCATION OF WELL

In diagram below show distances of well from road and lot line. Indicate north by arrow.



229580

Name of Wall Contractor: JOHNSON & BAETZ
Wall Contractor's Licence No.: 3030
Address: BRANTFORD
Name of Well Technician: JOHN BAETZ
Wall Technician's Licence No.: 3030
Signatura of Technician/Contractor: J Baetz
Submission data day mo yr

MINISTRY USE ONLY

Data source 58 | Contractor 59-62 3030 | Date received 63-68 NOV 23 2001 | 80

Date of inspection | Inspector

Remarks

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Ontario **Ministry of the Environment**

The Ontario Water Resources Act
WATER WELL RECORD

Print only in spaces provided.
Mark correct box with a checkmark, where applicable.

WELLAND

11 6604644

Municipality 66004 Con. CON 06

County or District	Township/Borough/City/Town/Village	Con block tract survey, etc.	Lot
Niagara Region	Pelham	6	12

[redacted]

Address RR#5 Fenwick 61 Welland Rd

Date completed 04 day 12 month 01 year

21 UTM Northing RC Elevation RC Basin Code ii iii iv

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)

General colour	Most common material	Other materials	General description	Depth - feet From	Depth - feet To
BROWN	sand			0	22
GREY	clay			23	64
Red	sand			64	96
Red	clay			96	130
Red	clay + gravel			130	168
Red	clay	boulders		168	208
GREY	limestone			208	215

31

32

41 WATER RECORD

Water found at - feet	Kind of water
213	1 ☒ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
214	1 ☒ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas

51 CASING & OPEN HOLE RECORD

Inside diam inches	Material	Wall thickness inches	Depth - feet From	Depth - feet To
6"	1 ☒ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic	188	208	215
	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic			
	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic			

SCREEN

Sizes of opening (Slot No.)	Diameter inches	Length feet

Material and type	Depth at top of screen feet

61 PLUGGING & SEALING RECORD

☐ Annular space ☐ Abandonment

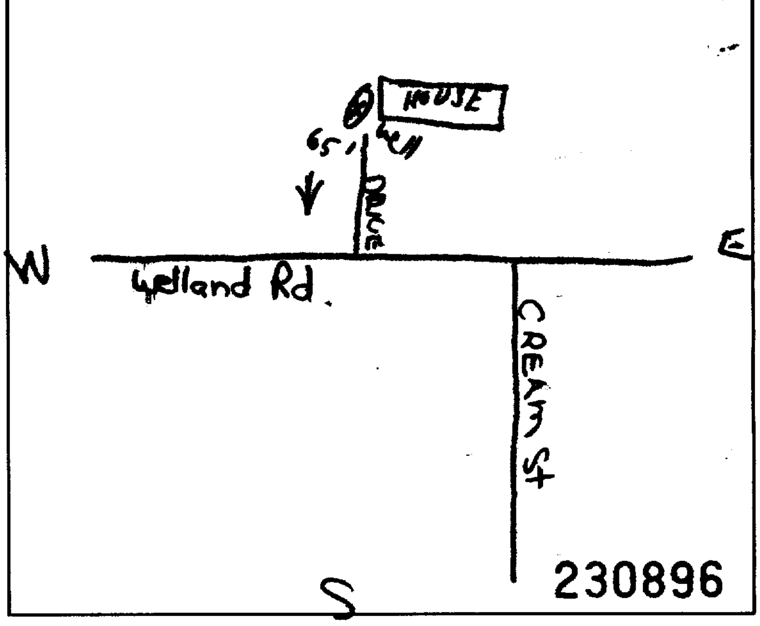
Depth set at - feet From	Depth set at - feet To	Material and type (Cement grout, bentonite, etc.)

71 PUMPING TEST

Pumping test method 1 ☐ Pump 2 ☐ Bailer	Pumping rate 78 GPM	Duration of pumping 1 Hours 0 Mins	
Static level feet	Water level end of pumping feet	Water levels during 1 ☐ Pumping 2 ☐ Recovery	
15 minutes feet	30 minutes feet	45 minutes feet	60 minutes feet
If flowing give rate GPM	Pump intake set at feet	Water at end of test ☐ Clear ☒ Cloudy	
Recommended pump type ☐ Shallow ☒ Deep	Recommended pump setting feet	Recommended pump rate 10 GPM	

LOCATION OF WELL

In diagram below show distances of well from road and lot line. Indicate north by arrow.



230896

FINAL STATUS OF WELL

1 ☒ Water supply
2 ☐ Observation well
3 ☐ Test hole
4 ☐ Recharge well
5 ☐ Abandoned, insufficient supply
6 ☐ Abandoned, poor quality
7 ☐ Abandoned (Other)
8 ☐ Dewatering
9 ☐ Unfinished
10 ☐ Replacement well

WATER USE

1 ☒ Domestic
2 ☐ Stock
3 ☐ Irrigation
4 ☐ Industrial
5 ☐ Commercial
6 ☐ Municipal
7 ☐ Public supply
8 ☐ Cooling & air conditioning
9 ☐ Not use
10 ☐ Other

METHOD OF CONSTRUCTION

1 ☐ Cable tool
2 ☐ Rotary (conventional)
3 ☐ Rotary (reverse)
4 ☒ Rotary (air)
5 ☐ Air percussion
6 ☐ Boring
7 ☐ Diamond
8 ☐ Jetting
9 ☐ Driving
10 ☐ Digging
11 ☐ Other

Name of Well Contractor FIELD WELL DRILLING	Well Contractor's Licence No. 2123
Address RR#1 Vineland	
Name of Well Technician Marshall R. FIELD	Well Technician's Licence No. T0365
Signature of Technician/Contractor	Submission date day mo yr

MINISTRY USE ONLY

Data source	Contractor 2123	Date received JAN 04 2002
Date of inspection	Inspector	
Remarks CSS.ES2		

0506 (07/00) Front Form 9

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Ontario Ministry of the Environment

The Ontario Water Resources Act

WATER WELL RECORD

Print only in spaces provided.
Mark correct box with a checkmark, where applicable.

WELLAND

11

6604646

Municipality 66004 Con. CON 09

County or District NIAGARA	Township/Borough/City/Town/Village FENWICK	Con block tract survey, etc. 1291 CREAM	Lot ST.
[redacted]	Address 1291 CREAM ST.	Date completed 5 day 12 month 01 year	

11

21 UTM · Northing · RC · Elevation · RC · Basin Code · ii · iii · iv

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)

General colour	Most common material	Other materials	General description	Depth - feet From	Depth - feet To
BROWN	TOP-SOIL			0	1
BROWN	SAND			1	36
BROWN	SAND		TIGHT	36	46
BROWN	SAND	RED SAND		46	56

31

32

41 WATER RECORD

Water found at - feet	Kind of water
36-56	1 ☑ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas

51 CASING & OPEN HOLE RECORD

Inside diam inches	Meteriel	Well thickness inches	Depth - feet From	Depth - feet To
36	1 ☐ Steel 2 ☐ Galvanized 3 ☑ Concrete 4 ☐ Open hole 5 ☐ Plastic	3	0	56
	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plestic			
	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plestic			

SCREEN

Sizes of opening (Slot No.)	Diameter inches	Length feet

Meterial and type	Depth at top of screen feet
PEA STONE	

61 PLUGGING & SEALING RECORD

☐ Annular space ☐ Abandonment

Depth set at - feet From	Depth set at - feet To	Meteriel end type (Cement grout, bentonite, etc.)
0	8	BENSEAL &
		SAKRITE JOINTS

71 PUMPING TEST

Pumping test method 1 ☐ Pump 2 ☐ Bailer
Pumping rate GPM
Duration of pumping Hours Mins
Stetic level 36 feet
Water level end of pumping feet
Weter levels during 1 ☐ Pumping 2 ☐ Recovery
15 minutes / 30 minutes / 45 minutes / 60 minutes: 20 FT WATER OVERNIGHT
If flowing give rate GPM
Pump intake set et feet
Weter et end of test ☐ Cleer ☐ Cloudy
Recommended pump type ☐ Shallow ☑ Deep
Recommended pump setting 50 feet
Recommended pump rate 4 GPM

FINAL STATUS OF WELL

1 ☑ Weter supply
2 ☐ Observetion well
3 ☐ Test hole
4 ☐ Recharge well
5 ☐ Abandoned, insufficient supply
6 ☐ Abandoned, poor quality
7 ☐ Abendoned (Other)
8 ☐ Dewatering
9 ☐ Unfinished
10 ☐ Replacement well

WATER USE

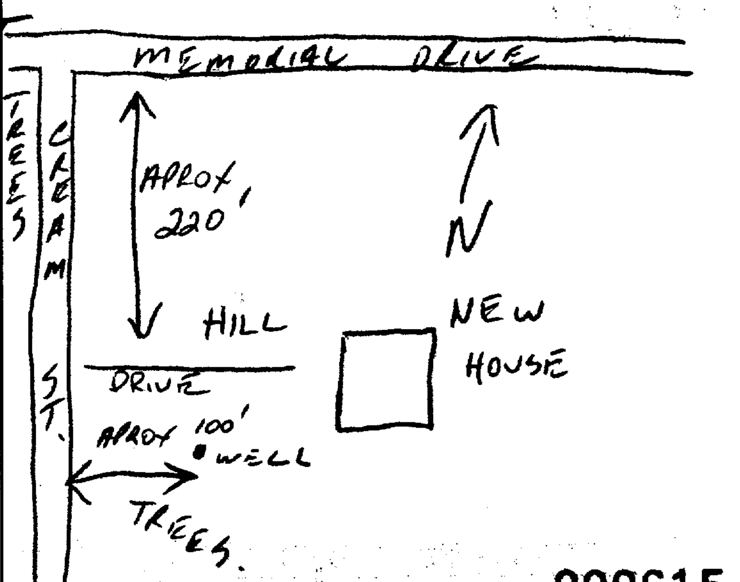
1 ☑ Domestic
2 ☐ Stock
3 ☐ Irrigation
4 ☐ Industrial
5 ☐ Commercial
6 ☐ Municipel
7 ☐ Public supply
8 ☐ Cooling & eir conditioning
9 ☐ Not use
10 ☐ Other

METHOD OF CONSTRUCTION

1 ☐ Cable tool
2 ☐ Rotary (conventionel)
3 ☐ Rotary (reverse)
4 ☐ Rotary (air)
5 ☐ Air percussion
6 ☑ Boring
7 ☐ Diamond
8 ☐ Jetting
9 ☐ Driving
10 ☐ Digging
11 ☐ Other

LOCATION OF WELL

In diagram below show distances of well from road and lot line. Indicate north by arrow.



229615

Name of Well Contractor: JOHNSON & BAETZ
Well Contractor's Licence No.: 3030
Address: BRANTFORD
Name of Well Technicien: DARCY AVEY
Well Technicien's Licence No.: 01-586
Signeture ot Technician/Contractor: J Baetz
Submission date day mo yr

MINISTRY USE ONLY

Data source
Contractor 3030
Dete received JAN 23 2002
Date of inspection
Inspector
Remarks CSS.ES2

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0506 (07/00) Front Form 9

Ontario Ministry of the Environment

Well Tag Numbr A 021290

Well Record

Regulation 903 Ontario Water Resources Act

DRAFT

page ___ of ___

Instructions for Completing Form

- For use in the **Province of Ontario** only. This document is a permanent **legal** document. Please retain for future reference.
- All Sections **must** be completed in full to avoid delays in processing. Further instructions and explanations are available on the back of this form.
- Questions regarding completing this application can be directed to the Water Well Management Coordinator at 416-235-6203.
- **All metre measurements shall be reported to 1/10th of a metre.**
- Please print clearly in blue or black ink only.

Ministry Use Only

MUN 66004 CON CON 09 LOT

Well Owner's Information and Location of Well Information

[redacted]

RR#/Street Number/Name: RR # 5 , 1129 CREAM ST.

City/Town/Village: PELHAM

Site/Compartment/Block/Tract etc.:

GPS Reading NAD 83 Zone 17 Easting 635216 Northing 4765016

Unit Make/Model: GARMIN E-MAP

Mode of Operation: ☐ Undifferentiated ☑ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth Metres From	Depth Metres To

→ WELL IMPROVEMENT

A) INSTALL NEW 6 5/8" STEEL CASING FROM GROUND SURFACE TO 3.96m

B) DEPOSIT 5/8" CLEAR STONE TO 2.75m

C) PLACE 0.3m INTERMEDIARY BENTONITE SEAL AT 2.75m

D) INSERT 10" SLEEVE AROUND REMAINING 6 5/8 CASING AND FILL ANNULAR SPACE WITH BENTONITE SEALANT

E) FILL ADDITIONAL SPACE WITH SAND TO SURFACE

F) CASING EXTENDS TO 0.45m ABOVE SURFACE

Hole Diameter

Depth Metres From	Depth Metres To	Diameter Centimetres
2.75	4.20	130
0	3.96	15.25

Water Record

Water found at ___ Metres	Kind of Water
___ m ☐ Gas ☐ Other:	☐ Fresh ☐ Sulphur ☐ Salty ☐ Minerals
___ m ☐ Gas ☐ Other:	☐ Fresh ☐ Sulphur ☐ Salty ☐ Minerals
___ m ☐ Gas ☐ Other:	☐ Fresh ☐ Sulphur ☐ Salty ☐ Minerals

After test of well yield, water was

☐ Clear and sediment free

☐ Other, specify

Chlorinated ☐ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth Metres From	Depth Metres To
Casing				
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	Slot No.		
No Casing or Screen				
	☐ Open hole			

Test of Well Yield

Pumping test method	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Pump intake set at - (metres)	Static Level			
Pumping rate - (litres/min)	1		1	
Duration of pumping ___hrs + ___ min	2		2	
Final water level end of pumping ___ metres	3		3	
Recommended pump type. ☐ Shallow ☐ Deep	4		4	
Recommended pump depth. ___ metres	5		5	
Recommended pump rate. (litres/min)	10		10	
	15		15	
If flowing give rate - (litres/min)	20		20	
	25		25	
If pumping discontinued, give reason.	30		30	
	40		40	
	50		50	
	60		60	

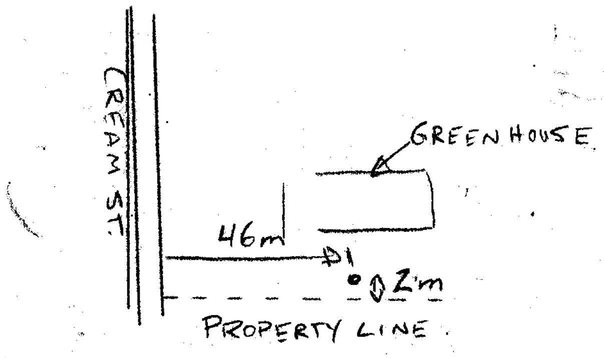
Plugging and Sealing Record

☑ Annular space ☐ Abandonment

Depth set at - Metres From	Depth set at - Metres To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	2.75	BENT. SEAL IN 10 SLEEVE	
0	2.45	SAND FILL - EXISTING DUG WELL	
2.45	2.75	BENT. SEAL - EXISTING DUG WELL	
2.75	4.20	5/8" CLEAR STONE	

Location of Well

In diagram below show distances of well from road, lot line, and building. Indicate north by arrow.



Method of Construction

☐ Cable Tool ☐ Rotary (air) ☐ Diamond ☐ Digging

☐ Rotary (conventional) ☐ Air percussion ☐ Jetting ☑ Other WELL IMPROVEMENT

☐ Rotary (reverse) ☐ Boring ☐ Driving

Water Use

☑ Domestic ☐ Industrial ☐ Public Supply ☐ Other

☐ Stock ☐ Commercial ☐ Not used

☐ Irrigation ☐ Municipal ☐ Cooling & air conditioning

Final Status of Well

☑ Water Supply ☐ Recharge well ☐ Unfinished ☐ Abandoned, (Other)

☐ Observation well ☐ Abandoned, insufficient supply ☐ Dewatering

☐ Test Hole ☐ Abandoned, poor quality ☐ Replecement well

Well Contractor/Technician Information

Name of Well Contractor: HITCHON PUMPS

Well Contractor's Licence No.: 6170

Business Address (street name, number, city etc.): 673 WALLBRIDGE-LOYALIST RD., BELLEVILLE.

Name of Well Technician (last neme, first name): Hitchon Stu.

Well Technician's Licence No.: T1041

Signature of Technician/Contractor X

Date Submitted YYYY 2004 MM 12 DD 06

Audit No. Z 21544

Date Well Completed YYYY 2004 MM 11 DD 25

Was the well owner's information package delivered? ☐ Yes ☐ No

Date Delivered YYYY MM DD

Ministry Use Only

Data Source

Contractor 6170

Date Received YYYY MM DD DEC 09 2004

Date of Inspection YYYY MM DD

Remerks

Well Record Number 6604841

0506E (09/03)

Contractor's Copy ☐ Ministry's Copy ☑ Well Owner's Copy ☐

Cette formule est disponible en français

Ontario Ministry of the Environment

Wel A 021405 t number below)

A021405

Well Record

Regulation 903 Ontario Water Resources Act

page 1 of 1

Instructions for Completing Form

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- **All metre measurements shall be reported to 1/10th of a metre.**
- Please print clearly in blue or black ink only.

Ministry Use Only

MUN | CON | LOT

Well Owner's Information and Location of Well Information

[redacted]

RR#/Street Number/Name

City/Town/Village

Site/Compartment/Block/Tract etc.

GPS Reading NAD 83 Zone 17 Easting 634891 Northing 4764829

Unit Make/Model Meggela

Mode of Operation: ☐ Undifferentiated ☑ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Metres To
Brown	sand			0	6
Brown	Silty Sand			6	27.4
Grey	Silty Sand			27.4	42.67
Brown	Silty Sand			42.67	29.5
Brown	fine sand			29.5	60.0
Grey	limestone			60.0	61.2

Hole Diameter

Depth From	Metres To	Diameter Centimetres
0	61.2	15

Water Record

Water found at Metres	Kind of Water	
60 m	☑ Fresh	☐ Sulphur
☐ Gas	☐ Salty	☐ Minerals
☐ Other:		
m	☐ Fresh	☐ Sulphur
☐ Gas	☐ Salty	☐ Minerals
☐ Other:		
m	☐ Fresh	☐ Sulphur
☐ Gas	☐ Salty	☐ Minerals
☐ Other:		

After test of well yield, water was
☑ Clear and sediment free
☐ Other, specify

Chlorinated ☑ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Metres To
Casing				
15	☑ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	188	0	60
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	Slot No.		
No Casing or Screen				
	☑ Open hole		60	61.2

Test of Well Yield

Pumping test method Submersible

Pump intake set at - (metres) 59.4

Pumping rate - (litres/min) 37.8

Duration of pumping 3 hrs + ___ min

Final water level end of pumping 11.2 metres

Recommended pump type. ☐ Shallow ☑ Deep

Recommended pump depth. 60 metres

Recommended pump rate. 37.8 (litres/min)

If flowing give rate - (litres/min)

If pumping discontinued, give reason.

Draw Down Time min	Water Level Metres	Recovery Time min	Water Level Metres
Static Level	8.2		11.20
1	8.93	1	10.7
2	9.40	2	10.48
3	9.69	3	10.02
4	10.11	4	9.6
5	10.46	5	9.23
10	10.54	10	9.11
15	10.6	15	8.93
20	10.75	20	8.86
25	10.88	25	8.74
30	11.0	30	8.65
40	11.06	40	8.62
50	11.12	50	8.42
60	11.20	60	8.56

Plugging and Sealing Record

☑ Annular space ☐ Abandonment

Depth set at - Metres From	To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	6	Quick Grout	34Bal

Method of Construction

☑ Cable Tool ☐ Rotary (conventional) ☐ Rotary (reverse)
☐ Rotary (air) ☐ Air percussion ☐ Boring
☐ Diamond ☐ Jetting ☐ Driving
☐ Digging ☐ Other

Water Use

☑ Domestic ☐ Stock ☐ Irrigation
☐ Industrial ☐ Commercial ☐ Municipal
☐ Public Supply ☐ Not used ☐ Cooling & air conditioning
☐ Other

Final Status of Well

☑ Water Supply ☐ Observation well ☐ Test Hole
☐ Recharge well ☐ Abandoned, insufficient supply ☐ Abandoned, poor quality
☐ Unfinished ☐ Dewatering ☐ Replacement well
☐ Abandoned, (Other)

Well Contractor/Technician Information

Name of Well Contractor: Circle Eddy's Drilling

Well Contractor's Licence No.: 7294

Business Address (street name, number, city etc.): 108 Queen St South Thorold L2V3V4

Name of Well Technician (last name, first name): Gladney Edward

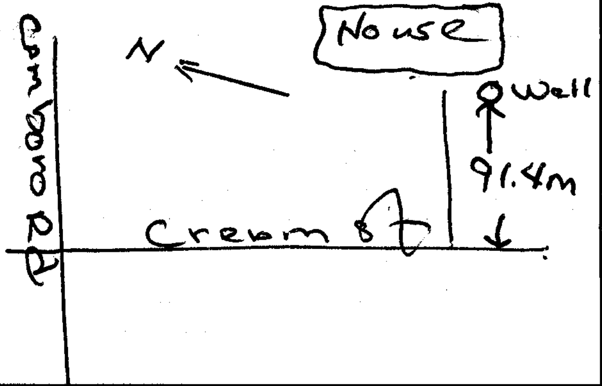
Well Technician's Licence No.: T-2099

Signature of Technician/Contractor: x

Date Submitted YYYY MM DD: 05 10 03

Location of Well

In diagram below show distances of well from road, lot line, and building. Indicate north by arrow.



Audit No. Z 21679

Date Well Completed YYYY MM DD: 05 09 15

Was the well owner's information package delivered? ☑ Yes ☐ No

Date Delivered YYYY MM DD: 05 10 03

Ministry Use Only

Data Source

Contractor 7294

Date Received YYYY MM DD: OCT 07 2005

Date of Inspection YYYY MM DD

Remarks

Well Record Number

0506E (09/03) Contractor's Copy ☐ Ministry's Copy ☑ Well Owner's Copy ☐ *Cette formule est disponible en français*

Ontario Ministry of the Environment

Measurements recorded in: ☐ Metric ☑ Imperial

Well Tag No. *(Place Sticker and/or Print Below)*
Decommission

Well Record

DRAFT

Regulation 903 Ontario Water Resources Act

Page ____ of ____

[redacted]

Address of Well Location (Street Number/Name): 1192 Balfour Street
Township: Pelham
Lot: 13&14
Concession:
County/District/Municipality: Fenwick Niagara
City/Town/Village: Fenwick
Province: **Ontario**
Postal Code: L0S 1C0
UTM Coordinates: NAD 8 3 | Zone: 17 | Easting: 634312 | Northing: 4765746
Municipal Plan and Sublot Number:
Other:

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth *(m/ft)* From	Depth *(m/ft)* To
	Pea gravel			40'	33'
	Bentonite Hole plug			33'	28'
	Clean soil fill			28'	0'

Annular Space

Depth Set at *(m/ft)* From	To	Type of Sealant Used *(Material and Type)*	Volume Placed *(m³/ft³)*

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, *specify*
If pumping discontinued, give reason:
Pump intake set at *(m/ft)*
Pumping rate *(l/min / GPM)*
Duration of pumping ____ hrs + ____ min
Final water level end of pumping *(m/ft)*
If flowing give rate *(l/min / GPM)*
Recommended pump depth *(m/ft)*
Recommended pump rate *(l/min / GPM)*
Well production *(l/min / GPM)*
Disinfected? ☐ Yes ☐ No

Draw Down Time *(min)*	Water Level *(m/ft)*	Recovery Time *(min)*	Water Level *(m/ft)*
Static Level			
1		1	
2		2	
3		3	
4		4	
5		5	
10		10	
15		15	
20		20	
25		25	
30		30	
40		40	
50		50	
60		60	

Method of Construction

☐ Cable Tool
☐ Rotary (Conventional)
☐ Rotary (Reverse)
☐ Boring
☐ Air percussion
☐ Other, *specify*
☐ Diamond
☐ Jetting
☐ Driving
☐ Digging

Well Use

☐ Public
☐ Domestic
☐ Livestock
☐ Irrigation
☐ Industrial
☐ Other, *specify*
☐ Commercial
☐ Municipal
☐ Test Hole
☐ Cooling & Air Conditioning
☐ Not used
☐ Dewatering
☐ Monitoring

Construction Record - Casing

Inside Diameter *(cm/in)*	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness *(cm/in)*	Depth *(m/ft)* From	To

Status of Well

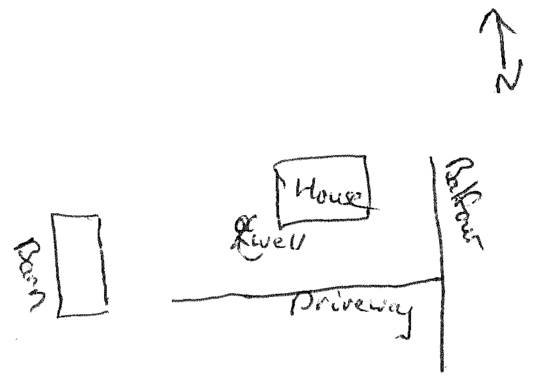
☐ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☐ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, *specify*
☐ Other, *specify*

Construction Record - Screen

Outside Diameter *(cm/in)*	Material (Plastic, Galvanized, Steel)	Slot No.	Depth *(m/ft)* From	To

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Water Details

Water found at Depth *(m/ft)* ☐ Gas | Kind of Water: ☐ Fresh ☐ Untested ☐ Other, *specify*
Water found at Depth *(m/ft)* ☐ Gas | Kind of Water: ☐ Fresh ☐ Untested ☐ Other, *specify*
Water found at Depth *(m/ft)* ☐ Gas | Kind of Water: ☐ Fresh ☐ Untested ☐ Other, *specify*

Hole Diameter

Depth *(m/ft)* From	To	Diameter *(cm/in)*

Well Contractor and Well Technician Information

Business Name of Well Contractor: Ted vanderZalm Well Drilling
Well Contractor's Licence No.: 7179
Business Address (Street Number/Name): 840 Concession 2 Rd
Municipality: Niagara on the lake
Province: ON
Postal Code: L0S 1J0
Business E-mail Address: ted@vanderzalmwelldrilling.com
Bus. Telephone No. *(inc. area code)*: 2896879355
Name of Well Technician (Last Name, First Name): vanderZalm, Ted
Well Technician's Licence No.: 295
Signature of Technician and/or Contractor:
Date Submitted: 20130609

Well owner's information package delivered: ☐ Yes ☑ No
Date Package Delivered: Y Y Y Y M M D D
Date Work Completed: 20130608

Ministry Use Only
Audit No. Z162133
JUN 17 2013
Received

0506E (2007/12)

Ministry's Copy

Summary of Testpit Logs
Hydrogeological Investigation
678 Canboro Road, Fenwick
TG22285, July 31, 2002

Testpit No.	Depth mbgs	Stratigraphy/Comments	Sample No./ Depth (mbgs)	% Moisture
1	0.0 - 0.43 0.43 - 2.5	Topsoil Brown fine sand with some silt, moist to wet with depth. Upon completion: Testpit dry and open. After 1.3 hrs, dry and open.	1-1 @ 0.8 1-2 @ 1.5 1-3 @ 2.3	8.8 16.3 18.3
2	0.0 - 0.38 0.38 - 2.4	Topsoil Brown fine sand with some silt, moist to wet with depth. Upon completion: Testpit dry and open. After 3 hr, 8 min, dry and open.	2-1 @ 0.6 2-2 @ 1.2 2-3 @ 2.2	6.6 8.5 13.9
3	0.0 - 0.32 0.32 -2.7	Topsoil Brown fine sand with occasional silt seams, moist to wet with depth. Upon completion: Testpit dry and open. After 2 hr, 46 min, dry and open.	3-1 @ 0.7 3-2 @1.2 3-3 @ 2.5	6.1 7.0 18.8
4	0.0 - 0.23 0.23 – 2.5	Topsoil Brown fine sand with traces of silt and occasional silt layers, moist. Upon completion: Testpit dry & open.	4-1 @ 0.6 4-2 @ 1.2 4-3 @ 2.3	5.4 7.5 6.9
5	0.0 – 0.20 0.20 – 2.5	Topsoil Brown fine sand with traces of silt and occasional silt layers to 1.5 m, moist. Upon completion: Testpit dry and open.	5-1 @ 0.6 5-2 @ 1.2 5-3 @ 2.4	5.0 8.2 9.0
6	0.0 – 0.30 0.30 – 2.6	Topsoil Brown fine sand with traces of silt & occasional silt seams, moist. Upon completion: Testpit dry & open.	6-1 @ 0.8 6-2 @ 1.1 6-3 @ 2.5	5.4 8.8 9.9
7	0.0 – 0.36 0.0 – 2.6	Topsoil Brown fine sand with traces of silt & occasional silt layers to 1.5 m, moist. Upon completion: testpit dry and open. After 24 min, testpit dry and open.	7-1 @ 0.7 7-2 @ 1.2 7-3 @ 2.5	13.1 11.6 8.1
8	0.0 – 0.26 0.26 – 2.5	Topsoil Brown fine sand with traces of silt and occasional silt layers to 1.5 m, moist. Upon completion: testpit dry and open. After 37 min, testpit dry and open	8-1 @ 0.6 8-2 @ 1.2 8-3 @ 2.4	4.8 4.6 6.4

9	0.0 – 0.26 0.26 – 2.4	Topsoil Brown fine sand with traces of silt and occasional silt layers to 1.5 m. Moist. Upon completion: testpit dry and open. After 52 min, testpit dry and open	9-1 @ 0.6 9-2 @ 1.2 9-3 @ 2.4	4.9 13.5 6.8
10	0.0 – 0.20 0.20 – 2.4	Topsoil Brown fine sand with traces of silt and occasional silt layers to 1.5 m, moist. Upon completion: testpit dry & open. After 68 min, testpit dry and open	10-1 @ 0.6 10-2 @ 1.1 10-3 @ 2.4	2.5 4.9 7.3
11	0.0 – 0.20 0.20 – 2.5	Topsoil Brown fine sand with numerous silt layers to 1.5 m, moist. Upon Completion: testpit dry and open	11-1 @ 0.7 11-2 @ 1.2 11-3 @ 2.4	8.1 17.8 9.0
12	0.0 – 0.82 0.82 – 2.6	Topsoil Brown fine sand with traces of silt, moist to wet with depth. Upon Completion: testpit dry and open. After 2 hrs, 10 min, testpit dry & open.	12-1 @ 0.5 12-2 @ 1.1 12-3 @ 2.0	8.9 9.6 26.6
13	0.0 – 0.72 0.72 – 2.4	Topsoil Brown fine sand with traces of silt, wet to saturated. Upon completion: seepage from 2.0 m. After 3 hrs, water level @ 1.85 m, testpit caved at 2.0 m	13-1 @ 0.6 13-2 @ 0.9 13-3 @ 1.9	19.8 20.3 27.3

APPENDIX B
Site Photographs

Matrix Solutions Inc.
June 8, 2017

1. Mature hedgerow with trees ranging in DBH from 50 to 110 cm

Matrix Solutions Inc.
June 8, 2017

2. Wetland immediately south of Canboro Road.

Matrix Solutions Inc.
June 8, 2017

3. Reach 1 between properties- ditch like with no riparian vegetation.

Matrix Solutions Inc.
June 8, 2017

4. Reach 2 displaying large quantities of riparian vegetation.

Matrix Solutions Inc.
June 8, 2017

5. Dry drainage feature downstream of Welland Road.

Matrix Solutions Inc.
June 8, 2017

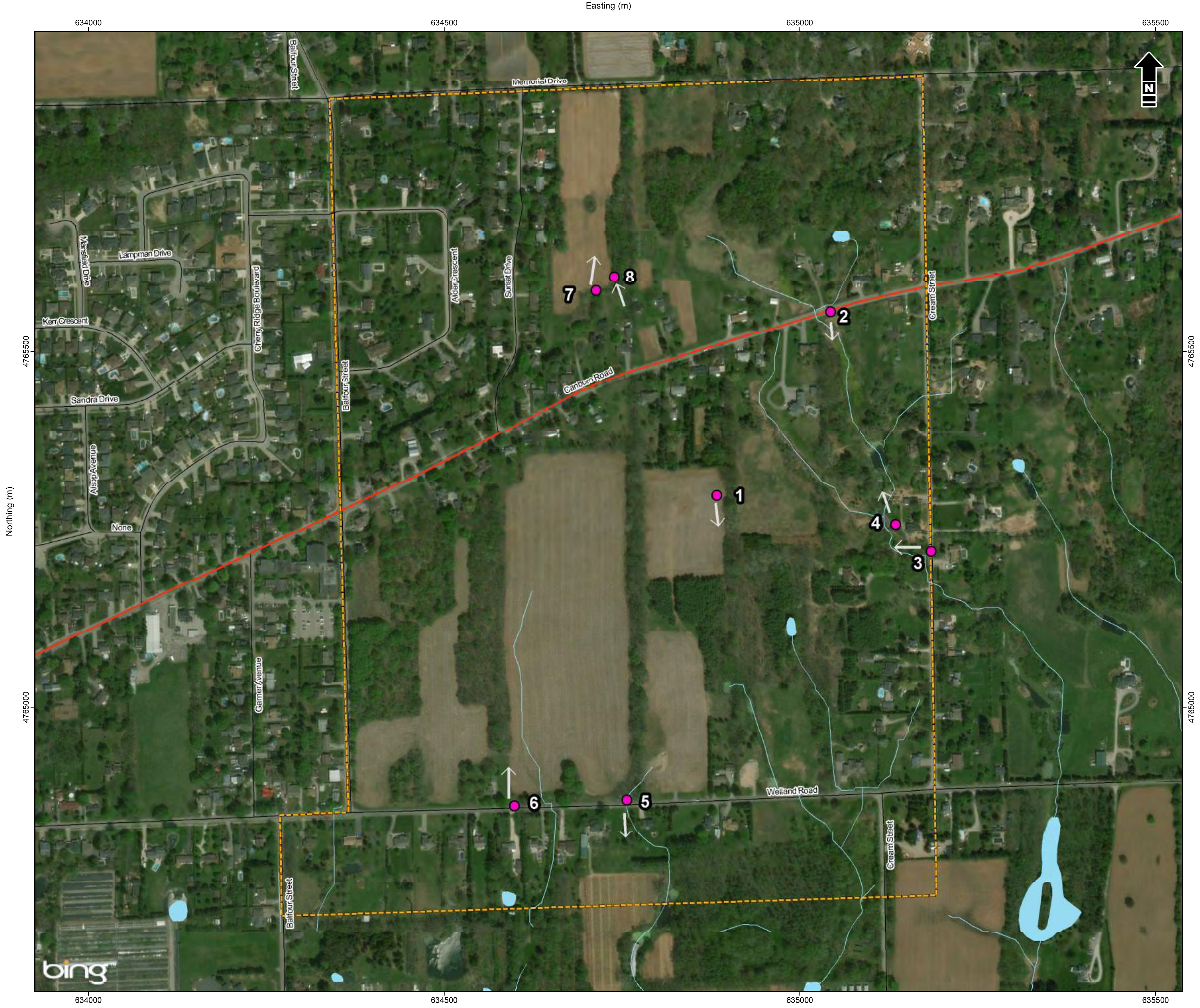
6. View of agricultural field showing no evidence of drainage feature during time of assessment.

Matrix Solutions Inc.
June 8, 2017

7. Mature hedgerow with Hickory species present.

Matrix Solutions Inc.
June 9, 2017

8. Hickory species in mature hedgerow.



- Study Area
- Water Body
- Watercourse
- Highway
- Road
- ● Photo Location
- Direction of Photo

1:5,500 metres

50 0 50 100

NAD 1983 UTM Zone 17N

Reference: Data obtained from GeoBase® used under license and Open Government Licence – Ontario.
Imagery obtained from ® 2008 Microsoft Coporation and its data suppliers.

Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

Niagara Region
East Fenwick Secondary Plan

Photo Locations

Date:	Project:	Submitter:	Reviewer:
July, 2017	24850	D. Relyea	S. Toner

Figure B

I:\NiagaraRegion\24850\FiguresandTables\SWM\2017\Report\Appendix\Figure-B-Photo_Locations.mxd - Tabloid_L - 18-Jul-17, 12:26 PM - gisguest - TID005

APPENDIX C
Regulatory Descriptions

APPENDIX C

REGULATORY BACKGROUND

1.1 Federal Acts and Regulations

1.1.1 Fisheries Act

The Fisheries Act sets out provisions to protect fish and fish habitat. In 2012, amendments were made to the Act with the aim to provide for the sustainability and ongoing productivity of commercial, recreational and Aboriginal fisheries (Government of Canada 2016). Section 35.1 prohibits serious harm to commercial, recreation, and Aboriginal fisheries, as well as, fish habitat supporting those fisheries. An additional provision is stated in Section 36, Fisheries Protection and Pollution Prevention, prohibiting the deposit of deleterious substances.

The Fisheries Act (Government of Canada 2016) requires that projects avoid causing serious harm to fish unless authorized by the Minister of Fisheries and Oceans Canada (DFO) or a designated representative. The determination of risk for serious harm to fish is typically done through a self-assessment process (DFO 2015). If the self-assessment indicates that the project cannot avoid serious harm to fish, then a formal request for review must be submitted to DFO. A self-assessment has been completed for the proposed East Fenwick Secondary Plan. The watercourse travelling down the east side of the study area is fully contained within the provincially significant wetland and therefore will not experience any alterations and require no input from DFO. In addition, minor intermittent watercourse within the study area will not need DFO input if all work is done above the high water line.

1.1.2 Migratory Bird Convention Act

The Migratory Birds Convention Act and associated Regulations have the goal of ensuring the conservation of migratory bird populations by regulating potentially harmful human activities (Government of Canada 2010). Sections 5 and 6 of the Act prohibit the destruction/disturbance of migratory bird habitat and killing/removing migratory bird fledglings, eggs, nests, or other harmful activity to migratory birds. Under certain conditions, authorization to undertake prohibited activities (including scaring, capturing or killing migratory birds or taking or destroying their nests or eggs) may be authorized through a permit issued by the Minister of Environment and Climate Change Canada (ECCC 2016).

A permit is not needed if the work can be completed without interfering with or harming migratory birds. Typically a nest sweep would be conducted during the migratory bird window of April 1 to August 30, in the case that trees would need to be removed. Should a nest be found during a sweep, the appropriate setback would be determined and no work would be completed in the setback area until it can be determined by a qualified biologist that the nest is no longer being used.

1.1.3 Species at Risk Act

The federal Species at Risk Act (SARA) was developed to help prevent wildlife from being extirpated or extinct, to provide for the recovery of wildlife species that are extirpated, endangered or threatened as a result of human activity, and to manage species of special concern to prevent them from becoming endangered or threatened (Government of Canada 2015). Currently, no habitat protection is provided to species listed as "of special concern"; however, their populations are being closely monitored and declines might result in reclassification to a protected category. The Act states that an animal listed as extirpated, endangered, or threatened may not be killed, harmed, or harassed and their critical habitat cannot be harmed (Government of Canada 2015).

1.2 Provincial Acts and Regulations

1.2.1 Endangered Species Act

The Endangered Species Act (ESA) provides for the conservation and protection of fauna and flora species within the Province of Ontario that are threatened with extinction (Government of Ontario 2008). The ESA prohibits the killing, harassment, capture, and destruction of habitat associated with SAR.

In instances where a SAR or their critical habitat is observed, under Section 17 (2) of the ESA an overall benefit permit may be required to move the SAR or alter their habitat. The overall benefit permit provides authorization to perform the activity that would otherwise not be allowed, as long as an overall benefit to the species in Ontario is provided (Government of Ontario 2008). Ontario Regulation 242/08 also outlines various exemptions or agreements that may be employed under the Act, which are project or species specific (Government of Ontario 2008). An authorization under the ESA is not required if the work is completed under the following conditions:

- Timing: conducting the activity at certain times of the year. Examples of this would include clearing brush outside of the breeding bird window (e.g., April 1 to August 30).

- Location: Moving the activity to a slightly different location or reducing the size of the area affected or avoid SAR and their habitat.

1.2.2 Conservation Authorities Act

Section 28(1) of the Conservation Authorities Act empowers Conservation Authorities (CAs) with the ability to make regulations governing development that can have an impact to watercourses and water bodies (Government of Ontario, 2013). The proposed Secondary Plan study area is located within a NRCA regulated watershed. Under Section 5 of the Act, a permit is required from the applicable CA before any site alteration to a watercourse, water body or wetland. The NRCA can, under Section 6 of the Act, grant permission to straighten, change, divert or interfere with the existing channel of a river, creek, stream or watercourse, or to change or interfere with a wetland under conditions outlined in the Act and associated regulation. Consultation with the NRCA will be required to discuss mitigation measures along all watercourses that will be affected by the results of the Secondary Plan.

1.2.3 Provincial Policy Statement

The Provincial Policy Statement (PPS; MAH 2014), as it relates to wise use and management of resources, sets out to protect natural heritage, water, agricultural, mineral, cultural heritage and archaeological resources for their economic, environmental, and social benefits. Under Section 2.1 of the PPS, development and site alteration shall not be permitted in fish habitat, habitat of endangered/threatened species, or on adjacent land to natural heritage features. In addition, under

Section 2.2 of the PPS, no development or site alteration shall occur in or near to sensitive surface water features in order to protect hydrologic functions.

1.2.4 Greenbelt Plan

The Greenbelt Plan (MAH, 2017) provides policies for the Natural Heritage System and the Water Resource System within the Greenbelt Protected Countryside. The Natural Heritage System incorporates core areas as well as linkage areas with high concentrations of highly sensitive and significant natural features and functions that require protection (MAH, 2017). The Water Resource System consists of both groundwater and surface water which provide resources necessary to sustain aquatic and terrestrial ecosystems in addition to human water consumption. Any development occurring on lands designated as Greenbelt Natural Heritage System must ensure that no negative impacts occur to features or functions, that connectivity of systems within 240m of one another is maintained or enhanced, that the removal of natural features be avoided at all costs, the disturbed area of the total developable area not exceed 25%, and impervious surfaces of the total developable area not exceed 10% (MAH, 2017). Any development occurring on lands designated as Water Resource Systems must ensure that all hydrologic features and functions are included in the long-term approach to protection and improvement of quality and quantity of water, that comprehensive watershed planning is undertaken, and that growth and planning of water be in accordance with the Growth Plan. The key natural heritage features and key hydrologic features do not permit development or site alteration.

1.3 Municipal Acts and Regulations

1.3.1 Niagara Region Official Plan

The Region of Niagara's Official Plan (2014) was prepared under the Government of Ontario's Planning Act (Government of Ontario, 2017). The Niagara Region's Official Plan's purpose is to promote a healthy landscape that recognizes that environmental conditions in any location affects, and is affected by, environmental conditions in the surrounding landscape (2014). Niagara Region organizes its natural environment into a Core Natural Heritage System that includes Core Natural Areas classified as either environmental protection areas or environmental conservation areas, potential natural heritage corridors connecting Core Natural Areas, Greenbelt Natural Heritage and Water Resource Systems, and Fish Habitat.

1.3.2 Town of Pelham Official Plan

The Town of Pelham has adopted a natural heritage system that is divided into three designations: Environmental Protection One (EP-1), Environmental Protection Two (EP-2) and Environmental Protection Three (EP-3). EP-1 identifies significant natural heritage features outside of the Greenbelt Plan and included provincially significant wetlands and Life Sciences Areas of Natural and Scientific Interest (ANSI). EP-2 builds upon EP-1 and includes protection of natural heritage features such as locally significant wetlands outside of the Greenbelt Plan, significant habitat of special concern species, significant woodlands and valleylands, regionally significant ANSI's, savannahs and tall grass prairies, alvars, significant wildlife habitat and publicly owned conservation lands. EP-3 designates areas within the Greenbelt Natural Heritage System and includes significant habitat of endangered, threatened, and special concern species, fish habitat, wetlands, ANSI's, significant woodlands and valleylands, significant wildlife habitat, sand barrens, savannahs and tallgrass prairies, alvars, permanent and intermittent streams, lakes and littoral zones, seepage areas and springs, and wetlands. New development may be allowed within EP-1 and EP-2 areas if an EIS is completed, however development within an EP-3 area is not anticipated because it represents the most sensitive lands. The wetland along the east side of the study area is designated as an EP-3 under the Town of Pelham Official Plan and therefore no development shall occur in that area or its legislated buffers.

PART 4

ASI: EAST FENWICK SECONDARY PLAN CULTURAL HERITAGE STUDY

CULTURAL HERITAGE RESOURCE ASSESSMENT

EXISTING CONDITIONS REPORT

EAST FENWICK SECONDARY PLAN CULTURAL HERITAGE STUDY

LOTS 12 & 13, CONCESSION 9 & 10 , VILLAGE OF FENWICK

TOWN OF PELHAM
NIAGARA REGION, ONTARIO

Prepared for:

Town of Pelham
20 Pelham Town Square
P.O. Box 400
Fonthill, ON L0S 1E0
T: 905-892-2607

ASI File 17CH-038

July 2017

ASI Archaeological & Cultural Heritage Services
528 Bathurst Street Toronto, ONTARIO M5S 2P9
416-966-1069 F 416-966-9723 asiheritage.ca

CULTURAL HERITAGE RESOURCE ASSESSMENT

EXISTING CONDITIONS REPORT

EAST FENWICK SECONDARY PLAN CULTURAL HERITAGE STUDY
LOTS 12 & 13, CONCESSION 9 & 10, VILLAGE OF FENWICK

TOWN OF PELHAM
NIAGARA REGION, ONTARIO

EXECUTIVE SUMMARY

ASI was retained by SGL Planning & Design Inc. on behalf of the Town of Pelham to conduct a Cultural Heritage Resource Assessment (CHRA) Study for the East Fenwick study area in the Town of Pelham, Ontario. The project involves a built heritage and cultural heritage landscape assessment of the subject lands in order to assist the Town of Pelham in the preparation of the East Fenwick Secondary Plan. The aim of this assessment is to guide future development within the 235 acre area of the East Fenwick community.

The purpose of this report is to describe the existing conditions of the study area, present known and identified built heritage and cultural landscapes, and to identify and propose appropriate mitigation measures and recommendations for minimizing and avoiding negative impacts to identified cultural heritage resources, for consideration as a part of the Secondary Plan process.

The results of background historical research and a review of secondary source material, including historical mapping, revealed that the study area has a rural land use history dating back to the early nineteenth century. The field review confirmed that this area retains a number of nineteenth- and twentieth-century cultural heritage resources. 23 cultural heritage resources within and adjacent to the study area have been identified, including: two cultural heritage landscapes, three residential/farmscape properties and 18 residential properties. Land use changes, road improvements and/or pedestrian realm improvements, and other alterations associated with the Secondary Plan process may have a variety of impacts upon cultural heritage resources.

Based on the results of this assessment and a review of the potential heritage impacts resulting from the secondary plan process, the following recommendations have been developed:

1. A total of 23 cultural heritage resources were identified within and/or adjacent to the East Fenwick Secondary Plan study area, which include two cultural heritage landscapes, three residential/farmscape properties and 18 residential properties. The East Fenwick Secondary Plan should incorporate policies that ensure the long-term viability and presence of significant built heritage resources and cultural heritage landscapes.

2. BHR 4 should be considered for designation under Part IV of the Ontario Heritage Act.

3. CHL 2 is important historic rural route and former Indigenous trail, which has been previously identified in the Pelham Heritage Master Plan, and in Section B2.2.7 of the Official Plan. CHL 2 maintains a strong connection to the historic settlement patterns of East Fenwick and to the built heritage resources found along the road. CHL 2 should be studied for designation or recognition as a Cultural Heritage Landscape, under Part V of the Ontario Heritage Act, or through an Official Plan Amendment.

4. CHL 1 is an important historic rural route, characterized by little or no shoulder, no formal ditches, no sidewalks, no curbs, relatively slow, low traffic levels, and mature roadside vegetation. These attributes facilitate pedestrian and cycling activity. CHL 1 acts as a boundary road between the urban and rural areas of East Fenwick. CHL1 should be studied for recognition as a Heritage Route under D4.2.2.6 of the Official Plan.

5. Alternative road and pedestrian realm improvement approaches to conserve and enhance the road corridors and alternative development and land use approaches that conserve and enhance the landscape and built form character of adjacent properties should be considered for CHL 1 and CHL 2 as a part of the secondary plan process. A gradual transition from the urban boundary to the rural areas to the north should be considered for CHL 1.

6. BHRs 2, 8, 16 and 20 contain heritage features that are good candidates for conservation. Based on a review of the East Fenwick Secondary Plan Area Conceptual Tertiary Plan, prepared by Upper Canada Consultants in 2010, and consideration of properties then shown to be owned by a developer's group, it is expected that these properties may be subject to impacts as a result of future development or land use changes. A Heritage Impact Assessment should be completed for the subject properties.

7. CHLs 1-2 and BHRs 1- 2, 4-21 may be altered as a result of changes in land use, future development, road widening and/or improvements and pedestrian realm improvements. Upon the completion of a proposed land use plan resulting from the secondary plan process, the heritage impacts should be assessed, including the development of specific mitigation measures.

ARCHAEOLOGICAL SERVICES INC.

PROJECT PERSONNEL

Senior Project Manager: Rebecca Sciarra, MA, CAHP
Partner and Director, Business Services

Project Manager: Lauren Archer, BA
Cultural Heritage Specialist, Cultural Heritage Division

Project Administrator: Carol Bella, Hons BA
Research Archaeologist and Administrative Assistant

Fieldwork Assistant: Laura Wickett, BA (Hon), Dip. Heritage Conservation
Cultural Heritage Assistant, Cultural Heritage Division

Report Preparation: Lauren Archer

Laura Wickett

Graphics: Jonas Fernandez, MA
Geomatics Specialist

Report Reviewer: Rebecca Sciarra

TABLE OF CONTENTS

LIST OF MAPS

LIST OF TABLES

1.0 INTRODUCTION

ASI was retained by SGL Planning & Design Inc. on behalf of the Town of Pelham to conduct a Cultural Heritage Resource Assessment (CHRA) Study for the East Fenwick study area in the Town of Pelham, Ontario (Figure 1). The project involves a built heritage and cultural heritage landscape assessment of the subject lands in order to assist the Town of Pelham in the preparation of the East Fenwick Secondary Plan. The aim of this assessment is to guide future development within the 235 acre area of the East Fenwick community.

The purpose of the CHRA report is to describe the existing conditions of the study area, present a built heritage and cultural landscape inventory of cultural heritage resources, and propose appropriate mitigation measures and recommendations for minimizing and avoiding negative impacts on identified cultural heritage resources. The assessment was completed by Lauren Archer, Cultural Heritage Specialist in the Cultural Heritage Division at ASI.

Figure 1: Location of the East Fenwick study area

2.0 BUILT HERITAGE RESOURCE AND CULTURAL HERITAGE LANDSCAPE ASSESSMENT CONTEXT

2.1 Legislation and Policy Context

The authority to request this heritage assessment arises from Section 2 (d) of the *Planning Act*. The *Planning Act* (1990) and related *Provincial Policy Statement* (*PPS*), which was updated in 2014, make a number of provisions relating to heritage conservation. One of the general purposes of the *Planning Act* is to integrate matters of provincial interest in provincial and municipal planning decisions. In order to inform all those involved in planning activities of the scope of these matters of provincial interest, Section 2 of the *Planning Act* provides an extensive listing. These matters of provincial interest shall be regarded when certain authorities, including the council of a municipality, carry out their responsibilities under the *Act*. One of these provincial interests is directly concerned with:

> 2.(d) the conservation of features of significant architectural, cultural, historical, archaeological or scientific interest

Part 4.7 of the *PPS* states that:

> The official plan is the most important vehicle for implementation of this Provincial Policy Statement. Comprehensive, integrated and long-term planning is best achieved through official plans.
>
> Official plans shall identify provincial interests and set out appropriate land use designations and policies. To determine the significance of some natural heritage features and other resources, evaluation may be required.
>
> Official plans should also coordinate cross-boundary matters to complement the actions of other planning authorities and promote mutually beneficial solutions. Official plans shall provide clear, reasonable and attainable policies to protect provincial interests and direct development to suitable areas.
>
> In order to protect provincial interests, planning authorities shall keep their official plans up-to-date with this Provincial Policy Statement. The policies of this Provincial Policy Statement continue to apply after adoption and approval of an official plan.

Those policies of particular relevance for the conservation of heritage features are contained in Section 2-Wise Use and Management of Resources, wherein Subsection 2.6 - Cultural Heritage and Archaeological Resources, makes the following provisions:

> 2.6.1 Significant built heritage resources and significant cultural heritage landscapes shall be conserved.

A number of definitions that have specific meanings for use in a policy context accompany the policy statement. These definitions include built heritage resources and cultural heritage landscapes.

A *built heritage resource* is defined as: “a building, structure, monument, installation or any manufactured remnant that contributes to a property’s cultural heritage value or interest as identified by a community, including an Aboriginal community” (PPS 2014).

A *cultural heritage landscape* is defined as “a defined geographical area that may have been modified by human activity and is identified as having cultural heritage value or interest by a community, including an Aboriginal community. The area may involve features such as structures, spaces, archaeological sites or natural elements that are valued together for their interrelationship, meaning or association” (PPS 2014). Examples may include, but are not limited to farmscapes, historic settlements, parks, gardens, battlefields, mainstreets and neighbourhoods, cemeteries, trailways, and industrial complexes of cultural heritage value.

In addition, significance is also more generally defined. It is assigned a specific meaning according to the subject matter or policy context, such as wetlands or ecologically important areas. With regard to cultural heritage and archaeology resources, resources of significance are those that are valued for the important contribution they make to our understanding of the history of a place, an event, or a people (*PPS* 2014).

Criteria for determining significance for the resources are recommended by the Province, but municipal approaches that achieve or exceed the same objective may also be used. While some significant resources may already be identified and inventoried by official sources, the significance of others can only be determined after evaluation (*PPS* 2014).

Accordingly, the foregoing guidelines and relevant policy statement were used to guide the scope and methodology of the cultural heritage assessment.

2.2 Town of Pelham Policies Regarding Cultural Heritage

The Town of Pelham provides cultural heritage policies in Section D4 of its Official Plan (2012). Cultural heritage policies relevant to this assessment are provided below:

> D4.2.1 Cultural Heritage Impact Statements
>
> Council may require the submission of a Heritage Impact Assessment (HIA) to support an application for development if the affected lands are the site of an identified cultural heritage resource or are located in close proximity to an identified cultural heritage resource. The intent of the HIA is to determine what impacts the development will have on the resource and whether the application for development will conform to the goals, objectives and policies of this Plan.
>
> D4.2.2.1 Built Heritage Register
>
> Under Section 27 of the Ontario Heritage Act, the Town must maintain a register of all designated properties, but Council may also include on the register, properties that have not been designated but that Council believes to be of cultural heritage value or interest.
>
> D4.2.2.2 Cultural Heritage Landscape Register
>
> In accordance with the Ontario Heritage Act, the Town must also prepare an inventory of cultural heritage landscapes. Landscapes such as existing rural and agricultural areas, historic hamlets, and heritage roads will be identified in the inventory. A cultural heritage landscape is a defined geographical area of heritage significance that has been modified by human activities. Such an area is valued by a community and is of significance to the understanding of the history of a people or place.
>
> The Town of Pelham also has a Heritage Master Plan, which was completed in August 2012. The Heritage Master Plan guides the Town's plans for finding, assessing, conserving and celebrating heritage resources. It encourages development that respects the heritage character of Pelham, recommends policies for inclusion in the Town's Official Plan and provides priorities and timelines for the Town's actions in heritage conservation.

> D4.2.2.6 Heritage Routes
>
> Council supports the development of Heritage Routes that weave through the Town's Rural Area, providing linkages for hiking, cycling, and car touring and highlighting cultural heritage resources. Selected Heritage Routes are to be identified in consultation with the Pelham Municipal Heritage Committee.
>
> In support of developing the Heritage Routes, Council shall endeavour to:
>
>> a) Prepare streetscape guidelines or standards to protect cultural heritage features and resources along heritage routes. The design guidelines will provide protection for existing trees and landscape features, and will ensure that the general heritage appeal and viewscapes are protected and enhanced;
>> b) Coordinate clear and consistent signage along the Heritage Routes that may serve wayfinding and/or educational purposes;
>> c) Cooperate with the Region, adjacent municipalities, and the Wine Council of Ontario to ensure Heritage Route signage is coordinated with any other local signage (e.g. for Wine Routes);
>> d) Support the development of appropriate scenic lookouts and other complementary uses along Heritage Routes, provided that such uses:
>>
>>> i) Are small in scale;
>>> ii) Are in keeping with, and complementary to the passive recreational character of the Route;
>>> iii) Have no negative impacts on the surrounding public and/or private land uses;
>>> iv) Have no negative impacts on the natural environment or on cultural heritage resources; and v) Will not require the extension of the municipal water supply or sanitary sewage services.
>>> e) Enhance cycling and driving conditions along the Heritage Route corridors where appropriate, including through the provision of bicycle lanes in accordance with the Niagara Region Bicycling Network. Wherever possible, linkages to other recreational driving routes and cycling/hiking trails in the Region should be achieved.
>
> To support the tourism role of Heritage Routes, the Town will promote the Heritage Routes and request that the Niagara Economic and Tourism Corporation include the Pelham Heritage Routes in its promotional materials and activities.

Section B2 of the Official Plan addresses Rural Area Designations, section B2.2 Specialty Agricultural includes the identification of the Canboro Road Corridor as a special area in the Town of Pelham:

> B2.2.7 The Canboro Road Corridor
>
> The Canboro Road corridor is an important transportation linkage between Downtown Fenwick and Fonthill and is considered to be an area of significant potential for enhancement as a rural promenade characterized by public parks and spaces geared to pedestrians and cyclists, as well as the promotion of agricultural based tourism and accessory commercial uses. In an effort to encourage and foster land use that contributes to the identity of a promenade, the Zoning By-law may establish site-specific provisions for agricultural–related and secondary uses along this corridor. In addition, the Canboro Road corridor between Fenwick and Fonthill shall be defined

as a Community Improvement Plan study area should Council wish to use the provisions of a Community Improvement Plan to foster and enhance this area as a promenade and tourist destination.

2.3 East Fenwick Secondary Plan Context

The Town of Pelham Council has identified the development of a Secondary Plan for East Fenwick as a priority. The Secondary Plan will guide future growth and development in East Fenwick, including the greenfield area. The Secondary Plan will be adopted by Town Council and approved by the Region of Niagara.

The project goals are to develop a Secondary Plan for the East Fenwick urban area that will provide the framework:

- for permitting new development compatible with the character of Fenwick and consistent with Provincial, Regional and Local planning policies and legislation;
- to establish appropriate land use designations and policies that will support the future development of East Fenwick for an appropriate and compatible mix of uses, local services and community infrastructure;
- to identify existing transportation and infrastructure, i.e. water, sanitary and storm services, available in and around the study area and upgrades that may be required to the systems to support the Secondary Plan;
- to establish a system of public space areas and linkages with natural heritage areas;
- to provide for an implementation and phasing plan;
- to establish design guidelines for built form and public realm development that is consistent with the policy objectives of the Secondary Plan and the provision of well-designed attractive; and accessible public spaces that prioritize the pedestrian experience.

The study area includes that area within the urban area boundary of Fenwick that is bounded by Memorial Drive to the north, Balfour Street to the west, land on the south side of Welland Road to a depth of approximately 120m to the south and Cream Street to the east and comprises approximately 95 ha (235 acres). Canboro Road bisects the study area and is identified as an arterial road and Welland Road along the south boundary is considered to be a collector road with all the other streets being local roads.

The lands are designated Urban Living Area/Built Boundary with the majority of the area identified within the Greenfield Overlay and a portion of the area is designated Environmental Protection Three in the Town Official Plan. The Official Plan also identifies provincially significant wetlands, woodlands and deer wintering area within the study area. Also, the study area is included within an area designated as being part of a highly vulnerable aquifer. The Region of Niagara Official Plan also identifies a significant portion of the Secondary Plan area as a designated greenfield area with the remainder as built up along with environmental protection and environmental conservation areas relating to provincially significant wetlands and significant woodlands.

2.4 Data Collection

In the course of the cultural heritage assessment, all potentially affected cultural heritage resources within the study area are subject to inventory. Short form names are usually applied to each resource type, (e.g. barn, residence). Generally, when conducting a preliminary identification of cultural heritage resources, three stages of research and data collection are undertaken to appropriately establish the potential for and existence of cultural heritage resources in a particular geographic area.

Background historic research, which includes consultation of primary and secondary source research and historic mapping, is undertaken to identify early settlement patterns and broad agents or themes of change in a study area. This stage in the data collection process enables the researcher to determine the presence of sensitive heritage areas that correspond to nineteenth and twentieth century settlement and development patterns. To augment data collected during this stage of the research process, federal, provincial, and municipal databases and/or agencies are consulted to obtain information about specific properties that have been previously identified and/or designated as retaining cultural heritage value. Typically, resources identified during these stages of the research process are reflective of particular architectural styles, associated with an important person, place, or event, and contribute to the contextual facets of a particular place, neighbourhood, or intersection.

A field review is then undertaken to confirm the location and condition of previously identified cultural heritage resources. The field review is also utilized to identify cultural heritage resources that have not been previously identified on federal, provincial, or municipal databases.

Several investigative criteria are utilized during the field review to appropriately identify new cultural heritage resources. These investigative criteria are derived from provincial guidelines, definitions, and past experience. A built structure or landscape is identified as a cultural heritage resource that should be considered during the course of the assessment, if the resource meets a combination of the following criteria:

- It is 40 years or older;
- It is a rare, unique, representative or early example of a style, type, expression, material or construction method;
- It displays a high degree of craftsmanship or artistic merit;
- It demonstrates a high degree of technical or scientific achievement;
- The site and/or structure retains original stylistic features and has not been irreversibly altered so as to destroy its integrity;
- It has a direct association with a theme, event, belief, person, activity, organization, or institution that is significant to: the Town of Pelham; the Province of Ontario; Canada; or the world heritage list;
- It yields, or had the potential to yield, information that contributes to an understanding of: the Town of Pelham; the Province of Ontario; Canada; or the world heritage list;
- It demonstrates or reflects the work or ideas of an architect, artist builder, designer, or theorist who is significant to: the Town of Pelham; the Province of Ontario; Canada; or the world heritage list;
- It is important in defining, maintaining, or supporting the character of an area;
- It is physically, functionally, visually, or historically linked to its surroundings;
- It is a landmark;
- It illustrates a significant phase in the development of the community or a major change or turning point in the community's history;
- The landscape contains a structure other than a building (fencing, culvert, public art, statue, etc.) that is associated with the history or daily life of that area or region; or
- There is evidence of previous historic and/or existing agricultural practices (e.g. terracing, deforestation, complex water canalization, apple orchards, vineyards, etc.).

If a resource satisfies an appropriate combination of these criteria, it will be identified as a cultural heritage resource and is subject to further research where appropriate and when feasible. Typically, further historical research and consultation is required to determine the specific significance of the identified cultural heritage resource. When identifying cultural heritage landscapes, the following categories are typically utilized for the purposes of the classification during the field review:

Farmscapes:	comprise two or more buildings, one of which must be a farmhouse or barn, and may include a tree-lined drive, tree windbreaks, fences, domestic gardens and small orchards.
Roadscapes:	generally two-lanes in width with absence of shoulders or narrow shoulders only, ditches, tree lines, bridges, culverts and other associated features.
Waterscapes:	waterway features that contribute to the overall character of the cultural heritage landscape, usually in relation to their influence on historic development and settlement patterns.
Railscapes:	active or inactive railway lines or railway rights of way and associated features.
Historical Settlements:	groupings of two or more structures with a commonly applied name.
Streetscapes:	generally consists of a paved road found in a more urban setting, and may include a series of houses that would have been built in the same time period.
Historical Agricultural Landscapes:	generally comprises a historically rooted settlement and farming pattern that reflects a recognizable arrangement of fields within a lot and may have associated agricultural outbuildings and structures
Cemeteries:	land used for the burial of human remains.

3.0 HISTORICAL CONTEXT

3.1 Introduction

This section provides a brief summary of historical research and a description of both previously identified above ground cultural heritage resources as well as cultural heritage resources that have been identified through fieldwork, which may be affected by the proposed undertaking. A review of available primary and secondary source material was undertaken to produce a contextual overview of the study area, including a general description of Euro-Canadian settlement and land use. Historically, the study area is located in the Former Township of Pelham, Welland County in the following lots:

- Lots 12 and 13, Concession 9-10

3.2 Natural Heritage, Geography and Physiography

East Fenwick is situated within the Haldimand Clay Plain physiographic region of southern Ontario (Chapman and Putnam 1984: 156–159). The Haldimand Clay Plain physiographic region, an area of approximately 3,500 square kilometres, comprises the majority of the Niagara Peninsula south of the Niagara Escarpment, the limestone bluffs of which channeled early settlement, especially in the Short Hills, along Twelve Mile Creek.

In the last Ice Age, the region was entirely submerged by glacial Lake Warren which now consists of predominantly glaciolacustrine clay overburden. The depth and even the presence of this clay overburden varies from place to place, and there are many relatively distinct sub-areas of the region. Predominant native vegetation at time of settlement included a mixed hardwood/coniferous climax forest of American Chestnut, White Pine, White and Red Oak, Beech, Sugar Maple, Black and White Ash (Cruickshank, 1887: 290). The study area is located between the watersheds of the Welland River to the south, and Fifteen Mile Creek to the north. The Fonthill Kame is recognized as a proglacial delta of the ancient Lake Warren. The Fonthill Kame influences the climate of Pelham by sheltering it from the winds from the southwest. This provides good growing conditions for fruit crops, including the vines that supply the local wine industry. It is also mined for sand and gravel. The best growing soil is in the area flanking Canboro Road between Fenwick and Fonthill, in the Fonthill Kame, which is optimal for fruit production.

The area is representative of a number of Carolinian species and is home to over 500 bog, valley, and meadow plant species The habitat within the Kame is also well suited for a variety of animal species including the white-tailed deer, opossum, red fox, and meadow voles. It also serves as a feeding and sanctuary area for wood ducks, green-winged teals, mallard and black ducks, and great blue herons. The Fonthill Kame is also home to some rare and threatened species including the spotted salamander, red-backed salamander, pickerel frog, pileated woodpecker, and the spotted turtle. Also prevalent are rare plant species including ginseng, broak-beech fern, flowering dogwood, black walnut, swamp white oak, sassafras, tulip tree and the cucumber tree. (Niagara Greenbelt, 2016)

3.3 Indigenous Land Use

The lands with the East Fenwick study area have a cultural history which begins approximately 11,000 years ago and continues to the present. Although East Fenwick does not appear to have been occupied by aboriginal groups on any permanent basis, it has primarily been used by early Indigenous people as an important travel route, through which parties of Indigenous peoples passed during certain times of the year. The land did not offer sufficient resources to support year-round occupation. Based on an inventory of documented archaeological sites, it appears that the extensive clay plains of the mid-peninsular area may have prevented Iroquoian peoples from establishing villages in this area (BRAY Heritage 2011). The majority of archaeological material from the pre-contact period represents the remains of small camps occupied for short periods of time as people moved throughout their territories on a seasonal basis. Oral narratives identify Canboro Road as an old Indigenous trail, along with Lundy's Lane (to the east) and the Talbot Road (to the west), which both connect with the Canboro Road (Brehault 1968: 14). A few small component sites may represent the traces of parties travelling between the major clusters of large Neutral settlements in the Hamilton-Brantford-Grimsby area to the west and the Fort Erie-Port Colborne area to the east (BRAY Heritage 2011).

3.4 Township Survey and Settlement

3.4.1 County of Welland

From 1841 to 1851 the entire Niagara Peninsula comprised a single county municipality, administered by a District Council whose headquarters were located at Niagara-on-the-Lake. During that time Welland County was part of Lincoln County, one of the nineteen counties created by Upper Canada's first Lieutenant-Governor, John Graves Simcoe, in 1792. (Mika and Mika 1977)

In 1851 the southern section of the district broke away to be governed by a provisional council under Warden John Fraser. The town of Welland, then known as Merrittsville, was chosen as the county seat in 1854, and here the first Welland County Council met at the new county buildings on August 18, 1856. (Mika and Mika 1977)

Welland County's early settlers were United Empire Loyalists who came to the area during and after the American Revolutionary War. Many of them were disbanded soldiers of "Butler's" Rangers, a corps of Loyalist refugees raised by Lt. Col. John Butler and led by him in numerous forays from the Niagara Peninsula into rebel territory. The building of the first Welland Canal in the 1820's stimulated the growth of settlements in the area. (Mika and Mika 1977)

3.4.2 Township of Pelham

Located centrally within the Niagara Peninsula, the Town of Pelham was, until January 1, 1970, the Township of Pelham. At that time its main centres of population were Fonthill, Ridgeville, Fenwick, and North Pelham. The Welland River forms the southern boundary of the town and Highway 20 cuts laterally across the area. The Toronto, Hamilton and Buffalo Railway runs across the southern portion of the town. (Mika and Mika 1977)

Settlement of the region began about 1784, the earliest inhabitants including David Secord, George Hansler, Jacob Reece, John Wenger, Samuel Beckett-Willson, John Crowe, A. Overholt, T. Page and T. Rice, as well as settlers Disher, Wilson, Miller, Nunn, Jennings, Foss and Oille. Many of these were Quakers from Pennsylvania and other parts of the United States. (Mika and Mika 1977)

Fonthill was originally known as Riceville, then Osborne's Corners, and Temperanceville, before receiving the name Fonthill in 1850. A post office was established in 1841 under the name of Pelham. John Price was first postmaster. A Baptist church was built in 1846, and the Fonthill Grammar School in 1856. Industries at Fonthill included the Fonthill Nurseries, established in 1837. The area continues to be an important area for fruit crops today. (Mika and Mika 1977)

By 1886 The Township of Pelham contained two woollen mills, three post offices, seven churches, ten public schools, and at least one nursery. Railway travel came to Pelham in 1853 when a Great Western Railway train made its first journey from Hamilton to Queenston.
On January 1, 1970 Pelham Township became the Town of Pelham. The region's rich soil and temperate climate support the growth of fruit and other cash crops. (Mika and Mika 1977)

3.4.3 Village of Fenwick

Situated on the historic Canboro Road, Fenwick was originally a police village in Pelham Township, Welland County. In 1970 Lincoln and Welland Counties were amalgamated to form the Regional Municipality of Niagara, and Fenwick was joined to the Village of Fonthill and the Township of Pelham and became a part of the newly created Town of Pelham. The town is situated in a rich market gardening and fruit-producing area. Prior to annexation, the population of Fenwick was 737. (Mika and Mika 1977)

Fenwick was first settled in the early 1790s, when it was known as Diffin's Corners. In 1853 a post office opened in the settlement and the name officially changed to Fenwick, likely in honour of a British nobleman. Sometime in the 1860s the settlement was incorporated as a police village. (Mika and Mika 1977)

Many of the original settlers in the area were United Empire Loyalists and Quakers who had emigrated from Pennsylvania and New Jersey. The early churches of Fenwick included the Episcopalian Methodist and the New Connexion Methodist. In 1977 there were three churches in Fenwick, the United Church, whose history began in 1835, with the present building erected in 1900, the Church of Christ, and St. Ann's Roman Catholic Church. In 1955 the Polish congregation built the latter church and services were conducted in Polish. (Mika and Mika 1977)

Fenwick had two hotels, the usual small businesses necessary to serve a pioneering community, and later, an Oddfellow's Hall, and the Lion's Club, which, in more recent times officially opened Centennial Park. Memorial School was named for the much respected Ed. Farr, an early school teacher. The Fenwick Fall Fair, under the auspices of the Pelham Township Agricultural Society, was held in Fenwick in the middle 1850s. Excursion trains brought people from Fort Erie, Hamilton and Toronto. Early industries in Fenwick included an apple-drying factory, a spinning mill, a sawmill, a cooperage and several blacksmith shops (Mika and Mika 1977).

3.4.4 Canboro Road Corridor

The Canboro Road, (sometimes “Canborough”, or the “Great West Road”), was the route along which the first settlements in Pelham were established, which initially centered around coach stops/inns, but also around early institutions. Historic mapping suggests that the Canboro Road was not actually surveyed and improved as a road until the 1840s (Cruikshank 1887: 293). Oral narratives identify Canboro Road as an old Indigenous trail, along with Lundy’s Lane (to the east) and the Talbot Road (to the west), which both connect with the Canboro Road (Brehault 1968: 14). The best growing soil is in Pelham flanking Canboro Road between Fenwick and Fonthill, within the Fonthill Kame, and is optimal for fruit production. Canboro Road runs diagonally through the historically surveyed roads that together form the historic road network which together formed the early infrastructure of Fenwick, and connected the area regionally. Additional historic corridors within the study area include Memorial Drive and Welland Road.

The Canboro Road Corridor has been identified as an important historic scenic route and grouping of heritage resources in the Town of Pelham Heritage Master Plan (BRAY Heritage 2012). Character defining elements include its diagonal alignment cutting across the concession grid, the component communities, including Fenwick, the cemeteries and community buildings along the road and the mature roadside vegetation. The Canboro Road Corridor benefits from slow traffic speeds and low-medium volumes of vehicular traffic. The large roadside trees and adjacent buildings provide the elements of a scenic drive and set it apart from roads that serve as traffic arteries (BRAY Heritage 2012).

3.5 Review of Historic Mapping

A number of property owners and historical features are illustrated within the study area within the 1862 *Tremaine Map of the Counties of Lincoln and Welland* and the 1880 *Illustrated Historical Atlas of the Township of Pelham*. It should be noted, however, that not all features of interest were mapped systematically in the Ontario series of historical atlases, given that they were financed by subscription, and subscribers were given preference with regard to the level of detail provided on the maps. Moreover, not every feature of interest would have been within the scope of the atlases. Table 1 provides a summary of early land owners and tenants, as well as identified historical features.

Historic mapping within the 1862 *Tremaine Map of the Counties of Lincoln and Welland* (Figure 2) confirmed that the study area was a rural, agricultural landscape in the mid-nineteenth century. In addition, historic map analysis demonstrates that that Memorial Drive, Balfour Street, Welland Road, Cream Street and Canboro Road were surveyed prior to 1859. The maps reviewed record the names of owners/occupants of properties within the study area, as well as the location and arrangement of residences, farmhouses, churches, schools and other key resources. The map depicts the location of the historic settlement area of Fenwick, to the west of the study area, including the Fenwick Post Office.

By 1880, the *Illustrated Historical Atlas of the Township of Pelham* (Figure 3) indicates that several properties have changed hands, and have been severed, however, the area is still a predominantly rural agricultural area. Farmsteads with farmhouses and orchards exist on many properties, and a church exists at the intersection Canboro Road and Belfour Street. The map depicts the course of a tributary of the Welland River. The historic settlement area of Fenwick, to the west, has experienced some growth at the intersection of Canboro Road and Welland Road.

National Topographic Survey (NTS) mapping from 1907, 1920, and 1938 as well as aerial photography from 1954 illustrates the development of the study area over the course of the early twentieth century. Generally, this mapping demonstrates a period of steady but limited growth of the historic settlement area of Fenwick east along Canboro Road. The area largely retains its rural agricultural character to the current day. Alder Crescent and Sunset Crescent are both later developments, occurring after 1954 but before 2007.

In the National Topographic Survey (NTS) mapping from1907 (Figure 4), light development of farmhouses and residences exists along Canboro Road, Cream Street, and to a lesser extent Welland Road and Memorial Drive. The historic settlement of Fenwick has grown along Canboro Road and north to Maple Street. This level of development stays consistent in the 1920 National Topographic Survey (NTS) mapping. The 1920 mapping indicates that (Figure 5) the area retains its rural agricultural character, very little changes in the study area.

In the National Topographic Survey (NTS) mapping from 1938 (Figure 6), the area retains its rural agricultural character. However, the historic settlement of Fenwick, along Canboro Road, has experienced steady but significant growth, increasing in density until Belfour Road, which was the traditional urban boundary of Fenwick. Additional residential development has also occurred along Cream Street and Welland Road.

In the Digital Aerial Photograph of Southern Ontario from 1954 (Figure 7), the area retains its rural agricultural character. Very little development has occurred beyond the historic agricultural and rural hamlet historic settlement patterns of Fenwick.

Table 1: Nineteenth-century Property Owners and Historical Features in the Study Area

Location		Tremaine		Illustrated Atlas	
Con	**Lot**	**Owner(s)/Tenant(s)**	**Historical Feature(s)**	**Owner(s)/Tenant(s)**	**Historical Feature(s)**
9	12	T.C. J.D. J. Fell J. Wellson J. Crow	Buildings (1) (Along Canboro Road)	E.S. W.M. Mrs. B J.S. A.B. B.F.	Buildings (5)(Along Canboro Road) Buildings (6)
	13	E.Mch. R. Farr G.W. Wulers J. Hicks	Buildings (1)	D.F.S. R.F. R. Farr C. Reece Geo. Cplar T.H.	Farmsteads (4), Orchards (4)
10	12	U. Rice J. Fliey G. Castle	Buildings (3)	T. Scanton	Farmstead (1), Building (1) Orchard (1)
	13	Geo. Waters	n/a	D. Leppert	Farmstead (1), Orchards (2)

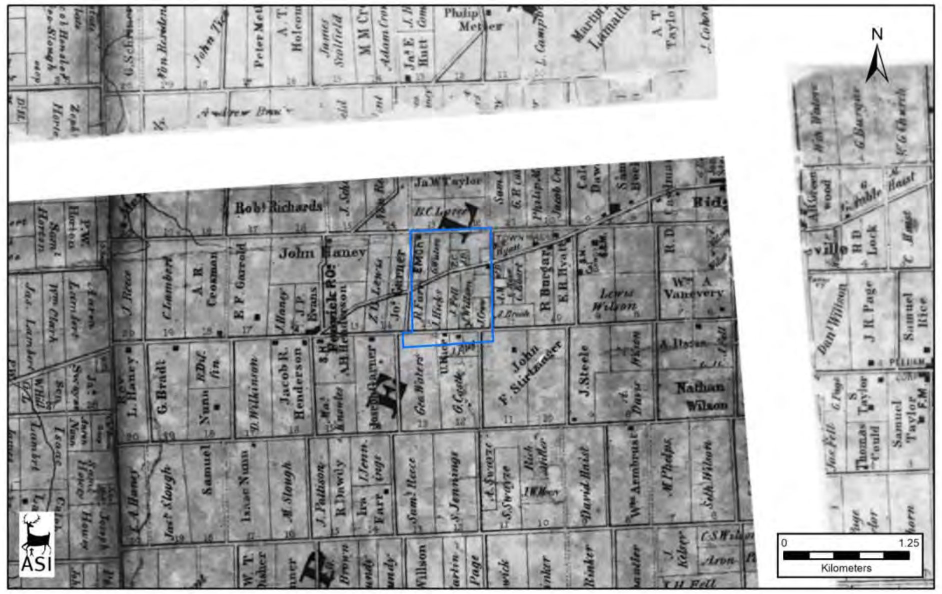


Figure 2: 1862 Tremaine's Map of the Counties of Lincoln and Welland
(Source: Tremaine 1862)

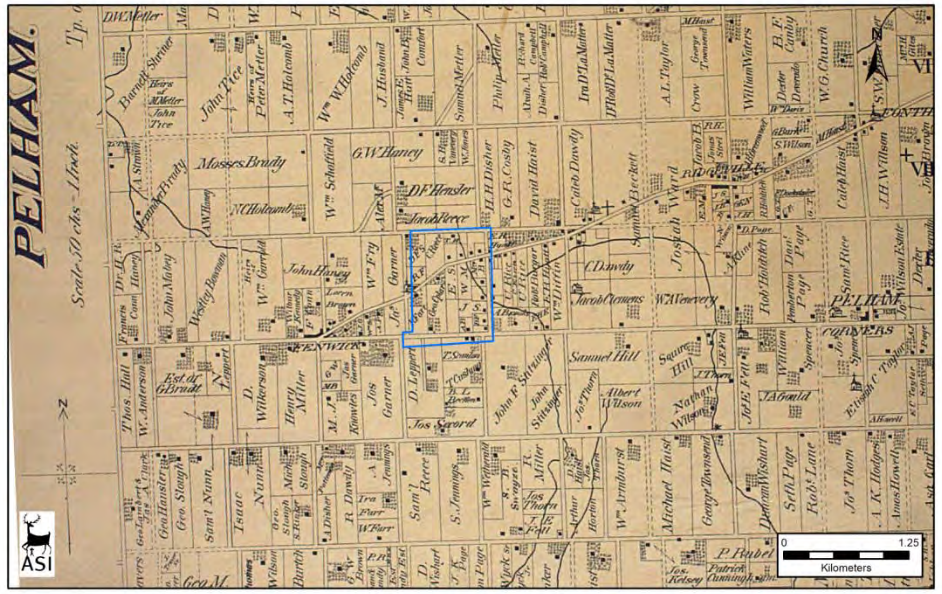


Figure 3: 1880 *Historic Atlas Map of Pelham* Township
(Source: Pope 1880)

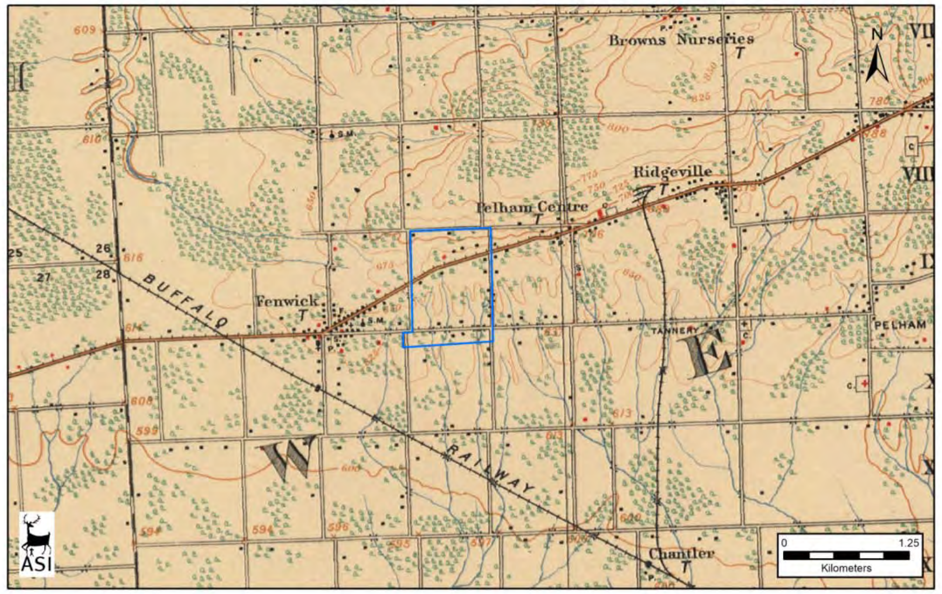


Figure 4: 1907 National Topographic Survey (NTS)
(Source: NTS 1907)

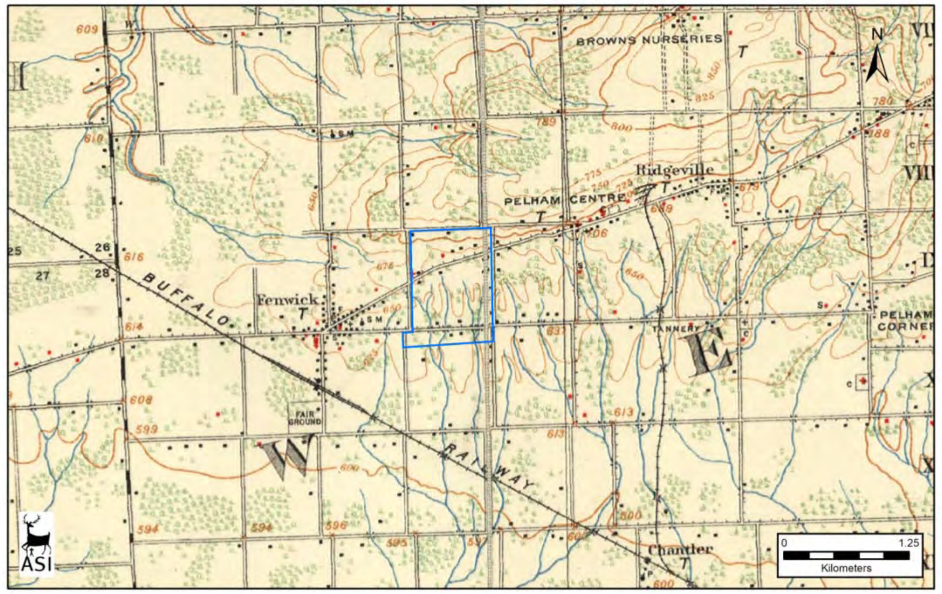


Figure 5: 1920 National Topographic Survey (NTS)
(Source: NTS 1920)

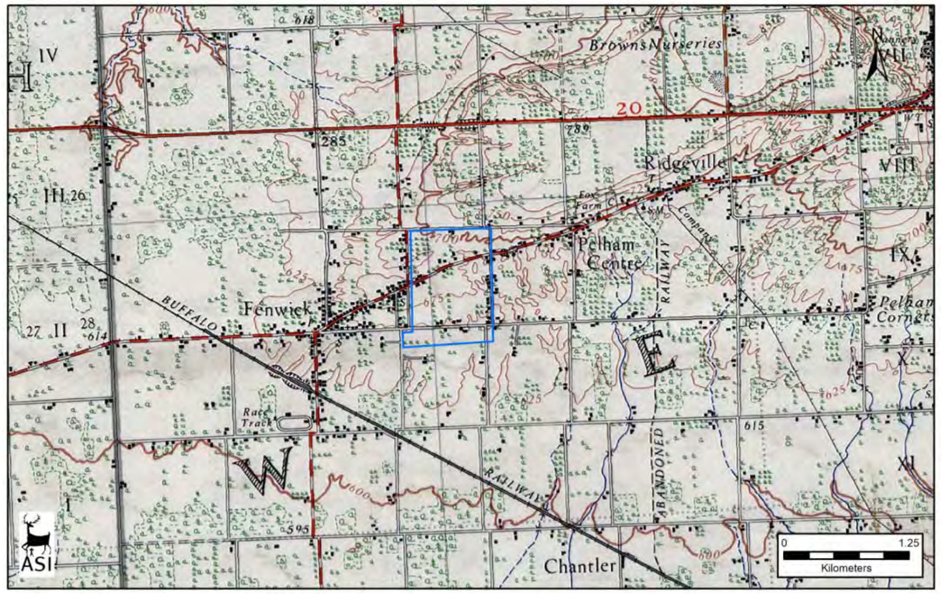


Figure 6: 1938 National Topographic Survey (NTS)
(Source: NTS 1938)

Figure 7: 1954 Aerial Photograph
(Source: Hunting Survey Corporation 1954)

4.0 DATA COLLECTION RESULTS

In order to make a preliminary identification of existing built heritage resources and cultural heritage landscapes within the study area and to collect any relevant information, the Town of Pelham's Municipal Register of Cultural Heritage Resources was consulted, including:

- Town of Pelham Municipal Register of Cultural Heritage Resources (2016)
- Niagara Region GIS Navigator, Heritage Designation layer (2016) (https://maps-beta.niagararegion.ca/Navigator/)
- Pelham Historical Society Collection and Archives, at the Fenwick Branch of the Pelham Public Library, in consultation with the Society Archivist, Mary Lamb, including the Pnyx Historical Calendar Collection (http://vitacollections.ca/pelhamlocalhistory/results?q=pnyx&st=kw)

Other resources consulted for the preliminary identification of cultural heritage resources within the study area included:

- The Ontario Heritage Trust's Ontario Heritage Plaque Guide, an online, searchable database of Ontario Heritage Plaques[1]
- the Federal Heritage Buildings Review Office (FHBRO) [these properties are recognized under the Treasury Board Policy on the Management of Real Property (TBPMRP)][2]
- Park's Canada's *Canada's Historic Places* website: available online[3], the searchable register provides information on historic places recognized for their heritage value at the local, provincial, territorial and national levels.
- Parks Canada website (national historic sites)[4]

In addition, municipal staff at the Town of Pelham was contacted to gather any relevant information regarding cultural heritage resources and concerns within the study area (by email communication, May 24th 2017).

A field review was undertaken by ASI on July 5, 2017 to document the existing conditions of the study area. The field review was preceded by a review of available, current, and historical aerial photographs and maps (including online sources such as Bing and Google maps). The existing conditions of the study area are described below. Identified cultural heritage resources are discussed in Table 2 and Table 3 and mapped in Figure 12 of this report.

4.1 East Fenwick Secondary Plan – Existing Conditions

The study area includes that area within the urban area boundary of Fenwick that is bounded by Memorial Drive to the north, Balfour Street to the west, land on the south side of Welland Road to a depth of approximately 120m to the south and Cream Street to the east and comprises approximately 95 ha (235 acres). Canboro Road bisects the study area and is identified as an arterial road and Welland Road along the south boundary is considered to be a collector road with all the other streets being local roads. As a

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[1] http://www.heritagetrust.on.ca/Resources-and-Learning/Online-Plaque-Guide.aspx [Accessed 24 October 2016]
[2] http://www.pc.gc.ca/progs/beefp-fhbro/roles/beefp-fhbro.aspx [Accessed 24 October 2016]
[3] http://www.historicplaces.ca/en/home-accueil.aspx (accessed 24 October 2016).
[4] http://www.pc.gc.ca/eng/progs/lhn-nhs/index.aspx [Accessed 24 October 2016]

part of the East Fenwick Secondary Plan, new zoning and land-use designations will be proposed for the area. The area is historically predominantly rural agricultural, and this agricultural character is still reflected in the existing conditions.

4.1.1 Character Areas

Prior to the identification of potentially significant cultural heritage landscapes, lands within the study area were classified into character areas in order to understand the predominant character and development patterns of the landscapes and streetscapes of East Fenwick (See Figure 8 in Appendix A). Identification of a character area does not necessarily indicate or confirm the presence of significant built heritage resources or cultural heritage landscapes.

Character areas share a consistent pattern of:

- Built form, such as architectural style, building height, building age, or setback;
- Streetscape features, road width, paving type, shoulders, ditches, sidewalks, streetlights;
- Landscape features, such as lot size, vegetation, topography, tree species, tree lines;
- And/or development pattern or history.

Seven distinct character areas have been identified:

- Traditional Agricultural Character Area
- Single Family Residential Infill Character Area
- Sunset Drive Development Character Area
- Alder Crescent Character Area
- Canboro Road Character Area
- Canboro Road Historic Scenic Road
- Memorial Drive Historic Scenic Road

Traditional Agricultural Character Area

This area includes properties in the interior of the study area, including the majority of properties to the north of Welland Road, as well as select properties to the north of Canboro Road, and to the south of Memorial Drive. These lands have traditionally been used as agricultural fields, or have been associated with former farms or early agricultural development, and currently retain this use or evidence of this use. The character attributes of this area include open, rolling and hilly terrain, the Fonthill Kame, agricultural fields, treelines, historic fence lines, black walnut trees and wild grapes. This area includes lands identified as being a part of the Canboro Road Provincially Significant Wetland. Part of the properties identified as BHR 2, BHR 8 and BHR 21 are located within this character area. This area has not been identified as a cultural heritage landscape (CHL).

Single Family Residential Infill Character Area

This area includes Cream Street and Welland Road as well as properties immediately adjacent to Cream Street, Memorial Drive and the south side of Welland Road. These lands have been developed gradually over time, and include primarily single family residences built between the nineteenth century and the present, with the majority of the buildings being built after 1964. They maintain a consistent, but varied setback, including front yards and driveways. These homes are typically 1-3 storeys, and include a variety of architectural styles, consistent with the development pattern of gradual infill. Almost all of the residences face the street. Cream Street, Memorial Drive, and to a lesser extent, Welland Road, maintain a more rural streetscape, including little or no shoulder, few ditches, no sidewalks, no curbs, and relatively slow, low traffic levels. Properties along Memorial Drive and Cream Street which are located adjacent to or within the Canboro Road Provincially Significant Wetland incorporate the natural landscape and features. The properties identified as BHRs 4, 5, 14, 15, 16, 18, 19 and 20 are located within this character area. This area has not been identified as a cultural heritage landscape (CHL).

Sunset Drive Development Character Area

This area includes Sunset Drive, as well as property immediately adjacent to Sunset Drive. Sunset drive was surveyed as a road circa 1960, and the agricultural lands on either site were subdivided and sold as individual lots for residential development. The majority of the residences within the study area were built between 1960 and 1980, and consist of architectural styles typical of this era. Homes are typically 1-2 stories, with large lot sizes, varied setbacks, mature trees and vegetation, driveways and front yards. Sunset Drive is a narrow road with no painted lines, shoulder, sidewalks, or ditches, with street lights and above ground power lines. Sunset drive connects Canboro Road and Memorial Drive, however, it is not a straight road, but curves gradually, back and forth. No BHRs have been identified within this character area. This area has not been identified as a cultural heritage landscape (CHL).

Alder Crescent Character Area

This area includes Adler Crescent, as well as well as property immediately adjacent to Adler Crescent. Adler Crescent is a recent contemporary sub division, built circa 2000, consisting of a crescent shaped roadway, large estate lots, and very large 1-4 storey single family residences. No BHRs have been identified within this character area. This area has not been identified as a cultural heritage landscape (CHL).

Canboro Road Character Area

This area includes properties immediately adjacent to Canboro Road. Canboro Road is a former Indigenous trail, which was used extensively for early travel and settlement. A clear pattern of development appears in topographic and air photos, growing out of Fenwick along Canboro Road, towards the former historic settlement area of Pelham Centre. These lands were developed gradually over time, and include primarily single family residences built between the nineteenth century and the present, with the majority of the buildings being built before 1973. They maintain a consistent, but varied setback, including front yards and driveways. These homes are typically 1-3 storeys, and include a variety of architectural styles, consistent with the development pattern of gradual infill. All of the residences face the street. A collection of properties identified as built heritage resources have been identified within this character area, including BHRs 1, 2, and 6-13 are located within this character area. This area has not been identified as a cultural heritage landscape (CHL), although it is located directly adjacent to the Canboro Road Historic Scenic Road (CHL 2). Built heritage resources along Canboro Road contribute to the heritage character of CHL 2.

Canboro Road Historic Scenic Road

This area includes the Canboro Road corridor and runs diagonally through the centre of East Fenwick. Canboro Road is a former Indigenous trail, which was used extensively for early travel and settlement. The Canboro Road Corridor has been identified as an important historic scenic route and grouping of heritage resources in the Town of Pelham Heritage Master Plan (2012). Character attributes include its diagonal alignment cutting across the concession grid, its connection to component communities, including Fenwick and Pelham Centre, the historic rural character of the street, including little or no shoulder, few ditches, few sidewalks, no curbs, and relatively slow, low traffic levels, and the mature roadside vegetation. Canboro Road benefits from slow traffic speeds and low-medium volumes of vehicular traffic. The large roadside trees and adjacent buildings provide the elements of a scenic drive and set it apart from roads that serve as traffic arteries. A collection of properties identified as built heritage resources have been identified adjacent to this character area, including BHRs 1, 2, and 6-13 are located within this character area. This area has been identified as a cultural heritage landscape (CHL 1) and retains cultural heritage value.

Memorial Drive Historic Scenic Road

This area includes the Memorial Drive corridor, a historically surveyed road. The area consists of a straight, undivided paved road with an east-west orientation. The topography is fairly flat with some gently rolling hills. The historic rural character of the street includes little or no shoulder, few ditches, no sidewalks, no curbs, and relatively slow, low traffic levels, and the mature roadside vegetation. The roadway is lined with hydro poles and mature trees. Memorial Drive is located adjacent to the Canboro Road Provincially Significant Wetland, and this is reflected in the natural landscape and mature vegetation adjacent to the road. Memorial Drive benefits from slow traffic speeds and low-medium volumes of vehicular traffic. This creates an environment that facilitates pedestrian and cycling activity, which contributes to the character of the area. Memorial drive also acts as the transition road between the urban boundary and the rural areas to the north. A gradual, and cohesive transition currently exists between these two areas. No BHRs have been identified within or adjacent to this character area. This area has been identified as a cultural heritage landscape (CHL 1) and retains cultural heritage value.

4.1.2 Summary of Public Consultation Results

On June 21, 2017, SGL associates, led by Ute Maya-Giambattista, conducted a presentation and workshop to the St. Ann Catholic Elementary School regarding the East Fenwick Secondary Plan. The aim of the workshop was to obtain student input regarding the key features that make Fenwick a great community and the desired development features for Fenwick’s growth. The students identified preserving the community’s greenspaces, wildlife and trail-system, maintaining the community’s small-town and agricultural feel, creating safe sidewalks and bike paths and creating more parks for the community as important.

On June 22, 2017, Town staff members and the consulting team assembled at the Village of Fenwick’s Fire Station 2 to conduct a Visioning Workshop regarding the East Fenwick Secondary Plan. The workshop aimed to obtain public input regarding the type of development most appropriate for the Village, and the types of community features most desired by the residents. In general, members of the public were concerned with the implications of the Secondary Plan with regards to development in the community, including concern for environmental preservation of trees, wildlife, the need for maintaining Fenwick’s small-town feel and the impacts of projected traffic counts based on Provincial minimum density requirements, and forecasted population growth as a result of development in the Secondary Plan study area.

The results of these public consultation sessions were considered as part of the cultural heritage analysis presented in this report, and through identification of the pedestrian-friendly historic rural routes, historic settlement patterns, and the contribution of natural heritage to the development and character of East Fenwick.

4.2 East Fenwick Secondary Plan – Identified Cultural Heritage Resources

Based on the results of the background research, character area analysis, and field review, there are 23 cultural heritage resources within and adjacent to the study area, including: two cultural heritage landscapes, three residential/farmscape properties and 18 residential properties. See Table 2 for a summary of built heritage resources and cultural heritage landscapes and Table 4 in Appendix B for a detailed description of these identified resources. See Figure 9 in Appendix B for detailed mapping. Built heritage resources are mapped to the property parcel, however, further analysis is required to determine the boundaries of each resource's significant heritage attributes.

Table 2: Summary of Built Heritage Resources (BHR) and Cultural Heritage Landscapes (CHL) in the Study Area

Feature ID	Location	Recognition	Description/Comments
CHL 1	Memorial Drive, between Balfour Street and Cream Street	Identified during field review	Approximately 815 m long portion of a straight, undivided paved road with an east-west orientation. Located in a transition area between urban and rural boundaries. Lined with mature trees and hydro poles, the character of the adjacent landscape ranges from residential houses, to farm fields, to brush and woodland.
CHL 2	Canboro Road, between Balfour Street and Cream Street	Identified in the Pelham Heritage Master Plan, and in section B2.2.7 of the Official Plan.	Approximately 860 m long portion of a two-lane paved road with a diagonal orientation running southwest to northeast. The road cuts through a rural agricultural area. Lined with mature trees and hydro poles, the majority of this road section is flanked by residential houses, but there are also fields and stretches of open green space.
BHR 1	695 Canboro Rd.	Listed	2.5-storey red brick church building built in 1886. Converted into apartments in the mid twentieth century.
BHR 2	655 Canboro Rd.	Listed	Two-storey, red brick Gothic Revival-style residential building built in 18712. A garage is located to the west of the house.
BHR 3	704 Canboro Rd.	Listed	Two-storey red brick Edwardian-style school building built in 1927 with large mid-century brick additions. Converted into apartments in the 1970s. Property contains a large parking lot.
BHR 4	1159 Cream St.	Listed	Two-storey Folk Victorian-style frame residential building clad in siding, built in 1870 as the home of John Crow.
BHR 5	606 Canboro Rd.	Identified during field review	1.5-storey L-shaped stucco residential cottage with a side addition.
BHR 6	607 Canboro Rd.	Identified during field review	1.5-storey frame residential building with board and batten siding. Original rectangular house has an addition similar in size and materials.
BHR 7	615 Canboro Rd.	Identified during field review	One-storey frame residential cottage clad in board and batten siding with a rear addition. A garage is located east of the house.
BHR 8	645 Canboro Rd.	Identified during field review	Two-storey frame residential building clad in siding. The property contains outbuildings and farm fields.
BHR 9	668 Canboro Rd.	Identified during field review	1.5-storey frame residential building clad in vinyl siding. An outbuilding is located behind the house.
BHR 10	675 Canboro Rd.	Identified during field review	1.5-storey frame residential building clad in aluminum siding with a rear addition. Outbuildings are located behind the house.

Table 2: Summary of Built Heritage Resources (BHR) and Cultural Heritage Landscapes (CHL) in the Study Area

Feature ID	Location	Recognition	Description/Comments
BHR 11	687 Canboro Rd.	Identified during field review	Two-storey frame residential building clad in vinyl siding. A garage has been added to the west side of the house.
BHR 12	688 Canboro Rd.	Identified during field review	Two-storey frame residential building clad in siding. A garage is located to the east of the house.
BHR 13	691 Canboro Rd.	Identified during field review	1.5-storey frame residential building clad in vinyl siding, with a rear addition. A large barn is located east of the house.
BHR 14	1108 Cream St.	Identified during field review	1.5-storey frame residential cottage built c. 1879. Clad in siding, with a large single storey addition on the south side.
BHR 15	1118 Cream St.	Identified during field review	1.5-storey Victorian frame residential building clad in siding.
BHR 16	1128 Cream St.	Identified during field review	1.5-storey frame residential building clad in siding.
BHR 17	1162 Cream St.	Identified during field review	1.5-storey frame residential building clad in siding with a brick-clad addition on the north side
BHR 18	578 Welland Rd.	Identified during field review	2-storey frame residential building clad in siding. A garage is located to the east of the house.
BHR 19	630 Welland Rd.	Identified during field review	1.5-storey frame residential building clad in siding, with a single-storey extension on the west side. A garage is located to the east of the house.
BHR 20	646 Welland Rd.	Identified during field review	1.5-storey frame residential building clad in vinyl siding, with a large addition at the rear.
BHR 21	663 Welland Rd.	Identified during field review	One-storey, frame residential building clad in vinyl siding. A garage is located northeast of the house.

4.3 East Fenwick Secondary Plan – Preliminary Impact Analysis

Development activities have the potential to affect cultural heritage resources in a variety of ways, and as such, appropriate mitigation measures need to be considered prior to the development of preferred land uses. Appropriate mitigation measures will be developed upon the selection of a preferred alternative for the subject secondary plan, including land uses, development, road and pedestrian realm improvements, and other recommendations resulting from the secondary plan process. A preliminary heritage impact analysis has been included below in Table 3 to inform the secondary plan process.

Table 3: Potential Impacts of Secondary Plan Land Uses on Identified CHLs and BHRs

Feature ID	Description	Potential Impact	Mitigation Approaches
CHL 1	Memorial Drive CHL	• Alteration or removal of heritage attributes due to: ○ Road widening ○ Loss of mature vegetation ○ Increased traffic volumes ○ Pedestrian realm improvements ○ Road improvements ○ Incompatible development adjacent to resource ○ Loss of gradual transition from urban boundary to rural area	• Study for recognition of Memorial Drive as a Heritage Route under D4.2.2.6 of the OP is recommended. • Consideration of alternative road and pedestrian realm improvement approaches to conserve and enhance the corridor. • Consideration of alternative development and land use approaches that conserve and enhance the landscape and built form character of adjacent properties, and encourage a gradual transition from the urban boundary to the rural areas to the north. • Heritage impact analysis of proposed land use plan, once a preferred alternative has been developed, with the development of

Table 3: Potential Impacts of Secondary Plan Land Uses on Identified CHLs and BHRs

Feature ID	Description	Potential Impact	Mitigation Approaches
			specific mitigation measures.
CHL 2	Canboro Road CHL	• Alteration or removal of heritage attributes due to: ○ Road widening ○ Loss of mature vegetation ○ Increased traffic volumes ○ Pedestrian realm improvements ○ Road improvements ○ Incompatible development adjacent to resource	• Study for designation or recognition of the Canboro Road Corridor as a Cultural Heritage Landscape, through Part V of the OHA or through an OPA is recommended. • Consideration of alternative road and pedestrian realm improvement approaches to conserve and enhance the corridor. • Consideration of alternative development and land use approaches that conserve and enhance the landscape and built form character of adjacent properties. • Heritage impact analysis of proposed land use plan, once a preferred alternative has been developed, with the development of specific mitigation measures.
BHR 2, 8, 16 and 20	655 Canboro Rd., 645 Canboro Rd., 1128 Cream St., and 646 Welland Rd.	• Alteration or demolition of property, related to future development and road widening and improvements and/or pedestrian realm improvements	• Properties contain heritage features that are good candidates for conservation. Based on a review of the East Fenwick Secondary Plan Area Conceptual Tertiary Plan, prepared by Upper Canada Consultants in 2010, and consideration of properties then shown to be owned by a developer's group, it is expected that these properties may be subject to impacts. • Heritage Impact Assessments should be completed for the subject properties, to confirm the cultural heritage value of the property, and assess the impacts of the proposed work. • Heritage impact analysis of proposed land use plan should be completed once a preferred alternative has been developed, with the development of specific mitigation measures.
BHRs 1, 5-7, 9-15, 17-19, and 21	Built Heritage Resources	• Alteration of properties, related to road widening and improvements and/or pedestrian realm improvements	• Properties contain heritage features that may, upon further investigation, warrant conservation. Based on a review of the East Fenwick Secondary Plan Area Conceptual Tertiary Plan, prepared by Upper Canada Consultants in 2010, and consideration of properties then shown to be owned by a developer's group, impacts to the subject properties are not anticipated by proposed land use changes. • Heritage impact analysis of proposed land use plan should be completed once a preferred alternative has been developed, with the development of specific mitigation measures. • Should future development propose alteration or demolition of the identified resources, a Heritage Impact Assessment should be completed, to confirm the cultural heritage value of the property, and assess the impacts of the proposed work.
BHR 3	704 Canboro Rd	• Outside of study area, no anticipated impacts	• No further work required for the Secondary Plan.

Table 3: Potential Impacts of Secondary Plan Land Uses on Identified CHLs and BHRs

Feature ID	Description	Potential Impact	Mitigation Approaches
			• Should future development propose alteration or demolition of the identified resource, a Heritage Impact Assessment should be completed, to confirm the cultural heritage value of the property, and assess the impacts of the proposed work.
BHR 4	1159 Cream St.	• Alteration to property related to road widening and improvements and/or pedestrian realm improvements	• Recognition through Part IV designation under Ontario Heritage Act is recommended. • Should future development propose alteration or demolition of the identified resource, a Heritage Impact Assessment should be completed, to confirm the cultural heritage value of the property, and assess the impacts of the proposed work.

5.0 CONCLUSIONS

The results of the background historical research and a review of secondary source material, including historical mapping revealed a study area with a rural land use history dating back to the early nineteenth century. The field review and character area analysis confirmed that this area retains a number of nineteenth- and twentieth-century cultural heritage resources. The following provides a summary of the assessment results:

Key Findings

- A total of 23 cultural heritage resources were identified within and/or adjacent to the East Fenwick Secondary Plan study area;
- These resources include two cultural heritage landscapes, three residential/farmscape properties and 18 residential properties.
- Identified cultural heritage resources are historically, architecturally, and contextually significant rural and agricultural properties and landscapes, which have emerged from their physiographic and natural heritage contextual setting, and contribute to consistent land use patterns within the East Fenwick Secondary Plan study area.

Preliminary Impact Assessment

All 23 cultural heritage resources identified within the study area were assessed for potential impacts, and the following provides a summary of impact screening results:

- BHR 3 is located outside of the study area, and no impacts are anticipated, accordingly, no further work for this property is required for this property as a part of the East Fenwick Secondary Plan.
- BHR 4 is located outside of the study area, but may be altered as a result of road widening and/or improvements and/or pedestrian realm improvements. Designation under Part IV of the Ontario Heritage Act is recommended for this property. The heritage impact of the proposed land use plan, resulting from the secondary plan process, should be assessed once a preferred alternative

has been developed, including the development of specific mitigation measures. A Heritage Impact Assessment should be completed should any additional alterations or demolition be proposed for the property.

- BHRs 2, 8, 16 and 20 contain heritage features that are good candidates for conservation. Based on a review of the East Fenwick Secondary Plan Area Conceptual Tertiary Plan, prepared by Upper Canada Consultants in 2010, and consideration of properties then shown to be owned by a developer's group, it is expected that these properties may be subject to impacts, through alteration or possible demolition, as a result of future development or land use changes, road widening and/or improvements and/or pedestrian realm improvements. A Heritage Impact Assessment should be completed for the subject properties. The heritage impact of the proposed land use plan resulting from the secondary plan process should be completed, once a preferred alternative has been developed, with the development of specific mitigation measures.

- BHRs 1, 5-7, 9-15, 17-19, and 21 may be altered as a result of road widening and/or improvements and/or pedestrian realm improvements. The heritage impact of the proposed land use plan resulting from the secondary plan process should be assessed, once a preferred alternative has been developed, including the development of specific mitigation measures. A Heritage Impact Assessment should be completed to confirm the cultural heritage value of these properties should any additional alterations or demolition be proposed for the property.

- CHL 2 is important historic rural route and former Indigenous trail, which has been previously identified in the Pelham Heritage Master Plan, and in Section B2.2.7 of the Official Plan. CHL 2 maintains a strong connection to the historic settlement patterns of East Fenwick and to the built heritage resources found along the road. CHL 2 is recommended to be studied for designation or recognition as a Cultural Heritage Landscape, through Part V of the Ontario Heritage Act or through an Official Plan Amendment. CHL2 may be impacted by the alteration or removal of heritage attributes due to: Road widening, loss of mature vegetation, increased traffic volumes or speeds, pedestrian realm improvements, road improvements, and incompatible development adjacent to resource. The heritage impact of the proposed land use plan resulting from the secondary plan process should be assessed, once a preferred alternative has been developed, including the development of specific mitigation measures. Alternative road and pedestrian realm improvement approaches to conserve and enhance the corridor and alternative development and land use approaches that conserve and enhance the landscape and built form character of adjacent properties should be considered for CHL 2 as a part of the secondary plan process.

- CHL 1 is an important historic rural route, characterized by little or no shoulder, no formal ditches, no sidewalks, no curbs, relatively slow, low traffic levels, and mature roadside vegetation. These attributes facilitate pedestrian and cycling activity. CHL 1 acts as a boundary road between the urban and rural areas of East Fenwick. CHL 1 is recommended to be studied for recognition as a Heritage Route under D4.2.2.6 of the Official Plan.CHL 1 may be impacted by the alteration or removal of heritage attributes due to: Road widening, loss of mature vegetation, increased traffic volumes or speeds, pedestrian realm improvements, road improvements, incompatible development adjacent to resource and the loss of the gradual transition from urban boundary to rural area. The heritage impact of the proposed land use plan resulting from the secondary plan process should be assessed once a preferred alternative has been developed, including the development of specific mitigation measures. Alternative road and pedestrian realm improvement approaches to conserve and enhance the corridor and alternative development and land use approaches that conserve and enhance the landscape and encourage a gradual transition from the urban boundary to the rural areas to the north should be considered for CHL 1, as a part of the secondary plan process.

6.0 RECOMMENDATIONS

The background research, data collection, and field review conducted for the study area determined that there are two cultural heritage landscapes, three residential/farmscape properties and 18 residential properties within the East Fenwick Secondary Plan study area. These cultural heritage resources combine to create a study area with a rural land use history dating back to the mid-nineteenth century, which has emerged from the unique physiographic and natural heritage contextual setting. As a result of the research and analysis found in this report, the identified cultural heritage resources are strong candidates for conservation and integration into future land uses in the secondary plan area, or should be subject to cultural heritage impact statements during subsequent development planning applications.

As part of the development of policies for the East Fenwick Secondary Plan, the following mitigation measures and/or alternative development approaches should be incorporated to reduce the potential for adverse impacts to the cultural heritage resources in the area. Common mitigation protocols may include, but are not limited to, the following and are suitable for consideration and application for minimizing impacts on cultural heritage resources:

- Avoidance and mitigation to allow development to proceed while retaining the cultural heritage resources in situ and intact;
- Adaptive re-use of a built heritage structure or cultural heritage resources;
- Alternative development approaches to conserve and enhance a significant heritage resource;
- Avoidance protocols to isolating development and land alterations to minimize impacts on significant built and natural features and vistas;
- Historical commemoration of the cultural heritage of a property/structure/area, historical commemoration by way of interpretive plaques;
- Documentation and salvage including the relocation of a structure or (as a last resort) the salvaging of its architectural components may be considered;
- Architectural design guidelines for buildings on adjacent and nearby lots to help integrate and harmonize mass, setback, setting, and materials;
- Limiting height and density of buildings on adjacent and nearby lots;
- Ensuring compatible lot patterns, situating parks and storm water ponds near a heritage resource;
- Vegetation buffer zones, tree planting, site plan control and other planning mechanisms;
- Allowing only compatible infill and additions;
- Preparation of cultural heritage impact assessments for all developments affecting a cultural heritage resource;
- Preparation of conservation, restoration and adaptive reuse plans as necessary;
- Heritage Designation, Heritage Conservation Easement; and
- Preparation of security plan and/or letter of credit to help ensure security and protection of heritage resources.

Based on the results of the assessment, the following recommendations have been developed:

1. A total of 23 cultural heritage resources were identified within and/or adjacent to the East Fenwick Secondary Plan study area, which include two cultural heritage landscapes, three residential/farmscape properties and 18 residential properties. The East Fenwick Secondary Plan

should incorporate policies that ensure the long-term viability and presence of significant built heritage resources and cultural heritage landscapes.

2. BHR 4 should be considered for designation under Part IV of the Ontario Heritage Act.

3. CHL 2 is important historic rural route and former Indigenous trail, which has been previously identified in the Pelham Heritage Master Plan, and in Section B2.2.7 of the Official Plan. CHL 2 maintains a strong connection to the historic settlement patterns of East Fenwick and to the built heritage resources found along the road. CHL 2 should be studied for designation or recognition as a Cultural Heritage Landscape, under Part V of the Ontario Heritage Act, or through an Official Plan Amendment.

4. CHL 1 is an important historic rural route, characterized by little or no shoulder, no formal ditches, no sidewalks, no curbs, relatively slow, low traffic levels, and mature roadside vegetation. These attributes facilitate pedestrian and cycling activity. CHL 1 acts as a boundary road between the urban and rural areas of East Fenwick. CHL1 should be studied for recognition as a Heritage Route under D4.2.2.6 of the Official Plan.

5. Alternative road and pedestrian realm improvement approaches to conserve and enhance the road corridors and alternative development and land use approaches that conserve and enhance the landscape and built form character of adjacent properties should be considered for CHL 1 and CHL 2 as a part of the secondary plan process. A gradual transition from the urban boundary to the rural areas to the north should be considered for CHL 1.

6. BHRs 2, 8, 16 and 20 contain heritage features that are good candidates for conservation. Based on a review of the East Fenwick Secondary Plan Area Conceptual Tertiary Plan, prepared by Upper Canada Consultants in 2010, and consideration of properties then shown to be owned by a developer’s group, it is expected that these properties may be subject to impacts as a result of future development or land use changes. A Heritage Impact Assessment should be completed for the subject properties.

7. CHLs 1-2 and BHRs 1- 2, 4-21 may be altered as a result of changes in land use, future development, road widening and/or improvements and pedestrian realm improvements. Upon the completion of a proposed land use plan resulting from the secondary plan process, the heritage impacts should be assessed, including the development of specific mitigation measures.

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Appendix A: *Major Participating Landowners*. Copy on file with ASI.

APPENDIX A: Character Areas Located Within the East Fenwick Secondary Plan Study Area

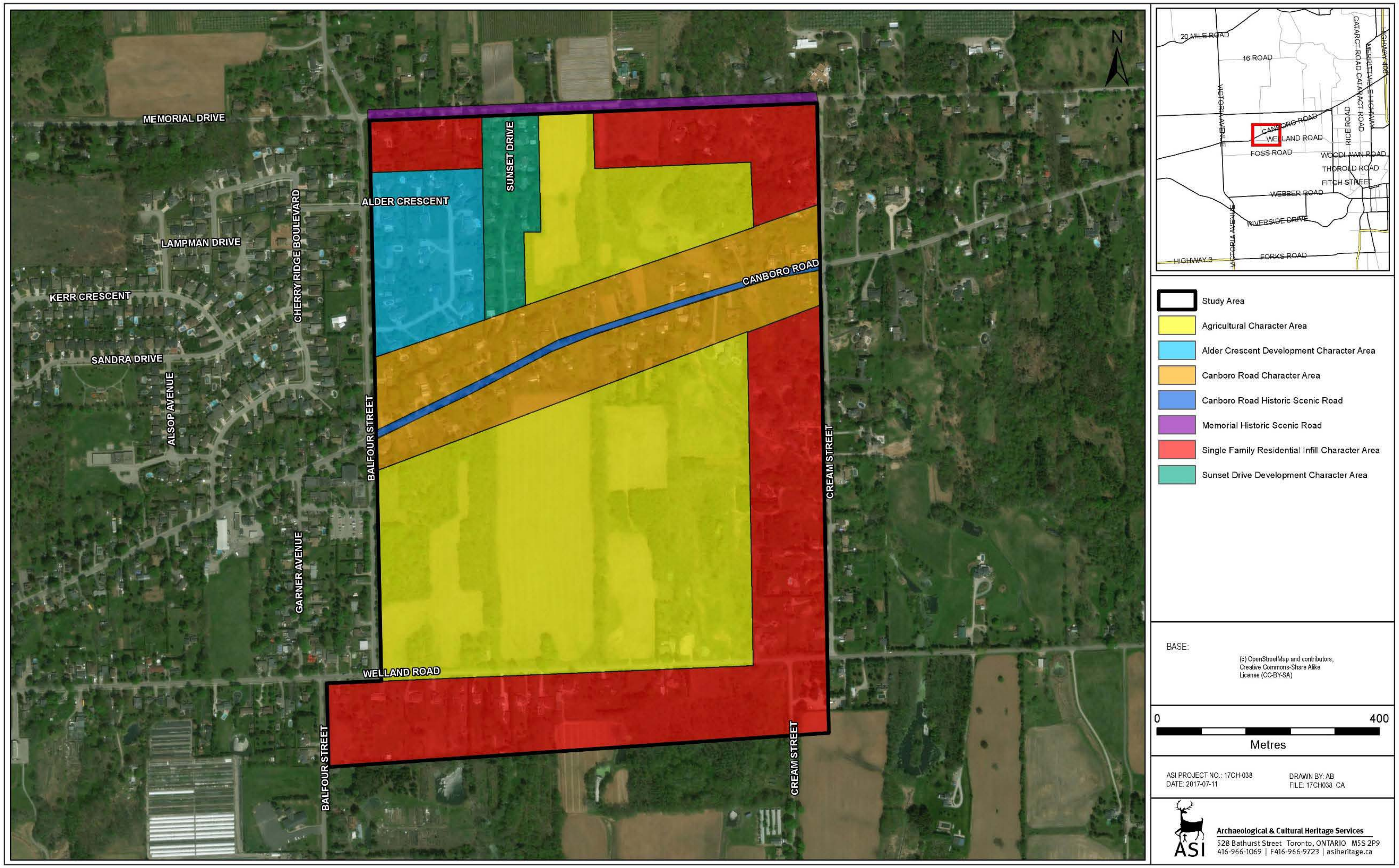


Figure 8: Location of identified Character Areas located within the East Fenwick Secondary Plan study area.

APPENDIX B: Identified Cultural Heritage Resources (CHR) Located Within the East Fenwick Secondary Plan Study Area

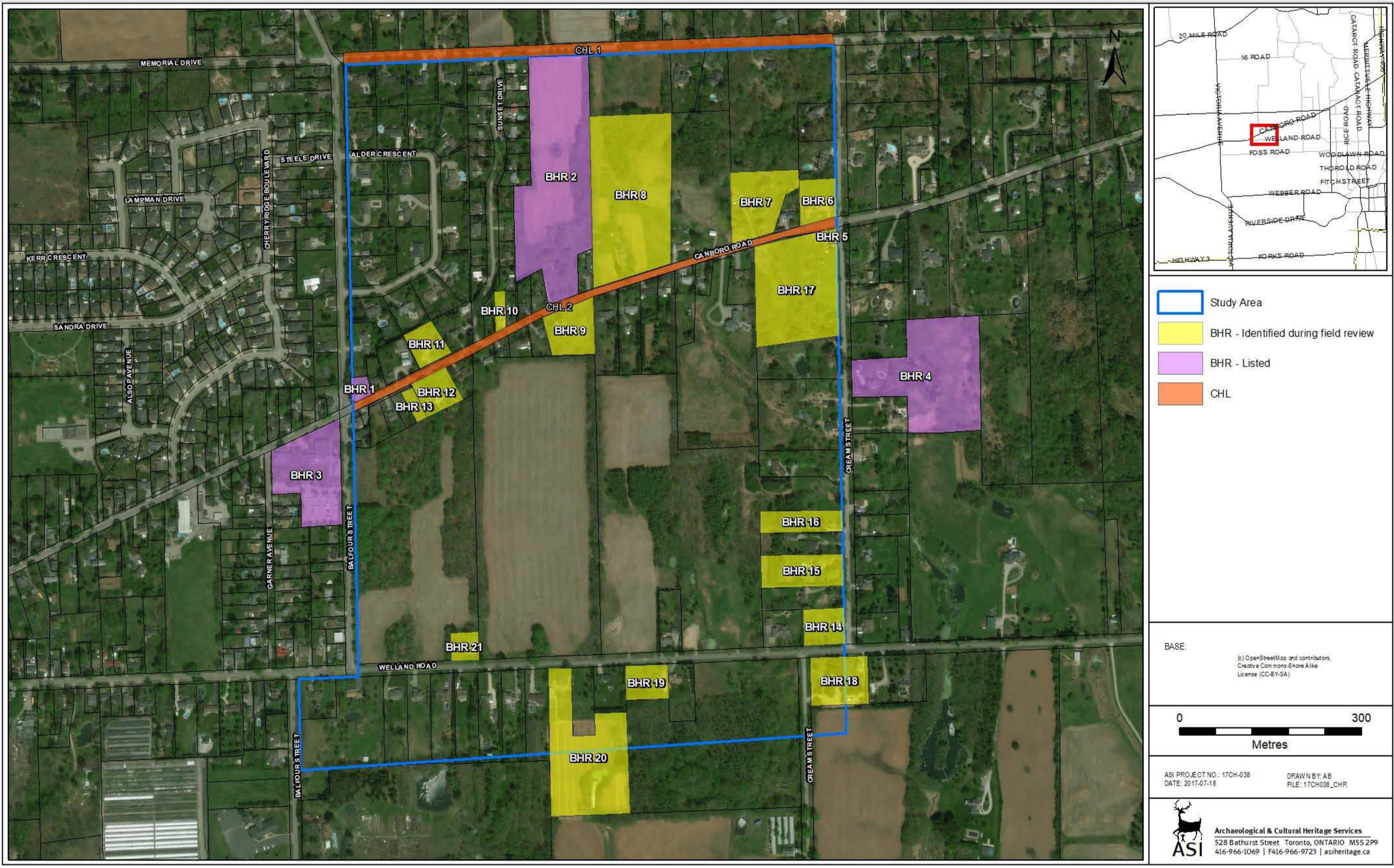


Figure 9: Location of identified Cultural Heritage Resources (CHR) located within the East Fenwick Secondary Plan study area.

Table 4 Detailed description of built heritage resources (BHR) and cultural heritage landscapes (CHL) in the study area

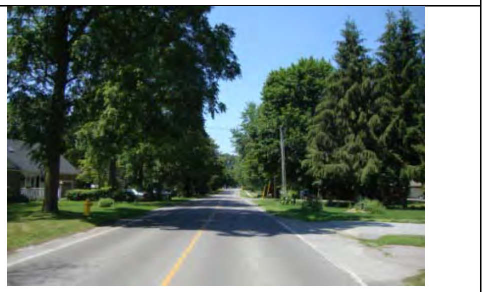
Feature ID	Address	Heritage Status	Resource Type	Description/Comments	Photograph(s)
CHL 1	Memorial Drive, between Balfour Street and Cream Street	Identified during field review	Cultural Heritage Landscape; Roadway and streetscape	Design: This portion (approximately 815 m) of Memorial Drive consists of a straight, undivided paved road and an east-west orientation. The topography is fairly flat with some gently rolling hills. There are no shoulders, curbs, sidewalks or formal ditches. The roadway is lined with hydro poles and mature trees. The character of the surrounding landscape along this section of road can be divided into three sections. The section west of Cream St. contains brush and woodland growing up to the edges of the road, with large homes hidden from view on large lots. The central section contains farm fields and some houses. The section east of Balfour St. contains a more dense concentration of houses. Most of the houses appear to have been built in the later twentieth century. History: A review of historic mapping reveals that Memorial Drive was an historically surveyed road, with development along it occurring slowly from the nineteenth century through to the mid twentieth century. The age of the homes along the road would indicate that the majority of the residential development occurred in the mid-to-late twentieth century. Context: Vehicle traffic along this section of road is low. Pedestrian traffic was also noted during the field visit. It is located in a transition area between urban and rural boundaries, with an expanse of agricultural lands to the north and a twenty-first-century subdivision located just southwest of the intersection of Memorial Drive and Balfour Street. This section of Memorial Drive also intersects with a small subdivision established in the 1970s on Sunset Drive.	 
CHL 2	Canboro Road, between Balfour Street and Cream Street	Identified during field review. The Canboro Road Corridor is also identified as a scenic drive in the Town of Pelham's Municipal Heritage Master Plan. It is also identified as a rural promenade in the Town of Pelham's Official Plan.	Cultural Heritage Landscape; Roadway and streetscape	Design: This portion (approximately 860 m) of Canboro Road consists of a two-lane, divided paved road with a diagonal orientation running southwest to northeast. The topography is fairly flat with some gently rolling hills. There is a narrow, paved shoulder, with no curbs and no formal ditches. A narrow sidewalk is located on the north side of the road for approximately 200 metres in the eastern-most part of the study area. The roadway is lined with hydro poles and mature trees. The majority of this road section is flanked by residential houses, but there are also fields and stretches of open green space. The houses along the road are a mix of ages and have varying setbacks. There are a number of nineteenth century farmhouses. History: The Canboro Road was the route along which the first settlements in Pelham were established. Historic mapping suggests that the Canboro Road was not actually surveyed and improved as a road until the 1840s. Oral narratives identify Canboro Road as an old Indigenous trail, along with Lundy's Lane (to the east) and the Talbot Road (to the west), which both connect with the Canboro Road. Canboro Road runs diagonally through the historically surveyed roads that together form the historic road network which together formed the early infrastructure of Fenwick, and connected the area regionally. The mix of house ages indicates that development occurred slowly along Canboro Road. Context: This section of Canboro Road cuts through a rural agricultural area, with some of the best soil for fruit production in Ontario. A twenty-first-century subdivision is located just northwest of the corner of Canboro Road and Balfour Street. The traffic speed is slow and vehicle volume is low-to-medium.	 

Table 4 Detailed description of built heritage resources (BHR) and cultural heritage landscapes (CHL) in the study area

Feature ID	Address	Heritage Status	Resource Type	Description/Comments	Photograph(s)
BHR 1	695 Canboro Rd.	Listed	Church, converted into apartment building	Design: A 2.5-storey red brick church building built in 1886 with a front gable roof. Two hip dormers have been added on the west side and an extension has been added on the east side. The symmetrical façade features a gabled projecting entryway and a door with sidelights and a flat transom topped with a lunette-shaped stained glass window. The first-storey has segmental windows with voussoirs. The upper storeys have semi-elliptical windows with voussoirs. The bays of the building are delineated by vertical bands of projecting brick and the frieze features decorative brickwork. A garage is located behind the building to the west. The property landscape consists mostly of a parking lot, with two exits onto Canboro Rd. History: This property is identified as belonging to "E.M." in the 1862 Tremaine's Map. R. Farr is identified as the property owner in the 1880 Historical Atlas map. Built in 1886 as the Bethany Episcopal Methodist Church. In 1902 the building was acquired by the Knox Presbyterian Church. On July 2nd 1947 the building was sold and then converted into an apartment building. Context: Located adjacent to the Canboro Rd. CHL at the northeast corner of Canboro Rd. and Balfour St., this property is in a transition area between urban and rural boundaries. A subdivision is located to the northwest, while the other surrounding areas are largely rural/agricultural.	
BHR 2	655 Canboro Rd.	Listed	Residential, farmscape	Design: Built in 1872. A two-storey, red brick Gothic Revival-style residential building with a front gable roof. A central front gable frames a single second-storey door. The first storey features two tall round-headed 2-over-2 sash windows and an off-centre entry, covered by a central porch supported by flattened columns. Bargeboard decorates the front gable and porch eaves. A garage is located to the west of the house. The property is set well back from the road and has a maintained lawn, mature plantings and an established entrance drive. The property also contains a large field behind the house. History: This property is identified as belonging to George Waters in the 1862 Tremaine's Map. C. Reece is identified as the property owner in the 1880 Historical Atlas map. Context: Located adjacent to the Canboro Rd. CHL.	
BHR 3	704 Canboro Rd.	Listed	School, converted into apartment building	Design: A two-storey red brick Edwardian-style school building built in 1927. The symmetrical, stepped façade features a projecting centre bay with quoining. The frontispiece is topped by a pediment, with a semi-circular window with moulded trim on the second storey. The front door has a flat transom and moulded trim. The first and second storeys feature a moulded cornice and flat-headed windows. The building has long brick additions added in the mid-twentieth century on the west and south sides. The property features a maintained lawn with mature trees, a small parking lot at the front and a large rear parking lot. History: Built in 1927 as the Pelham Secondary School. Served as school from 1927-1974. It was then converted into an apartment building called the Canboro Gardens. This property is identified as belonging to James Garner in the 1862 Tremaine's Map and in the 1880 Historical Atlas map. A building is identified as being in this location in the 1938 topographic map. Context: Located at the southwest corner of Canboro Rd. and Balfour St., this property is in a transition area between urban and rural boundaries. A subdivision is located to the northwest, while the other surrounding areas are largely rural/agricultural.	

Table 4 Detailed description of built heritage resources (BHR) and cultural heritage landscapes (CHL) in the study area

Feature ID	Address	Heritage Status	Resource Type	Description/Comments	Photograph(s)
BHR 4	1159 Cream St.	Listed	Residential	Design: A two-storey Folk Victorian-style frame residential building clad in siding, built ca. 1870. The building features a rectangular floor plan and a symmetrical façade. The central entranceway has double doors framed by a portico and second storey balcony. The one-over-one sash windows have decorative trim. The cornice features brackets and a decorated soffit. A belvedere sits atop the hip roof. The property features a semi-circular driveway, a maintained lawn and numerous mature plantings. History: No property owner is identified in the 1862 Tremaine's Map or in the 1880 Historical Atlas map, but a house is identified as being in this location in 1880. Johannes Groh (anglicized to John Crow) was a weaver who migrated from Pennsylvania in 1788 to settle in Pelham in with his wife and five children. His fifth child, Jacob Crow Sr., was a prosperous landowner who purchased this property in 1854, and it remained in the Crow family until 1914. The house (built ca. 1870) is recorded as the residence of Jacob's nephew, William Crow, who lived there with his wife, Sarah Jane (Huntsman). Their son Alandis started canning produce on the property before establishing a canning factory at 410 Canboro Rd (later the site of Lindsay Lumber and now the site of the Ridgeville Post Office). William Crow's cousin, John Bowman Crow (1821-1887), was a notable member of the Crow family who in 1859 was appointed clerk to the Township of Pelham. In 1883 he also took on the job of Township Treasurer. His son Judson C. Crow, who had been a schoolmaster, succeeded him in the post of clerk. Context: Located adjacent to the Canboro Rd. CHL.	
BHR 5	606 Canboro Rd.	Identified during field review	Residential	Design: A 1.5-storey, L-shaped stucco residential cottage with a side addition, likely built prior to 1880. The building has gable and hip roofs, an off-centre entrance, a brick chimney and flat-headed windows. It is located atop a berm at the corner of Cream St. and Canboro Rd., with a driveway accessible from both roads. The property has a maintained lawn and mature trees. History: No property owner is identified in the 1862 Tremaine's Map. "Mrs. B." is identified as the property owner in the 1880 Historical Atlas map. A house is identified as being in this location in 1880. Context: Located adjacent to the Canboro Rd. CHL., at the southwest corner of Canboro Rd. and Cream St.	
BHR 6	607 Canboro Rd.	Identified during field review	Residential	Design: A 1.5-storey frame residential building with board and batten siding, likely built prior to 1880. The building consists of two rectangular plans of similar size joined end to end with, with side gable roofs and flat-headed windows. The house is located atop a berm, with a maintained lawn, mature trees, and a driveway exiting onto Cream St. History: No property owner is identified in the 1862 Tremaine's Map or the 1880 Historical Atlas map. A house is identified as being in this location in 1880. Context: Located adjacent to the Canboro Rd. CHL., at the northwest corner of Canboro Rd. and Cream St.	
BHR 7	615 Canboro Rd.	Identified during field review	Residential	Design: A one-storey, frame residential cottage clad in board and batten siding, likely built prior to 1880. The building features a rectangular floorplan and a side gable roof. A central entry is flanked by a wide flat-headed window on one side. A garage is located to the east of the house. The buildings are set well back from Canboro Rd. and accessed by a long driveway. History: No property owner is identified in the 1862 Tremaine's Map or the 1880 Historical Atlas map. A house is identified as being in this location in 1880. Context: Located adjacent to the Canboro Rd. CHL.	

Table 4 Detailed description of built heritage resources (BHR) and cultural heritage landscapes (CHL) in the study area

Feature ID	Address	Heritage Status	Resource Type	Description/Comments	Photograph(s)
BHR 8	645 Canboro Rd.	Identified during field review	Residential, farmscape	Design: A two-storey, frame residential building with a hip roof and a rectangular floorplan, likely built prior to 1880. A front porch is topped with a balcony and two symmetrical flat-headed windows with shutters on the second-storey. Paired wooden brackets are featured along the cornice. Outbuildings are located to the north and northwest of the house. The property has a maintained lawn, mature trees, an established entrance drive and farm fields. History: This property is identified as belonging to "T.C." in the 1862 Tremaine's Map. No property owner is identified in the 1880 Historical Atlas map. A house is identified as being in this location in 1880. Context: Located adjacent to the Canboro Rd. CHL. The property appears to be an active farmscape, with fields located to the east and north of the house and possible agricultural buildings located behind the house.	
BHR 9	668 Canboro Rd.	Identified during field review	Residential	Design: A 1.5-storey, frame residential building with an L-shaped plan, likely built prior to 1880. The building has flat-headed windows and a cross gable roof. The entryway features a small porch with a bell-curved roof. Small setback. An outbuilding is located directly behind the house. The property has a maintained lawn, mature trees and an established entrance drive. History: This property is identified as belonging to J. Hicks in the 1862 Tremaine's Map. George Cplar is identified as the property owner in the 1880 Historical Atlas map. A house and orchard are identified as being in this location in 1880. Context: Located adjacent to the Canboro Rd. CHL.	
BHR 10	675 Canboro Rd.	Identified during field review	Residential	Design: A 1.5-storey, frame residential building clad in aluminum siding with a cross gable roof and a rear addition, likely built between 1920 and 1938. The building has a front central gable, flat-headed windows, a central bay window and two brick chimneys. A garage and an outbuilding are located to the north of the house. The property has a maintained lawn, mature trees and an established entrance drive, with a small setback. History: This property is identified as belonging to George Waters in the 1862 Tremaine's Map. C. Reece is identified as the property owner in the 1880 Historical Atlas map. Context: Located adjacent to the Canboro Rd. CHL.	
BHR 11	687 Canboro Rd.	Identified during field review	Residential	Design: A two-storey, frame residential building clad in vinyl siding with a side gable roof, rectangular floorplan and symmetrical façade, likely built between 1907 and 1920. The building features a central entranceway with a transom, sidelights and pilasters, flanked by flat-headed windows. A garage has been added to the west side of the house. The property has a maintained lawn, mature trees and an established entrance drive. History: This property is identified as belonging to "E.M." in the 1862 Tremaine's Map. R. Farr is identified as the property owner in the 1880 Historical Atlas map. Context: Located adjacent to the Canboro Rd. CHL.	
BHR 12	688 Canboro Rd.	Identified during field review	Residential	Design: A two-storey frame residential building clad in siding, likely built prior to 1880. The building has a verandah with a central pediment, decorative turned posts and decorative moulding along the verandah roofline. A garage is located to the east of the house. The property has a maintained lawn, mature trees and an established entrance drive. History: This property is identified as belonging to R. Farr in the 1862 Tremaine's Map and in the 1880 Historical Atlas map. A house and an orchard are identified as being in this location in 1880. Context: Located adjacent to the Canboro Rd. CHL.	

Table 4 Detailed description of built heritage resources (BHR) and cultural heritage landscapes (CHL) in the study area

Feature ID	Address	Heritage Status	Resource Type	Description/Comments	Photograph(s)
BHR 13	691 Canboro Rd.	Identified during field review	Residential	Design: A 1.5-storey frame residential building clad in vinyl siding, with a rear addition, likely built between 1920 and 1938. The building has an L-shaped floorplan with cross gable roofs and stacked oriel windows. The entranceway is covered by a porch with a bell-curved roof, and a gable is centred over the porch. The porch features bargeboard and is supported by turned posts. The 2-over-2 sash windows are flat-headed. A large barn is located east of the house and is connected by the semi-circular driveway. The property has a maintained lawn and mature trees. History: This property is identified as belonging to R. Farr in the 1862 Tremaine's Map and in the 1880 Historical Atlas map. Context: Located adjacent to the Canboro Rd. CHL.	
BHR 14	1108 Cream St.	Identified during field review	Residential	Design: A 1.5-storey frame residential cottage built c. 1879. Clad in siding, with a large single storey addition on the south side. The original cottage features a symmetrical facade with a side gable roof, a pointed central gable and flat-headed windows. The property has a maintained lawn, mature trees and an established entrance drive. History: Rason Cottage. This property is identified as belonging to J. Crow in the 1862 Tremaine's Map. No property owner is identified in the 1880 Historical Atlas map. A house is identified as being in this location in 1880. Context: The property is located on Cream St., which is largely comprised of residential properties set back from the road within a rural/agricultural area.	
BHR 15	1118 Cream St.	Identified during field review	Residential	Design: A 1.5 storey, Victorian frame residential building clad in siding with an L-shaped floorplan, likely built prior to 1880. The building has cross gable roofs, flat-headed windows and a porch decorated with bargeboard and supported by turned posts. The property has a maintained lawn, mature trees and an established entrance drive with a large setback. History: This property is identified as belonging to J. Crow in the 1862 Tremaine's Map. "B.F" is identified as the property owner in the 1880 Historical Atlas map. A house is identified as being in this location in 1880. Context: The property is located on Cream St., which is largely comprised of residential properties set back from the road within a rural/agricultural area.	
BHR 16	1128 Cream St.	Identified during field review	Residential	Design: A 1.5-storey, frame residential building clad in siding, likely built prior to 1880. The building has a T-shaped floorplan with a cross gable roof and flat-headed windows. The entranceway is covered by a porch, and a pointed gable is centred over the porch. The property has a maintained lawn, mature trees and an established entrance drive, with a large setback. History: This property is identified as belonging to J. Crow in the 1862 Tremaine's Map. "J.S." is identified as the property owner in the 1880 Historical Atlas map. A house is identified as being in this location in 1880. Context: The property is located on Cream St., which is largely comprised of residential properties set back from the road within a rural/agricultural area.	
BHR 17	1162 Cream St.	Identified during field review	Residential	Design: A 1.5-storey frame residential building clad in siding with a brick-clad addition on the north side, likely built prior to 1880. The building has a rectangular floorplan and symmetrical façade, with a central entranceway flanked by flat-headed windows, a side gable roof and an open verandah supported by turned posts. A shed is located to the north of the house. The property has a maintained lawn, mature plantings and an established entrance drive. History: No property owner is identified in the 1862 Tremaine's Map or the 1880 Historical Atlas map. A house is identified as being in this location in 1880. Context: The property is located on Cream St., which is largely comprised of residential properties set back from the road within a rural/agricultural area.	

Table 4 Detailed description of built heritage resources (BHR) and cultural heritage landscapes (CHL) in the study area

Feature ID	Address	Heritage Status	Resource Type	Description/Comments	Photograph(s)
BHR 18	578 Welland Rd.	Identified during field review	Residential	Design: A 2-storey frame residential building clad in siding with a square floorplan, a hip roof and an external brick chimney, likely built between 1920 and 1938. The asymmetrical façade features a portico supported by columns, a second-storey balcony, and a gabled dormer. The flat-headed windows have shutters. A garage is located to the east of the house. The property has a maintained lawn, a picket fence, mature plantings and an established entrance drive. History: This property is identified as belonging to J. F. Stitzinger in the 1862 Tremaine's Map and in the 1880 Historical Atlas map. Context: The property is located near the corner of Cream St. on Welland Rd., which is largely comprised of residential properties and agricultural land.	
BHR 19	630 Welland Rd.	Identified during field review	Residential	Design: A 1.5-storey frame residential building clad in siding, with a single-storey extension on the west side, likely built prior to 1862. The building features a rectangular floor plan and a symmetrical façade. The central entranceway is flanked by flat-headed windows with shutters. The side gable roof features a central gable, and a second-storey window is centred above a porch with a bell-curve roof. A garage is located to the east of the house. The property has a maintained lawn, mature trees and an established entrance drive. History: No property owner is identified in the 1862 Tremaine's Map. A house is identified in this location in 1862. T. Scanton is identified as the property owner in the 1880 Historical Atlas map. Context: The property is located on Welland Rd., which is largely comprised of residential properties and agricultural land.	
BHR 20	646 Welland Rd.	Identified during field review	Residential, farmscape	Design: A 1.5-storey frame residential building clad in vinyl siding, with a large addition at the rear, likely built prior to 1862. The building features a symmetrical façade with a porch. The side gable roof has a central gable and the central entranceway is flanked by flat-headed windows with shutters. The property has a maintained lawn, mature trees and an established entrance drive. The property contains a field behind the house. History: This property is identified as belonging to U. Rice in the 1862 Tremaine's Map. A house is identified as being in this location in 1862. D. Leppert is identified as the property owner in the 1880 Historical Atlas map. Context: The property is located on Welland Rd., which is largely comprised of residential properties and agricultural land.	
BHR 21	663 Welland Rd.	Identified during field review	Residential	Design: A one-storey, frame residential building clad in vinyl siding, likely built between 1920 and 1938. The L-shaped floorplan has a cross gable roof. The asymmetrical façade features flat-headed windows. A garage is located northeast of the house. The property has a maintained lawn, mature trees and an established entrance drive. History: This property is identified as belonging to R. Farr in the 1862 Tremaine's Map and in the 1880 Historical Atlas map. Context: The property is located on Welland Rd., which is largely comprised of residential properties and agricultural land.	

PART 6

AE: TRANSPORTATION ASSESSMENT EXISTING CONDITIONS REPORT

Associated Engineering
GLOBAL PERSPECTIVE.
LOCAL FOCUS.

REPORT

SGL Planning and Design Inc.

East Fenwick Secondary Plan Transportation Assessment Existing Conditions

September 2017

Table of Contents

SECTION **PAGE NO.**

This report was prepared by Associated Engineering (Ont.) Ltd. for the account of SGL Planning and Design Inc.. The material in it reflects Associated Engineering (Ont.) Ltd.'s best judgement, in the light of the information available to it, at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Associated Engineering (Ont.) Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

List of Tables

List of Figures

1 Introduction

1.1 DEVELOPMENT CONTEXT AND STUDY AREA

The East Fenwick Secondary Plan is a proposed residential development that will provide housing for full-time residents within the Town of Pelham in a neighbourhood marked by sustainable transportation infrastructure through the implementation of bike lanes, sidewalks, and multi-use paths. The proposed development is situated immediately east of the community of Fenwick in an rural area bounded by Memorial Drive to the north, Cream Street to the east, Welland Road to the south, and Balfour Road to the west. The study area is presented in **Figure 1-1**.

1.2 ANALYSIS APPROACH AND METHODOLOGY

While the planning and design of the development lands is determined throughout additional studies, the overall purpose for this report is to document the anticipated impacts to the flow of traffic along the existing roadways prior to and after full build-out of the subject lands contained within the East Fenwick Secondary Plan. Specific tasks for quantifying the existing state of traffic flow and anticipated impacts include:

Task 1 – Review of Existing Conditions in the Base Year
- Collect and review eight (8) hour turning movement count (TMC) data and twenty-four (24) hour automated traffic recorder (ATR) data for intersections and midblock sections within the study area during the peak hours and weekday peaks;
- Undertake a site visit to review existing conditions in terms of traffic control, lane configuration, and geometry as well as identify any existing active transportation facilities; and
- Review traffic operations for existing conditions in Synchro.

Task 2 – Review of Proposed Development Traffic in the Full Build-Out Year
- Determine the trip generation and attraction with regards to the proposed development during the peak hours – morning (AM) and afternoon (PM); and
- Assess the proposed internal road network, active transportation facilities, and access/integration with the existing external road network.

Task 3 – Review of Future Background Traffic in the Horizon Year

Task 4 – Review of Impacts on Existing Roadway Traffic Flows in the Horizon Year
- Review operational impacts on the existing road network in terms of background traffic and generated traffic (total traffic) to examine the ability of the road network to accommodate the additional traffic volumes generated by the East Fenwick Secondary Plan development.

Task 5 – Identify and Recommend Improvements to Address Any Capacity Issues

Contained within this report are the findings of the review of the existing conditions only. The final report will provide the assessment of the anticipated traffic impacts for the East Fenwick Secondary Plan.

Figure 1-1
Study Area

2 Existing Transportation Conditions

The following section documents the state of the current multi-modal transportation infrastructure within the study area and assesses the performance of the intersections through the utilization of the traffic data collected and Synchro. The existing transportation network is described below in the following subsections.

2.1 EXISTING ROAD NETWORK

There are five (5) key roadways within the study area. All the intersections are currently under stop-control. The intersections of Canboro Road at Balfour Street and Canboro Road at Cream Street are both all-way stop controlled. The remaining intersections within the study area are only under stop control along the minor roadway approaches. All subject roadways have a posted speed of fifty (50) kilometres per hour. The count and classification data, collected in both 2016 and 2017, was used to determine the classification of the roadways in accordance with Transportation Associated of Canada's *Geometric Design Guide for Canadian Roads*, 2017. **Table 2-1** provides a summary of the count and classification data collected and the classification of the respective roadway based on the average annual daily traffic (AADT) volume. **Figure 2-1** illustrates the types of traffic control in effect at the study intersections. **Appendix A** contains all the traffic data collected as part of this study.

Table 2-1
Summary of ATR Data

Roadway	From/To Roadways	Year	AADT	Class
Canboro Rd	Balfour Street to Cream Street	2016	1,662	Collector
Canboro Rd	Cream Street to Centre Street	2017	2,904	Collector
Canboro Rd	Centre Street to Effingham Street	2016	2,390	Collector
Balfour Rd	Memorial Drive @ Canboro Road	2017	1,649	Collector
Memorial Dr	Balfour Street @ Cream Street	2017	569	Local
Welland Rd	Balfour Street @ Cream Street	2017	591	Local
Cream St	Welland Road @ Canboro Road	2017	315	Local

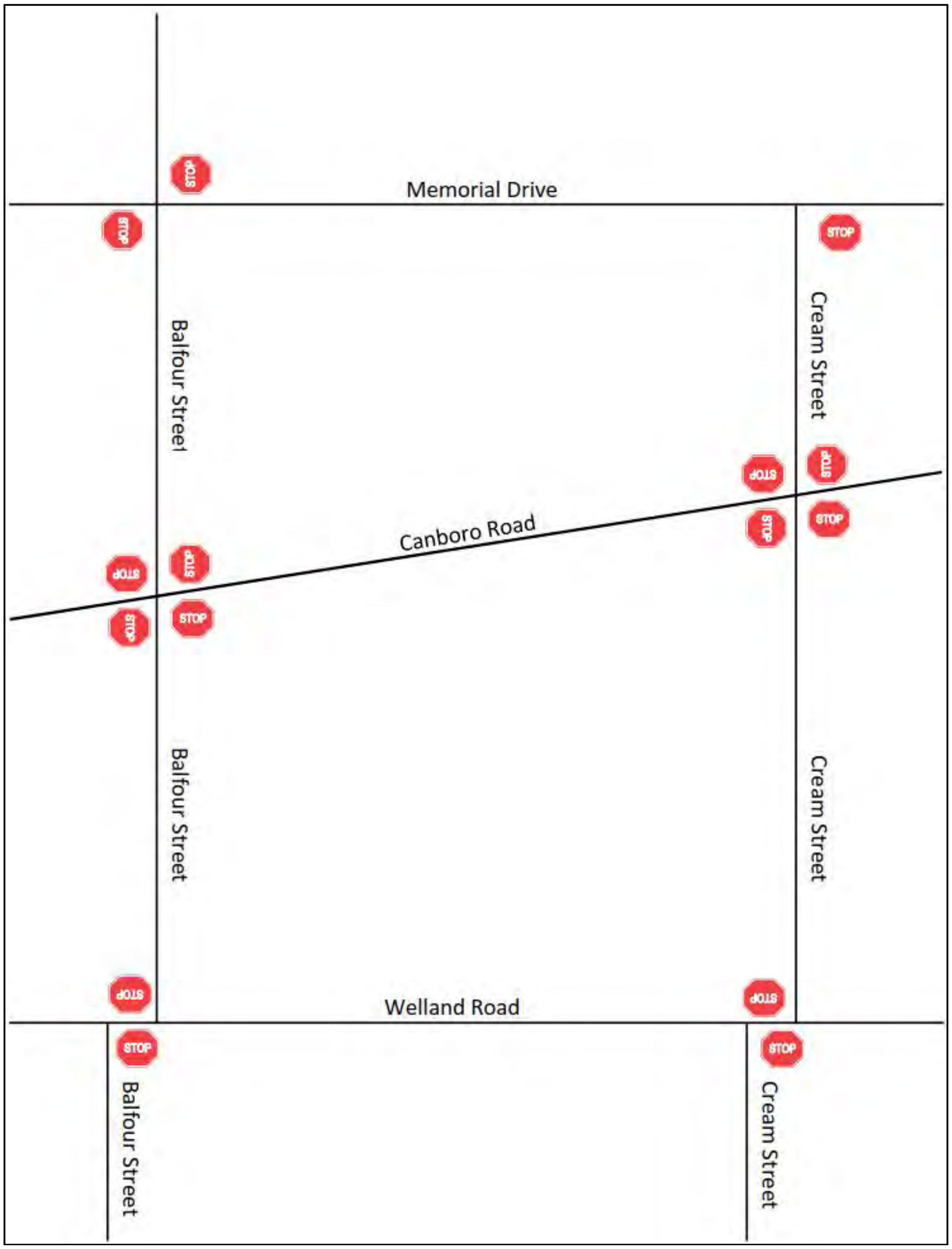


Figure 2-1
Existing Intersection Traffic Control

The following is a description of the five (5) primary roadways situated within the study area.

Canboro Road is a two-lane road with a rural cross section that provides a direct connection between the community of Fenwick to the west and the community of Fonthill to the east. The roadway bisects through the middle of the East Fenwick Secondary Plan area. Per traffic data, the roadway operates as a ‘collector’ roadway, with traffic volumes around 1,700 vehicles per day. Canboro Road at Balfour Street and Canboro Road at Cream Street are both under all-way stop controlled. The roadway has a primarily straight alignment. The rolling terrain results in some moderate vertical grades, particularly in the east end. Due to a vertical crest on Canboro Road immediately west of Cream Street and an embankment, sightlines at the intersection of Canboro Road and Cream Street are limited on the south approach (to the west). Sightlines are also limited on the south approach (to the east) due to vegetation noted on the southeast quadrant of the intersection. As this intersection is under all-way stop controlled, no issue was identified with the limited sightlines.

Memorial Drive is a two-lane road that forms the north boundary of the East Fenwick Secondary Plan. Memorial Drive continues to Maple Street in the west and Canboro Road in the east. Per traffic data, the roadway operates as a ‘local’ roadway, with traffic volumes in the range of 600 vehicles per day. The cross-section width was noted to be in the range of five (5.0) to six (6.0) metres; an insufficient width for a local roadway. If traffic volumes are anticipated to significantly increase on Memorial Drive, consideration should be given to widening the roadway to a six (6.0) metre cross section along the entire portion within the study area. Extensive foliage on either side of the roadway limits advance sight lines to the intersection with Cream Street.

Cream Street is a two-lane roadway that forms the east boundary of the East Fenwick Secondary Plan. Cream Street terminates at Memorial Drive in the north and intersects with Welland Road in the south at a tee-intersection (north leg). A separate tee-intersection between Welland Road and Cream Street (south leg) is located approximately 75 metres to the west. Per traffic data, the roadway operates as a ‘local’ roadway, with traffic volumes in the range of 300 vehicles per day. As with Memorial Drive, the cross-section width was noted to be in the range of five (5.0) to six (6.0) metres; an insufficient width for a local roadway. If traffic volumes are anticipated to significantly increase on Cream Street, consideration should be given to widening the roadway to a suitable width along the entire portion within the study area. Cream Street has a generally straight and flat alignment; however, sight lines at the intersection of Cream Street and Memorial Drive are limited for northbound drivers to the west due to extensive foliage on either side of Memorial Drive.

Welland Road is a two-lane roadway that is located almost at the south boundary of the East Fenwick Secondary Plan. Welland Road terminates at a tee-intersection with Canboro Road in the community of Fenwick in the west and continues east to Pelham Street (Regional Road 36) before changing its name to Quaker Road. According to traffic data, the roadway operates as a ‘collector’ roadway, with traffic volumes in the range of 1,600 vehicles per day.

Balfour Street is a two-lane road with a rural cross section roadway that forms the west boundary of the East Fenwick Secondary Plan. Balfour Street has a direct connection with Regional Road 20 to the north and intersects with Welland Road at a tee-intersection (north leg). A separate tee-intersection between Welland Road and Balfour Street (south leg) is located approximately 100 metres to the west. According to traffic data, the roadway operates as a ‘collector’ roadway, with daily traffic volumes around 1,700 vehicles per day. Balfour Street has a primarily straight and flat alignment, except for a subtle s-curve located near

Memorial Drive. Sightlines are somewhat limited to the north for drivers on the east approach; however, they are still considered acceptable.

2.2 EXISTING TRANSIT ROUTES

Pelham Transit operates on a route between the Community of Fonthill and the Community of Fenwick along Canboro Road throughout the day. A transit stop is located at the intersection of Canboro Road and Balfour Street. A modified version of the route is offered twice during the day; providing a connection to North Pelham via Canboro Road/Balfour Street. With the development of the East Fenwick Secondary Plan, there is an opportunity to provide enhanced transit service within the study area.

2.3 EXISTING ACTIVE TRANSPORTATION FACILITIES

Canboro Road has limited active transportation facilities. A sidewalk is provided on the north side of Canboro Road between Balfour Road and Sunset Drive. No bicycle facilities are provided.

Balfour Street also has limited active transportation facilities. A sidewalk is provided on the west side of Balfour Street between Canboro Road and Memorial Drive. No bicycle facilities are provided.

None of the remaining roads within the study area have sidewalks or bicycle facilities.

With the development of the East Fenwick Secondary Plan, there is an opportunity to provide dedicated active transportation facilities for cyclists and pedestrians. These would include sidewalks, bike lanes, and shared-use facilities.

2.4 PEAK PERIOD TURNING MOVEMENT COUNTS

On June 6th, 2017, Pyramid Traffic Incorporated undertook the collection of peak period turning movement counts (TMCs) at six intersections situated within the study area during the weekday morning (AM) and afternoon (PM) peak periods. **Table 2-2** highlights the intersection counted alongside the busiest morning and afternoon hours.

Table 2-2
Summary of TMC Data

Intersection	Weekday Morning Peak	Weekday Afternoon Peak
Memorial Dr and Balfour St	7:15 a.m. – 8:15 a.m.	3:00 p.m. – 4:00 p.m.
Canboro Rd and Balfour St	7:45 a.m. – 8:45 a.m.	3:00 p.m. – 4:00 p.m.
Welland Rd and Balfour St	8:00 a.m. – 9:00 a.m.	4:15 p.m. – 5:15 p.m.
Memorial Dr and Cream St	7:30 a.m. – 8:30 a.m.	4:45 p.m. – 5:45 p.m.

Intersection	Weekday Morning Peak	Weekday Afternoon Peak
Canboro Rd and Cream St	7:30 a.m. – 8:30 a.m.	4:30 p.m. – 5:30 p.m.
Welland Rd and Cream St	8:00 a.m. – 9:00 a.m.	4:15 p.m. – 5:15 p.m.

2.5 TRAFFIC ANALYSIS METHODOLOGY

Intersections are the critical capacity control points for a transportation network. The six (6) intersections within the study area have been analyzed to determine the average vehicular delay and level of service as well as capacity constraints (if any) in selected traffic movements (as measured by the volume-to-capacity ratios). Intersection capacity analysis was undertaken using Synchro 9.

The need for an auxiliary left-turn lane at the locations under two-way stop control was evaluated using the warranting criteria in the Ministry of Transportation Ontario’s *Geometric Design Standards for Ontario Highways*, 1985. A review of the volume thresholds at which a left-turn lane would be considered indicated that there is no justification for a left-turn lane at any of the intersections under existing conditions.

The need for an all-way stop control at the two-way stop controlled intersections was not formally evaluated. Per warranting criteria in the Ministry of Transportation Ontario’s *Ontario Traffic Manual: Book 5: Regulatory Signs*, traffic volumes are insufficient to justify installation of an all-way stop. The need for a traffic signal was also not evaluated for similar reasons.

2.6 EXISTING TRAFFIC CONDITIONS

Existing traffic volumes (AM/PM peak hour) used in the analysis are presented within **Figure 2-2**. The volumes are in general agreement with the ATR data collected, indicating that the heaviest traffic volumes occurring are the east-west through movements along Canboro Road.

Existing traffic conditions, through level of service, are shown in **Figure 2-3**. The analysis indicates that all intersections (for all movements under stop-control) are operating at a level of service ‘A’, indicating minimal vehicular delay or queuing during the peak hours. Vehicular queues are also minimal on all intersection approaches. Reports prepared using Synchro are provided in **Appendix B**.

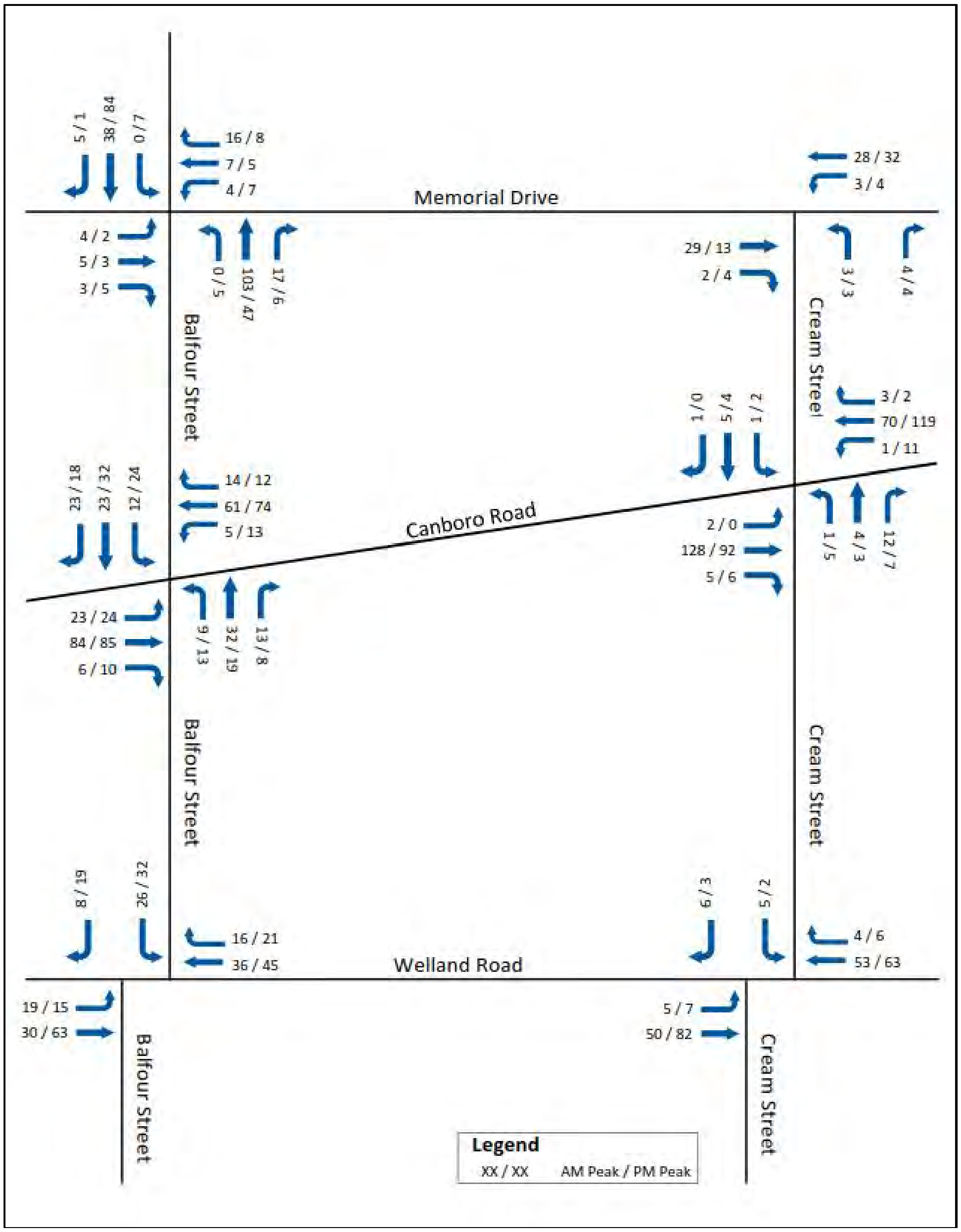


Figure 2-2
Peak Period Turning Movement Counts

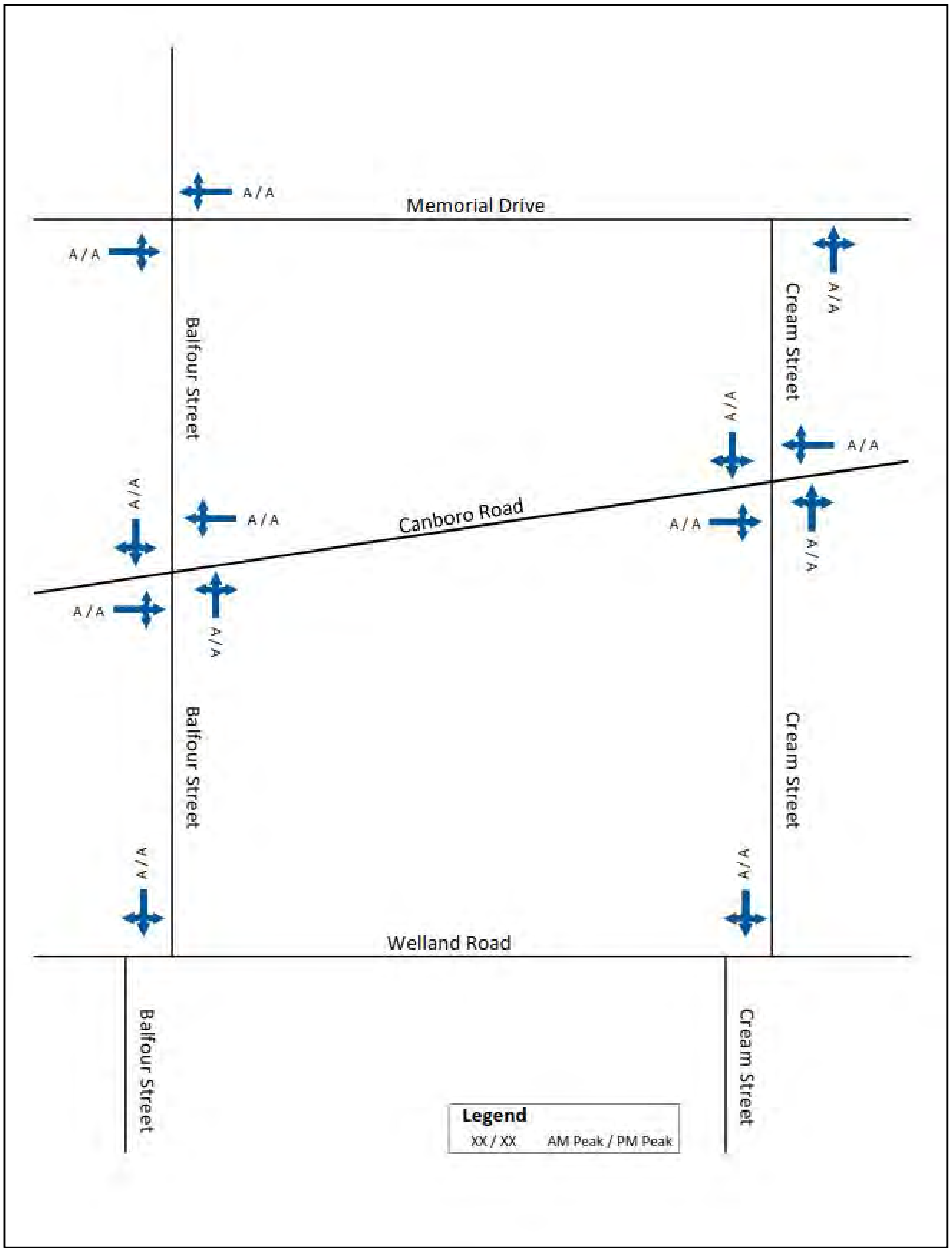


Figure 2-3
Level of Service– Existing Conditions

3 Conclusions

The previous sections within this report document the review of existing conditions along the subject roadways within the East Fenwick Secondary Plan from a traffic engineering perspective. Based on our review, the following conclusions are drawn.

A review of existing conditions indicates that Canboro Road and Balfour Road are characterized as being ‘collector’ roads based on their respective traffic volumes. Memorial Drive, Welland Road, and Cream Street have considerably lower traffic volumes and are ‘local’ roads based on their traffic volume.

Under existing conditions, the existing local road network is able to support traffic during the morning (AM) and afternoon (PM) peak hour conditions. All intersections are currently operating at a level of service ‘A’, indicating minimal delay and queueing. Furthermore, there is no need for any improvements or changes to traffic control at any of the study intersections at this point in time.

The following potential issues were identified that should be addressed with the development of the East Fenwick Secondary Plan:

- Under existing conditions, there is limited transit service provided within the study area and as a result, enhancements to transit should be considered within the study area;
- Under existing conditions, there are limited active transportation facilities (bike lanes, sidewalks, or multi-use paths) within the study area and therefore, active transportation facilities should be considered on the existing and proposed roadways within the study area;
- Cream Street and Memorial Drive have a cross-section width within the range of five (5.0) to six (6.0) metres. Consideration should be given to widening the two (2) roadways to a suitable width along the entire portion of the roadway within the study area in context of the anticipated increase in local traffic; and
- Sight lines at the intersection of Cream Street and Memorial Drive are limited for northbound motorists to the west due to extensive foliage on either side of the roadway. Clearing and grubbing of vegetation should be undertaken at this intersection to improve sightlines for drivers on the west and south approaches.

Closure

This report was prepared for the SGL Planning and Design Inc. to identify and discuss the existing conditions within the East Fenwick Secondary Plan development area within the context of traffic engineering.

The services provided by Associated Engineering (Ont.) Ltd. in the preparation of this report were conducted in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions. No other warranty expressed or implied is made.

Respectfully submitted,
Associated Engineering (Ont.) Ltd.

Jeff Suggett, M.Sc.	Jordan Frost, P.Eng.
Project Manager	Project Engineer

PERMIT STAMP

Appendix A – Traffic Data

MH Corbin Traffic Analyzer Study
Computer Generated Summary Report
City: Pelham
Street: Balfour St - NB
Location: 1

A study of vehicle traffic was conducted with the device having serial number 134390. The study was done in the NB lane at Balfour St - NB in Pelham, ON in btwn Memorial Dr & Canboro Rd county. The study began on 2017-06-06 at 12:00 AM and concluded on 2017-06-07 at 12:00 AM, lasting a total of 24.00 hours. Traffic statistics were recorded in 15 minute time periods. The total recorded volume showed 770 vehicles passed through the location with a peak volume of 23 on 2017-06-06 at [07:15 AM-07:30 AM] and a minimum volume of 0 on 2017-06-06 at [11:15 PM-11:30 PM]. The AADT count for this study was 770.

SPEED

Chart 1 lists the values of the speed bins and the total traffic volume for each bin. At least half the vehicles were traveling in the 50 - 55 KM/H range or lower. The average speed for all classifed vehicles was 51 KM/H with 64.44% vehicles exceeding the posted speed of 50 KM/H. 0.00% percent of the total vehicles were traveling in excess of 89 KM/H. The mode speed for this traffic study was 50KM/H and the 85th percentile was 58.81 KM/H.

< to 39	40 to 44	45 to 49	50 to 54	55 to 59	60 to 64	65 to 69	70 to 74	75 to 79	80 to 84	85 to 89	90 to 94	95 to 99	100 to 104	105 to >
50	65	156	258	155	59	11	6	2	0	0	0	0	0	0

CHART 1

CLASSIFICATION

Chart 2 lists the values of the classification bins and the total traffic volume accumulated for each bin.

Most of the vehicles classified during the study were Passenger Vehicles. The number of Passenger Vehicles in the study was 735 which represents 96 percent of the total classified vehicles. The number of Small Trucks in the study was 11 which represents 1 percent of the total classified vehicles. The number of Trucks/Buses in the study was 13 which represents 2 percent of the total classified vehicles. The number of Tractor Trailers in the study was 3 which represents 0 percent of the total classified vehicles.

< to 4.9	5.0 to 7.9	8.0 to 9.9	10.0 to 12.9	13.0 to 15.9	16.0 to 18.9	19.0 to 21.9	22.0 to >							
477	258	11	13	2	1	0	0							

CHART 2

HEADWAY

During the peak traffic period, on 2017-06-06 at [07:15 AM-07:30 AM] the average headway between vehicles was 37.5 seconds. During the slowest traffic period, on 2017-06-06 at [11:15 PM-11:30 PM] the average headway between vehicles was 900 seconds.

WEATHER

The roadway surface temperature over the period of the study varied between 16.00 and 27.00 degrees C.

MH Corbin Traffic Analyzer Study
Computer Generated Summary Report
City: Pelham
Street: Balfour St - SB
Location: 1

A study of vehicle traffic was conducted with the device having serial number 132476. The study was done in the SB lane at Balfour St - SB in Pelham, ON in btwn Memorial Dr & Canboro Rd county. The study began on 2017-06-06 at 12:00 AM and concluded on 2017-06-07 at 12:00 AM, lasting a total of 24.00 hours. Traffic statistics were recorded in 15 minute time periods. The total recorded volume showed 879 vehicles passed through the location with a peak volume of 24 on 2017-06-06 at [11:45 AM-12:00 PM] and a minimum volume of 0 on 2017-06-06 at [11:45 PM-12:00 AM]. The AADT count for this study was 879.

SPEED

Chart 1 lists the values of the speed bins and the total traffic volume for each bin. At least half the vehicles were traveling in the 50 - 55 KM/H range or lower. The average speed for all classifed vehicles was 52 KM/H with 69.38% vehicles exceeding the posted speed of 50 KM/H. 0.00% percent of the total vehicles were traveling in excess of 89 KM/H. The mode speed for this traffic study was 50KM/H and the 85th percentile was 60.27 KM/H.

< to 39	40 to 44	45 to 49	50 to 54	55 to 59	60 to 64	65 to 69	70 to 74	75 to 79	80 to 84	85 to 89	90 to 94	95 to 99	100 to 104	105 to >
49	67	151	285	184	94	28	11	3	0	0	0	0	0	0

CHART 1

CLASSIFICATION

Chart 2 lists the values of the classification bins and the total traffic volume accumulated for each bin.

Most of the vehicles classified during the study were Passenger Vehicles. The number of Passenger Vehicles in the study was 835 which represents 96 percent of the total classified vehicles. The number of Small Trucks in the study was 18 which represents 2 percent of the total classified vehicles. The number of Trucks/Buses in the study was 19 which represents 2 percent of the total classified vehicles. The number of Tractor Trailers in the study was 0 which represents 0 percent of the total classified vehicles.

< to 4.9	5.0 to 7.9	8.0 to 9.9	10.0 to 12.9	13.0 to 15.9	16.0 to 18.9	19.0 to 21.9	22.0 to >							
570	265	18	19	0	0	0	0							

CHART 2

HEADWAY

During the peak traffic period, on 2017-06-06 at [11:45 AM-12:00 PM] the average headway between vehicles was 36 seconds. During the slowest traffic period, on 2017-06-06 at [11:45 PM-12:00 AM] the average headway between vehicles was 900 seconds.

WEATHER

The roadway surface temperature over the period of the study varied between 16.00 and 28.00 degrees C.

MH Corbin Traffic Analyzer Study
Computer Generated Summary Report
City: Pelham
Street: Memorial Dr - EB
Location: 2

A study of vehicle traffic was conducted with the device having serial number 133288. The study was done in the EB lane at Memorial Dr - EB in Pelham, ON in btwn Balfour St & Cream St county. The study began on 2017-06-06 at 12:00 AM and concluded on 2017-06-07 at 12:00 AM, lasting a total of 24.00 hours. Traffic statistics were recorded in 15 minute time periods. The total recorded volume showed 297 vehicles passed through the location with a peak volume of 11 on 2017-06-06 at [08:15 AM-08:30 AM] and a minimum volume of 0 on 2017-06-06 at [09:30 PM-09:45 PM]. The AADT count for this study was 297.

SPEED

Chart 1 lists the values of the speed bins and the total traffic volume for each bin. At least half the vehicles were traveling in the 50 - 55 KM/H range or lower. The average speed for all classifed vehicles was 48 KM/H with 57.14% vehicles exceeding the posted speed of 50 KM/H. 0.00% percent of the total vehicles were traveling in excess of 89 KM/H. The mode speed for this traffic study was 50KM/H and the 85th percentile was 59.78 KM/H.

< to 39	40 to 44	45 to 49	50 to 54	55 to 59	60 to 64	65 to 69	70 to 74	75 to 79	80 to 84	85 to 89	90 to 94	95 to 99	100 to 104	105 to >
43	29	48	74	45	18	13	5	5	0	0	0	0	0	0

CHART 1

CLASSIFICATION

Chart 2 lists the values of the classification bins and the total traffic volume accumulated for each bin.

Most of the vehicles classified during the study were Passenger Vehicles. The number of Passenger Vehicles in the study was 272 which represents 97 percent of the total classified vehicles. The number of Small Trucks in the study was 3 which represents 1 percent of the total classified vehicles. The number of Trucks/Buses in the study was 5 which represents 2 percent of the total classified vehicles. The number of Tractor Trailers in the study was 0 which represents 0 percent of the total classified vehicles.

< to 4.9	5.0 to 7.9	8.0 to 9.9	10.0 to 12.9	13.0 to 15.9	16.0 to 18.9	19.0 to 21.9	22.0 to >							
145	127	3	5	0	0	0	0							

CHART 2

HEADWAY

During the peak traffic period, on 2017-06-06 at [08:15 AM-08:30 AM] the average headway between vehicles was 75 seconds. During the slowest traffic period, on 2017-06-06 at [09:30 PM-09:45 PM] the average headway between vehicles was 900 seconds.

WEATHER

The roadway surface temperature over the period of the study varied between 15.00 and 23.00 degrees C.

MH Corbin Traffic Analyzer Study
Computer Generated Summary Report
City: Pelham
Street: Memorial Dr - WB
Location: 2

A study of vehicle traffic was conducted with the device having serial number 134641. The study was done in the WB lane at Memorial Dr - WB in Pelham, ON in btwn Balfour St & Cream St county. The study began on 2017-06-06 at 12:00 AM and concluded on 2017-06-07 at 12:00 AM, lasting a total of 24.00 hours. Traffic statistics were recorded in 15 minute time periods. The total recorded volume showed 272 vehicles passed through the location with a peak volume of 13 on 2017-06-06 at [07:30 AM-07:45 AM] and a minimum volume of 0 on 2017-06-06 at [08:45 PM-09:00 PM]. The AADT count for this study was 272.

SPEED

Chart 1 lists the values of the speed bins and the total traffic volume for each bin. At least half the vehicles were traveling in the 45 - 50 KM/H range or lower. The average speed for all classifed vehicles was 44 KM/H with 38.66% vehicles exceeding the posted speed of 50 KM/H. 0.00% percent of the total vehicles were traveling in excess of 89 KM/H. The mode speed for this traffic study was 45KM/H and the 85th percentile was 55.21 KM/H.

< to 39	40 to 44	45 to 49	50 to 54	55 to 59	60 to 64	65 to 69	70 to 74	75 to 79	80 to 84	85 to 89	90 to 94	95 to 99	100 to 104	105 to >
53	50	62	62	24	9	5	4	0	0	0	0	0	0	0

CHART 1

CLASSIFICATION

Chart 2 lists the values of the classification bins and the total traffic volume accumulated for each bin.

Most of the vehicles classified during the study were Passenger Vehicles. The number of Passenger Vehicles in the study was 251 which represents 93 percent of the total classified vehicles. The number of Small Trucks in the study was 3 which represents 1 percent of the total classified vehicles. The number of Trucks/Buses in the study was 12 which represents 4 percent of the total classified vehicles. The number of Tractor Trailers in the study was 3 which represents 1 percent of the total classified vehicles.

< to 4.9	5.0 to 7.9	8.0 to 9.9	10.0 to 12.9	13.0 to 15.9	16.0 to 18.9	19.0 to 21.9	22.0 to >							
140	111	3	12	2	0	0	1							

CHART 2

HEADWAY

During the peak traffic period, on 2017-06-06 at [07:30 AM-07:45 AM] the average headway between vehicles was 64.286 seconds. During the slowest traffic period, on 2017-06-06 at [08:45 PM-09:00 PM] the average headway between vehicles was 900 seconds.

WEATHER

The roadway surface temperature over the period of the study varied between 14.00 and 22.00 degrees C.

MH Corbin Traffic Analyzer Study
Computer Generated Summary Report
City: Pelham
Street: Welland Rd - EB
Location: 3

A study of vehicle traffic was conducted with the device having serial number 134649. The study was done in the EB lane at Welland Rd - EB in Pelham, ON in btwn Balfour St & Cream St county. The study began on 2017-06-06 at 12:00 AM and concluded on 2017-06-07 at 12:00 AM, lasting a total of 24.00 hours. Traffic statistics were recorded in 15 minute time periods. The total recorded volume showed 751 vehicles passed through the location with a peak volume of 24 on 2017-06-06 at [04:30 PM-04:45 PM] and a minimum volume of 0 on 2017-06-06 at [11:15 PM-11:30 PM]. The AADT count for this study was 751.

SPEED

Chart 1 lists the values of the speed bins and the total traffic volume for each bin. At least half the vehicles were traveling in the 60 - 65 KM/H range or lower. The average speed for all classifed vehicles was 61 KM/H with 92.06% vehicles exceeding the posted speed of 50 KM/H. 0.67% percent of the total vehicles were traveling in excess of 89 KM/H. The mode speed for this traffic study was 60KM/H and the 85th percentile was 69.80 KM/H.

< to 39	40 to 44	45 to 49	50 to 54	55 to 59	60 to 64	65 to 69	70 to 74	75 to 79	80 to 84	85 to 89	90 to 94	95 to 99	100 to 104	105 to >
10	6	43	135	155	165	122	69	16	17	5	0	0	0	0

CHART 1

CLASSIFICATION

Chart 2 lists the values of the classification bins and the total traffic volume accumulated for each bin.

Most of the vehicles classified during the study were Passenger Vehicles. The number of Passenger Vehicles in the study was 721 which represents 97 percent of the total classified vehicles. The number of Small Trucks in the study was 8 which represents 1 percent of the total classified vehicles. The number of Trucks/Buses in the study was 11 which represents 1 percent of the total classified vehicles. The number of Tractor Trailers in the study was 3 which represents 0 percent of the total classified vehicles.

< to 4.9	5.0 to 7.9	8.0 to 9.9	10.0 to 12.9	13.0 to 15.9	16.0 to 18.9	19.0 to 21.9	22.0 to >							
366	355	8	11	3	0	0	0							

CHART 2

HEADWAY

During the peak traffic period, on 2017-06-06 at [04:30 PM-04:45 PM] the average headway between vehicles was 36 seconds. During the slowest traffic period, on 2017-06-06 at [11:15 PM-11:30 PM] the average headway between vehicles was 900 seconds.

WEATHER

The roadway surface temperature over the period of the study varied between 17.00 and 29.00 degrees C.

MH Corbin Traffic Analyzer Study
Computer Generated Summary Report
City: Pelham
Street: Welland Rd - WB
Location: 3

A study of vehicle traffic was conducted with the device having serial number 134624. The study was done in the WB lane at Welland Rd - WB in Pelham, ON in btwn Balfour St & Cream St county. The study began on 2017-06-06 at 12:00 AM and concluded on 2017-06-07 at 12:00 AM, lasting a total of 24.00 hours. Traffic statistics were recorded in 15 minute time periods. The total recorded volume showed 840 vehicles passed through the location with a peak volume of 25 on 2017-06-06 at [04:30 PM-04:45 PM] and a minimum volume of 0 on 2017-06-06 at [09:45 PM-10:00 PM]. The AADT count for this study was 840.

SPEED

Chart 1 lists the values of the speed bins and the total traffic volume for each bin. At least half the vehicles were traveling in the 55 - 60 KM/H range or lower. The average speed for all classifed vehicles was 60 KM/H with 92.10% vehicles exceeding the posted speed of 50 KM/H. 0.60% percent of the total vehicles were traveling in excess of 89 KM/H. The mode speed for this traffic study was 55KM/H and the 85th percentile was 68.92 KM/H.

< to 39	40 to 44	45 to 49	50 to 54	55 to 59	60 to 64	65 to 69	70 to 74	75 to 79	80 to 84	85 to 89	90 to 94	95 to 99	100 to 104	105 to >
7	15	44	152	201	192	125	61	24	9	5	0	0	0	0

CHART 1

CLASSIFICATION

Chart 2 lists the values of the classification bins and the total traffic volume accumulated for each bin.
Most of the vehicles classified during the study were Passenger Vehicles. The number of Passenger Vehicles in the study was 806 which represents 97 percent of the total classified vehicles. The number of Small Trucks in the study was 8 which represents 1 percent of the total classified vehicles. The number of Trucks/Buses in the study was 17 which represents 2 percent of the total classified vehicles. The number of Tractor Trailers in the study was 4 which represents 0 percent of the total classified vehicles.

< to 4.9	5.0 to 7.9	8.0 to 9.9	10.0 to 12.9	13.0 to 15.9	16.0 to 18.9	19.0 to 21.9	22.0 to >							
478	328	8	17	4	0	0	0							

CHART 2

HEADWAY

During the peak traffic period, on 2017-06-06 at [04:30 PM-04:45 PM] the average headway between vehicles was 34.615 seconds. During the slowest traffic period, on 2017-06-06 at [09:45 PM-10:00 PM] the average headway between vehicles was 900 seconds.

WEATHER

The roadway surface temperature over the period of the study varied between 16.00 and 29.00 degrees C.

MH Corbin Traffic Analyzer Study
Computer Generated Summary Report
City: Pelham
Street: Cream St - NB
Location: 4

A study of vehicle traffic was conducted with the device having serial number 134631. The study was done in the NB lane at Cream St - NB in Pelham, ON in btwn Welland Rd & Canboro Rd county. The study began on 2017-06-06 at 12:00 AM and concluded on 2017-06-07 at 12:00 AM, lasting a total of 24.00 hours. Traffic statistics were recorded in 15 minute time periods. The total recorded volume showed 161 vehicles passed through the location with a peak volume of 10 on 2017-06-06 at [07:45 AM-08:00 AM] and a minimum volume of 0 on 2017-06-06 at [04:00 PM-04:15 PM]. The AADT count for this study was 161.

SPEED

Chart 1 lists the values of the speed bins and the total traffic volume for each bin. At least half the vehicles were traveling in the 39 KM/H range or lower. The average speed for all classifed vehicles was 44 KM/H with 45.63% vehicles exceeding the posted speed of 50 KM/H. 0.00% percent of the total vehicles were traveling in excess of 89 KM/H. The mode speed for this traffic study was 39KM/H and the 85th percentile was 59.33 KM/H.

< to 39	40 to 44	45 to 49	50 to 54	55 to 59	60 to 64	65 to 69	70 to 74	75 to 79	80 to 84	85 to 89	90 to 94	95 to 99	100 to 104	105 to >
44	19	24	35	15	12	5	4	2	0	0	0	0	0	0

CHART 1

CLASSIFICATION

Chart 2 lists the values of the classification bins and the total traffic volume accumulated for each bin.

Most of the vehicles classified during the study were Passenger Vehicles. The number of Passenger Vehicles in the study was 143 which represents 89 percent of the total classified vehicles. The number of Small Trucks in the study was 5 which represents 3 percent of the total classified vehicles. The number of Trucks/Buses in the study was 11 which represents 7 percent of the total classified vehicles. The number of Tractor Trailers in the study was 1 which represents 1 percent of the total classified vehicles.

< to 4.9	5.0 to 7.9	8.0 to 9.9	10.0 to 12.9	13.0 to 15.9	16.0 to 18.9	19.0 to 21.9	22.0 to >							
91	52	5	11	0	1	0	0							

CHART 2

HEADWAY

During the peak traffic period, on 2017-06-06 at [07:45 AM-08:00 AM] the average headway between vehicles was 81.818 seconds. During the slowest traffic period, on 2017-06-06 at [04:00 PM-04:15 PM] the average headway between vehicles was 900 seconds.

WEATHER

The roadway surface temperature over the period of the study varied between 14.00 and 22.00 degrees C.

MH Corbin Traffic Analyzer Study
Computer Generated Summary Report
City: Pelham
Street: Cream St - SB
Location: 4

A study of vehicle traffic was conducted with the device having serial number 133560. The study was done in the SB lane at Cream St - SB in Pelham, ON in btwn Welland Rd & Canboro Rd county. The study began on 2017-06-06 at 12:00 AM and concluded on 2017-06-07 at 12:00 AM, lasting a total of 24.00 hours. Traffic statistics were recorded in 15 minute time periods. The total recorded volume showed 154 vehicles passed through the location with a peak volume of 6 on 2017-06-06 at [04:30 PM-04:45 PM] and a minimum volume of 0 on 2017-06-06 at [01:30 PM-01:45 PM]. The AADT count for this study was 154.

SPEED

Chart 1 lists the values of the speed bins and the total traffic volume for each bin. At least half the vehicles were traveling in the 50 - 55 KM/H range or lower. The average speed for all classifed vehicles was 49 KM/H with 58.33% vehicles exceeding the posted speed of 50 KM/H. 0.00% percent of the total vehicles were traveling in excess of 89 KM/H. The mode speed for this traffic study was 50KM/H and the 85th percentile was 63.44 KM/H.

< to 39	40 to 44	45 to 49	50 to 54	55 to 59	60 to 64	65 to 69	70 to 74	75 to 79	80 to 84	85 to 89	90 to 94	95 to 99	100 to 104	105 to >
24	14	22	35	16	16	10	5	2	0	0	0	0	0	0

CHART 1

CLASSIFICATION

Chart 2 lists the values of the classification bins and the total traffic volume accumulated for each bin.

Most of the vehicles classified during the study were Passenger Vehicles. The number of Passenger Vehicles in the study was 133 which represents 92 percent of the total classified vehicles. The number of Small Trucks in the study was 5 which represents 3 percent of the total classified vehicles. The number of Trucks/Buses in the study was 6 which represents 4 percent of the total classified vehicles. The number of Tractor Trailers in the study was 0 which represents 0 percent of the total classified vehicles.

< to 4.9	5.0 to 7.9	8.0 to 9.9	10.0 to 12.9	13.0 to 15.9	16.0 to 18.9	19.0 to 21.9	22.0 to >							
76	57	5	6	0	0	0	0							

CHART 2

HEADWAY

During the peak traffic period, on 2017-06-06 at [04:30 PM-04:45 PM] the average headway between vehicles was 128.571 seconds. During the slowest traffic period, on 2017-06-06 at [01:30 PM-01:45 PM] the average headway between vehicles was 900 seconds.

WEATHER

The roadway surface temperature over the period of the study varied between 15.00 and 23.00 degrees C.

MH Corbin Traffic Analyzer Study
Computer Generated Summary Report
City: Town of Pelham
Street: Canboro Rd - EB
Location: 13

A study of vehicle traffic was conducted with the device having serial number 134589. The study was done in the EB lane at Canboro Rd - EB in Town of Pelham, ON in Balfour St to Cream St county. The study began on 2016-05-31 at 12:00 AM and concluded on 2016-06-01 at 12:00 AM, lasting a total of 24.00 hours. Traffic statistics were recorded in 15 minute time periods. The total recorded volume showed 892 vehicles passed through the location with a peak volume of 30 on 2016-05-31 at [03:30 PM-03:45 PM] and a minimum volume of 0 on 2016-05-31 at [11:00 PM-11:15 PM]. The AADT count for this study was 892.

SPEED

Chart 1 lists the values of the speed bins and the total traffic volume for each bin. At least half the vehicles were traveling in the 50 - 60 KM/H range or lower. The average speed for all classifed vehicles was 56 KM/H with 82.20% vehicles exceeding the posted speed of 50 KM/H. 1.25% percent of the total vehicles were traveling in excess of 89 KM/H. The mode speed for this traffic study was 50KM/H and the 85th percentile was 65.86 KM/H.

< to 39	40 to 49	50 to 59	60 to 69	70 to 79	80 to 89	90 to 99	100 to >							
34	123	469	210	35	10	0	1							

CHART 1

CLASSIFICATION

Chart 2 lists the values of the classification bins and the total traffic volume accumulated for each bin.
Most of the vehicles classified during the study were Passenger Vehicles. The number of Passenger Vehicles in the study was 839 which represents 95 percent of the total classified vehicles. The number of Small Trucks in the study was 24 which represents 3 percent of the total classified vehicles. The number of Trucks/Buses in the study was 16 which represents 2 percent of the total classified vehicles. The number of Tractor Trailers in the study was 3 which represents 0 percent of the total classified vehicles.

< to 4.9	5.0 to 7.9	8.0 to 9.9	10.0 to 12.9	13.0 to 15.9	16.0 to 18.9	19.0 to 24.9	25.0 to >							
459	380	24	16	3	0	0	0							

CHART 2

HEADWAY

During the peak traffic period, on 2016-05-31 at [03:30 PM-03:45 PM] the average headway between vehicles was 29.032 seconds. During the slowest traffic period, on 2016-05-31 at [11:00 PM-11:15 PM] the average headway between vehicles was 900 seconds.

WEATHER

The roadway surface temperature over the period of the study varied between 22.00 and 49.00 degrees C.

MH Corbin Traffic Analyzer Study
Computer Generated Summary Report
City: Town of Pelham
Street: Canboro Rd - WB
Location: 13

A study of vehicle traffic was conducted with the device having serial number 113545. The study was done in the WB lane at Canboro Rd - WB in Town of Pelham, ON in Balfour St to Cream St county. The study began on 2016-05-31 at 12:00 AM and concluded on 2016-06-01 at 12:00 AM, lasting a total of 24.00 hours. Traffic statistics were recorded in 15 minute time periods. The total recorded volume showed 770 vehicles passed through the location with a peak volume of 24 on 2016-05-31 at [05:30 PM-05:45 PM] and a minimum volume of 0 on 2016-05-31 at [10:30 PM-10:45 PM]. The AADT count for this study was 770.

SPEED

Chart 1 lists the values of the speed bins and the total traffic volume for each bin. At least half the vehicles were traveling in the 50 - 60 KM/H range or lower. The average speed for all classifed vehicles was 55 KM/H with 76.70% vehicles exceeding the posted speed of 50 KM/H. 0.92% percent of the total vehicles were traveling in excess of 89 KM/H. The mode speed for this traffic study was 50KM/H and the 85th percentile was 66.10 KM/H.

< to 39	40 to 49	50 to 59	60 to 69	70 to 79	80 to 89	90 to 99	100 to >							
40	138	363	177	39	4	3	0							

CHART 1

CLASSIFICATION

Chart 2 lists the values of the classification bins and the total traffic volume accumulated for each bin.

Most of the vehicles classified during the study were Passenger Vehicles. The number of Passenger Vehicles in the study was 731 which represents 96 percent of the total classified vehicles. The number of Small Trucks in the study was 13 which represents 2 percent of the total classified vehicles. The number of Trucks/Buses in the study was 19 which represents 2 percent of the total classified vehicles. The number of Tractor Trailers in the study was 1 which represents 0 percent of the total classified vehicles.

< to 4.9	5.0 to 7.9	8.0 to 9.9	10.0 to 12.9	13.0 to 15.9	16.0 to 18.9	19.0 to 24.9	25.0 to >							
403	328	13	19	1	0	0	0							

CHART 2

HEADWAY

During the peak traffic period, on 2016-05-31 at [05:30 PM-05:45 PM] the average headway between vehicles was 36 seconds. During the slowest traffic period, on 2016-05-31 at [10:30 PM-10:45 PM] the average headway between vehicles was 900 seconds.

WEATHER

The roadway surface temperature over the period of the study varied between 22.00 and 52.00 degrees C.

MH Corbin Traffic Analyzer Study
Computer Generated Summary Report
City: Town of Pelham
Street: Canboro Road
Location: 550 Canboro Road

A study of vehicle traffic was conducted with the device having serial number 400369. The study was done in the East Bound lane at Canboro Road in Town of Pelham, On in Niagara Region county. The study began on 05/29/2017 at 01:30 PM and concluded on 05/31/2017 at 01:30 PM, lasting a total of 48.00 hours. Traffic statistics were recorded in 15 minute time periods. The total recorded volume showed 2,992 vehicles passed through the location with a peak volume of 50 on 05/31/2017 at [07:30 AM-07:45 AM] and a minimum volume of 0 on 05/29/2017 at [11:00 PM-11:15 PM]. The AADT count for this study was 1,496.

SPEED

Chart 1 lists the values of the speed bins and the total traffic volume for each bin. At least half the vehicles were traveling in the 70 - 90 KPH range or lower. The average speed for all classifed vehicles was 72 KPH with 93.15% vehicles exceeding the posted speed of 50 KPH. 61.69% percent of the total vehicles were traveling in excess of 89 KPH. The mode speed for this traffic study was 70KPH and the 85th percentile was 87.99 KPH.

< to 29	30 to 49	50 to 69	70 to 89	90 to 109	110 to 129	130 to >								
156	48	937	1545	257	26	9								

CHART 1

CLASSIFICATION

Chart 2 lists the values of the classification bins and the total traffic volume accumulated for each bin.

Most of the vehicles classified during the study were Vans & Pickups. The number of Passenger Vehicles in the study was 574 which represents 19 percent of the total classified vehicles. The number of Vans & Pickups in the study was 1324 which represents 44 percent of the total classified vehicles. The number of Busses & Trucks in the study was 707 which represents 24 percent of the total classified vehicles. The number of Tractor Trailers in the study was 373 which represents 13 percent of the total classified vehicles.

< to 2.9	3.0 to 5.9	6.0 to 7.9	8.0 to 11.9	12.0 to >										
154	893	1162	539	230										

CHART 2

HEADWAY

During the peak traffic period, on 05/31/2017 at [07:30 AM-07:45 AM] the average headway between vehicles was 17.647 seconds. During the slowest traffic period, on 05/29/2017 at [11:00 PM-11:15 PM] the average headway between vehicles was 900 seconds.

WEATHER

The roadway surface temperature over the period of the study varied between 16.00 and 41.00 degrees C.

MH Corbin Traffic Analyzer Study
Computer Generated Summary Report
City: Town of Pelham
Street: Canboro Road
Location: 550 Canboro Road

A study of vehicle traffic was conducted with the device having serial number 400680. The study was done in the West Bound lane at Canboro Road in Town of Pelham, On in Niagara Region county. The study began on 05/29/2017 at 01:30 PM and concluded on 05/31/2017 at 01:30 PM, lasting a total of 48.00 hours. Traffic statistics were recorded in 15 minute time periods. The total recorded volume showed 2,816 vehicles passed through the location with a peak volume of 52 on 05/29/2017 at [05:00 PM-05:15 PM] and a minimum volume of 0 on 05/30/2017 at [10:30 PM-10:45 PM]. The AADT count for this study was 1,408.

SPEED

Chart 1 lists the values of the speed bins and the total traffic volume for each bin. At least half the vehicles were traveling in the 50 - 70 KPH range or lower. The average speed for all classifed vehicles was 60 KPH with 92.60% vehicles exceeding the posted speed of 50 KPH. 11.46% percent of the total vehicles were traveling in excess of 89 KPH. The mode speed for this traffic study was 50KPH and the 85th percentile was 69.11 KPH.

< to 29	30 to 49	50 to 69	70 to 89	90 to 109	110 to 129	130 to >								
91	117	2279	292	18	7	5								

CHART 1

CLASSIFICATION

Chart 2 lists the values of the classification bins and the total traffic volume accumulated for each bin.

Most of the vehicles classified during the study were Passenger Vehicles. The number of Passenger Vehicles in the study was 1368 which represents 49 percent of the total classified vehicles. The number of Vans & Pickups in the study was 966 which represents 34 percent of the total classified vehicles. The number of Busses & Trucks in the study was 373 which represents 13 percent of the total classified vehicles. The number of Tractor Trailers in the study was 101 which represents 4 percent of the total classified vehicles.

< to 2.9	3.0 to 5.9	6.0 to 7.9	8.0 to 11.9	12.0 to >										
112	1729	606	313	49										

CHART 2

HEADWAY

During the peak traffic period, on 05/29/2017 at [05:00 PM-05:15 PM] the average headway between vehicles was 16.981 seconds. During the slowest traffic period, on 05/30/2017 at [10:30 PM-10:45 PM] the average headway between vehicles was 900 seconds.

WEATHER

The roadway surface temperature over the period of the study varied between 16.00 and 47.00 degrees C.

Balfour St @ Canboro Rd

Morning Peak Diagram

Specified Period
From: 7:00:00
To: 9:00:00

One Hour Peak
From: 7:45:00
To: 8:45:00

Municipality: Pelham
Site #: 0000000002
Intersection: Canboro Rd & Balfour St
TFR File #: 2
Count date: 6-Jun-2017

Weather conditions:
Cloudy/Wet

Person(s) who counted:
Cam

**** Non-Signalized Intersection ****

Major Road: Canboro Rd runs W/E

North Leg Total: 127
North Entering: 58
North Peds: 0
Peds Cross: ⋈

Balfour St

	↲	↓	↳	
Heavys	3	1	0	4
Trucks	0	0	1	1
Cars	9	22	22	53
Totals	12	23	23	

↑	
Heavys	4
Trucks	0
Cars	65
Totals	69

East Leg Total: 200
East Entering: 80
East Peds: 0
Peds Cross: ⧗

Canboro Rd ←

Heavys	Trucks	Cars	Totals
5	0	77	82

	Cars	Trucks	Heavys	Totals
↰	14	0	0	14
←	60	0	1	61
↲	5	0	0	5
	79	0	1	

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Canboro Rd

Heavys	Trucks	Cars	Totals	
0	0	23	23	↱
1	1	82	84	→
1	0	5	6	↳
2	1	110		

Canboro Rd →

Cars	Trucks	Heavys	Totals
116	2	2	120

Balfour St

Peds Cross: ⧗
West Peds: 1
West Entering: 113
West Leg Total: 195

↓	
Cars	32
Trucks	0
Heavys	2
Totals	34

	↰	↑	↱	
Cars	8	28	12	48
Trucks	0	0	0	0
Heavys	1	4	1	6
Totals	9	32	13	

Peds Cross: ⋈
South Peds: 0
South Entering: 54
South Leg Total: 88

Comments

Balfour St @ Canboro Rd

Mid-day Peak Diagram

Specified Period
From: 11:00:00
To: 14:00:00

One Hour Peak
From: 11:45:00
To: 12:45:00

Municipality: Pelham
Site #: 0000000002
Intersection: Canboro Rd & Balfour St
TFR File #: 2
Count date: 6-Jun-2017

Weather conditions:
Cloudy/Wet

Person(s) who counted:
Cam

**** Non-Signalized Intersection ****

Major Road: Canboro Rd runs W/E

North Leg Total: 106
North Entering: 51
North Peds: 0
Peds Cross: ⋈

Heavys	3	1	1	5
Trucks	0	2	0	2
Cars	13	25	6	44
Totals	16	28	7	
	↲	↓	↳	

Balfour St

↑	
Heavys	2
Trucks	5
Cars	48
Totals	55

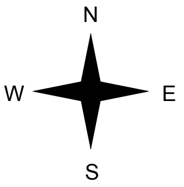
East Leg Total: 176
East Entering: 93
East Peds: 2
Peds Cross: ⧗

Heavys	Trucks	Cars	Totals
4	2	87	93

←

Canboro Rd

	Cars	Trucks	Heavys	Totals
↰	12	0	0	12
←	72	2	1	75
↲	6	0	0	6
	90	2	1	



Heavys	Trucks	Cars	Totals	
2	2	18	22	↱
2	0	67	69	→
0	1	8	9	↳
4	3	93		

Canboro Rd

→

Cars	Trucks	Heavys	Totals
80	0	3	83

Balfour St

Peds Cross: ⧗
West Peds: 0
West Entering: 100
West Leg Total: 193

↓	
Cars	39
Trucks	3
Heavys	1
Totals	43

	↰	↑	↱	
Cars	2	18	7	27
Trucks	0	3	0	3
Heavys	0	0	0	0
Totals	2	21	7	

Peds Cross: ⋈
South Peds: 0
South Entering: 30
South Leg Total: 73

Comments

Balfour St @ Canboro Rd

Afternoon Peak Diagram

Specified Period
From: 15:00:00
To: 18:00:00

One Hour Peak
From: 15:00:00
To: 16:00:00

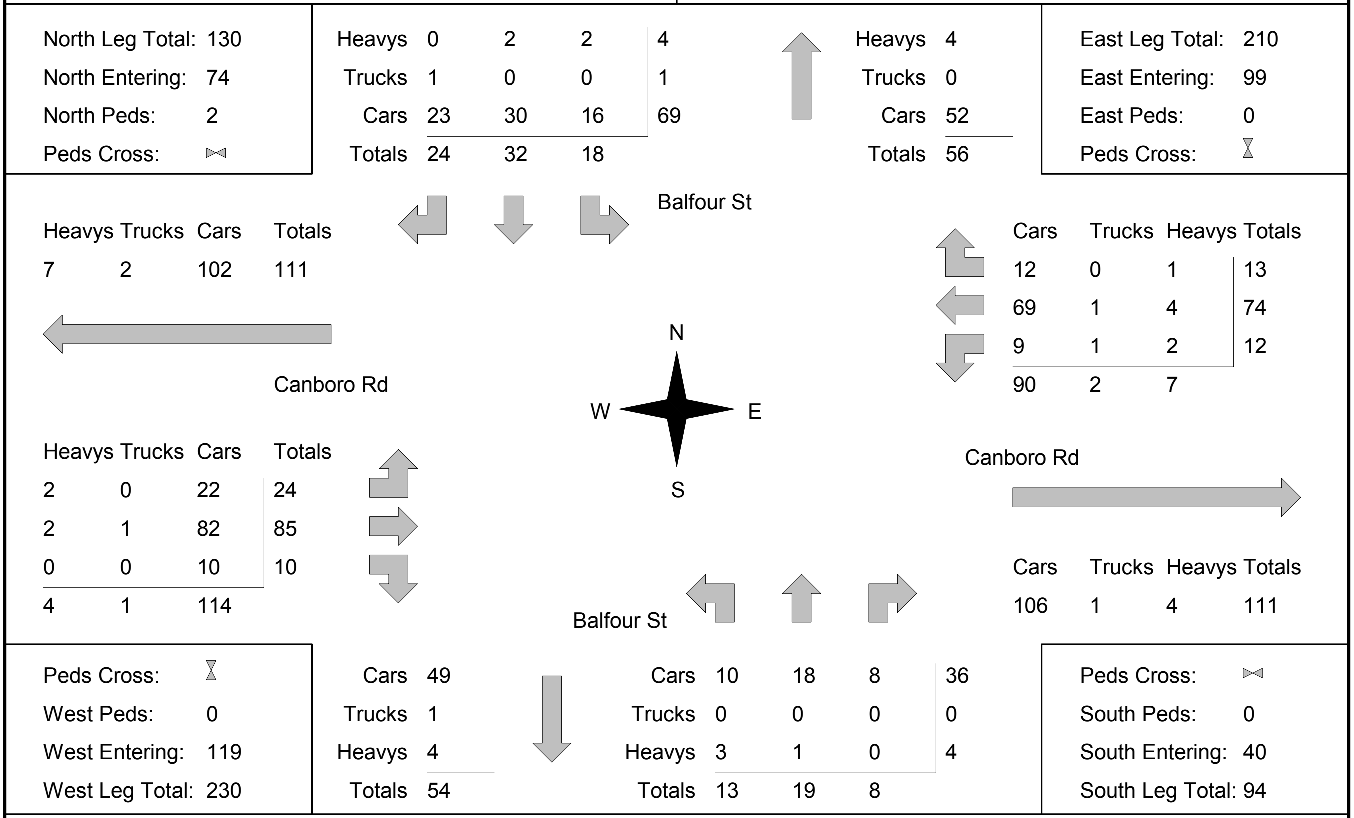
Municipality: Pelham
Site #: 0000000002
Intersection: Canboro Rd & Balfour St
TFR File #: 2
Count date: 6-Jun-2017

Weather conditions:
Cloudy/Wet

Person(s) who counted:
Cam

**** Non-Signalized Intersection ****

Major Road: Canboro Rd runs W/E



North Leg Total: 130
North Entering: 74
North Peds: 2
Peds Cross: ⋈

Heavys	0	2	2	4
Trucks	1	0	0	1
Cars	23	30	16	69
Totals	24	32	18	

Heavys	4
Trucks	0
Cars	52
Totals	56

East Leg Total: 210
East Entering: 99
East Peds: 0
Peds Cross: ⧗

Heavys	Trucks	Cars	Totals
7	2	102	111

Cars	Trucks	Heavys	Totals
12	0	1	13
69	1	4	74
9	1	2	12
90	2	7	

Heavys	Trucks	Cars	Totals
2	0	22	24
2	1	82	85
0	0	10	10
4	1	114	

Cars	Trucks	Heavys	Totals
106	1	4	111

Peds Cross: ⧗
West Peds: 0
West Entering: 119
West Leg Total: 230

Cars	49
Trucks	1
Heavys	4
Totals	54

Cars	10	18	8	36
Trucks	0	0	0	0
Heavys	3	1	0	4
Totals	13	19	8	

Peds Cross: ⋈
South Peds: 0
South Entering: 40
South Leg Total: 94

Comments

Balfour St @ Canboro Rd

Total Count Diagram

Municipality: Pelham
Site #: 0000000002
Intersection: Canboro Rd & Balfour St
TFR File #: 2
Count date: 6-Jun-2017

Weather conditions:
Cloudy/Wet

Person(s) who counted:
Cam

**** Non-Signalized Intersection ****

Major Road: Canboro Rd runs W/E

North Leg Total: 910
North Entering: 467
North Peds: 8
Peds Cross: ⋈

Heavys	9	11	5	25
Trucks	3	4	2	9
Cars	147	195	91	433
Totals	159	210	98	

Heavys	21
Trucks	9
Cars	413
Totals	443

East Leg Total: 1432
East Entering: 683
East Peds: 3
Peds Cross: ⧗

Balfour St

Heavys	Trucks	Cars	Totals
23	10	698	731

Canboro Rd

Cars	Trucks	Heavys	Totals
102	0	3	105
502	7	10	519
56	1	2	59
660	8	15	

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Heavys	Trucks	Cars	Totals
11	4	147	162
11	9	565	585
3	1	64	68
25	14	776	

Canboro Rd

Cars	Trucks	Heavys	Totals
720	11	18	749

Balfour St

Peds Cross: ⧗
West Peds: 1
West Entering: 815
West Leg Total: 1546

Cars	315
Trucks	6
Heavys	16
Totals	337

Cars	49	164	64	277
Trucks	0	5	0	5
Heavys	4	7	2	13
Totals	53	176	66	

Peds Cross: ⋈
South Peds: 3
South Entering: 295
South Leg Total: 632

Comments

Balfour St @ Memorial Dr

Morning Peak Diagram

Specified Period
From: 7:00:00
To: 9:00:00

One Hour Peak
From: 7:15:00
To: 8:15:00

Municipality: Pelham
Site #: 0000000001
Intersection: Balfour St & Memorial Dr
TFR File #: 1
Count date: 6-Jun-2017

Weather conditions:
Cloudy/Wet

Person(s) who counted:
Cam

**** Non-Signalized Intersection ****

Major Road: Balfour St runs N/S

North Leg Total: 166
North Entering: 43
North Peds: 0
Peds Cross: ⋈

Heavys	0	2	0	2
Trucks	0	3	0	3
Cars	0	33	5	38
Totals	0	38	5	

Heavys	11
Trucks	0
Cars	112
Totals	123

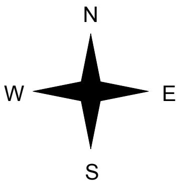
East Leg Total: 54
East Entering: 27
East Peds: 0
Peds Cross: ⧗

Balfour St

Heavys	Trucks	Cars	Totals
0	0	7	7

Cars	Trucks	Heavys	Totals
14	0	2	16
7	0	0	7
3	0	1	4
24	0	3	

Memorial Dr



Heavys	Trucks	Cars	Totals
2	0	2	4
0	0	5	5
0	0	3	3
2	0	10	

Memorial Dr

Cars	Trucks	Heavys	Totals
26	0	1	27

Balfour St

Peds Cross: ⧗
West Peds: 0
West Entering: 12
West Leg Total: 19

Cars	39
Trucks	3
Heavys	3
Totals	45

Cars	0	96	16	112
Trucks	0	0	0	0
Heavys	0	7	1	8
Totals	0	103	17	

Peds Cross: ⋈
South Peds: 0
South Entering: 120
South Leg Total: 165

Comments

Balfour St @ Memorial Dr

Mid-day Peak Diagram

Specified Period
From: 11:00:00
To: 14:00:00

One Hour Peak
From: 12:00:00
To: 13:00:00

Municipality: Pelham
Site #: 0000000001
Intersection: Balfour St & Memorial Dr
TFR File #: 1
Count date: 6-Jun-2017

Weather conditions:
Cloudy/Wet

Person(s) who counted:
Cam

**** Non-Signalized Intersection ****

Major Road: Balfour St runs N/S

North Leg Total:	119
North Entering:	59
North Peds:	0
Peds Cross:	⋈

Heavys	0	4	0	4
Trucks	0	2	1	3
Cars	0	46	6	52
Totals	0	52	7	

Heavys	2
Trucks	3
Cars	55
Totals	60

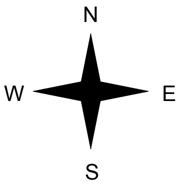
East Leg Total:	42
East Entering:	20
East Peds:	0
Peds Cross:	⧗

Balfour St

Heavys	Trucks	Cars	Totals
0	1	13	14

Cars	Trucks	Heavys	Totals
6	0	0	6
10	0	0	10
4	0	0	4
20	0	0	

Memorial Dr



Heavys	Trucks	Cars	Totals
0	0	0	0
0	1	5	6
0	0	2	2
0	1	7	

Memorial Dr

Cars	Trucks	Heavys	Totals
19	3	0	22

Balfour St

Peds Cross:	⧗
West Peds:	0
West Entering:	8
West Leg Total:	22

Cars	52
Trucks	2
Heavys	4
Totals	58

Cars	3	49	8	60
Trucks	1	3	1	5
Heavys	0	2	0	2
Totals	4	54	9	

Peds Cross:	⋈
South Peds:	1
South Entering:	67
South Leg Total:	125

Comments

Balfour St @ Memorial Dr

Afternoon Peak Diagram

Specified Period
From: 15:00:00
To: 18:00:00

One Hour Peak
From: 16:00:00
To: 17:00:00

Municipality: Pelham
Site #: 0000000001
Intersection: Balfour St & Memorial Dr
TFR File #: 1
Count date: 6-Jun-2017

Weather conditions:
Cloudy/Wet

Person(s) who counted:
Cam

**** Non-Signalized Intersection ****

Major Road: Balfour St runs N/S

North Leg Total: 149
North Entering: 92
North Peds: 0
Peds Cross: ⋈

Heavys	0	4	0	4
Trucks	0	0	0	0
Cars	1	80	7	88
Totals	1	84	7	

Heavys	2
Trucks	1
Cars	54
Totals	57

East Leg Total: 36
East Entering: 20
East Peds: 0
Peds Cross: ⧗

Balfour St

Heavys	Trucks	Cars	Totals
0	1	10	11

Cars	Trucks	Heavys	Totals
8	0	0	8
4	1	0	5
7	0	0	7
19	1	0	

Memorial Dr

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Heavys	Trucks	Cars	Totals
0	0	2	2
0	0	3	3
0	0	5	5
0	0	10	

Memorial Dr

Cars	Trucks	Heavys	Totals
16	0	0	16

Balfour St

Peds Cross: ⧗
West Peds: 1
West Entering: 10
West Leg Total: 21

Cars	92
Trucks	0
Heavys	4
Totals	96

Cars	5	44	6	55
Trucks	0	1	0	1
Heavys	0	2	0	2
Totals	5	47	6	

Peds Cross: ⋈
South Peds: 1
South Entering: 58
South Leg Total: 154

Comments

Balfour St @ Memorial Dr

Total Count Diagram

Municipality: Pelham
Site #: 0000000001
Intersection: Balfour St & Memorial Dr
TFR File #: 1
Count date: 6-Jun-2017

Weather conditions:
Cloudy/Wet

Person(s) who counted:
Cam

**** Non-Signalized Intersection ****

Major Road: Balfour St runs N/S

North Leg Total: 1032
North Entering: 491
North Peds: 1
Peds Cross: ⋈

Heavys	0	21	2	23
Trucks	0	7	1	8
Cars	2	412	46	460
Totals	2	440	49	

Heavys	23
Trucks	11
Cars	507
Totals	541

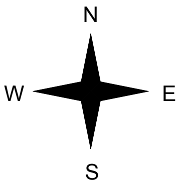
East Leg Total: 336
East Entering: 180
East Peds: 0
Peds Cross: ⧗

Balfour St

Heavys	Trucks	Cars	Totals
3	5	68	76

Cars	Trucks	Heavys	Totals
71	3	2	76
46	3	0	49
52	1	2	55
169	7	4	

Memorial Dr



Heavys	Trucks	Cars	Totals
3	0	19	22
1	1	42	44
3	2	22	27
7	3	83	

Memorial Dr

Cars	Trucks	Heavys	Totals
148	3	5	156

Balfour St

Peds Cross: ⧗
West Peds: 2
West Entering: 93
West Leg Total: 169

Cars	486
Trucks	10
Heavys	26
Totals	522

Cars	20	417	60	497
Trucks	2	8	1	11
Heavys	3	18	2	23
Totals	25	443	63	

Peds Cross: ⋈
South Peds: 3
South Entering: 531
South Leg Total: 1053

Comments

Balfour St @ Welland Rd

Morning Peak Diagram

Specified Period
From: 7:00:00
To: 9:00:00

One Hour Peak
From: 8:00:00
To: 9:00:00

Municipality: Pelham
Site #: 0000000003
Intersection: Welland Rd & Balfour St
TFR File #: 3
Count date: 6-Jun-2017

Weather conditions:
Cloudy/Wet

Person(s) who counted:
Cam

**** Non-Signalized Intersection ****

Major Road: Welland Rd runs W/E

North Leg Total: 69
North Entering: 34
North Peds: 0
Peds Cross: ⋈

Heavys	0	2	2
Trucks	0	0	0
Cars	8	24	32
Totals	8	26	
	↲	↳	

Balfour St

↑	Heavys	5
	Trucks	0
	Cars	30
	Totals	35

East Leg Total: 108
East Entering: 52
East Peds: 0
Peds Cross: ⧗

	Heavys	Trucks	Cars	Totals
←	2	0	42	44

Welland Rd

	Cars	Trucks	Heavys	Totals
↰	14	0	2	16
←	34	0	2	36
	48	0	4	

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	Heavys	Trucks	Cars	Totals
↱	3	0	16	19
→	5	1	24	30
	8	1	40	

Welland Rd

	Cars	Trucks	Heavys	Totals
→	48	1	7	56

Peds Cross: ⧗
West Peds: 0
West Entering: 49
West Leg Total: 93

Comments

Balfour St @ Welland Rd

Mid-day Peak Diagram

Specified Period
From: 11:00:00
To: 14:00:00

One Hour Peak
From: 12:00:00
To: 13:00:00

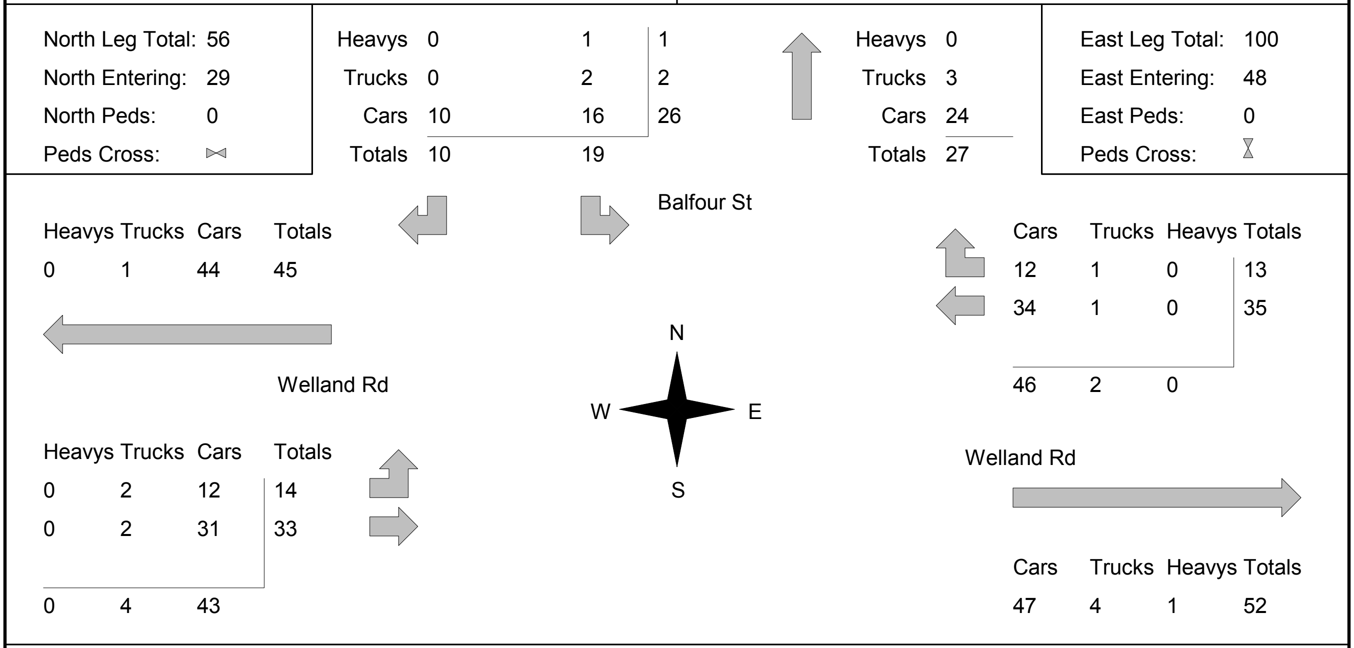
Municipality: Pelham
Site #: 0000000003
Intersection: Welland Rd & Balfour St
TFR File #: 3
Count date: 6-Jun-2017

Weather conditions:
Cloudy/Wet

Person(s) who counted:
Cam

**** Non-Signalized Intersection ****

Major Road: Welland Rd runs W/E



North Leg Total:	56
North Entering:	29
North Peds:	0
Peds Cross:	⋈

Heavys	0	1	1
Trucks	0	2	2
Cars	10	16	26
Totals	10	19	

Heavys	0
Trucks	3
Cars	24
Totals	27

East Leg Total:	100
East Entering:	48
East Peds:	0
Peds Cross:	⧗

Heavys	Trucks	Cars	Totals
0	1	44	45

Cars	Trucks	Heavys	Totals
12	1	0	13
34	1	0	35
46	2	0	

Heavys	Trucks	Cars	Totals
0	2	12	14
0	2	31	33
0	4	43	

Cars	Trucks	Heavys	Totals
47	4	1	52

Peds Cross:	⧗
West Peds:	0
West Entering:	47
West Leg Total:	92

Comments

Balfour St @ Welland Rd

Afternoon Peak Diagram

Specified Period
From: 15:00:00
To: 18:00:00

One Hour Peak
From: 16:15:00
To: 17:15:00

Municipality: Pelham
Site #: 0000000003
Intersection: Welland Rd & Balfour St
TFR File #: 3
Count date: 6-Jun-2017

Weather conditions:
Cloudy/Wet

Person(s) who counted:
Cam

**** Non-Signalized Intersection ****

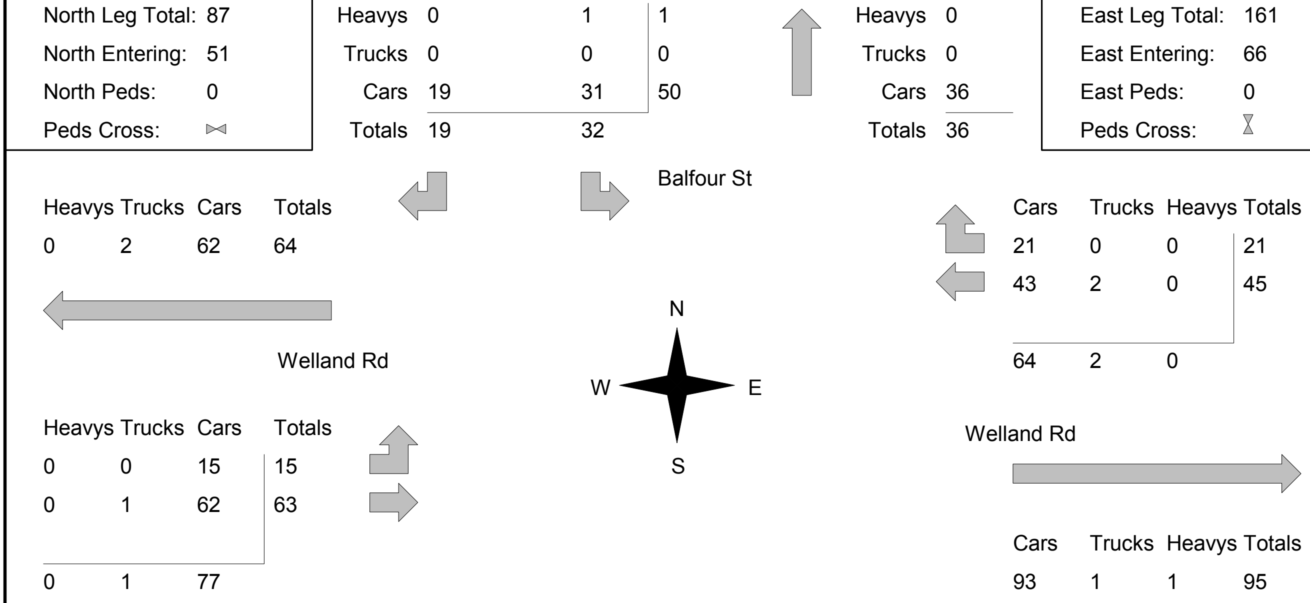
Major Road: Welland Rd runs W/E

North Leg Total: 87
North Entering: 51
North Peds: 0
Peds Cross: ⋈

Heavys	0	1	1
Trucks	0	0	0
Cars	19	31	50
Totals	19	32	

Heavys	0
Trucks	0
Cars	36
Totals	36

East Leg Total: 161
East Entering: 66
East Peds: 0
Peds Cross: ⧗



Heavys	Trucks	Cars	Totals
0	2	62	64

Cars	Trucks	Heavys	Totals
21	0	0	21
43	2	0	45
64	2	0	

Heavys	Trucks	Cars	Totals
0	0	15	15
0	1	62	63
0	1	77	

Cars	Trucks	Heavys	Totals
93	1	1	95

Peds Cross: ⧗
West Peds: 0
West Entering: 78
West Leg Total: 142

Comments

Balfour St @ Welland Rd

Total Count Diagram

Municipality: Pelham
Site #: 0000000003
Intersection: Welland Rd & Balfour St
TFR File #: 3
Count date: 6-Jun-2017

Weather conditions:
Cloudy/Wet

Person(s) who counted:
Cam

**** Non-Signalized Intersection ****

Major Road: Welland Rd runs W/E

North Leg Total:	543
North Entering:	295
North Peds:	1
Peds Cross:	⋈

Heavys	9	6	15
Trucks	4	2	6
Cars	105	169	274
Totals	118	177	

Heavys	9
Trucks	4
Cars	235
Totals	248

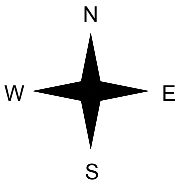
East Leg Total:	876
East Entering:	399
East Peds:	0
Peds Cross:	⧗

Balfour St

Heavys	Trucks	Cars	Totals
18	8	357	383

Welland Rd

Cars	Trucks	Heavys	Totals
128	1	5	134
252	4	9	265
380	5	14	



Heavys	Trucks	Cars	Totals
4	3	107	114
9	5	286	300
13	8	393	

Welland Rd

Cars	Trucks	Heavys	Totals
455	7	15	477

Peds Cross:	⧗
West Peds:	0
West Entering:	414
West Leg Total:	797

Comments

Cream St @ Canboro Rd

Morning Peak Diagram

Specified Period
From: 7:00:00
To: 9:00:00

One Hour Peak
From: 7:30:00
To: 8:30:00

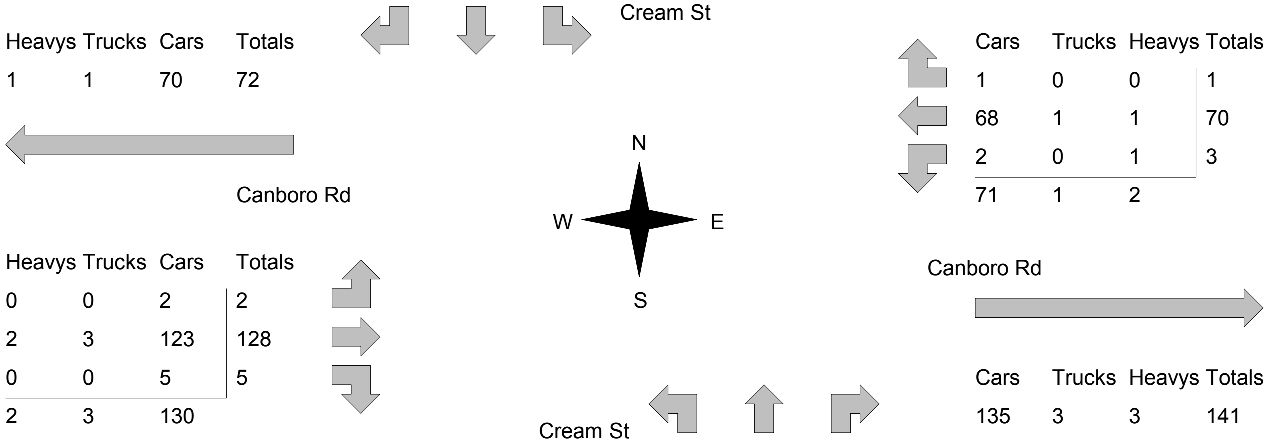
Municipality: Pelham
Site #: 0000000005
Intersection: Canboro Rd & Cream St
TFR File #: 5
Count date: 6-Jun-2017

Weather conditions:
Cloudy/Wet

Person(s) who counted:
Cam

**** Non-Signalized Intersection ****

Major Road: Canboro Rd runs W/E



North Leg Total: 14
North Entering: 7
North Peds: 1
Peds Cross: ⋈

Heavys	0	0	0	0
Trucks	0	0	0	0
Cars	1	5	1	7
Totals	1	5	1	

Heavys	2
Trucks	0
Cars	5
Totals	7

East Leg Total: 215
East Entering: 74
East Peds: 0
Peds Cross: ⧗

Heavys	Trucks	Cars	Totals
1	1	70	72

Cars	Trucks	Heavys	Totals
1	0	0	1
68	1	1	70
2	0	1	3
71	1	2	

Heavys	Trucks	Cars	Totals
0	0	2	2
2	3	123	128
0	0	5	5
2	3	130	

Cars	Trucks	Heavys	Totals
135	3	3	141

Peds Cross: ⧗
West Peds: 0
West Entering: 135
West Leg Total: 207

Cars	12
Trucks	0
Heavys	1
Totals	13

Cars	1	2	11	14
Trucks	0	0	0	0
Heavys	0	2	1	3
Totals	1	4	12	

Peds Cross: ⋈
South Peds: 0
South Entering: 17
South Leg Total: 30

Comments

Cream St @ Canboro Rd

Mid-day Peak Diagram

Specified Period
From: 11:00:00
To: 14:00:00

One Hour Peak
From: 11:15:00
To: 12:15:00

Municipality: Pelham
Site #: 0000000005
Intersection: Canboro Rd & Cream St
TFR File #: 5
Count date: 6-Jun-2017

Weather conditions:
Cloudy/Wet

Person(s) who counted:
Cam

**** Non-Signalized Intersection ****

Major Road: Canboro Rd runs W/E

North Leg Total: 10
North Entering: 4
North Peds: 0
Peds Cross: ⋈

Heavys	0	0	0	0
Trucks	0	0	0	0
Cars	0	2	2	4
Totals	0	2	2	

Heavys	1
Trucks	0
Cars	5
Totals	6

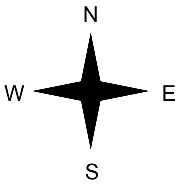
East Leg Total: 177
East Entering: 80
East Peds: 1
Peds Cross: ⧗

Cream St

Heavys	Trucks	Cars	Totals
1	2	74	77

Canboro Rd

Cars	Trucks	Heavys	Totals
2	0	1	3
71	2	1	74
3	0	0	3
76	2	2	



Heavys	Trucks	Cars	Totals
0	0	1	1
1	0	86	87
0	0	1	1
1	0	88	

Canboro Rd

Cars	Trucks	Heavys	Totals
96	0	1	97

Cream St

Peds Cross: ⧗
West Peds: 0
West Entering: 89
West Leg Total: 166

Cars	6
Trucks	0
Heavys	0
Totals	6

Cars	3	2	8	13
Trucks	0	0	0	0
Heavys	0	0	0	0
Totals	3	2	8	

Peds Cross: ⋈
South Peds: 0
South Entering: 13
South Leg Total: 19

Comments

Cream St @ Canboro Rd

Afternoon Peak Diagram

Specified Period
From: 15:00:00
To: 18:00:00

One Hour Peak
From: 16:30:00
To: 17:30:00

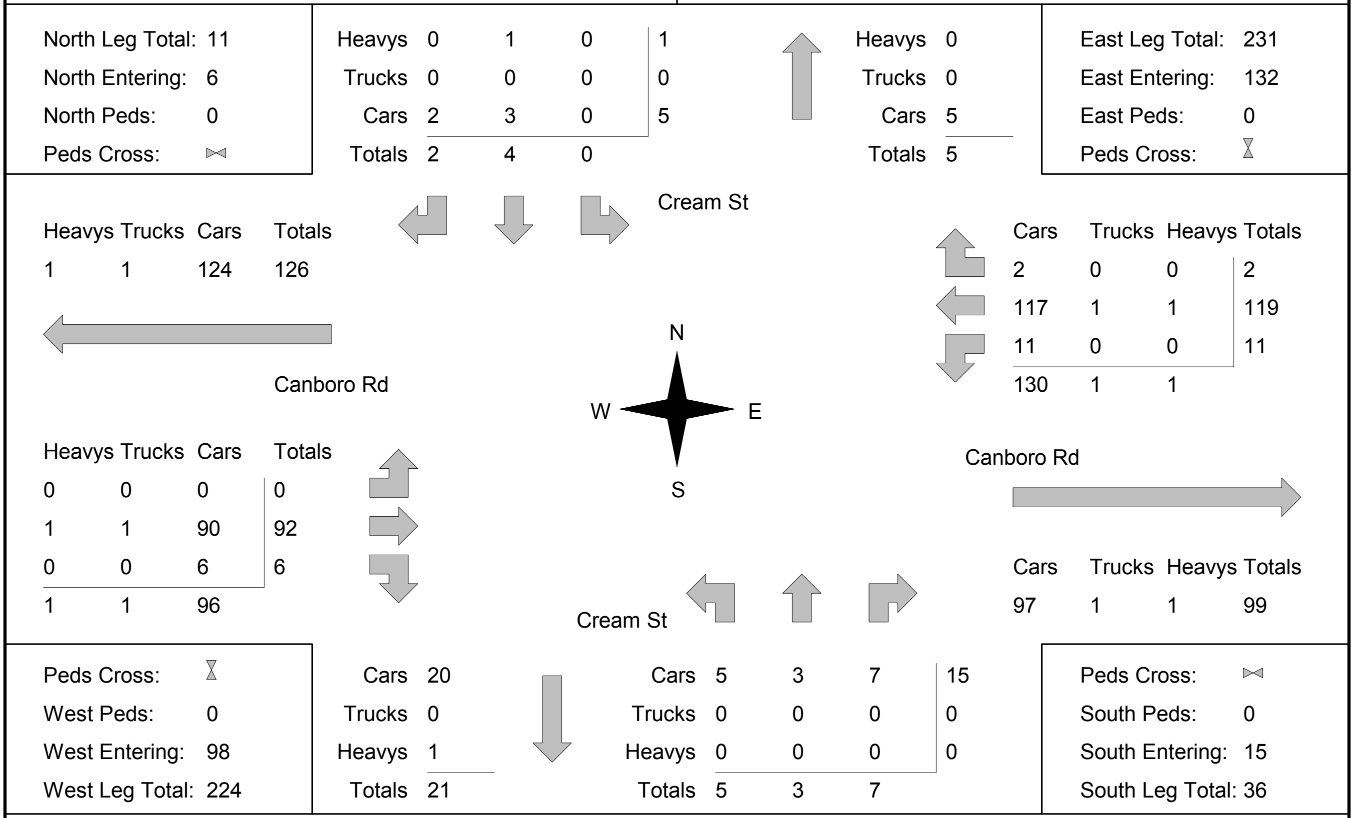
Municipality: Pelham
Site #: 0000000005
Intersection: Canboro Rd & Cream St
TFR File #: 5
Count date: 6-Jun-2017

Weather conditions:
Cloudy/Wet

Person(s) who counted:
Cam

**** Non-Signalized Intersection ****

Major Road: Canboro Rd runs W/E



North Leg Total: 11
North Entering: 6
North Peds: 0
Peds Cross: ⋈

Heavys	0	1	0	1
Trucks	0	0	0	0
Cars	2	3	0	5
Totals	2	4	0	

Heavys	0
Trucks	0
Cars	5
Totals	5

East Leg Total: 231
East Entering: 132
East Peds: 0
Peds Cross: ⧗

Cream St

Heavys	Trucks	Cars	Totals
1	1	124	126

Cars	Trucks	Heavys	Totals
2	0	0	2
117	1	1	119
11	0	0	11
130	1	1	

Canboro Rd

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Heavys	Trucks	Cars	Totals
0	0	0	0
1	1	90	92
0	0	6	6
1	1	96	

Canboro Rd

Cars	Trucks	Heavys	Totals
97	1	1	99

Cream St

Peds Cross: ⧗
West Peds: 0
West Entering: 98
West Leg Total: 224

Cars	20
Trucks	0
Heavys	1
Totals	21

Cars	5	3	7	15
Trucks	0	0	0	0
Heavys	0	0	0	0
Totals	5	3	7	

Peds Cross: ⋈
South Peds: 0
South Entering: 15
South Leg Total: 36

Comments

Cream St @ Canboro Rd

Total Count Diagram

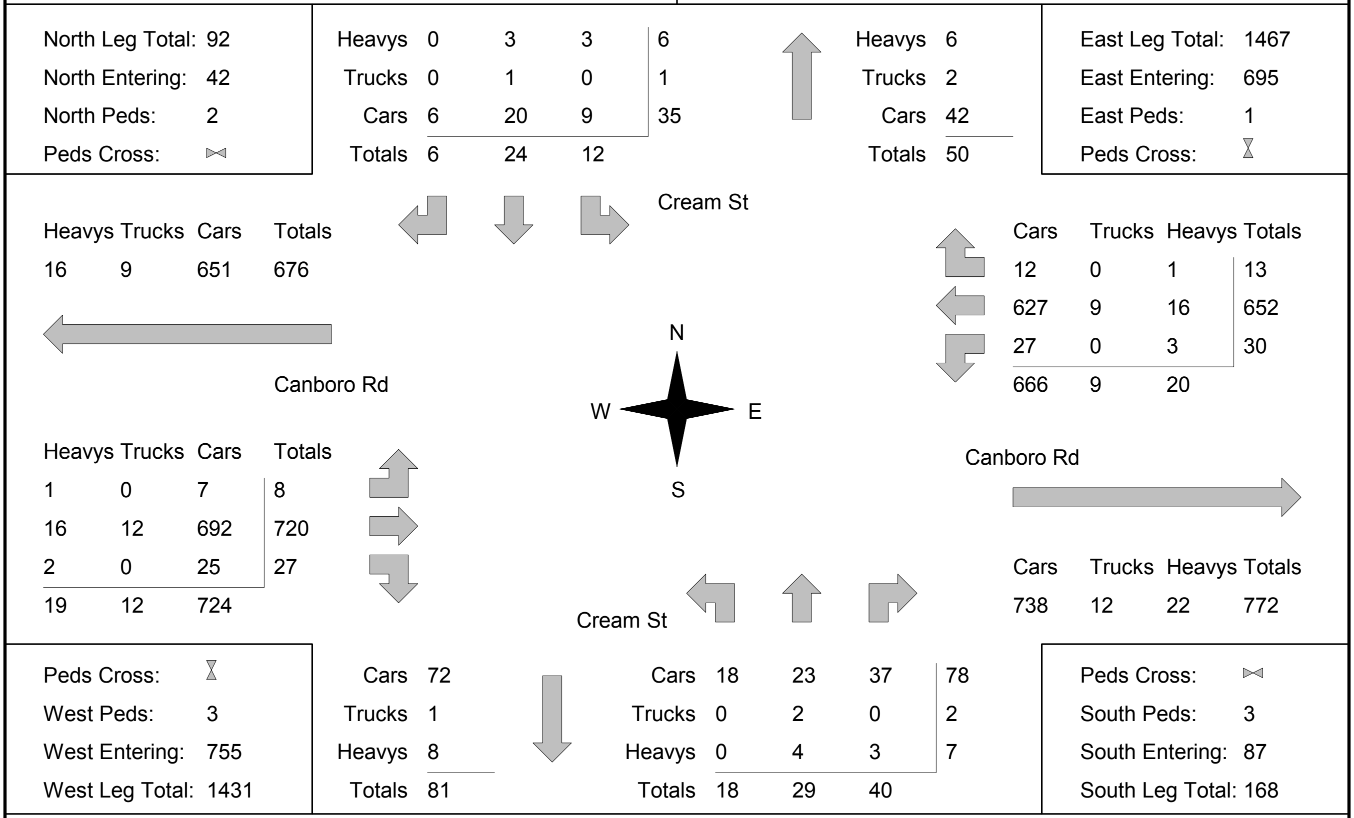
Municipality: Pelham
Site #: 0000000005
Intersection: Canboro Rd & Cream St
TFR File #: 5
Count date: 6-Jun-2017

Weather conditions:
Cloudy/Wet

Person(s) who counted:
Cam

**** Non-Signalized Intersection ****

Major Road: Canboro Rd runs W/E



North Leg Total: 92
North Entering: 42
North Peds: 2
Peds Cross: ⋈

Heavys	0	3	3	6
Trucks	0	1	0	1
Cars	6	20	9	35
Totals	6	24	12	

Heavys	6
Trucks	2
Cars	42
Totals	50

East Leg Total: 1467
East Entering: 695
East Peds: 1
Peds Cross: ⧗

Heavys	Trucks	Cars	Totals
16	9	651	676

Cars	Trucks	Heavys	Totals
12	0	1	13
627	9	16	652
27	0	3	30
666	9	20	

Heavys	Trucks	Cars	Totals
1	0	7	8
16	12	692	720
2	0	25	27
19	12	724	

Cars	Trucks	Heavys	Totals
738	12	22	772

Peds Cross: ⧗
West Peds: 3
West Entering: 755
West Leg Total: 1431

Cars	72
Trucks	1
Heavys	8
Totals	81

Cars	18	23	37	78
Trucks	0	2	0	2
Heavys	0	4	3	7
Totals	18	29	40	

Peds Cross: ⋈
South Peds: 3
South Entering: 87
South Leg Total: 168

Comments

Cream St @ Memorial Dr

Morning Peak Diagram

Specified Period
From: 7:00:00
To: 9:00:00

One Hour Peak
From: 7:30:00
To: 8:30:00

Municipality: Pelham Rd
Site #: 0000000004
Intersection: Memorial Dr & Cream St
TFR File #: 4
Count date: 6-Jun-2017

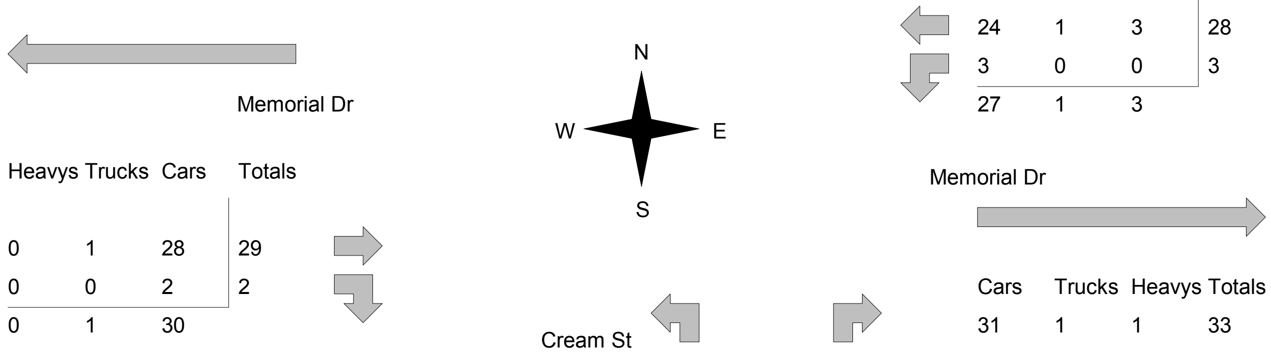
Weather conditions:
Cloudy/Wet

Person(s) who counted:
Cam

**** Non-Signalized Intersection ****

Major Road: Memorial Dr runs W/E

East Leg Total: 64
East Entering: 31
East Peds: 0
Peds Cross: ⧗



Heavys	Trucks	Cars	Totals
4	1	26	31

Cars	Trucks	Heavys	Totals
24	1	3	28
3	0	0	3
27	1	3	

Heavys	Trucks	Cars	Totals
0	1	28	29
0	0	2	2
0	1	30	

Cars	Trucks	Heavys	Totals
31	1	1	33

Peds Cross: ⧗
West Peds: 0
West Entering: 31
West Leg Total: 62

Cars	5
Trucks	0
Heavys	0
Totals	5

Cars	2	3	5
Trucks	0	0	0
Heavys	1	1	2
Totals	3	4	

Peds Cross: ⋈
South Peds: 0
South Entering: 7
South Leg Total: 12

Comments

Cream St @ Memorial Dr

Mid-day Peak Diagram

Specified Period
From: 11:00:00
To: 14:00:00

One Hour Peak
From: 12:00:00
To: 13:00:00

Municipality: Pelham Rd
Site #: 0000000004
Intersection: Memorial Dr & Cream St
TFR File #: 4
Count date: 6-Jun-2017

Weather conditions:
Cloudy/Wet

Person(s) who counted:
Cam

**** Non-Signalized Intersection ****

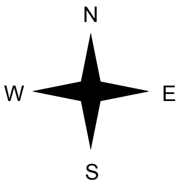
Major Road: Memorial Dr runs W/E

East Leg Total: 45
East Entering: 24
East Peds: 0
Peds Cross: ⧗

Heavys	Trucks	Cars	Totals
0	0	25	25

Memorial Dr

Heavys	Trucks	Cars	Totals
0	1	19	20
0	1	1	2
0	2	20	



Cars	Trucks	Heavys	Totals
24	0	0	24
0	0	0	0
24	0	0	

Memorial Dr

Cars	Trucks	Heavys	Totals
20	1	0	21

Cream St

Peds Cross: ⧗
West Peds: 0
West Entering: 22
West Leg Total: 47

Cars	1
Trucks	1
Heavys	0
Totals	2

Cars	1	1	2
Trucks	0	0	0
Heavys	0	0	0
Totals	1	1	

Peds Cross: ⋈
South Peds: 0
South Entering: 2
South Leg Total: 4

Comments

Cream St @ Memorial Dr

Afternoon Peak Diagram

Specified Period
From: 15:00:00
To: 18:00:00

One Hour Peak
From: 16:45:00
To: 17:45:00

Municipality: Pelham Rd
Site #: 0000000004
Intersection: Memorial Dr & Cream St
TFR File #: 4
Count date: 6-Jun-2017

Weather conditions:
Cloudy/Wet

Person(s) who counted:
Cam

**** Non-Signalized Intersection ****

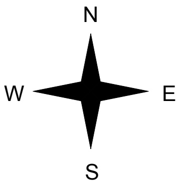
Major Road: Memorial Dr runs W/E

East Leg Total: 53
East Entering: 36
East Peds: 0
Peds Cross: ⧗

Heavys	Trucks	Cars	Totals
0	0	35	35

Memorial Dr

Heavys	Trucks	Cars	Totals
0	0	13	13
1	0	3	4
1	0	16	



Cars	Trucks	Heavys	Totals
32	0	0	32
4	0	0	4
36	0	0	

Memorial Dr

Cars	Trucks	Heavys	Totals
16	0	1	17

Cream St

Peds Cross: ⧗
West Peds: 0
West Entering: 17
West Leg Total: 52

Cars	7
Trucks	0
Heavys	1
Totals	8

Cars	3	3	6
Trucks	0	0	0
Heavys	0	1	1
Totals	3	4	

Peds Cross: ⋈
South Peds: 0
South Entering: 7
South Leg Total: 15

Comments

Cream St @ Memorial Dr

Total Count Diagram

Municipality: Pelham Rd
Site #: 0000000004
Intersection: Memorial Dr & Cream St
TFR File #: 4
Count date: 6-Jun-2017

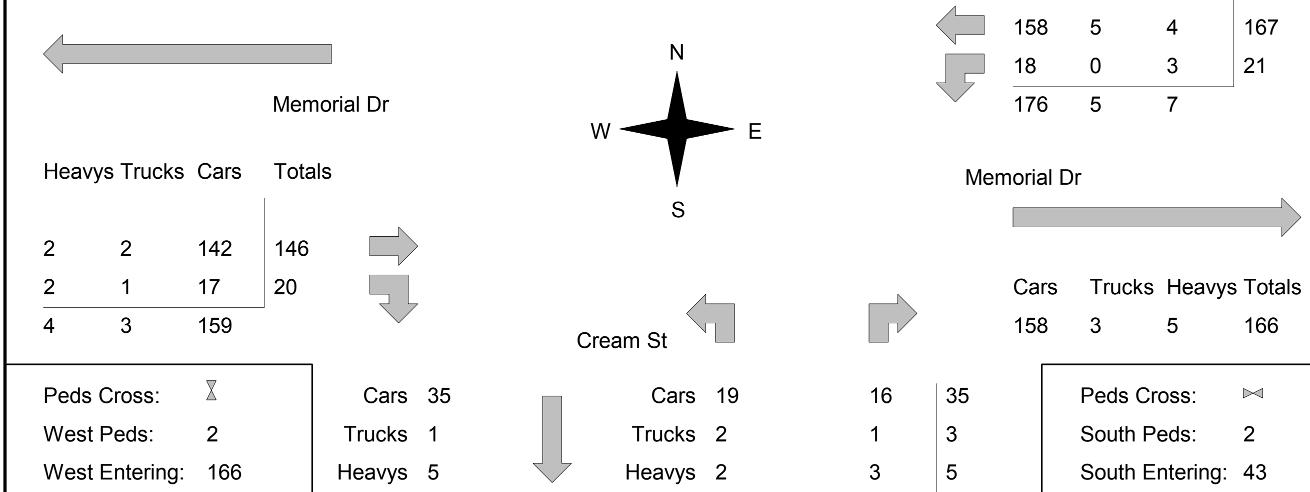
Weather conditions:
Cloudy/Wet

Person(s) who counted:
Cam

**** Non-Signalized Intersection ****

Major Road: Memorial Dr runs W/E

East Leg Total: 354
East Entering: 188
East Peds: 0
Peds Cross: ⧗



Heavys	Trucks	Cars	Totals
6	7	177	190

Cars	Trucks	Heavys	Totals
158	5	4	167
18	0	3	21
176	5	7	

Heavys	Trucks	Cars	Totals
2	2	142	146
2	1	17	20
4	3	159	

Cars	Trucks	Heavys	Totals
158	3	5	166

Peds Cross: ⧗
West Peds: 2
West Entering: 166
West Leg Total: 356

Cars	35
Trucks	1
Heavys	5
Totals	41

Cars	19	16	35
Trucks	2	1	3
Heavys	2	3	5
Totals	23	20	

Peds Cross: ⋈
South Peds: 2
South Entering: 43
South Leg Total: 84

Comments

Cream St @ Welland Rd

Morning Peak Diagram

Specified Period
From: 7:00:00
To: 9:00:00

One Hour Peak
From: 8:00:00
To: 9:00:00

Municipality: Pelham
Site #: 0000000006
Intersection: Welland Rd & Cream St
TFR File #: 6
Count date: 6-Jun-2017

Weather conditions:
Cloudy/Wet

Person(s) who counted:
Cam

**** Non-Signalized Intersection ****

Major Road: Welland Rd runs W/E

North Leg Total: 20
North Entering: 11
North Peds: 0
Peds Cross: ⋈

Heavys	1	1	2
Trucks	0	0	0
Cars	5	4	9
Totals	6	5	

Heavys	1
Trucks	0
Cars	8
Totals	9

East Leg Total: 112
East Entering: 57
East Peds: 0
Peds Cross: ⧗

Cream St

Heavys	Trucks	Cars	Totals
3	0	56	59

Cars	Trucks	Heavys	Totals
4	0	0	4
51	0	2	53
55	0	2	

Welland Rd

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Heavys	Trucks	Cars	Totals
1	0	4	5
7	1	42	50
8	1	46	

Welland Rd

Cars	Trucks	Heavys	Totals
46	1	8	55

Peds Cross: ⧗
West Peds: 0
West Entering: 55
West Leg Total: 114

Comments

Cream St @ Welland Rd

Mid-day Peak Diagram

Specified Period
From: 11:00:00
To: 14:00:00

One Hour Peak
From: 11:15:00
To: 12:15:00

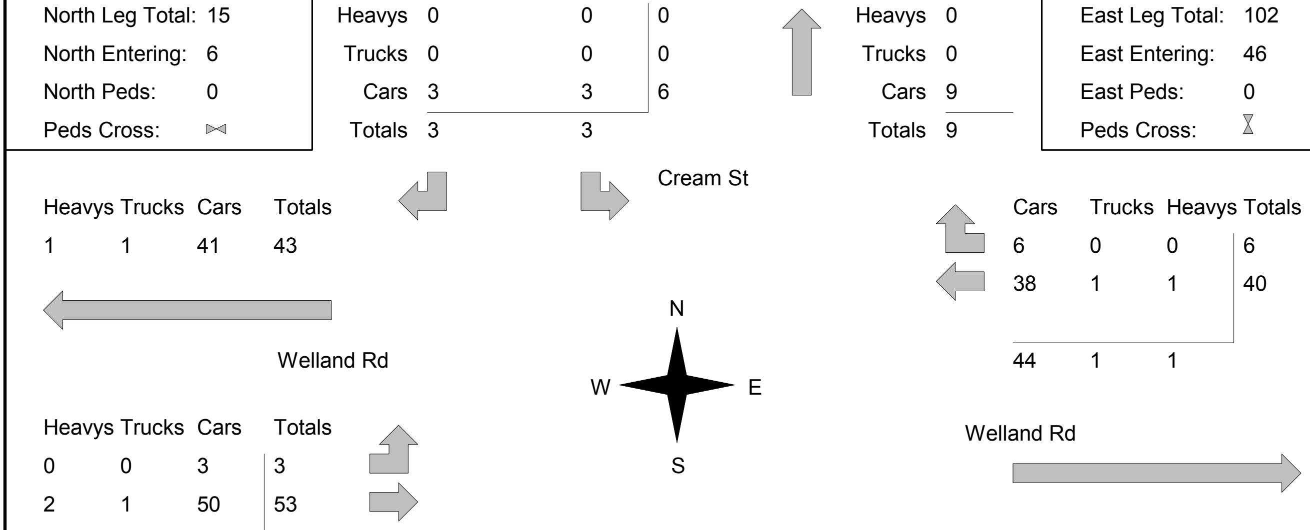
Municipality: Pelham
Site #: 0000000006
Intersection: Welland Rd & Cream St
TFR File #: 6
Count date: 6-Jun-2017

Weather conditions:
Cloudy/Wet

Person(s) who counted:
Cam

**** Non-Signalized Intersection ****

Major Road: Welland Rd runs W/E



North Leg Total: 15
North Entering: 6
North Peds: 0
Peds Cross: ⋈

Heavys	0	0	0
Trucks	0	0	0
Cars	3	3	6
Totals	3	3	

Heavys	0
Trucks	0
Cars	9
Totals	9

East Leg Total: 102
East Entering: 46
East Peds: 0
Peds Cross: ⧗

Heavys	Trucks	Cars	Totals
1	1	41	43

Cars	Trucks	Heavys	Totals
6	0	0	6
38	1	1	40
44	1	1	

Heavys	Trucks	Cars	Totals
0	0	3	3
2	1	50	53
2	1	53	

Cars	Trucks	Heavys	Totals
53	1	2	56

Peds Cross: ⧗
West Peds: 0
West Entering: 56
West Leg Total: 99

Comments

Cream St @ Welland Rd

Afternoon Peak Diagram

Specified Period
From: 15:00:00
To: 18:00:00

One Hour Peak
From: 16:15:00
To: 17:15:00

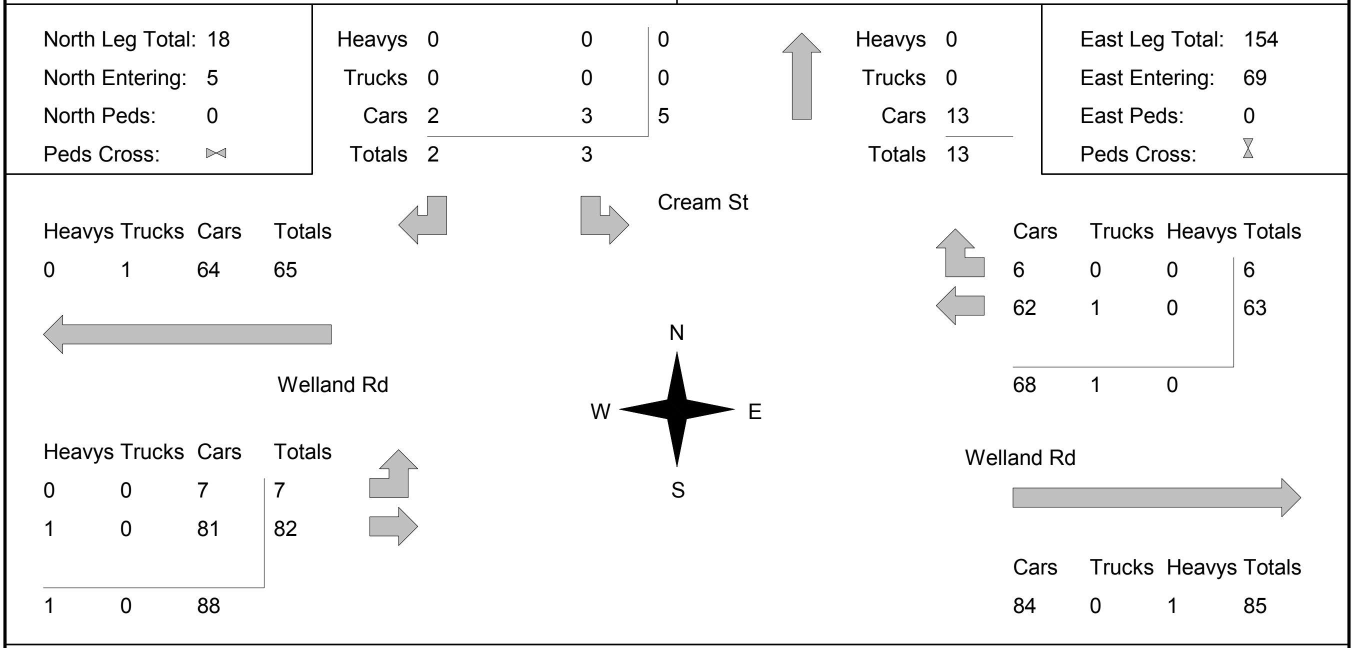
Municipality: Pelham
Site #: 0000000006
Intersection: Welland Rd & Cream St
TFR File #: 6
Count date: 6-Jun-2017

Weather conditions:
Cloudy/Wet

Person(s) who counted:
Cam

**** Non-Signalized Intersection ****

Major Road: Welland Rd runs W/E



North Leg Total: 18
North Entering: 5
North Peds: 0
Peds Cross: ⋈

Heavys	0	0	0
Trucks	0	0	0
Cars	2	3	5
Totals	2	3	

Heavys	0
Trucks	0
Cars	13
Totals	13

East Leg Total: 154
East Entering: 69
East Peds: 0
Peds Cross: ⧗

Heavys	Trucks	Cars	Totals
0	1	64	65

Cars	Trucks	Heavys	Totals
6	0	0	6
62	1	0	63
68	1	0	

Heavys	Trucks	Cars	Totals
0	0	7	7
1	0	81	82
1	0	88	

Cars	Trucks	Heavys	Totals
84	0	1	85

Peds Cross: ⧗
West Peds: 0
West Entering: 89
West Leg Total: 154

Comments

Cream St @ Welland Rd

Total Count Diagram

Municipality: Pelham
Site #: 0000000006
Intersection: Welland Rd & Cream St
TFR File #: 6
Count date: 6-Jun-2017

Weather conditions:
Cloudy/Wet

Person(s) who counted:
Cam

**** Non-Signalized Intersection ****

Major Road: Welland Rd runs W/E

North Leg Total: 134
North Entering: 64
North Peds: 0
Peds Cross: ⋈

Heavys	2	3	5
Trucks	0	0	0
Cars	22	37	59
Totals	24	40	
	↲	↳	

↑	Heavys	6
	Trucks	1
	Cars	63
	Totals	70

East Leg Total: 903
East Entering: 425
East Peds: 1
Peds Cross: ⧗

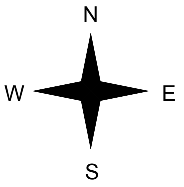
Cream St

Heavys	Trucks	Cars	Totals
14	3	396	413

←

Welland Rd

	Cars	Trucks	Heavys	Totals
↰	34	1	1	36
←	374	3	12	389
	408	4	13	



Heavys	Trucks	Cars	Totals	
5	0	29	34	↱
14	4	420	438	→
19	4	449		

Welland Rd

→

Cars	Trucks	Heavys	Totals
457	4	17	478

Peds Cross: ⧗
West Peds: 0
West Entering: 472
West Leg Total: 885

Comments

Prepared For: Town of Pelham
Prepared By: *PYRAMID* Traffic Inc.
Location: Canboro Rd, Centre St to Effingham St
Start Date: Tuesday May 31, 2016

Site ID: 14
Interval: 15 min.

Period Ending	Channel 1 EB	Channel 2 WB	Hourly Summary
0:15	4	2	
0:30	0	1	
0:45	0	2	
1:00	1	0	10
1:15	0	2	6
1:30	0	0	5
1:45	0	0	3
2:00	1	1	4
2:15	1	0	3
2:30	0	0	3
2:45	1	0	4
3:00	2	0	4
3:15	0	0	3
3:30	0	0	3
3:45	0	0	2
4:00	0	0	0
4:15	0	0	0
4:30	0	0	0
4:45	2	2	4
5:00	0	2	6
5:15	1	1	8
5:30	0	0	8
5:45	1	2	7
6:00	6	5	16
6:15	2	1	17
6:30	6	2	25
6:45	16	2	40
7:00	10	7	46
7:15	9	9	61
7:30	10	10	73
7:45	25	9	89
8:00	24	19	115
8:15	24	17	138
8:30	18	21	157
8:45	21	16	160
9:00	32	22	171
9:15	29	12	171
9:30	20	19	171
9:45	21	22	177
10:00	21	15	159
10:15	11	15	144
10:30	26	14	145
10:45	23	13	138
11:00	20	12	134
11:15	20	23	151
11:30	23	20	154
11:45	13	16	147
12:00	28	12	155
12:15	10	17	139
12:30	19	21	136
12:45	24	22	153
13:00	32	18	163
13:15	26	21	183
13:30	22	16	181
13:45	15	18	168
14:00	19	15	152
14:15	18	19	142
14:30	20	17	141
14:45	28	15	151
15:00	24	20	161
15:15	22	16	162
15:30	27	21	173
15:45	21	23	174
16:00	26	20	176
16:15	17	32	187
16:30	25	23	187
16:45	21	18	182
17:00	34	21	191
17:15	21	25	188
17:30	24	33	197
17:45	20	33	211
18:00	20	27	203
18:15	16	23	196
18:30	18	24	181
18:45	17	14	159
19:00	14	25	151
19:15	13	24	149
19:30	15	14	136
19:45	15	15	135
20:00	13	21	130
20:15	17	16	126
20:30	24	14	135
20:45	7	17	129
21:00	22	11	128
21:15	9	13	117
21:30	4	12	95
21:45	12	9	92
22:00	3	11	73
22:15	5	3	59
22:30	2	4	49
22:45	3	3	34
23:00	2	6	28
23:15	3	3	26
23:30	5	1	26
23:45	1	0	21
0:00	1	0	14

AM Peak: 177

PM Peak: 211

24 HR VOLUME: 2390

Prepared For: Town of Pelham
Prepared By: *PYRAMID* Traffic Inc.
Location: Canboro Rd, Balfour St to Cream St
Start Date: Tuesday May 31, 2016

Site ID: 13
Interval: 15 min.

Period Ending	Channel 1 EB	Channel 2 WB	Hourly Summary
0:15	1	3	
0:30	0	0	
0:45	1	1	
1:00	1	0	7
1:15	0	1	4
1:30	0	0	4
1:45	1	0	3
2:00	0	0	2
2:15	0	0	1
2:30	0	0	1
2:45	0	0	0
3:00	2	0	2
3:15	0	0	2
3:30	0	0	2
3:45	0	0	2
4:00	0	0	0
4:15	0	0	0
4:30	0	0	0
4:45	1	0	1
5:00	1	1	3
5:15	0	0	3
5:30	0	0	3
5:45	1	1	4
6:00	3	5	10
6:15	2	2	14
6:30	7	2	23
6:45	8	3	32
7:00	5	4	33
7:15	3	5	37
7:30	10	6	44
7:45	16	9	58
8:00	15	18	82
8:15	15	9	98
8:30	13	6	101
8:45	17	15	108
9:00	17	20	112
9:15	16	7	111
9:30	19	9	120
9:45	19	20	127
10:00	14	13	117
10:15	15	11	120
10:30	15	9	116
10:45	14	7	98
11:00	10	7	88
11:15	14	15	91
11:30	14	7	88
11:45	11	13	91
12:00	16	8	98

Period Ending	Channel 1 EB	Channel 2 WB	Hourly Summary
12:15	8	12	89
12:30	15	21	104
12:45	18	18	116
13:00	17	11	120
13:15	16	12	128
13:30	20	13	125
13:45	8	15	112
14:00	13	14	111
14:15	16	13	112
14:30	16	13	108
14:45	19	8	112
15:00	20	15	120
15:15	16	13	120
15:30	24	13	128
15:45	30	15	146
16:00	20	19	150
16:15	8	21	150
16:30	23	16	152
16:45	19	10	136
17:00	17	14	128
17:15	11	15	125
17:30	15	19	120
17:45	15	24	130
18:00	8	13	120
18:15	12	16	122
18:30	17	14	119
18:45	11	9	100
19:00	12	11	102
19:15	9	21	104
19:30	11	10	94
19:45	9	12	95
20:00	12	14	98
20:15	8	7	83
20:30	20	11	93
20:45	8	7	87
21:00	19	10	90
21:15	6	7	88
21:30	4	9	70
21:45	10	3	68
22:00	2	6	47
22:15	3	3	40
22:30	4	3	34
22:45	1	0	22
23:00	2	2	18
23:15	0	1	13
23:30	1	0	7
23:45	2	0	8
0:00	0	0	4

AM Peak: 127

PM Peak: 152

24 HR VOLUME: 1662

Prepared For: Town of Pelham
Prepared By: *PYRAMID* Traffic Inc.
Location: Welland Rd, Balfour St to Canboro Rd
Start Date: Tuesday May 31, 2016

Site ID: 12
Interval: 15 min.

Period Ending	Channel 1 EB	Channel 2 WB	Hourly Summary
0:15	0	1	
0:30	0	1	
0:45	0	0	
1:00	3	0	5
1:15	0	0	4
1:30	0	0	3
1:45	0	1	4
2:00	0	1	2
2:15	0	1	3
2:30	1	0	4
2:45	0	0	3
3:00	0	0	2
3:15	0	0	1
3:30	0	0	0
3:45	0	1	1
4:00	0	1	2
4:15	0	0	2
4:30	0	0	2
4:45	0	1	2
5:00	2	1	4
5:15	0	1	5
5:30	0	1	6
5:45	0	2	7
6:00	0	3	7
6:15	2	4	12
6:30	3	2	16
6:45	4	4	22
7:00	4	10	33
7:15	5	5	37
7:30	7	7	46
7:45	7	7	52
8:00	6	11	55
8:15	13	13	71
8:30	9	9	75
8:45	10	10	81
9:00	14	9	87
9:15	11	7	79
9:30	8	12	81
9:45	6	9	76
10:00	9	12	74
10:15	7	9	72
10:30	8	4	64
10:45	4	6	59
11:00	5	9	52
11:15	8	2	46
11:30	9	6	49
11:45	9	7	55
12:00	8	7	56

Period Ending	Channel 1 EB	Channel 2 WB	Hourly Summary
12:15	9	2	57
12:30	9	9	60
12:45	6	13	63
13:00	9	6	63
13:15	10	9	71
13:30	7	8	68
13:45	8	8	65
14:00	5	9	64
14:15	5	6	56
14:30	11	12	64
14:45	11	8	67
15:00	7	6	66
15:15	15	11	81
15:30	9	9	76
15:45	14	11	82
16:00	5	16	90
16:15	10	6	80
16:30	14	16	92
16:45	12	8	87
17:00	12	8	86
17:15	13	11	94
17:30	15	12	91
17:45	15	19	105
18:00	18	19	122
18:15	13	23	134
18:30	12	12	131
18:45	8	14	119
19:00	8	1	91
19:15	16	9	80
19:30	10	15	81
19:45	8	9	76
20:00	7	9	83
20:15	13	7	78
20:30	26	5	84
20:45	8	11	86
21:00	6	8	84
21:15	7	9	80
21:30	4	11	64
21:45	6	7	58
22:00	4	3	51
22:15	4	2	41
22:30	3	8	37
22:45	2	2	28
23:00	2	0	23
23:15	1	4	22
23:30	0	2	13
23:45	0	2	11
0:00	2	1	12

AM Peak: 87

PM Peak: 134

24 HR VOLUME: 1214

Prepared For: Town of Pelham
Prepared By: *PYRAMID* Traffic Inc.
Location: Welland Rd, Centre St to Cream St
Start Date: Tuesday May 31, 2016

Site ID: 11
Interval: 15 min.

Period Ending	Channel 1 EB	Channel 2 WB	Hourly Summary	Period Ending	Channel 1 EB	Channel 2 WB	Hourly Summary
0:15	0	2		12:15	11	9	86
0:30	0	1		12:30	10	9	84
0:45	0	0		12:45	12	21	96
1:00	2	0	5	13:00	8	11	91
1:15	0	0	3	13:15	8	12	91
1:30	0	0	2	13:30	12	11	95
1:45	0	0	2	13:45	15	9	86
2:00	0	0	0	14:00	14	11	92
2:15	0	1	1	14:15	7	9	88
2:30	0	0	1	14:30	16	11	92
2:45	0	0	1	14:45	15	11	94
3:00	0	0	1	15:00	11	11	91
3:15	0	0	0	15:15	23	14	112
3:30	0	0	0	15:30	12	9	106
3:45	0	1	1	15:45	13	19	112
4:00	1	0	2	16:00	12	12	114
4:15	1	0	3	16:15	16	10	103
4:30	0	0	3	16:30	16	10	108
4:45	1	0	3	16:45	11	8	95
5:00	1	0	3	17:00	16	14	101
5:15	1	0	3	17:15	20	10	105
5:30	1	0	4	17:30	17	22	118
5:45	2	1	6	17:45	15	16	130
6:00	0	4	9	18:00	29	17	146
6:15	1	3	12	18:15	20	27	163
6:30	3	5	19	18:30	13	14	151
6:45	11	0	27	18:45	12	15	147
7:00	5	11	39	19:00	13	8	122
7:15	8	6	49	19:15	13	8	96
7:30	9	8	58	19:30	14	6	89
7:45	11	10	68	19:45	10	15	87
8:00	10	7	69	20:00	7	8	81
8:15	19	15	89	20:15	11	14	85
8:30	19	5	96	20:30	31	6	102
8:45	13	8	96	20:45	9	12	98
9:00	23	9	111	21:00	5	13	101
9:15	15	7	99	21:15	12	13	101
9:30	10	9	94	21:30	6	13	83
9:45	11	13	97	21:45	7	8	77
10:00	11	4	80	22:00	2	2	63
10:15	8	10	76	22:15	4	3	45
10:30	11	5	73	22:30	4	10	40
10:45	7	7	63	22:45	2	6	33
11:00	10	6	64	23:00	3	3	35
11:15	11	12	69	23:15	0	2	30
11:30	14	7	74	23:30	0	6	22
11:45	17	4	81	23:45	2	1	17
12:00	14	10	89	0:00	1	0	12

AM Peak: 111
PM Peak: 163
24 HR VOLUME: 1521

Appendix B – Synchro Reports

HCM 2010 AWSC
9: Balfour Street & Canboro Road

6/13/2017

Intersection	
Intersection Delay, s/veh	7.9
Intersection LOS	A

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Lane Configurations			✥				✥				✥	
Traffic Vol, veh/h	0	23	84	6	0	5	61	14	0	9	32	13
Future Vol, veh/h	0	23	84	6	0	5	61	14	0	9	32	13
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	0	1	17	2	0	2	0	2	11	13	8
Mvmt Flow	0	25	91	7	0	5	66	15	0	10	35	14
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	1
HCM Control Delay	8	7.7	7.9
HCM LOS	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	17%	20%	6%	40%
Vol Thru, %	59%	74%	76%	40%
Vol Right, %	24%	5%	17%	21%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	54	113	80	58
LT Vol	9	23	5	23
Through Vol	32	84	61	23
RT Vol	13	6	14	12
Lane Flow Rate	59	123	87	63
Geometry Grp	1	1	1	1
Degree of Util (X)	0.074	0.146	0.102	0.077
Departure Headway (Hd)	4.512	4.293	4.22	4.388
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	796	840	852	819
Service Time	2.526	2.293	2.231	2.401
HCM Lane V/C Ratio	0.074	0.146	0.102	0.077
HCM Control Delay	7.9	8	7.7	7.8
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.2	0.5	0.3	0.2

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Movement	SBU	SBL	SBT	SBR
Lane Configurations			✥	
Traffic Vol, veh/h	0	23	23	12
Future Vol, veh/h	0	23	23	12
Peak Hour Factor	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	0	4	25
Mvmt Flow	0	25	25	13
Number of Lanes	0	0	1	0

Approach	SB
Opposing Approach	NB
Opposing Lanes	1
Conflicting Approach Left	WB
Conflicting Lanes Left	1
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	7.8
HCM LOS	A

Intersection	
Intersection Delay, s/veh	7.9
Intersection LOS	A

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Lane Configurations			✥				✥				✥	
Traffic Vol, veh/h	0	2	128	5	0	3	70	1	0	1	4	12
Future Vol, veh/h	0	2	128	5	0	3	70	1	0	1	4	12
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	0	2	0	2	33	1	0	2	0	50	8
Mvmt Flow	0	2	139	5	0	3	76	1	0	1	4	13
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	1
HCM Control Delay	7.8	8.2	7.1
HCM LOS	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	6%	1%	4%	14%
Vol Thru, %	24%	95%	95%	71%
Vol Right, %	71%	4%	1%	14%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	17	135	74	7
LT Vol	1	2	3	1
Through Vol	4	128	70	5
RT Vol	12	5	1	1
Lane Flow Rate	18	147	80	8
Geometry Grp	1	1	1	1
Degree of Util (X)	0.021	0.162	0.103	0.009
Departure Headway (Hd)	4.003	3.986	4.616	4.37
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	900	897	774	824
Service Time	2.003	2.026	2.658	2.371
HCM Lane V/C Ratio	0.02	0.164	0.103	0.01
HCM Control Delay	7.1	7.8	8.2	7.4
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.1	0.6	0.3	0

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Movement	SBU	SBL	SBT	SBR
Lane Configurations			✥	
Traffic Vol, veh/h	0	1	5	1
Future Vol, veh/h	0	1	5	1
Peak Hour Factor	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	0	0	0
Mvmt Flow	0	1	5	1
Number of Lanes	0	0	1	0

Approach	SB
Opposing Approach	NB
Opposing Lanes	1
Conflicting Approach Left	WB
Conflicting Lanes Left	1
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	7.4
HCM LOS	A

Intersection	
Int Delay, s/veh	2.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Traffic Vol, veh/h	4	5	3	4	7	16	0	103	17	5	38	0
Future Vol, veh/h	4	5	3	4	7	16	0	103	17	5	38	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	50	0	0	25	0	13	0	7	6	0	6	0
Mvmt Flow	4	5	3	4	8	17	0	112	18	5	41	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	186	182	41	178	173	121	41	0	0	130	0	0
Stage 1	52	52	-	121	121	-	-	-	-	-	-	-
Stage 2	134	130	-	57	52	-	-	-	-	-	-	-
Critical Hdwy	7.6	6.5	6.2	7.35	6.5	6.33	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.6	5.5	-	6.35	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.6	5.5	-	6.35	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.95	4	3.3	3.725	4	3.417	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	680	716	1036	736	724	901	1581	-	-	1468	-	-
Stage 1	852	856	-	831	800	-	-	-	-	-	-	-
Stage 2	767	792	-	900	856	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	660	714	1036	728	722	901	1581	-	-	1468	-	-
Mov Cap-2 Maneuver	660	714	-	728	722	-	-	-	-	-	-	-
Stage 1	852	853	-	831	800	-	-	-	-	-	-	-
Stage 2	745	792	-	889	853	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.9	9.6	0	0.9
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1581	-	-	752	819	1468	-	-
HCM Lane V/C Ratio	-	-	-	0.017	0.036	0.004	-	-
HCM Control Delay (s)	0	-	-	9.9	9.6	7.5	0	-
HCM Lane LOS	A	-	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.1	0	-	-

Intersection	
Int Delay, s/veh	3.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		⅄	
Traffic Vol, veh/h	19	30	36	16	26	8
Future Vol, veh/h	19	30	36	16	26	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	16	17	6	13	8	0
Mvmt Flow	21	33	39	17	28	9

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	57	0	-	0	122	48
Stage 1	-	-	-	-	48	-
Stage 2	-	-	-	-	74	-
Critical Hdwy	4.26	-	-	-	6.48	6.2
Critical Hdwy Stg 1	-	-	-	-	5.48	-
Critical Hdwy Stg 2	-	-	-	-	5.48	-
Follow-up Hdwy	2.344	-	-	-	3.572	3.3
Pot Cap-1 Maneuver	1462	-	-	-	859	1027
Stage 1	-	-	-	-	959	-
Stage 2	-	-	-	-	934	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1462	-	-	-	846	1027
Mov Cap-2 Maneuver	-	-	-	-	846	-
Stage 1	-	-	-	-	959	-
Stage 2	-	-	-	-	920	-

Approach	EB	WB	SB
HCM Control Delay, s	2.9	0	9.3
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1462	-	-	-	883
HCM Lane V/C Ratio	0.014	-	-	-	0.042
HCM Control Delay (s)	7.5	0	-	-	9.3
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Int Delay, s/veh	1.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱			↰	⇆	
Traffic Vol, veh/h	29	2	3	28	3	4
Future Vol, veh/h	29	2	3	28	3	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	11	33	25
Mvmt Flow	32	2	3	30	3	4

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	34	0	70	33
Stage 1	-	-	-	-	33	-
Stage 2	-	-	-	-	37	-
Critical Hdwy	-	-	4.1	-	6.73	6.45
Critical Hdwy Stg 1	-	-	-	-	5.73	-
Critical Hdwy Stg 2	-	-	-	-	5.73	-
Follow-up Hdwy	-	-	2.2	-	3.797	3.525
Pot Cap-1 Maneuver	-	-	1591	-	863	978
Stage 1	-	-	-	-	915	-
Stage 2	-	-	-	-	911	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1591	-	861	978
Mov Cap-2 Maneuver	-	-	-	-	861	-
Stage 1	-	-	-	-	915	-
Stage 2	-	-	-	-	909	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.7	8.9
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	924	-	-	1591	-
HCM Lane V/C Ratio	0.008	-	-	0.002	-
HCM Control Delay (s)	8.9	-	-	7.3	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		⑂	
Traffic Vol, veh/h	5	50	53	4	5	6
Future Vol, veh/h	5	50	53	4	5	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	20	14	4	0	20	17
Mvmt Flow	5	54	58	4	5	7

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	62	0	-	0	125	60
Stage 1	-	-	-	-	60	-
Stage 2	-	-	-	-	65	-
Critical Hdwy	4.3	-	-	-	6.6	6.37
Critical Hdwy Stg 1	-	-	-	-	5.6	-
Critical Hdwy Stg 2	-	-	-	-	5.6	-
Follow-up Hdwy	2.38	-	-	-	3.68	3.453
Pot Cap-1 Maneuver	1434	-	-	-	829	965
Stage 1	-	-	-	-	919	-
Stage 2	-	-	-	-	914	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1434	-	-	-	826	965
Mov Cap-2 Maneuver	-	-	-	-	826	-
Stage 1	-	-	-	-	919	-
Stage 2	-	-	-	-	910	-

Approach	EB	WB	SB
HCM Control Delay, s	0.7	0	9.1
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1434	-	-	-	896
HCM Lane V/C Ratio	0.004	-	-	-	0.013
HCM Control Delay (s)	7.5	0	-	-	9.1
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

Intersection	
Intersection Delay, s/veh	8.2
Intersection LOS	A

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Lane Configurations			✥				✥				✥	
Traffic Vol, veh/h	0	24	85	10	0	12	74	13	0	13	19	8
Future Vol, veh/h	0	24	85	10	0	12	74	13	0	13	19	8
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	8	2	0	2	17	5	8	2	23	5	0
Mvmt Flow	0	26	92	11	0	13	80	14	0	14	21	9
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	1
HCM Control Delay	8.3	8.3	8.2
HCM LOS	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	33%	20%	12%	24%
Vol Thru, %	47%	71%	75%	43%
Vol Right, %	20%	8%	13%	32%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	40	119	99	74
LT Vol	13	24	12	18
Through Vol	19	85	74	32
RT Vol	8	10	13	24
Lane Flow Rate	43	129	108	80
Geometry Grp	1	1	1	1
Degree of Util (X)	0.059	0.16	0.137	0.102
Departure Headway (Hd)	4.884	4.447	4.576	4.547
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	735	808	786	790
Service Time	2.905	2.462	2.592	2.566
HCM Lane V/C Ratio	0.059	0.16	0.137	0.101
HCM Control Delay	8.2	8.3	8.3	8.1
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.2	0.6	0.5	0.3

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Movement	SBU	SBL	SBT	SBR
Lane Configurations			✣	
Traffic Vol, veh/h	0	18	32	24
Future Vol, veh/h	0	18	32	24
Peak Hour Factor	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	11	7	0
Mvmt Flow	0	20	35	26
Number of Lanes	0	0	1	0

Approach		SB
Opposing Approach		NB
Opposing Lanes		1
Conflicting Approach Left		WB
Conflicting Lanes Left		1
Conflicting Approach Right		EB
Conflicting Lanes Right		1
HCM Control Delay		8.1
HCM LOS		A

Intersection	
Intersection Delay, s/veh	7.7
Intersection LOS	A

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Lane Configurations			✥				✥				✥	
Traffic Vol, veh/h	0	0	92	6	0	11	119	2	0	5	3	7
Future Vol, veh/h	0	0	92	6	0	11	119	2	0	5	3	7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	0	1	0	2	0	1	0	2	0	0	0
Mvmt Flow	0	0	100	7	0	12	129	2	0	5	3	8
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	1
HCM Control Delay	7.6	7.8	7.3
HCM LOS	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	33%	0%	8%	0%
Vol Thru, %	20%	94%	90%	67%
Vol Right, %	47%	6%	2%	33%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	15	98	132	6
LT Vol	5	0	11	0
Through Vol	3	92	119	4
RT Vol	7	6	2	2
Lane Flow Rate	16	107	143	7
Geometry Grp	1	1	1	1
Degree of Util (X)	0.019	0.119	0.16	0.008
Departure Headway (Hd)	4.227	4.027	4.027	4.678
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	852	886	888	770
Service Time	2.227	2.068	2.061	2.678
HCM Lane V/C Ratio	0.019	0.121	0.161	0.009
HCM Control Delay	7.3	7.6	7.8	7.7
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.1	0.4	0.6	0

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Movement	SBU	SBL	SBT	SBR
Lane Configurations			✥	
Traffic Vol, veh/h	0	0	4	2
Future Vol, veh/h	0	0	4	2
Peak Hour Factor	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	0	25	0
Mvmt Flow	0	0	4	2
Number of Lanes	0	0	1	0

Approach	SB
Opposing Approach	NB
Opposing Lanes	1
Conflicting Approach Left	WB
Conflicting Lanes Left	1
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	7.7
HCM LOS	A

HCM 2010 TWSC
1: Balfour Street & Memorial Drive

6/13/2017

Intersection	
Int Delay, s/veh	2.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Vol, veh/h	2	3	5	7	5	8	5	47	6	7	84	1
Future Vol, veh/h	2	3	5	7	5	8	5	47	6	7	84	1
Conflicting Peds, #/hr	1	0	2	1	0	0	1	0	0	0	0	1
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0	0	4	0	0	5	0
Mvmt Flow	2	3	5	8	5	9	5	51	7	8	91	1

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	181	176	95	178	174	55	93	0	0	58	0	0
Stage 1	108	108	-	65	65	-	-	-	-	-	-	-
Stage 2	73	68	-	113	109	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	785	721	967	789	723	1018	1514	-	-	1559	-	-
Stage 1	902	810	-	951	845	-	-	-	-	-	-	-
Stage 2	942	842	-	897	809	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	768	715	964	776	717	1017	1511	-	-	1558	-	-
Mov Cap-2 Maneuver	768	715	-	776	717	-	-	-	-	-	-	-
Stage 1	898	805	-	948	842	-	-	-	-	-	-	-
Stage 2	924	839	-	882	804	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.4	9.4	0.6	0.6
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1511	-	-	834	838	1558	-	-
HCM Lane V/C Ratio	0.004	-	-	0.013	0.026	0.005	-	-
HCM Control Delay (s)	7.4	0	-	9.4	9.4	7.3	0	-
HCM Lane LOS	A	A	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0.1	0	-	-

Intersection	
Int Delay, s/veh	3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		Y	
Traffic Vol, veh/h	15	63	45	21	32	19
Future Vol, veh/h	15	63	45	21	32	19
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	7	0
Mvmt Flow	16	68	49	23	35	21

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	72	0	-	0	161	60
Stage 1	-	-	-	-	60	-
Stage 2	-	-	-	-	101	-
Critical Hdwy	4.1	-	-	-	6.47	6.2
Critical Hdwy Stg 1	-	-	-	-	5.47	-
Critical Hdwy Stg 2	-	-	-	-	5.47	-
Follow-up Hdwy	2.2	-	-	-	3.563	3.3
Pot Cap-1 Maneuver	1541	-	-	-	818	1011
Stage 1	-	-	-	-	950	-
Stage 2	-	-	-	-	911	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1541	-	-	-	809	1011
Mov Cap-2 Maneuver	-	-	-	-	809	-
Stage 1	-	-	-	-	950	-
Stage 2	-	-	-	-	901	-

Approach	EB	WB	SB
HCM Control Delay, s	1.4	0	9.4
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1541	-	-	-	874
HCM Lane V/C Ratio	0.011	-	-	-	0.063
HCM Control Delay (s)	7.4	0	-	-	9.4
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection	
Int Delay, s/veh	1.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱			↰	Y	
Traffic Vol, veh/h	13	4	4	32	3	4
Future Vol, veh/h	13	4	4	32	3	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	25	0	0	0	25
Mvmt Flow	14	4	4	35	3	4

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	18	0	59	16
Stage 1	-	-	-	-	16	-
Stage 2	-	-	-	-	43	-
Critical Hdwy	-	-	4.1	-	7.1	6.45
Critical Hdwy Stg 1	-	-	-	-	6.1	-
Critical Hdwy Stg 2	-	-	-	-	6.1	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.525
Pot Cap-1 Maneuver	-	-	1612	-	942	1000
Stage 1	-	-	-	-	1009	-
Stage 2	-	-	-	-	976	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1612	-	940	1000
Mov Cap-2 Maneuver	-	-	-	-	940	-
Stage 1	-	-	-	-	1009	-
Stage 2	-	-	-	-	973	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.8	8.7
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	973	-	-	1612	-
HCM Lane V/C Ratio	0.008	-	-	0.003	-
HCM Control Delay (s)	8.7	-	-	7.2	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

8: Welland Road & Cream Street

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		⋎	
Traffic Vol, veh/h	7	82	63	6	3	2
Future Vol, veh/h	7	82	63	6	3	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	1	0	0	0	0
Mvmt Flow	8	89	68	7	3	2

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	75	0	-	0	176	72
Stage 1	-	-	-	-	72	-
Stage 2	-	-	-	-	104	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1537	-	-	-	818	996
Stage 1	-	-	-	-	956	-
Stage 2	-	-	-	-	925	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1537	-	-	-	814	996
Mov Cap-2 Maneuver	-	-	-	-	814	-
Stage 1	-	-	-	-	956	-
Stage 2	-	-	-	-	920	-

Approach	EB	WB	SB
HCM Control Delay, s	0.6	0	9.1
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1537	-	-	-	878
HCM Lane V/C Ratio	0.005	-	-	-	0.006
HCM Control Delay (s)	7.4	0	-	-	9.1
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

PART 5

AE: MUNICIPAL SERVICING EXISTING CONDITIONS REPORT

REPORT

SGL Planning and Design Inc.

East Fenwick Secondary Plan
Municipal Servicing
Existing Conditions Report

January 2018

Table of Contents

1 Introduction

The Town of Pelham identified the development of a Secondary Plan as a priority to provide for detailed land use planning policies for a mix of uses including policies that address infrastructure requirements, and natural and cultural heritage considerations. The Secondary Plan will guide future growth and development for the study area in East Fenwick. This report reviews background information and provides capacity analysis for existing water, sanitary, and storm sewer servicing in the study area. This analysis is used to provide general recommendations for municipal water, sanitary, and storm servicing requirements.

1.1 STUDY AREA

The Study Area includes that area within the urban area boundary of Fenwick that is bounded by Memorial Drive to the north, Balfour Street to the west, land on the south side of Welland Road to a depth of approximately 120 m to the south and Cream Street to the east and comprises approximately 95 ha (Figure 1-1). Canboro Road bisects through the Study Area and is identified as an arterial road; Welland Road along the south boundary is considered a collector road, with all other streets considered local roads.

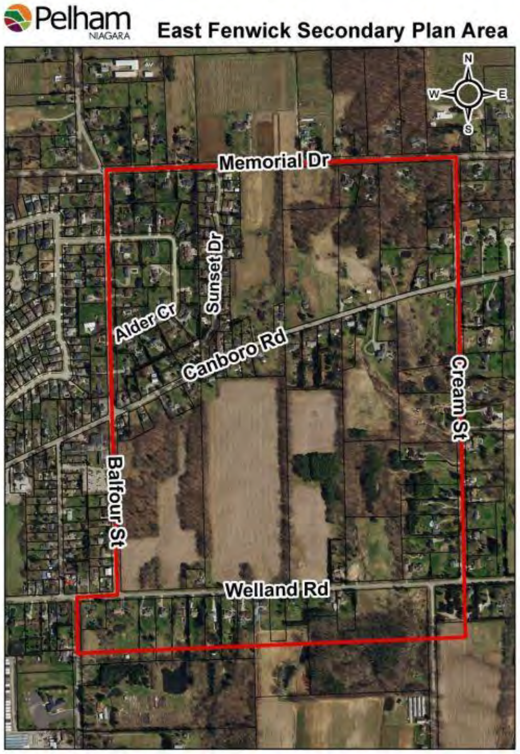


Figure 1-1: East Fenwick Secondary Plan Study Area

The lands are designated Urban Living Area/Built Boundary with most of the area identified within the Greenfield Overlay and a portion of the area designated Environmental Protection Three in the Town Official Plan. The Official Plan also identifies provincially significant wetlands, woodlands and deer wintering area within the Study Area. Also, the Study Area is included within an area designated as being part of a highly vulnerable aquifer.

The Region of Niagara Official Plan also identifies a significant portion of the Secondary Plan area as a designated greenfield area with the remainder as built up along with environmental protection and environmental conservation areas relating to provincially significant wetlands and significant woodlands. The intensification target for the Town is 15% within the built-up area.

The existing land uses are primarily residential and agricultural. Currently, there are limited municipal services available in the Secondary Plan area with a Regional watermain along Canboro Road and local water mains along a portion of Balfour Street, Alder Crescent and Sunrise Drive, and local sanitary sewer services along a portion of Balfour Street and Canboro Roads. There are no Regional Roads within the Secondary Plan area, however Canboro Road and Welland Road are identified as part of the Regional Bicycle network.

2 Background Information

2.1 SOURCES

Table 2-1 provides a list of sources used to aid the analysis of existing water, wastewater, and stormwater servicing.

2.2 DATA GAPS

Data gaps are presented in Table 2-2, which summarizes missing, relevant information that would provide a clearer picture of the existing and future needs of the systems in future steps of this process (i.e.: confirmation of criteria to be used in future pre-design of systems). The Table contains a description of the key considerations, along with the potential impacts on the servicing strategies and future planning. These are things that would be good to have going forward, to help prepare meaningful alternatives in the next phase.

Assessments of each system would be benefited from the collection of detailed population / housing density, to provide better servicing estimates. The water distribution system was well represented in the existing model and no further information is required to define the system at this time, unless new information becomes available. The current sanitary model is skeletonized; there are no local sewer conduits in the model. Therefore, assessment of the sanitary system would be benefited from the collection of local sanitary sewer information for all sanitary sewer pipes and connections. In addition, there was conflicting information from various sources related to the existing in-ground sanitary infrastructure including, most notably, discrepancies in pipe diameters. These discrepancies arose between the 2004 and 2007/2008 versions of the sewerage capacity calculations by Upper Canada Consultants and the current sanitary hydraulic model. These discrepancies were addressed by performing two separate analyses. One, resolving the discrepancies between the 2004 and 2007/2008 calculation sheets; and another analysis which updates these calculations using parameters from the hydraulic model. The hydraulic model was considered to be a more current and accurate representation of the existing sanitary conditions however, as-built drawings would be useful to resolve these discrepancies and confirm the properties of the existing sanitary system.

Table 2-1: Water, Sanitary, and Storm Data and Sources

System	Description	File Type(s)	Author(s)
All	Conceptual Tertiary Plan of East Fenwick Secondary Plan Area 2010	PDF	Upper Canada Consultants
	Elevation Contours	DWG	NPCA
	Niagara Region GIS Data	GIS	Niagara Region
	2016 Water and Wastewater Master Servicing Plan Update, May 2017	PDF	GM Blue Plan
Water	2016 Water and Wastewater Master Servicing Plan Update Hydraulic Model for City of Welland, May 2017	PDF	GM Blue Plan
	Welland Water Model (part of the Niagara Region Water Model for the 2017 Niagara Region Master Servicing Plan), 2017	InfoWater	
Wastewater	Niagara Region Hydraulic Wastewater Model	InfoSWMM SA	
	Fenwick East Secondary Plan existing and future sanitary servicing east and west of Balfour Street	PDF	Upper Canada Consultants
	Sewerage calculations for existing and future upgrade conditions, 2004	PDF	Upper Canada Consultants
	Sewerage calculations for existing and future upgrade conditions, 2007/2008	PDF	Upper Canada Consultants
	Sewage flow calculations at Foss Rd. Pumping station (January 2005 – December 2006)	PDF	Upper Canada Consultants
	Fenwick Sewer System GIS	GIS	Town of Pelham
	On-site sewage evaluation, 678 Canboro Road, Fenwick, Ontario	PDF	AMEC
	The Town of Pelham, Sanitary Sewer Inflow and Infiltration Study	PDF	GM Blue Plan
Storm	Stormwater Management Plan, The Woodlands, 2008	PDF	Town of Pelham
	Municipal Engineering Design Criteria and Standard Drawings, 2016		

	Drainage Management Manual, 1997	PDF	MTO Drainage & Hydrology Section
	Stormwater Management Planning and Design Manual, March 2003	PDF	MOE
	City of Welland Municipal Standards, February 2012	PDF	City of Welland
	Volume Control Targets for Ontario – Final Report, October 2016	PDF	Aquafor Beech for MOECC
	Advancing Low Impact Development as a Smart Solution for Stormwater Management – Version 3.0 – Monitoring Data 2011 to 2015	PDF	Credit Valley Conservation Authority

Table 2-2: Data Gaps

System	Data Gaps	Justification
All	Population / housing density	To provide better servicing estimates (demands / use)
	Housing and properties layout / new development plan	To provide better servicing estimates (spatial context)
	Field investigations	To provide context and identify additional on-site conditions
Water	None	
Sanitary	As-built drawings	To confirm properties of the local sanitary system (conduit length, diameters, slopes, etc.)
	All-pipes hydraulic model	To determine if local conduits have conveyance capacity, to confirm which properties are connected to sewer mains (which are connected to local sanitary and which are on septic), and to help visualize the entire sanitary system

System	Data Gaps	Justification
	Foss Road Pumping Station pump curves and station info	To provide a better estimate of pumping capacities at Foss Road PS and determine potential alternatives for station upgrades
Storm	As-builts drawings	To confirm existing culvert properties (length, diameters, slopes, material, etc.)
	Detailed topographic survey	To confirm elevations, including watershed and structures (i.e. culverts)
	NPCA Defined Environmental Protection Zones	To confirm NPCA requirements for treatment

3 Water

A schematic of the extent of existing water services in the study area is present in Figure 3-1. For the purposes of this analysis, the Region's 2016 Hydraulic Model created in InfoWater for the Water and Wastewater Master Servicing Update was used. It was assumed that this model was calibrated and the information it contains is accurate. No quality control checks were conducted and no changes were made to the existing model.

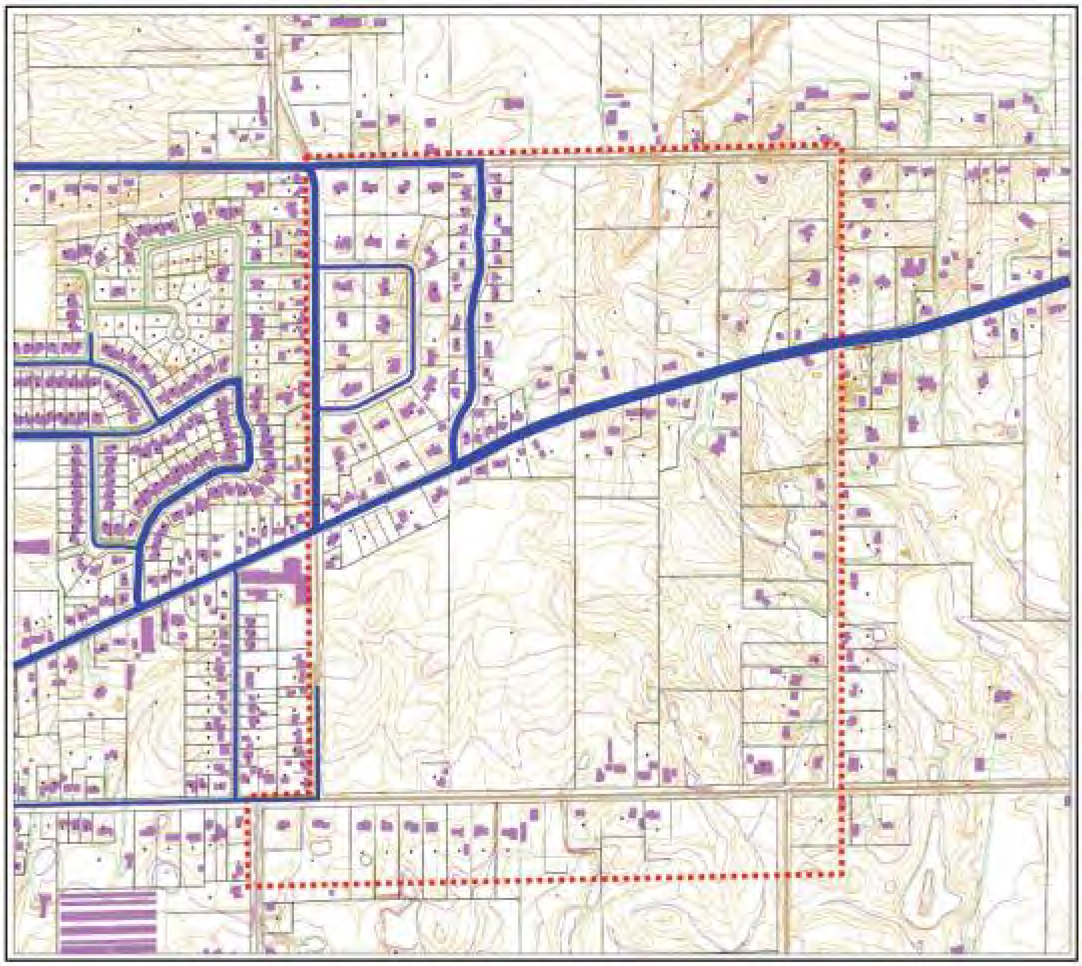


Figure 3-1: Schematic of water distribution servicing in East Fenwick study area

3.1 DESIGN CRITERIA

The design criteria used for the analysis of the existing system and its capacities include:

- Preferred Residual System Pressure: 50 psi to 70 psi
- Allowable Residual System Pressure: 40 psi to 100 psi
- Fireflow Requirements at MDD with 20 psi residual for zones within the study area (in the absence of fireflow requirements in the Town of Fenwick we have used the City of Welland requirements for our assessment):
  - Open Space: 67.7 L/s
  - Residential (single family): 67.7 L/s
  - Residential (multi-family): 133.3 L/s
- Demand patterns for average day demand (ADD) and maximum day demand (MDD) based on 2014 SCADA data
- Pipe C-Factors for pipes within and surrounding the study area:
  - PVC: 140
  - AC: 110

3.2 EXISTING CONDITIONS

Currently, the area surrounding the proposed development is pipe fed from the Pelham Elevated Storage Tank which is supplied by the Welland Water Treatment Plant. A 300 mm diameter Regional trunk watermain flows west along Canboro Road. A Pressure Reducing Valve (PRV) is located on Canboro Road at Sunset Drive, which is set to 53 psi. Within the study area, there are two local watermains that are connected to the Regional trunk main. The first main is a 200 mm diameter watermain along Sunset Drive, and the second is a 200 mm diameter watermain along Balfour Street, north of Canboro Road. There is a 150 mm diameter main that is fed from Balfour Drive along Alder Crescent. A 200mm diameter main connects Sunset Drive and Balfour Street along Memorial Drive. To the south of Canboro Road, there is a 150 mm diameter main along Balfour Street that is connected to Welland Road but is not connected to the trunk main on Canboro Road. All other properties within the study area along Welland Road, Cream Street, and Memorial Drive are assumed to be on wells or cisterns. The existing system configuration with pipe diameters can be found below in Figure 3-2.

Figure 3-2: Existing Configuration of Watermains in Study Area

The existing model provided for this analysis had current (2016) ADD and MDD scenarios set up based on the 2014 SCADA data. Both of these scenarios were run to determine the existing system pressures. The pressures within the study area are adequate during both ADD and MDD, as shown below in Figure 3-3 and Figure 3-4, respectively. As stated in the design criteria, the allowable residual system pressure is between 40 psi and 100 psi, with the preferable residual system pressure being between 50 psi and 70 psi. Pressure along Canboro Road, although still within the allowable pressure range, are above the preferable pressure range. As mentioned above, a PRV is located on Canboro Road at Sunset Drive to reduce pressures from above 80 psi to 53 psi, which is within the preferable pressure range.

Figure 3-3: 2016 ADD Junction Pressures

Figure 3-4: 2016 MDD Junction Pressures

A fireflow scenario was run using the MDD demand set. In the given model, the required fireflow controls at each node was set to 75 L/s, which is slightly higher than the City of Welland's 67.7 L/s fireflow requirement for single family and multi-density housing zones. During a MDD +FF scenario, the system pressures must be at or above 20 psi during fireflow. Figure 3-5 shows which nodes will remain at or above 20 psi in the event of a fire, and the available flow at each of the nodes. As shown in the figures, the majority of the nodes provide adequate pressure and flow. There are a minimum number of nodes unable to provide adequate fireflow and these nodes are located at deadends of 150 mm diameter mains. In order for these nodes to provide adequate flow, the main to the nodes would need to be a larger diameter or looped.

Figure 3-5: Fireflow Availability

3.3 CAPACITY ASSESSMENT

To determine if there is capacity available with the proposed development, the conceptual layout, population and demands from the Conceptual Tertiary Plan, which was part of the East Fenwick Secondary Plan Area created by Upper Canada Consultants in August 2010 was used. This conceptual plan is shown in Figure 3-6.

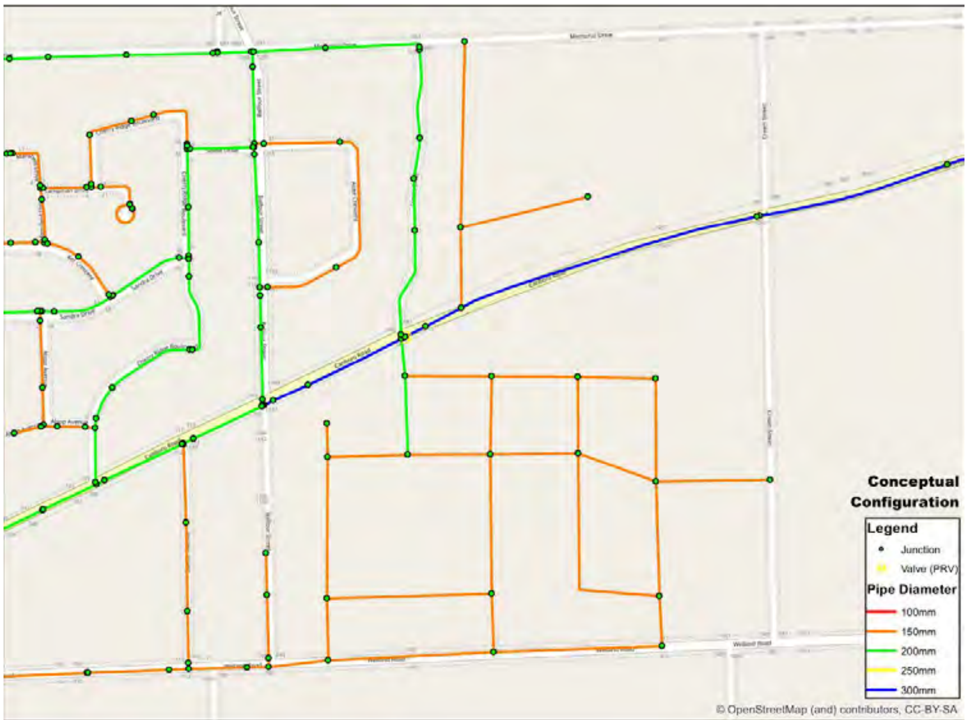


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Figure 3-6: Conceptual Configuration of Watermains in Study Area

Child scenarios of the existing ADD and MDD scenarios were created and the conceptual development was added using the existing ground elevations for the nodes. These child scenarios were run to determine the available pressures within the new development area. As shown in Figure 3-7 and Figure 3-8, pressure in the proposed development are all within the allowable pressure range. Pressures in the development area to the north of Canboro Road, although within the allowable pressure range, are above the preferred pressure range. This is due to the fact that the connection is shown prior to the PRV where system pressures are above 80 psi. When designing the local watermain, all connections to the trunk main on Canboro Road must consider the PRV. Discussions should be had with the Region, during the detailed design stage, regarding moving the PRV further upstream, or the addition of PRV(s) at the connections for new local municipal mains.

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Figure 3-7: Conceptual 2016 ADD Junction Pressures

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Figure 3-8: Conceptual 2016 MDD Junction Pressures

A fireflow analysis was run using the MDD child scenario. All nodes within the development area were assigned fireflow requirements of 67.7 L/s, which is the City of Welland's standard for open space and residential (single family) zoned lands. Results from this analysis are shown below in Figure 3-9. As shown in the figure, nodes at the end of the mains provide less flow and pressure. To remediate this issue, mains should be looped. Increasing pipe size is also an option; however, that could increase the occurrence of water quality issues as it would increase the age of the water in the pipes. As seen in the figure below, and as expected, fireflow in the are would be limited to an approximate maximum of 93 L/s which is sufficient for single family homes (67.7 L/s fireflow) but may not be sufficient for multi-family housing depending on the construction of the housing (i.e.; City of Welland fireflow requirement for multi-family housing zoning is 133.3 l/s).

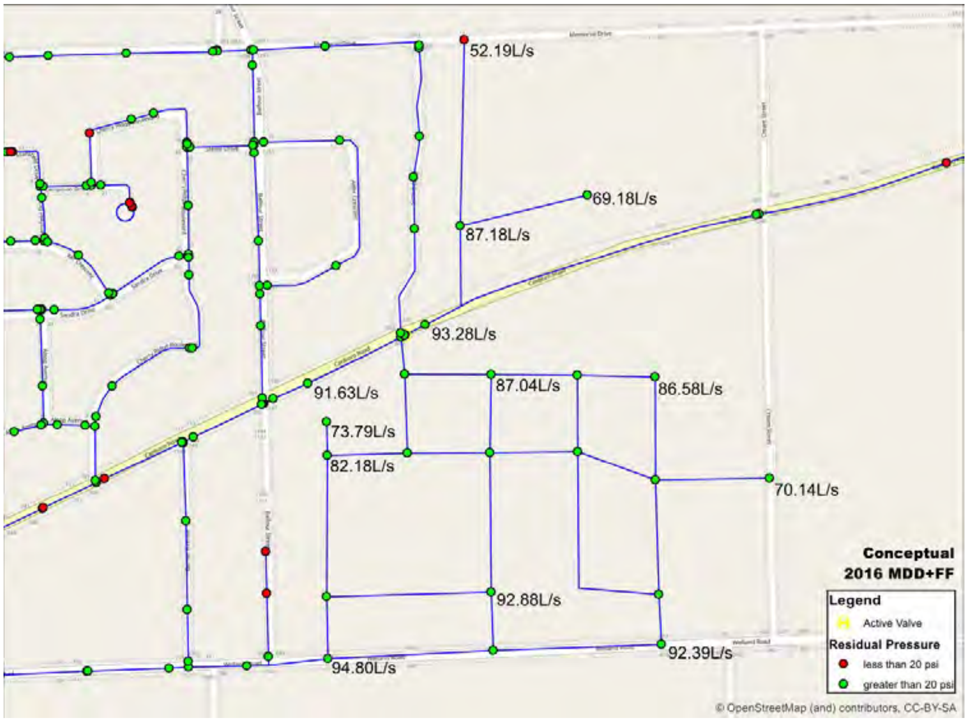

Figure 3-9: Conceptual 2016 MDD+FF

It should be noted that the current Region MSP recommended capital projects for upgrades to the Shoalt's Drive pumping stations and to the Pelham Elevated Tank. Detailed design of these upgrades should consider their effect on fireflow availability to the Fenwick area.

4 Sanitary

Based on a review of existing information, the Fenwick wastewater system is comprised of:

- Over 8 km of local and regional gravity mains

- Foss Road Pumping Station (2 pumps)
- Forcemain along Foss Road to gravity sewers on South Pelham Road
- Contributing catchment area of approximately 134 ha
- All Fenwick flows ultimately treated at Welland WWTP

A schematic of the existing sanitary servicing within the East Fenwick study area is provided in Figure 4-1.

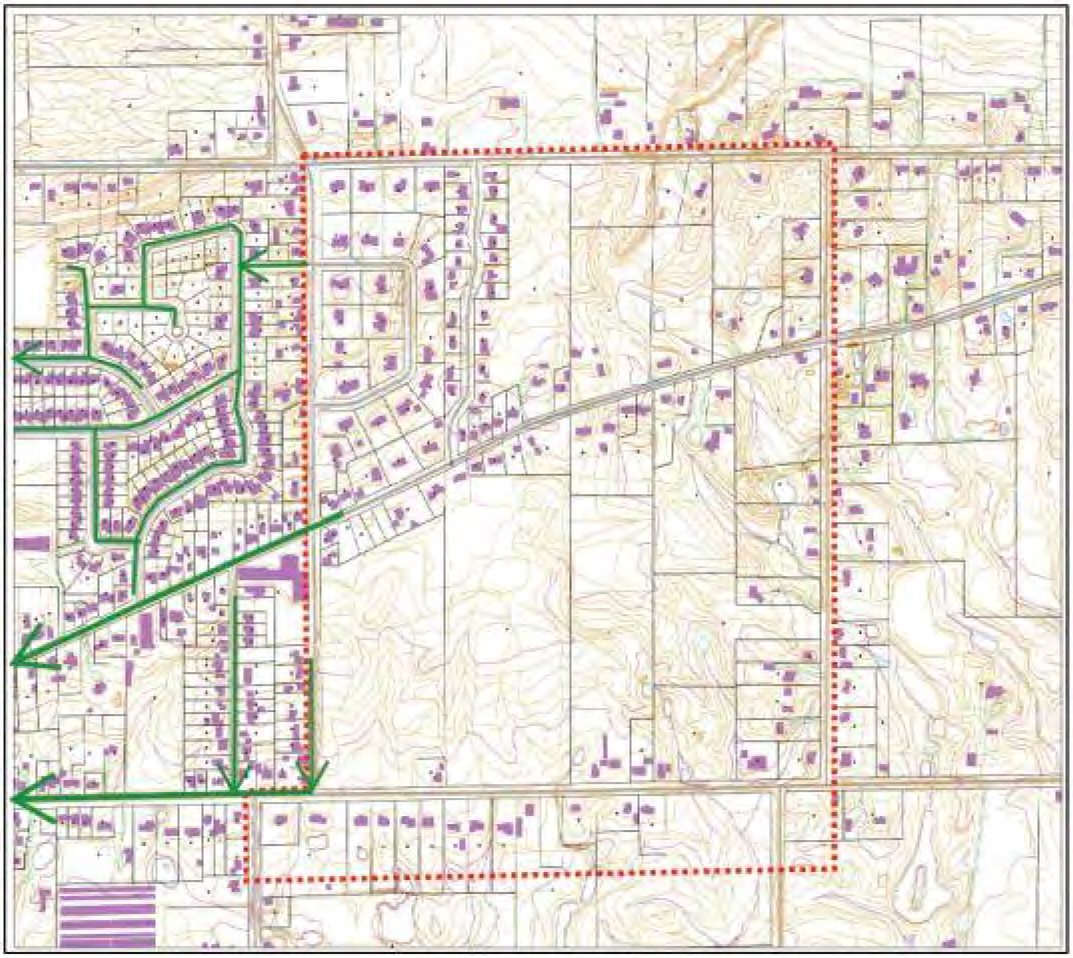

Figure 4-1: Schematic of existing sanitary services in East Fenwick area

For the purposes of this analysis, the Region's 2016 Hydraulic Sanitary InfoSWMM model was used to assess wastewater collection system capacities. It was assumed that this hydraulic model was calibrated and that the information contained therein was up-to-date and accurate. No quality control checks were conducted on the model and no changes to the existing model were made.

4.1 EXISTING CONDITIONS

The existing sanitary system services a portion of Fenwick, which does not extend to all homes within the urban boundary of Fenwick. Currently, there are no sanitary sewers on Alder Crescent and Sunset Drive; the properties along these roads are currently serviced by septic systems only.

The existing sanitary hydraulic model does not explicitly consider local mains or laterals (Figure 4-2). The model includes two pumps at Foss Rd. pumping station, with pumping rates of 26.64 L/s and 13.32 L/s, respectively (total capacity of the pumping station is 39.96 L/s).

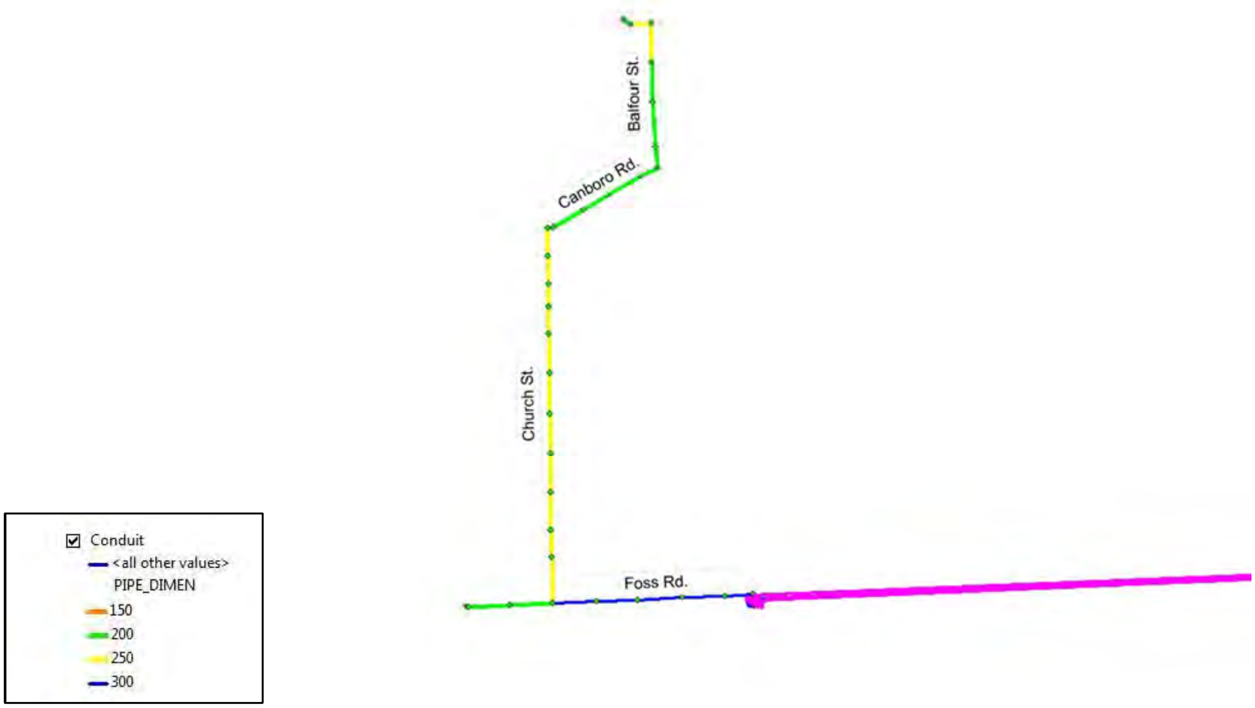

Figure 4-2: Niagara Region Existing Hydraulic Model for Sanitary Servicing in Fenwick

4.2 DESIGN CRITERIA

The existing sanitary system services only a portion of Fenwick. Without additional information pertaining to the local and lateral connections, it was not possible to determine exactly which properties were connected to the existing sanitary system, and which ones were on septic or other systems. Therefore, sanitary loadings used in the capacity assessment were assumed to be the same as those used in the analysis completed by Upper Canada Consultants. In addition, the following criteria were considered:

- Extraneous flows = 0.286 L/s/ha (from Master Servicing Plan)

- Roughness coefficients = 0.013 (as per City of Welland Municipal Standards)
- Residential per capita flow rate = 320 L/cap/day (average daily usage for North America; from Upper Canada Consultants Analysis)
- Peaking factors = various (from Upper Canada Consultants Analysis)

It may be important to note that a Sanitary Sewer Inflow and Infiltration Study was completed by GM BluePlan in 2017, which concluded that "the Pelham system does not exhibit a measurable response to rainfall events, meaning that for the relatively short duration rainfall events that were observed, the system does not exhibit measurable I/I." However, the same report acknowledged that the analysis was somewhat limited due to unseasonably dry conditions during the flow monitoring period. Thus, a value of 0.286 L/s/ha was used in estimating extraneous flows for sanitary capacity assessment, which is the suggested I/I rate for future planning as taken from the Niagara Region's current Master Servicing Plan.

4.3 CAPACITY ASSESSMENT

A spreadsheet capacity assessment was completed for the existing Fenwick sanitary collection system (Appendix A). Those pipes with sufficient capacity to transmit existing peak sanitary flows are indicated by a rating of "OK" and those pipes with insufficient capacity to transmit flows are indicated by "OOPS". As can be seen in the capacity analysis, most of the existing sanitary system has insufficient capacity to transmit existing peak sanitary flows. In addition, the pumps at Foss Road SPS will require an upgrade to increase pumping capacity at the station. The Niagara Region's MSP has identified (at a high level) that peak flows at Foss Road SPS will exceed current capacities by 2041. As such, the MSP identified a capital project to upgrade the station and forcemain, anticipated during the timeframe of 2022 - 2031. Note that if the proposed development were to proceed prior to 2022, it may likely trigger the need for an upgrade sooner.

5 Storm

5.1 EXISTING CONDITIONS

The existing topography of the East Fenwick Secondary Plan Area is that of gentle rolling hills, natural drainage in a southerly direction, interspersed with country residential homes and pasture land (Figure 5-1). A significant portion of the Plan Area is designated as environmental conservation area (approximately 16.4 ha). The total developable area is approximately 56.7 ha. This 56.7 ha of developed land will be used as the basis of the stormwater analysis.

Based on the design criteria that the post development peak runoff rate will be controlled to the design pre-development runoff rate, the more conservative value between the existing culvert capacities and the 5-year predevelopment peak flow rate will be used for the pre-development condition.

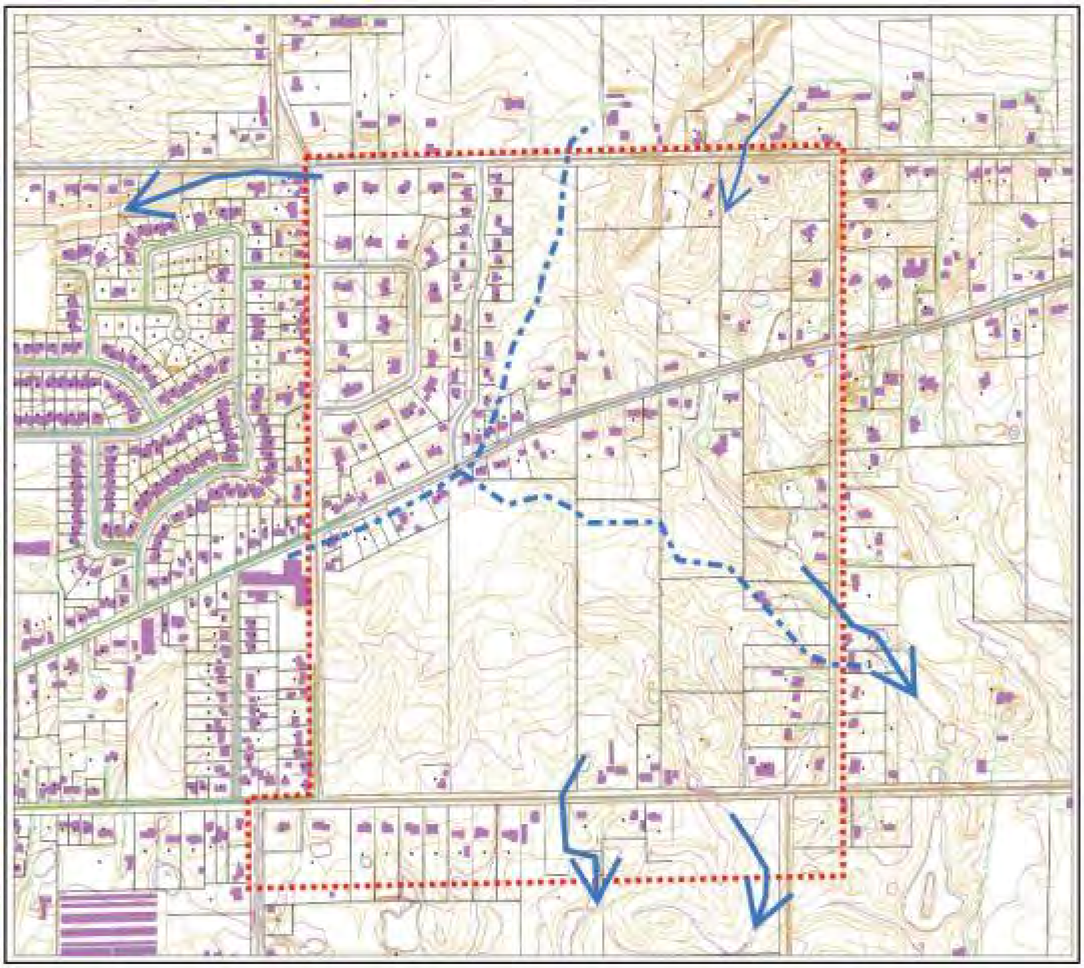

Figure 5-1: Schematic of stormwater drainage paths in the East Fenwick study area (red dotted line delineates study area boundary; blue dash-dot line delineates the approximate drainage areas; arrows indicate approximate drainage paths)

5.2 DESIGN CRITERIA

The design criteria that will be used for the stormwater analysis are the following, based on Town of Pelham Engineering Design Criteria, City of Welland Municipal Standards, MOECC Guidelines, MTO Drainage Management Manual:

- Where applicable, the Rational Method may be used for stormwater system design;
- The design storm hyetographs used for the storm system design are the 5 and 100-year rainfall events based on the City of Welland rainfall data;

- For water quality management, the 25 mm rainfall event based on the City of Welland rainfall data will be used for stormwater pond sizing, based on MOECC guidelines.
- The use of Low Impact Development techniques will be encouraged and explored in the design.
- The receiving water course (Dishers Municipal Drain – Coyle Creek) is classified as a warm water fishery and an important fish habitat by the Ministry of Natural Resources (MNR). Therefore, erosion protection controls are considered necessary.

The following table of IDF curves were used in the analysis:

Table 5-1
IDF Curves for the City of Welland

Return Period (Yrs.)	a	b	c
5	830	0.777	7.3
100	1020	0.731	4.7

5.3 PRELIMINARY STORMWATER ASSESSMENT

5.3.1 Predevelopment Condition

There are several existing drainage paths that convey runoff in a north to south direction through the site area. Several existing culverts cross two roads, Canboro Road and Welland Road to aid the conveyance of runoff downstream; see Figure 5-2 for the existing site plan. The subcatchments draining to the culverts were analyzed for the pre-development condition using the Rational Method. See the Appendix B for detailed calculations. The design parameters and flow results are provided in Table 5-2.

There are two large culverts (1200 diameter) that cross Cream Street between Canboro Road and Welland Road. These culverts were not included as part of the analysis as the existing peak flows for both culverts will not be affected by the development. The 12.93 ha subcatchment leading to one of these large culverts is part of the site area, but is mostly deemed environmental conservation area and so little, if any, development is expected to occur in this area. Furthermore, post-development subcatchments will take the sensitive areas into account at the detailed design stage. The existing culvert analysis is therefore summarized in Table 5-3.

The design pre-development flow rate for each subcatchment will be the culvert's capacity when the culvert capacity is smaller than the 5-year peak flow rate. Alternatively, where the culvert exceeds the 5-year pre-development flow rate, then the subcatchment flow rate will be used as the design pre-development flow. Each subcatchment's design pre-development flow rates are therefore as presented in Table 5-4:

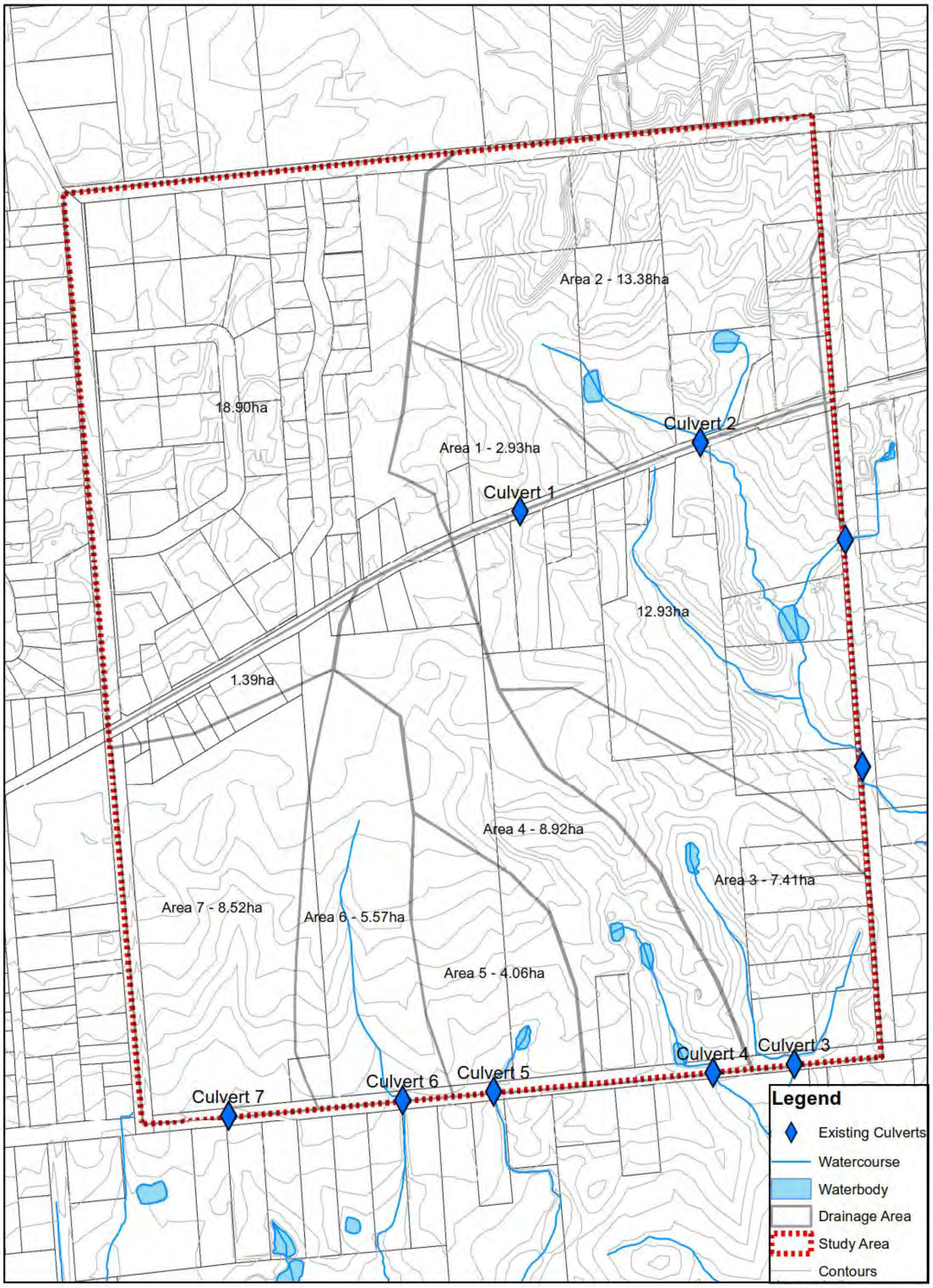

Figure 5-2: Existing Storm Site Plan

Table 5-2: Subcatchment Design Parameters

Subcatchment	Area (ha)	Slope (%)	Runoff Coefficient	5-yr Flow (m^3/s)	100-yr Flow (m^3/s)
1	2.93	3.0	0.25	0.151	0.235
2	13.38	3.5	0.25	0.588	0.905
3	7.4	3.1	0.25	0.307	0.472
4	8.9	2.4	0.25	0.317	0.486
5	4.06	2.5	0.25	0.191	0.295
6	5.57	2.6	0.25	0.222	0.341
7	8.52	2.4	0.25	0.340	0.522

1. Time of concentration was calculated using the Federal Aviation Administration (FAA) method.

Table 5-3: Culvert Design Parameters

Culvert	Material	Size (mm)[1]	Catchment Area (ha)	Slope (%)[2]	Capacity (m^3/s)	Meets 5-yr Flow?
1	CSP	375	2.93	3.0	0.21	Yes
2	CSP	450	13.38	3.5	0.32	No
3	CSP	600	7.4	3.1	0.58	Yes
4	CSP	450	8.9	2.4	0.27	No
5	CSP	375	4.06	2.5	0.16	No
6	CSP	400	5.57	2.6	0.20	No
7	CSP	400	8.52	2.4	0.19	No

1. Size to be confirmed in detailed design.
2. Culvert slope was assumed to be the same as the catchment slope.
3. Inlet control was assumed for all culverts, as downstream slope was adequate and no immediate pons or storage were directly downstream from the culverts.

Table 5-4: Design Pre-Development Flow Rates

Subcatchment	Pre-Development Flow Rate (m^3/s)
1	0.151
2	0.32
3	0.307
4	0.27
5	0.16
6	0.20
7	0.19

5.3.2 Stormwater Management Facilities (SWMF)

Due to the numerous environmentally sensitive areas in the site area as well as downstream of the site, thorough consideration of the location of the stormwater management facilities must be taken. Combining sub-catchments to make one large SWMF may not be beneficial to the downstream wetland as it disrupts the natural flow regime to the wetlands. Niagara Peninsula Conservation Authority (NPCA) approvals may be required where runoff is proposed to be directed to other subcatchments.

The two subcatchments above Canboro Road can and would likely be combined to a single outlet that will cross Canboro Road at Culvert 2. Catchments 1 and 2 are fairly small and both lead to the same environmental protection area. This will need approval from the NPCA, but is expected to be allowed. The SWMF is proposed to be located adjacent to Culvert 2. This will allow the peak runoff north of Canboro Road to be controlled to the predevelopment rate before crossing Canboro Road.

Due to the rolling topography along Welland Road, along with environmental conservation/protection area considerations, two SWMFs may be likely along the north side of Welland Road. The two SWMFs will likely be located directly upstream of Culverts 4 and 6.

The SWMFs would be sized to detain the 100 year design storm, and release at the predevelopment flow rate. The control for the SWMF will likely be orifices installed on the outlet pipe within a manhole, for ease of maintenance.

5.3.3 Source Control Practices: Opportunities

The construction of roads, buildings, paved walkways and parking lots results in increased runoff from developed areas. Additional runoff and higher peak flows can increase erosion in streams that are connected to developed catchments. Thus, increasing the runoff rate and volume can negatively impact the natural drainage paths. The drainage paths in the East Fenwick Secondary Plan Area have been developed by erosion of natural waterways over a number of years. Erosion can be accelerated by development if proper control measures aren't in place. Regardless of peak flow rate, an increase in annual runoff volume is likely for new developments that use conventional end-of-pipe stormwater management practices. Runoff volumes and peaks can be reduced by promoting infiltration as far upstream in the catchment as possible.

Source control practices are measures to reduce the amount of runoff from a development at the lot level. Reducing runoff to an acceptable level has many benefits such as aquafer recharge, maintaining watershed biodiversity, reduced sizing of stormwater management facilities. Low Impact Development (LID) is a broad term describing the various techniques that can be used to promote infiltration higher up in the watershed.

The transition from conventional end-of-pipe to source control stormwater management approaches is one that is supported by the Ministry of Environment and Climate Change (MOECC). In October 2016, the Runoff Volume Control Targets for Ontario was published. This report gives guidance to the target percentage of annual rainfall that should be kept and infiltrated into the catchment. Based on this report, the runoff volume control target for Ontario is the 90th percentile of the total annual rainfall seen at the site. Or rather, only 10% of the total annual rainfall should be release downstream from the development. In addition to this report, a guiding document for LIDs is also being developed by MOECC and is currently in draft.

The implementation of LIDs in developments such as the East Fenwick Secondary Plan Area can effectively reduce the size of stormwater ponds required for the development, thus allowing developers to use the land typically reserved for stormwater management facility as for more lots. Using LIDs for urban settings can reduce stormwater runoff by up to 50% in comparison to conventional end-of-pipe stormwater management, and thus decrease the stormwater volumes required for developed sites (CVCA 2015).

6 Conclusions

The following conclusions from the water, sanitary, and storm servicing capacity assessments are as follows:

Water:

- Adequate pressure available throughout study area
- Adequate fireflow availability throughout study area for single family homes. Availability for multi-family homes will require analysis using the Fire Underwriters Survey, taking into account fire separations and firewalls in proposed structures.
- There is adequate capacity to supply customer demand for the new development
- May consider moving the PRV east to the intersection of Canboro Road and Cream Street
    - Would require discussion with the Region

- When designing main sizes, minimize the size as much as possible, while still allowing for adequate pressure and fireflow, to reduce the age of the water in the pipes, which in turn will increase the water quality
- When designing the system, minimize the dead-end mains and use loops where possible, which will increase water quality and fireflow availability

Sanitary:

- Insufficient capacity under existing conditions
- Inflow to Foss Road SPS is currently equal to the maximum pumping capacity. No reserve capacity is available.
- Capacity downstream of the Foss Road PS forcemain outlet is insufficient
- Entire sanitary system requires evaluation in order to meet current – and future – sanitary loads

Storm:

The following recommendations have been provided to aid in the detailed design of the Plan Area:

- Two (or three) stormwater management facilities (ponds) will be required to adequately address the drainage for the East Fenwick Secondary Plan area.
- The crossing culverts over Canboro and Welland provide the basis for the pre-development condition where their capacity is less than the peak flow rate from the 5-year storm.

Appendix A – Fenwick Existing Sanitary Sewer Capacity Assessment

SANITARY SEWER DESIGN SHEET

Date: 25-Sep-17
Design By: AP
Checked By:

Project: Sanitary Sewer Servicing
Location: Fenwick East

Roughness Coefficient (n) = 0.013
Residential Per Capita Flow Rate = 0.0037037 L/cap/s (320 L/cap/day)
Commercial Flows = 0 L/s/ha (10000 L/ha/day)
Industrial Sewage Flows = 0 L/s/ha (20000 L/ha/day)
Institutional Flows = 0 L/s/ha (20000 L/ha/day)
Infiltration Rate= 0.286 L/s/ha

Location						**RESIDENTIAL AREA AND POPULATION**								**C+I+I**		**INFILTRATION**			**TOTALS**		**SEWER DESIGN**										
Description	MANHOLE		Invert Elevns		Length	AREA	POP.		CUMULATIVE		AVG. DAILY FLOW	PEAKING FACTOR	PEAK FLOW (NO INFIL.)	AVG. FLOW	PEAK FLOW	TOTAL AREA	ACCU. AREA	INFILT. FLOW	AVG. FLOW	PEAK FLOW	PIPE SIZE	SLOPE	Act. Dia.	PIPE AREA	HYD. RAD.	FULL FLOW VELOCITY	FULL FLOW CAPACITY	PERCENT FULL	CAPACITY CHECK	Available Capacity	Comparison UCC vs. Model Results
			U/S	D/S					AREA	POP. Served																					
STREET	FROM	TO			m	(ha)	(per ha)	(ppl)	(ha)	(ppl)	(l/s)	Upper Can	(l/s)	(l/s)	(l/s)	(ha)	(ha)	(l/s)	(l/s)	(l/s)	(mm)	(%)	(mm)	(m^2)	(m)	(m/s)	(L/s)	(%)		(L/s)	(L/s)
BALFOUR-A1	A	B				0.23	26.1	6	0.23	6	0.02	4.50	0.10	0.00	0.00	0.23	0.23	0.07	0.1	0.2	200	1.00	203.2	0.032	0.051	1.06	**34.2**	**0.5**	**OK**	34.05	0.05
FENWICK APART-A2	APRTS	B				0.89	258.4	230	0.89	230	0.85	4.50	3.83	0.00	0.00	0.89	0.89	0.25	1.1	4.1	150	1.00	152.4	0.018	0.038	0.87	**15.9**	**25.7**	**OK**	11.80	0.19
BALFOUR STREET - A3	B	C				0.50	18.0	9	1.62	245	0.91	4.50	4.08	0.00	0.00	0.50	1.62	0.46	1.4	4.5	200	1.20	203.2	0.032	0.051	1.16	**37.5**	**12.1**	**OK**	32.94	0.35
BALFOUR STREET - A4	C	31				0.51	23.5	12	2.13	257	0.95	4.50	4.28	0.00	0.00	0.51	2.13	0.61	1.6	4.9	200	1.20	203.2	0.032	0.051	1.16	**37.5**	**13.1**	**OK**	32.59	0.46
WELLAND ROAD - A22	31	21				25.32	12.1	306	27.45	563	2.09	4.50	9.39	0.00	0.00	25.32	27.45	7.85	9.9	17.2	200	0.30	203.2	0.032	0.051	0.58	**18.7**	**92.0**	**OK**	1.50	5.93
CANBORO ROAD - A37-A47	48	37				44.11	21.3	940	44.11	940	3.48	4.50	15.66	0.00	0.00	44.11	44.11	12.62	16.1	28.3											
MAPLE STREET - A50	51	50				1.96	10.7	21	1.96	21	0.08	4.50	0.35	0.00	0.00	1.96	1.96	0.56	0.6	0.9											
MAPLE STREET - A49	50	49				2.28	17.1	39	4.24	60	0.22	4.50	1.00	0.00	0.00	2.28	4.24	1.21	1.4	2.2											
MAPLE STREET - A48	49	37				0.92	14.1	13	5.16	73	0.27	4.50	1.22	0.00	0.00	0.92	5.16	1.48	1.7	2.7											
CANBORO ROAD - A21	37	21	193.14	192.33	95.70	0.51	19.0	10	49.78	1022	3.79	4.50	17.04	0.00	0.00	0.51	49.78	14.24	18.0	31.3											
CANBORO ROAD	21	17	191.82	190.97	15.40		0.0	0	77.23	1586	5.87	4.50	26.42	0.00	0.00	0.00	77.23	22.09	28.0	48.5	200	5.52	203.2	0.032	0.051	2.48	**80.4**	**60.3**	**OK**	31.87	12.81
ST ANNES SCHOOL								60		60	0.22	4.50	1.00	0.00	0.00	0.00	0.00	0.00	0.2	1.0											
CANBORO ROAD - A17	20	17				8.85	7.3	65	8.85	125	0.46	4.50	2.08	0.00	0.00	8.85	8.85	2.53	3.0	4.6											
		@ 17							86.08	1710	6.33																				
CHURCH STREET - A16	17	16	190.92	190.42	76.90	0.71	14.1	10	86.79	1720	6.37	4.49	28.60	0.00	0.00	0.71	86.79	24.82	31.2	53.4	250	0.65	254.0	0.051	0.064	0.99	**50.0**	**106.8**	**OOPS**	-3.40	18.35
CHURCH STREET - A15	16	15	190.40	189.89	75.20	2.07	10.1	21	88.86	1741	6.45	4.48	28.89	0.00	0.00	2.07	88.86	25.41	31.9	54.3	250	0.68	254.0	0.051	0.064	1.01	**51.1**	**106.3**	**OOPS**	-3.21	19.64
CHURCH STREET - A14	15	14	189.89	188.99	64.30	1.68	10.7	18	90.54	1759	6.51	4.47	29.12	0.00	0.00	1.68	90.54	25.89	32.4	55.0	250	1.40	254.0	0.051	0.064	1.45	**73.4**	**75.0**	**OK**	18.38	19.56
CHURCH STREET - A13	14	13	188.98	187.96	73.40	1.99	7.5	15	92.53	1774	6.57	4.47	29.37	0.00	0.00	1.99	92.53	26.46	33.0	55.8	250	1.39	254.0	0.051	0.064	1.44	**73.1**	**76.3**	**OK**	17.30	19.73
CHURCH STREET - A12	13	12	187.94	187.66	106.00	3.00	9.0	27	95.53	1801	6.67	4.45	29.68	0.00	0.00	3.00	95.53	27.32	34.0	57.0	250	0.26	254.0	0.051	0.064	0.63	**31.9**	**178.8**	**OOPS**	-25.12	40.19
CHURCH STREET - A11	12	11	187.58	187.25	110.80	3.11	9.0	28	98.64	1829	6.77	4.44	30.08	0.00	0.00	3.11	98.64	28.21	35.0	58.3	250	0.30	254.0	0.051	0.064	0.67	**33.9**	**172.2**	**OOPS**	-24.43	42.70
CHURCH STREET - A10	11	10	187.20	186.92	110.90	2.92	7.2	21	101.56	1850	6.85	4.43	30.35	0.00	0.00	2.92	101.56	29.05	35.9	59.4	250	0.25	254.0	0.051	0.064	0.62	**31.2**	**190.5**	**OOPS**	-28.23	41.21
CHURCH STREET - A9	10	9	186.91	185.70	106.70	3.32	4.5	15	104.88	1865	6.91	4.42	30.53	0.00	0.00	3.32	104.88	30.00	36.9	60.5	250	1.13	254.0	0.051	0.064	1.30	**66.1**	**91.6**	**OK**	5.54	21.95
CHURCH STREET - A8	9	8	185.68	184.50	102.70	3.10	8.7	27	107.98	1892	7.01	4.41	30.90	0.00	0.00	3.10	107.98	30.88	37.9	61.8	250	1.15	254.0	0.051	0.064	1.31	**66.5**	**92.9**	**OK**	4.72	23.35
CHURCH STREET - A7	8	7	184.48	183.89	74.50	2.98	9.1	27	110.96	1919	7.11	4.40	31.27	0.00	0.00	2.98	110.96	31.73	38.8	63.0	250	0.79	254.0	0.051	0.064	1.09	**55.2**	**114.1**	**OOPS**	-7.80	15.60
MARTHA CT - A7a		7A				1.93	10.9	21	1.93	21	0.08	4.50	0.35	0.00	0.00	1.93	1.93	0.55	0.6	0.9	200	0.50	203.2	0.032	0.051	0.75	**24.2**	**3.7**	**OK**	23.29	0.42
MARTHA CT - A7b	7A	7B				0.93	29.0	27	2.86	48	0.18	4.50	0.80	0.00	0.00	0.93	2.86	0.82	1.0	1.6	200	0.50	203.2	0.032	0.051	0.75	**24.2**	**6.7**	**OK**	22.58	0.62
MARTHA CT - A7c	7B	7				0.77	27.3	21	3.63	69	0.26	4.50	1.15	0.00	0.00	0.77	3.63	1.04	1.3	2.2	200	0.50	203.2	0.032	0.051	0.75	**24.2**	**9.0**	**OK**	22.01	0.78
CHURCH STREET - A7d	7	4	183.89	183.33	125.10	1.35	17.8	24	115.94	2012	7.45	4.35	32.42	0.00	0.00	1.35	115.94	33.16	40.6	65.6	250	0.45	254.0	0.051	0.064	0.82	**41.5**	**158.0**	**OOPS**	-24.07	65.34
																										0.00					
FOSS ROAD - A6	6	5	183.42	182.92	116.10	4.44	10.4	46	4.44	46	0.17	4.50	0.77	0.00	0.00	4.44	4.44	1.27	1.4	2.0	200	0.43	203.2	0.032	0.051	0.69	**22.5**	**9.1**	**OK**	20.42	19.19
FOSS ROAD - A5	5	4	182.91	182.41	116.30	1.03	20.4	21	5.47	67	0.25	4.50	1.12	0.00	0.00	1.03	5.47	1.56	1.8	2.7	200	0.43	203.2	0.032	0.051	0.69	**22.4**	**12.0**	**OK**	19.75	18.95
		@ 4							121.41	2079	7.70																				
FOSS ROAD - A4	4	3	182.41	182.16	120.80	2.13	12.7	27	123.54	2106	7.80	4.32	33.70	0.00	0.00	2.13	123.54	35.33	43.1	69.0	300	0.21	304.8	0.073	0.076	0.63	**45.9**	**150.4**	**OOPS**	-23.14	25.91
FOSS ROAD - A3	3	2	182.14	181.87	113.20	2.79	7.9	22	126.33	2128	7.88	4.31	33.97	0.00	0.00	2.79	126.33	36.13	44.0	70.1	300	0.24	304.8	0.073	0.076	0.68	**49.3**	**142.3**	**OOPS**	-20.84	28.46
FOSS ROAD - A2	2	1	181.87	181.61	120.70	3.18	4.1	13	129.51	2141	7.93	4.30	34.10	0.00	0.00	3.18	129.51	37.04	45.0	71.1	300	0.22	304.8	0.073	0.076	0.64	**46.8**	**151.9**	**OOPS**	-24.32	27.38
FOSS ROAD - A1	1	1B	181.61	181.39	117.00	2.80	2.5	7	132.31	2148	7.96	4.30	34.21	0.00	0.00	2.80	132.31	37.84	45.8	72.1	300	0.19	304.8	0.073	0.076	0.60	**43.7**	**164.7**	**OOPS**	-28.31	29.95
PUMPING STATION - A1B	1B	1A	181.39	181.09	77.00	1.23	0.0	0	133.54	2148	7.96	4.30	34.21	0.00	0.00	1.23	133.54	38.19	46.1	72.4	300	0.39	304.8	0.073	0.076	0.86	**63.0**	**115.0**	**OOPS**	-9.44	30.47

PUMPED TO WELLAND	10005619	10005616	185.97	185.13	12.49															72.4	250	6.73	254.0	0.051	0.064	3.18	**160.9**	**45.0**	**OK**	88.48	
1 PIPE D/S	10005616	10005618	183.50	183.40	4.50															406.4	525	2.22	533.4	0.223	0.133	2.99	**668.8**	**60.8**	**OK**	262.44	
2 PIPE D/S	10005618	1000905	183.20	182.67	88.00															415.6	526	0.60	534.4	0.224	0.134	1.56	**350.0**	**118.8**	**OOPS**	-65.66	

	P1	P2	Comb.	Peak	Capacity
	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)
PUMP	26.64	13.32	39.96	72.4	-32.4

Notes:
1. Residential design flows as per UCC
2. Diameters as per UCC & **Hydraulic Model**
2. Slopes as per UCC & **Hydraulic Model** (based on invert elevations)
3. Infiltration rate is **0.286 as per Region Master Plan 2017**
4. Peak Factors as per Upper Canada Consultants analysis
5. Population as per Upper Canada Consultants analysis
6. D/S pipes are based on running a 5Yr Existing Scenario using InfoSWMM model

Appendix B - Rational Method for Stormwater Management Facility Sizing

Existing Site Peak Runoff - Catchment 1

Rational Method Calculations

PROJECT: East Fenwick Secondary Plan
PROJECT NUMBER: 2017-5106
CLIENT: SGL Planning & Design Inc.
MUNICIPALITY: Town of Pelham

Associated Engineering Ltd.
Suite 201, 110A Hannover Drive
St. Catharines, ON, L2W 1A4

DESIGN STORM :	5 yr
A=	830
b=	0.777
c=	7.3

IDF I = A / (Tc+c) ^ b

Total Catchment Area	29300	m2	
Runoff Coefficient, C	0.25		
time of concentration	15.00	minutes	(Calculated using FAA Method)
Rainfall Intensity			

I = A / (Tc+c) ^ b
I = (830) / (Tc+7.3) ^ (0.777)
I = **74.37 mm/hr**

5 year Runoff Peak Flow Rate

Q = CIA
Q = (0.25) * (74.37 mm/hr) * (29300 m^2) * (1 m / 1000 mm) * (1 hr / 3600 s)
Q = **0.151 m^3/s**
151.32 lps

Design by: S.Bourke, P.Eng September 25, 2017

DESIGN STORM :	100 yr
A=	1020
b=	0.731
c=	4.7

IDF I = A / (Tc+c) ^ b

Total Catchment Area	29300	m2	
Runoff Coefficient, C	0.25		
time of concentration	15.00	minutes	(Calculated using FAA Method)
Rainfall Intensity			

I = A / (Tc+c) ^ b
I = (1020) / (Tc+4.7) ^ (0.731)
I = **115.43 mm/hr**

100 year Runoff Peak Flow Rate

Q = CIA
Q = (0.25) * (115.43 mm/hr) * (29300 m^2) * (1 m / 1000 mm) * (1 hr / 3600 s)
Q = **0.235 m^3/s**
234.86 lps

Existing Site Peak Runoff - Catchment 2

Rational Method Calculations

PROJECT: East Fenwick Secondary Plan
PROJECT NUMBER: 2017-5106
CLIENT: SGL Planning & Design Inc.
MUNICIPALITY: Town of Pelham

Associated Engineering Ltd.
Suite 201, 110A Hannover Drive
St. Catharines, ON, L2W 1A4

DESIGN STORM :	5 yr
A=	830
b=	0.777
c=	7.3

IDF I = A / (Tc+c) ^ b

Total Catchment Area	133786 m2	
Runoff Coefficient, C	0.25	
time of concentration	20.15 minutes	(Calculated using FAA Method)
Rainfall Intensity		

I = A / (Tc+c) ^ b
I = (830) / (Tc+7.3) ^ (0.777)
I = **63.28 mm/hr**

5 year Runoff Peak Flow Rate

Q = CIA
Q = (0.25) * (63.28 mm/hr) * (133786 m^2) * (1 m / 1000 mm) * (1 hr / 3600 s)
Q = **0.588 m^3/s**
587.93 lps

Design by: S.Bourke, P.Eng September 25, 2017

DESIGN STORM :	100 yr
A=	1020
b=	0.731
c=	4.7

IDF I = A / (Tc+c) ^ b

Total Catchment Area	133786 m2	
Runoff Coefficient, C	0.25	
time of concentration	20.15 minutes	(Calculated using FAA Method)
Rainfall Intensity		

I = A / (Tc+c) ^ b
I = (1020) / (Tc+4.7) ^ (0.731)
I = **97.40 mm/hr**

100 year Runoff Peak Flow Rate

Q = CIA
Q = (0.25) * (97.40 mm/hr) * (133786 m^2) * (1 m / 1000 mm) * (1 hr / 3600 s)
Q = **0.905 m^3/s**
904.92 lps

Existing Site Peak Runoff - Catchment 3

Rational Method Calculations

PROJECT: East Fenwick Secondary Plan
PROJECT NUMBER: 2017-5106
CLIENT: SGL Planning & Design Inc.
MUNICIPALITY: Town of Pelham

Associated Engineering Ltd.
Suite 201, 110A Hannover Drive
St. Catharines, ON, L2W 1A4

DESIGN STORM : 5 yr
A= 830
b= 0.777
c= 7.3
IDF I = A / (Tc+c) ^ b

Total Catchment Area 74093 m2
Runoff Coefficient, C 0.25
time of concentration 22.26 minutes (Calculated using FAA Method)
Rainfall Intensity
I = A / (Tc+c) ^ b
I = (830) / (Tc+7.3) ^ (0.777)
I = **59.75 mm/hr**

5 year Runoff Peak Flow Rate

Q = CIA
Q = (0.25) * (59.75 mm/hr) * (74093 m^2) * (1 m / 1000 mm) * (1 hr / 3600 s)
Q = **0.307 m^3/s**
307.44 lps

Design by: S.Bourke, P.Eng September 25, 2017

DESIGN STORM : 100 yr
A= 1020
b= 0.731
c= 4.7
IDF I = A / (Tc+c) ^ b

Total Catchment Area 74093 m2
Runoff Coefficient, C 0.25
time of concentration 22.26 minutes (Calculated using FAA Method)
Rainfall Intensity
I = A / (Tc+c) ^ b
I = (1020) / (Tc+4.7) ^ (0.731)
I = **91.78 mm/hr**

100 year Runoff Peak Flow Rate

Q = CIA
Q = (0.25) * (91.78 mm/hr) * (74093 m^2) * (1 m / 1000 mm) * (1 hr / 3600 s)
Q = **0.472 m^3/s**
472.24 lps

Existing Site Peak Runoff - Catchment 4

Rational Method Calculations

PROJECT: East Fenwick Secondary Plan
PROJECT NUMBER: 2017-5106
CLIENT: SGL Planning & Design Inc.
MUNICIPALITY: Town of Pelham

Associated Engineering Ltd.
Suite 201, 110A Hannover Drive
St. Catharines, ON, L2W 1A4

DESIGN STORM :	5 yr
A=	830
b=	0.777
c=	7.3

IDF I = A / (Tc+c) ^ b

Total Catchment Area	89056	m2
Runoff Coefficient, C	0.25	
time of concentration	28.68	minutes (Calculated using FAA Method)

Rainfall Intensity

I = A / (Tc+c) ^ b
I = (830) / (Tc+7.3) ^ (0.777)
I = **51.28 mm/hr**

5 year Runoff Peak Flow Rate

Q = CIA
Q = (0.25) * (51.28 mm/hr) * (89056 m^2) * (1 m / 1000 mm) * (1 hr / 3600 s)
Q = **0.317 m^3/s**
317.17 lps

Design by: S.Bourke, P.Eng September 25, 2017

DESIGN STORM :	100 yr
A=	1020
b=	0.731
c=	4.7

IDF I = A / (Tc+c) ^ b

Total Catchment Area	89056	m2
Runoff Coefficient, C	0.25	
time of concentration	28.68	minutes (Calculated using FAA Method)

Rainfall Intensity

I = A / (Tc+c) ^ b
I = (1020) / (Tc+4.7) ^ (0.731)
I = **78.51 mm/hr**

100 year Runoff Peak Flow Rate

Q = CIA
Q = (0.25) * (78.51 mm/hr) * (89056 m^2) * (1 m / 1000 mm) * (1 hr / 3600 s)
Q = **0.486 m^3/s**
485.52 lps

Existing Site Peak Runoff - Catchment 5

Rational Method Calculations

PROJECT: East Fenwick Secondary Plan
PROJECT NUMBER: 2017-5106
CLIENT: SGL Planning & Design Inc.
MUNICIPALITY: Town of Pelham

Associated Engineering Ltd.
Suite 201, 110A Hannover Drive
St. Catharines, ON, L2W 1A4

DESIGN STORM : 5 yr
A= 830
b= 0.777
c= 7.3
IDF I = A / (Tc+c) ^ b

Total Catchment Area 40633 m2
Runoff Coefficient, C 0.25
time of concentration 17.82 minutes (Calculated using FAA Method)
Rainfall Intensity

I = A / (Tc+c) ^ b
I = (830) / (tc+7.3) ^ (0.777)
I = **67.80 mm/hr**

5 year Runoff Peak Flow Rate

Q = CIA
Q = (0.25) * (67.80 mm/hr) * (40633 m^2) * (1 m / 1000 mm) * (1 hr / 3600 s)
Q = **0.191 m^3/s**
191.30 lps

Design by: S.Bourke, P.Eng September 25, 2017

DESIGN STORM : 100 yr
A= 1020
b= 0.731
c= 4.7
IDF I = A / (Tc+c) ^ b

Total Catchment Area 40633 m2
Runoff Coefficient, C 0.25
time of concentration 17.82 minutes (Calculated using FAA Method)
Rainfall Intensity

I = A / (Tc+c) ^ b
I = (1020) / (tc+4.7) ^ (0.731)
I = **104.67 mm/hr**

100 year Runoff Peak Flow Rate

Q = CIA
Q = (0.25) * (104.67 mm/hr) * (40633 m^2) * (1 m / 1000 mm) * (1 hr / 3600 s)
Q = **0.295 m^3/s**
295.34 lps

Existing Site Peak Runoff - Catchment 6

Rational Method Calculations

PROJECT: East Fenwick Secondary Plan
PROJECT NUMBER: 2017-5106
CLIENT: SGL Planning & Design Inc.
MUNICIPALITY: Town of Pelham

Associated Engineering Ltd.
Suite 201, 110A Hannover Drive
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DESIGN STORM : 5 yr
A= 830
b= 0.777
c= 7.3
IDF I = A / (Tc+c) ^ b

Total Catchment Area 55687 m2
Runoff Coefficient, C 0.25
time of concentration 23.74 minutes (Calculated using FAA Method)
Rainfall Intensity

I = A / (Tc+c) ^ b
I = (830) / (tc+7.3) ^ (0.777)
I = **57.52 mm/hr**

5 year Runoff Peak Flow Rate

Q = CIA
Q = (0.25) * (57.52 mm/hr) * (55687 m^2) * (1 m / 1000 mm) * (1 hr / 3600 s)
Q = **0.222 m^3/s**
222.45 lps

Design by: S.Bourke, P.Eng September 25, 2017

DESIGN STORM : 100 yr
A= 1020
b= 0.731
c= 4.7
IDF I = A / (Tc+c) ^ b

Total Catchment Area 55687 m2
Runoff Coefficient, C 0.25
time of concentration 23.74 minutes (Calculated using FAA Method)
Rainfall Intensity

I = A / (Tc+c) ^ b
I = (1020) / (tc+4.7) ^ (0.731)
I = **88.26 mm/hr**

100 year Runoff Peak Flow Rate

Q = CIA
Q = (0.25) * (88.26 mm/hr) * (55687 m^2) * (1 m / 1000 mm) * (1 hr / 3600 s)
Q = **0.341 m^3/s**
341.32 lps

Existing Site Peak Runoff - Catchment 7

Rational Method Calculations

PROJECT: East Fenwick Secondary Plan
PROJECT NUMBER: 2017-5106
CLIENT: SGL Planning & Design Inc.
MUNICIPALITY: Town of Pelham

Associated Engineering Ltd.
Suite 201, 110A Hannover Drive
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DESIGN STORM : 5 yr
A= 830
b= 0.777
c= 7.3
IDF I = A / (Tc+c) ^ b

Total Catchment Area 85222 m2
Runoff Coefficient, C 0.25
time of concentration 23.74 minutes (Calculated using FAA Method)
Rainfall Intensity

I = A / (Tc+c) ^ b
I = (830) / (tc+7.3) ^ (0.777)
I = **57.52 mm/hr**

5 year Runoff Peak Flow Rate

Q = CIA
Q = (0.25) * (57.52 mm/hr) * (85222 m^2) * (1 m / 1000 mm) * (1 hr / 3600 s)
Q = **0.340 m^3/s**
340.43 lps

Design by: S.Bourke, P.Eng September 25, 2017

DESIGN STORM : 100 yr
A= 1020
b= 0.731
c= 4.7
IDF I = A / (Tc+c) ^ b

Total Catchment Area 85222 m2
Runoff Coefficient, C 0.25
time of concentration 23.74 minutes (Calculated using FAA Method)
Rainfall Intensity

I = A / (Tc+c) ^ b
I = (1020) / (tc+4.7) ^ (0.731)
I = **88.26 mm/hr**

100 year Runoff Peak Flow Rate

Q = CIA
Q = (0.25) * (88.26 mm/hr) * (85222 m^2) * (1 m / 1000 mm) * (1 hr / 3600 s)
Q = **0.522 m^3/s**
522.34 lps

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