

3. EXISTING AND FUTURE CONDITIONS

Background information was collected from numerous sources including:

- the review of pertinent background studies and reports;
- data provided by Halton Region;
- investigations undertaken by the Region's consultants as part of this Class EA study;
- meetings with the Project Team;
- correspondence or meetings with participating Technical Agencies, the Town of Oakville, Oakville Transit, City of Burlington, Burlington Transit and utilities; and
- consultation with members of the public, including key stakeholders (e.g. property owners, representatives of churches, etc.).

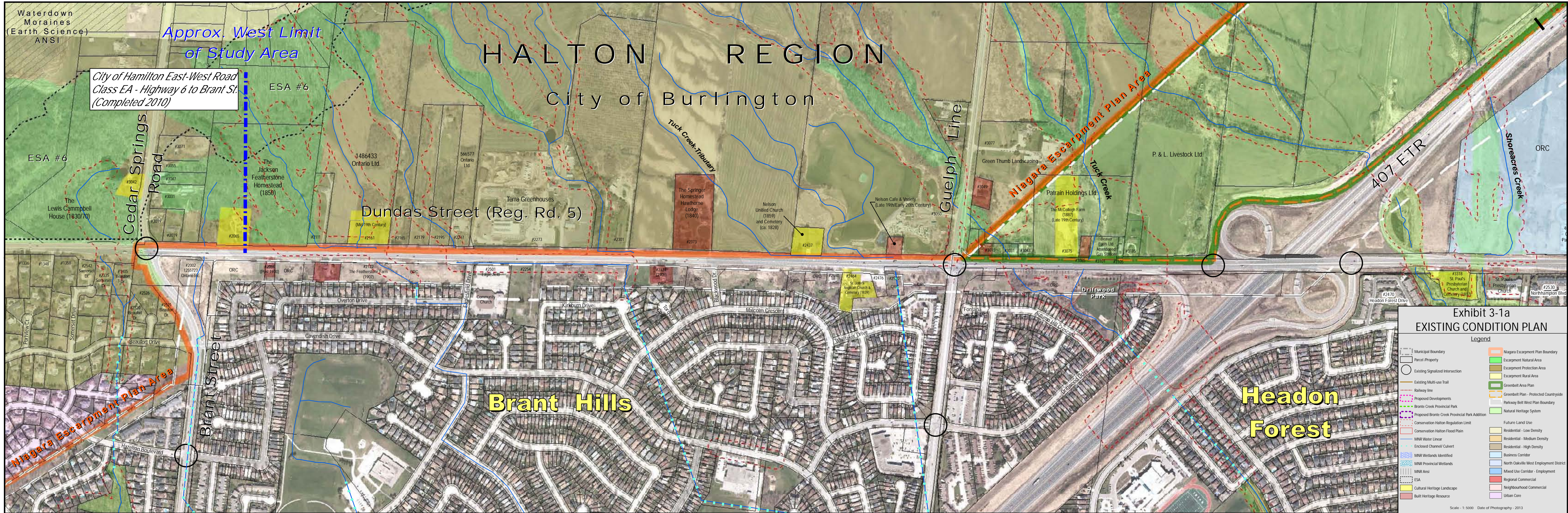
The study area focuses on Dundas Street from Brant Street to Bronte Road, and is located within the City of Burlington and the Town of Oakville in Halton Region. **Exhibit 1-3** provides a key plan of the study area. **Exhibit 3-1a** to **3-1c** are aerial mosaic of the study area identifying existing conditions and key features which are discussed in the following sections.

3.1 Transportation

The main components of the existing road network are described in **Table 3-1**:

Table 3-1: Existing Road Network

Road	Description
Dundas Street (Regional Road 5) – Brant Street to Bronte Road	<ul style="list-style-type: none"> • under the jurisdiction of Halton Region • mostly 4-lane rural cross-section; Appleby Line / Dundas Street and Bronte Road / Dundas Street intersections already a 6-lane urban cross-section • posted speed of 60 km/h to 80 km/h • Tansley Bridge (Bronte Creek) west of Tremaine Road • CN rail grade separated crossing east of Appleby Line • signalized intersections (from west to east): Brant Street, Guelph Line, 407 ETR interchange off ramps, Northampton Boulevard, Walkers Line, Berwick Drive/Rotary Way, Tim Dobbie Drive, Millcroft Park Drive, Appleby Line, Sutton Drive, Tremaine Road, Colonel William Parkway/Zenon Drive, Valleyridge Drive, and Bronte Road • limited existing provisions for cyclists or pedestrians • limited amenities / infrastructure for transit services • limited illumination • farming equipment utilize Dundas Street • Burlington Transit and Oakville Transit serve some sections of Dundas Street – see Section 3.1.1.1.



Waterdown Moraines (Earth Science) ANSI

Approx. West Limit of Study Area

City of Hamilton East-West Road Class EA - Highway 6 to Brant St. (Completed 2010)

HALTON REGION

City of Burlington

Dundas Street (Reg. Rd. 5)

Brant Hills

Headon Forest

Exhibit 3-1a EXISTING CONDITION PLAN

Legend



HALTON REGION

City of Burlington

Alton

Headon Forest

Millcreek

Exhibit 3-1b
EXISTING CONDITION PLAN

Legend

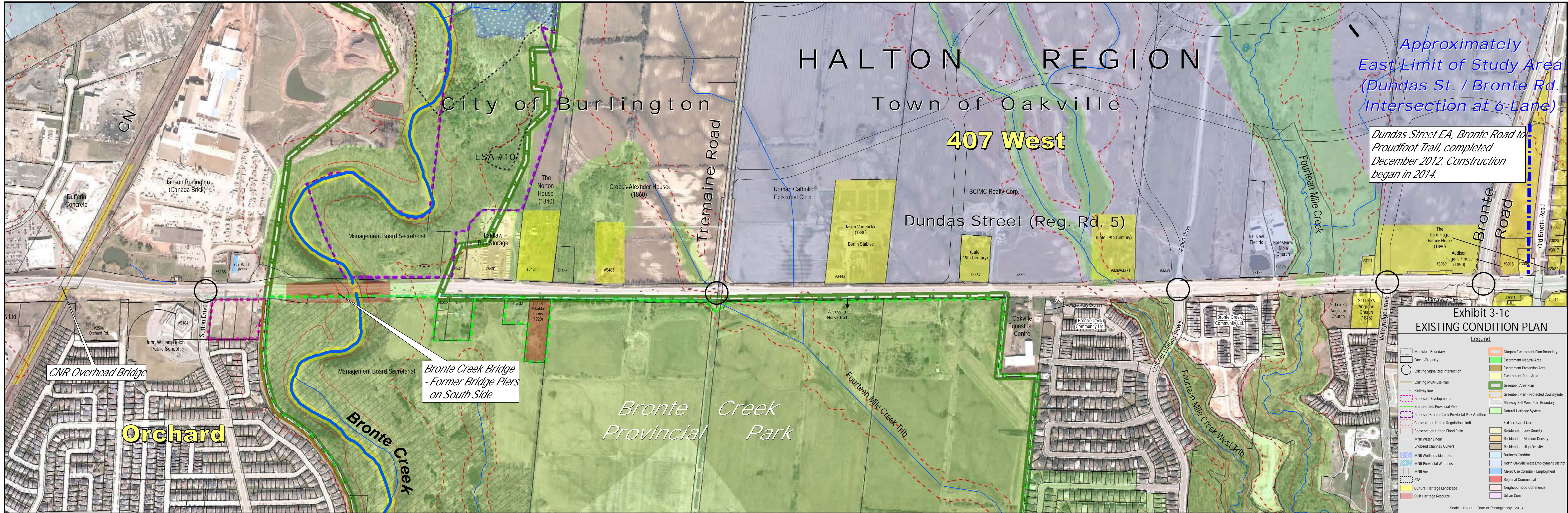


Table 3-1: Existing Road Network (cont'd)

Road	Description
Brant Street (Regional Road 18) / Cedar Springs Road	<ul style="list-style-type: none"> • under the jurisdiction of Halton Region • major arterial road south of Dundas Street • Cedar Springs Road – minor arterial road north of Dundas Street, under City of Burlington jurisdiction • signalized intersection at Dundas Street • Currently undergoing detailed design for the widening to 6-lanes at Dundas Street / Brant Street intersection
Guelph Line (Regional Road 1)	<ul style="list-style-type: none"> • under the jurisdiction of Halton Region • major arterial road • signalized intersection with Dundas Street • 4-lane urban road south of Dundas Street • 2-lane rural road north of Dundas Street
407 ETR	<ul style="list-style-type: none"> • Provincial toll highway • Parclo A-4 interchange with Dundas Street • dedicated lanes to W-N ramp and E-S ramp
Walkers Line	<ul style="list-style-type: none"> • intersection under the jurisdiction of Halton Region • minor arterial road, under City of Burlington jurisdiction • signalized intersection at Dundas Street • 4-lane urban road north and south of Dundas Street
Appleby Line (Regional Road 20)	<ul style="list-style-type: none"> • under the jurisdiction of Halton Region • major arterial road • signalized intersection at Dundas Street • intersection already at 6-lanes approaching the Appleby Line intersection
Tremaine Road (Regional Road 22)	<ul style="list-style-type: none"> • under the jurisdiction of Halton Region • major arterial road • signalized (T-intersection) at Dundas Street • 2-lane rural road north of Dundas Street
Bronte Road (Regional Road 25)	<ul style="list-style-type: none"> • under the jurisdiction of Halton Region • major arterial road • 4-lane roadway south and north of Dundas Street • signalized intersection at Dundas Street • Dundas Street already at 6-lanes approaching the Bronte Road intersection

3.1.1 Transit

3.1.1.1 Existing Transit

Currently, Burlington Transit and Oakville Transit operate a few bus routes which utilize portions of Dundas Street within the Study Area between Brant Street and Bronte Road:

Burlington Transit:

- Route 2x (Brant North) to Burlington GO Station. Peak hour service operates on Dundas Street between Guelph Line and the GO Transit lot at 407 ETR interchange. Monday to Friday, no Sunday or holidays services.
- Route 52 (Burlington Northwest) to Burlington GO Station – late night service bus route which operates on Dundas Street between Guelph Line and the GO Transit lot at 407 ETR interchange. Monday to Friday and Saturday, no Sunday or holidays services.
- Route 6 (Headon) to Burlington GO Station operates on Dundas Street between GO Transit lot at 407 ETR and Walkers Line. Monday to Sunday, including holidays.
- Route 25 (Walkers) to Burlington GO Station operates on Dundas Street between GO Transit lot at 407 ETR and Walkers Line. Monday to Sunday, excluding holidays.
- Route 11 (Sutton – Alton) to Appleby GO Station operates on Dundas street between GO Transit lot at 407 ETR and Tim Dobbie Drive. Monday to Sunday, including holidays.

Oakville Transit:

- Route 5 operates along Dundas Street between Colonel William Parkway and the Uptown Core Terminal located at Trafalgar Road
- Route 33 services the Palermo area and operates along Dundas Street between Colonel William Parkway and Postmaster Drive

GO Transit:

- GO Transit bus route 47 (Hamilton – York University), including route # 47E,47G and 47H, stop at the GO Transit lot at 407 ETR.

3.1.1.2 Metrolinx Regional Transportation Plan (2008)

In November 2008, Metrolinx published its Regional Transportation Plan (RTP) – *The Big Move*. The RTP identifies three sets of priorities: for the first 15 years; years 15 to 25; and longer term. Dundas Street between Brant Street in the City of Burlington and the Kipling TTC Station in the City of Toronto has been identified as a key higher order transit corridor as part of the RTP 15-year plan (See **Section 2.1.4**).

3.1.2 Active Transportation

Dundas Street is currently a 4-lane roadway with mostly a rural cross section within the Study Area between Brant Street and Bronte Road; with the exception that the Appleby Line and Bronte Road intersections are already at 6-lane. There are currently some multi-use trails along on Dundas Street to accommodate cyclists or pedestrians. Specifically, there is a multi-use path on the north side of Dundas Street between Walkers Line and Appleby Line and on the south side of Dundas Street between Northampton Boulevard and Appleby Line.

Halton Region is carrying out an Active Transportation Master Plan Study to create a 20-year vision for active transportation in Halton Region. Active transportation is any form of

human-powered transportation, including walking, cycling, roller-blading, skateboarding and moving with mobility devices. An active transportation network includes sidewalks, multi-use paths, crosswalks, on-road bike lanes and off-road trails. As part of the Dundas Street improvements, features of active transportation were considered, such as implementation of cycle tracks, on-road bike lanes, multi-use paths and sidewalks for pedestrians and cyclists.

3.2 Existing and Future Land Use

3.2.1 Existing Land Use

There is a variety of land use adjacent to Dundas Street between Brant Street and Bronte Road including residential, commercial, industrial, as well as natural open space. This section describes the existing and future land use within the Study Area from west to east. **Exhibits 3-1a to 3-1c** is a set of aerial photos from 2013 showing existing land uses and key features. *(Note: There are ongoing developments in areas adjacent to Dundas Street; some of the recent developments may not be captured in the aerial photo).*

Brant Street to Guelph Line (City of Burlington)

The lands south of Dundas Street from Brant Street to Guelph Line are mainly residential developments which are part of the Brant Hills Community. There are intermittent rural residential properties with direct access onto Dundas Street. However, much of the Brant Hills community are set back from Dundas Street by approximately 60 m (lands which are part of the Parkway Belt West Plan). The Eaglesfield Community Church is located in the southeast quadrant of Dundas Street / Eaglesfield Drive intersection (access from Eaglesfield Drive), and the St. John's Anglican Church is located in the southeast quadrant of Dundas Street / Guelph Line intersection with direct access to Dundas Street.

Lands on the north side of Dundas Street are within the Niagara Escarpment Plan; mostly designated as Escarpment Protection Area with some Escarpment Natural Area just east of Brant Street. There are intermittent rural residential houses with direct access to Dundas Street. Commercial uses include Terra Greenhouse opposite to Eaglesfield Drive with three accesses to Dundas Street and Nelson Variety Store located just west of Guelph Line also with direct access to Dundas Street. Nelson United Church is located approximately 350 m west of Guelph Line with direct access to Dundas Street.

Guelph Line to Walkers Line (City of Burlington)

The 407 ETR interchange is located between Guelph Line and Walkers Line. A GO Station / carpool lot is located to the east of the interchange. Access to the GO Station / carpool lot is approximately 450 m west of Walkers Line at the signalized intersection of Northampton Boulevard. The lands south of Dundas Street between Guelph Line and 407 ETR interchange are residential developments and set back from Dundas Street by approximately 60 m (lands which are part of the Parkway Belt West Plan). Between 407 ETR and Walkers Line, land on the south side of Dundas Street are part of the Headon Forest community; most are reversed frontage townhouses with no direct access to Dundas Street. St. Paul's Presbyterian Church is located opposite to the E-N on-ramp to 407 ETR with direct access to Dundas Street. A commercial plaza (Headon Forest Plaza) is located in the southwest quadrant of Dundas Street / Walkers Line.

The lands north of Dundas Street between Guelph Line and 407 ETR are part of the Greenbelt Plan, Protected Countryside area. There are intermittent rural residential houses with direct access to Dundas Street. Lands between 407 ETR and Walkers Line on the north side of Dundas Street are currently undeveloped. Future land uses within this area are designated for business and commercial development with some residential to the north.

Walkers Line to Appleby Line (City of Burlington)

A Hydro One corridor crosses Dundas Street between Walkers Line and Appleby Line. One of the hydro towers is located in close proximity to Dundas Street right-of-way west of Millcroft Park Drive.

Lands on the south side of Dundas Street are part of the Millcroft community. Residential houses are mostly fronting Dundas Street separated by a local intervening road; some residential houses are side lots to Dundas Street. Commercial uses are located in the southeast quadrant of Dundas Street / Walkers Line and in the southwest quadrant of Dundas Street / Appleby Line intersection (Cornerstone Centre).

Millcroft Golf Club is located south of Dundas Street. Access to the maintenance facility for the golf course is located on Dundas Street, approximately 200 m west of Millcroft Park Drive. Hole 12 and Hole 13 of the golf course are located on the west and east side of Millcroft Park Drive, respectively. Access between the two holes require crossing of Millcroft Park Drive at Dundas Street.

Lands on the north side of Dundas Street are part of the Alton community. Residential houses are mostly located away from the Dundas Street corridor with the exception of a low rise complex in the northwest quadrant of Dundas Street / Rotary Way. Commercial uses are located in the northeast quadrant of Dundas Street / Walkers Line and in the northwest quadrant of Dundas Street / Appleby Line intersection (Smart Centre). Dr. Frank J. Hayden Secondary School and Norton Community Park are located on the west and east side of Tim Dobbie Drive, respectively. A trail system associated with the North Community Park is located on the north side of Dundas Street and extends to east of Cornerstone Drive.

Appleby Line to Tremaine Road (City of Burlington)

The Dundas Street / Appleby Line intersection is already at 6-lanes. Dundas Street is grade separated with the CN railway (2 tracks) approximately 450 m east of Appleby Line. Lands on the north and south sides of Dundas Street between Appleby Line and the CN railway are for commercial uses. Smart Centre is located in the northeast quadrant of Appleby Line and Dundas Street and The Appleby Crossing is located in the southeast quadrant of Appleby Line and Dundas Street. Both commercial centres have right-in/right-out access from Dundas Street.

On the south side of Dundas Street, lands between the CN railway and just east of Sutton Drive (i.e. boundary of Bronte Creek Provincial Park) are part of the Orchard community. Residential houses are generally away from the Dundas Street right-of-way. A future condominium development located in the southeast quadrant of Dundas Street / Sutton

Drive is currently undergoing development application. John William Boich Public School is located in the southwest quadrant of Dundas Street / Sutton Drive intersection.

On the north side of Dundas Street, lands between the CN railway to just east of Sutton Drive are for industrial uses, including Canada Brick, and a car wash. The entrance to Canada Brick is at the signalized intersection at Sutton Drive, and access to the car wash is directly from Dundas Street east of Sutton Drive (right-in/right-out).

From just east of Sutton Drive to Tremaine Road, lands on the south side of Dundas Street are part of the Bronte Creek Provincial Park. There are no formal public entrances to the Provincial Park from Dundas Street; however, park maintenance vehicles may access the park from Dundas Street. There are also private residential houses with direct access to Dundas Street.

On the north side of Dundas Street, between just east of Sutton Drive and Tremaine Road, a great portion of the lands are associated with the Bronte Creek valley. Immediately to the east of the valley, one of the properties is currently occupied by First Student where they service schools in the Burlington and Oakville areas. There are also intermittent rural residential houses with direct access to Dundas Street.

Tremaine Road to Bronte Road (Town of Oakville)

On the south side of Dundas Street from Tremaine Road to approximately 700 m easterly, lands are part of the Bronte Creek Provincial Park. Similar to the area west of Tremaine Road, there are no formal public entrances to the Provincial Park from Dundas Street; however, park maintenance vehicles may access the park from Dundas Street.

East of the Bronte Creek Provincial Park boundary to Bronte Road, there are residential communities located on the south side of Dundas Street. Most of the residential houses are side lot or front onto Dundas Street separated by a local intervening road. The one commercial use in this area is the Wag-A-Way Kennels located 300 m west of Colonel William Parkway with direct access to Dundas Street.

Areas north of Dundas Street are currently largely undeveloped with intermittent residential houses and commercial properties. Lands within this area are within the North Oakville Secondary Plan, which are designated for future development. Forestview Church and New Electric share the same access from Dundas Street and are located approximately 520 m west of Dundas Street.

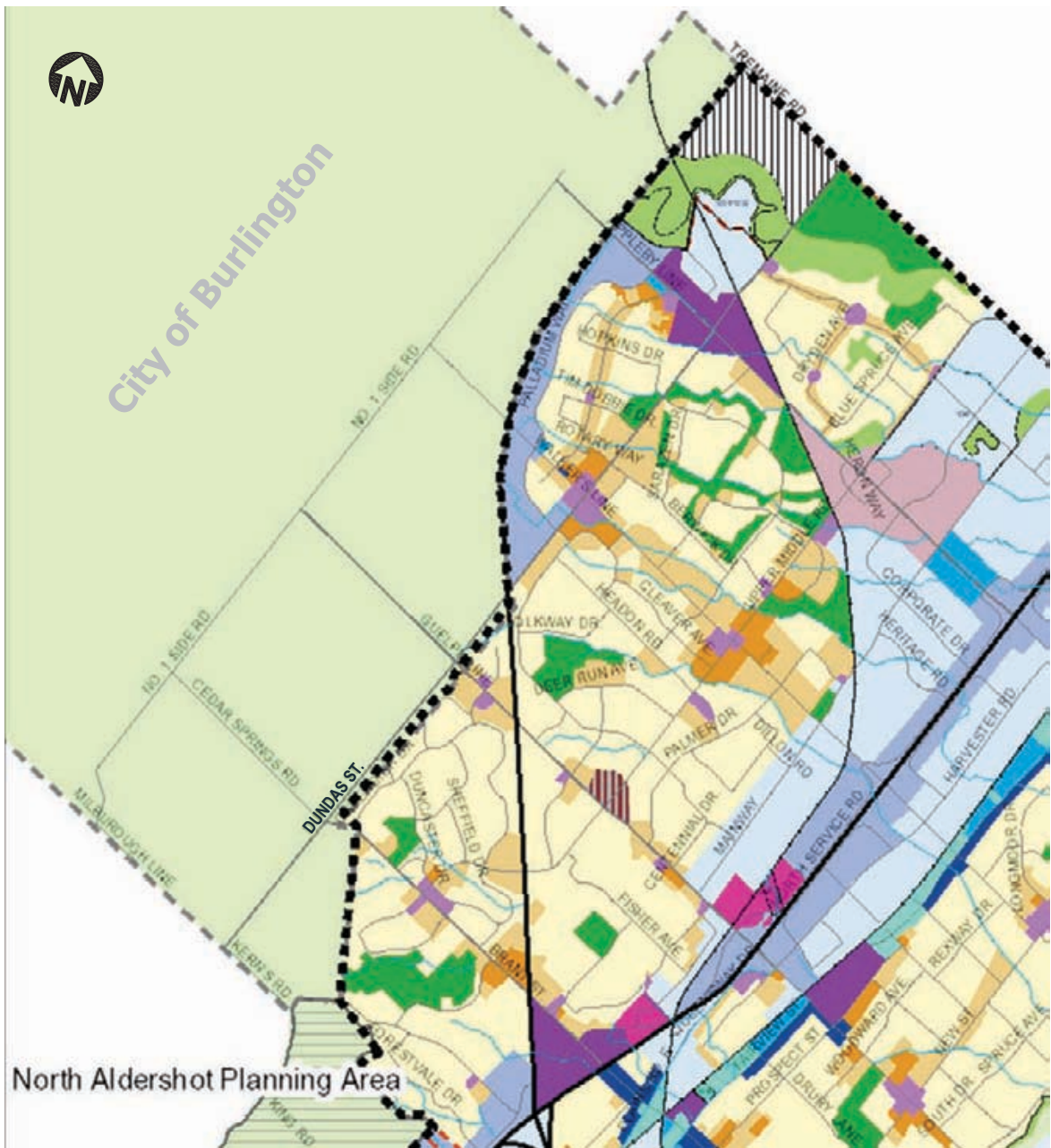
3.2.2 Future Land Use

Most of the lands adjacent to Dundas Street within the City of Burlington are developed except for lands on the north side of Dundas Street between 407 ETR and Walkers Line. Lands within that area are largely designated for future commercial and business development (see **Exhibit 3-2a**). The lands north of Dundas Street within the North Oakville West Secondary Plan are mostly designated for employment use with some Natural Heritage System Area (see **Exhibit 3-2b**). The Secondary Plan identifies the lands as part of the employment district. Future development is subject to approval of development applications by the Town of Oakville and Halton Region.

LEGEND

-  Community Commercial
-  MUC - Employment
-  MUC - Commercial
-  MUC - General
-  General Employment
-  Employment Commercial
-  Regional Commercial
-  Business Corridor
-  Parkway Belt Plan Area
-  Deferral
-  Environmentally Sensitive Area
-  Greenlands
-  Land Use Designation to be
-  Major Parks and Open Space
-  Mixed Use Centre
-  Neighbourhood Commercial
-  Referral
-  Residential - High Density
-  Residential - Low Density
-  Residential Medium Density

SOURCE: City of Burlington Official Plan - Schedule B
Comprehensive Land Use Plan - Urban Planning Area





SOURCE: Town of Oakville, North Oakville West of Sixteen Mile Creek
Secondary Plan, Figure NOW2 - Land Use Plan, April 2009

LEGEND

- SECONDARY PLAN AREA BOUNDARY
- PROVINCIAL FREEWAY
- MAJOR ARTERIAL/TRANSIT CORRIDOR
- MINOR ARTERIAL/TRANSIT CORRIDOR
- AVENUE/TRANSIT CORRIDOR
- TRANSITWAY
- SPECIAL STUDY AREA
- EMPLOYMENT DISTRICT
- HEALTH ORIENTED MIXED USE NODE
- NATURAL HERITAGE SYSTEM AREA
- COMMUNITY PARK AREA
- SUBJECT LANDS UNDER APPEAL



DUNDAS STREET CLASS EA STUDY
Brant Street to Bronte Road



North Oakville West
Secondary Plan

Exhibit

3-2b

3.3 Social Environment

3.3.1 Existing Communities

Currently, the Study Area consists of existing residential areas on the south side of Dundas Street, which are (from west to east) part of the Brant Hills, Headon Forest, Millcroft and Orchard communities within the City of Burlington, as well as the Alton community on the north side of Dundas Street between Walkers Line and Appleby Line.

Within the Town of Oakville, the residential development on the south side of Dundas Street between Tremaine Road and Bronte Road are part of the Palermo West and Palermo Village Centre communities.

Within the Study Area, there are also some intermittent rural residential properties with direct access to Dundas Street; mostly on the north side of the road.

3.3.2 Noise

There are Noise Sensitive Areas (NSAs) located within the study limits, which are mainly residential properties on the south side of Dundas Street. A noise analysis has been carried out as part of this Class EA Study (see **Section 6.4.1.4**).

It should be noted that noise analysis will have to be prepared for new residential developments on the north side of Dundas Street as part of the development site plan approval process, where the ultimate configuration of Dundas Street and other roadways in the proximity will need to be taken into consideration. Therefore, noise analysis for the new residential developments along the Dundas Street corridor was not carried out as part of the EA Study.

3.3.3 Pedestrian and Cycling Facilities

As noted in **Section 3.1.2**, Dundas Street within the Study Area is largely a 4-lane roadway with a rural cross section with limited active transportation facilities along Dundas Street to accommodate cyclists or pedestrians (except in the proximity of Appleby Line where the intersection of Dundas Street / Appleby Line is already widened to 6-lanes).

As noted in **Section 2.1.9**, Halton Region is carrying out an Active Transportation Master Plan Study to create a 20-year vision for active transportation in Halton Region. As part of the Dundas Street improvements, features of active transportation were considered, including cycle tracks, on-road bike lanes, multi-use paths and sidewalks.

As part of the City of Burlington Cycling Master Plan, Dundas Street between Brant Street and the Oakville/Burlington municipal boundary is proposed to include cycle tracks and multi-use paths to accommodate cyclists and pedestrians.

The Town of Oakville developed an Active Transportation Master Plan with a focus on walking and cycling. The plan recommended multi-use trails along Dundas Street within the limits of Oakville, as well as, a sidewalk along one side of the roadway and multiple grade-separated pedestrian crossings. In the Study Area between Tremaine Road and Bronte Road, it is proposed that off-road / in-boulevard multi-use trails be implemented along Dundas Street.

3.4 Natural Environment

3.4.1 Study Approach

3.4.1.1 Background Data Collection and Analysis

Background information was reviewed to assess the general character of the Study Area, identify potential constraints and sensitivities, and assess the general connectivity of natural features within the study limits to features within the surrounding landscape. **Exhibits 3-3a to 3-3I** illustrate the natural environment features.

Background natural environment information collection included the following sources:

- Topographic mapping and Google mapping;
- Liaison with the Aurora District Ministry of Natural Resources and Forestry (MNR) and Conservation Halton (CH) staff to gather and confirm existing natural environment information in the vicinity of the study area, including information concerning Species at Risk (SAR) presence/potential;
- MNR's Natural Heritage Information Centre (NHIC) database;
- Department of Fisheries and Oceans (DFO) SAR habitat mapping;
- North Oakville Creeks Subwatershed Study (Town of Oakville 2006);
- North Oakville East Secondary Plan (Town of Oakville 2008); and
- Burlington Oakville Interconnecting Watermains Natural Sciences Report (LGL 2009)².

3.4.1.2 Aquatic Survey Approach

Field surveys of watercourse crossings within the study area between Brant Street and Bronte Road were conducted in 2008, 2009 and 2011. The compiled background information, including comments and input from agencies, was considered specifically in developing and undertaking the field program. As listed in **Section 3.4.1.1**, SAR information discussed below was obtained from a variety of background information sources including consultation with agency staff, and review of DFO's Distribution of Fish Species at Risk Mapping and the Natural Heritage Information Centre (NHIC) database.

Site specific information, including fish community composition, was gathered for those watercourse / drainage features where information was lacking, or where fish use was unknown. Sampling was undertaken by electrofishing and/or dip netting depending on the habitat being investigated.

² LGL. 2009. Natural Sciences Report: Zone 3 Burlington Oakville Interconnecting Watermains Class Environmental Assessment.



ELC Code	ELC Community Name
CUT1	Mineral Cultural Thicket
CUM1	Mineral Cultural Woodland
FOD7	Fresh-Moist Low land Deciduous Forest
FOD7-4	Fresh-Moist Black Walnut Low land Deciduous Forest
FOC4	Fresh-Moist White Cedar Coniferous Forest
CUM1-1	Dry-Moist Old Field Meadow (Cultural Meadow)
MAS2-1	Cattail Mineral Shallow Marsh
MAM2	Mineral Meadow Marsh
FOM4	Dry-Fresh White Cedar Mixed Forest
FOD5-3	Dry-Fresh Sugar Maple-Oak Deciduous Forest
MAM2-10	Forb Mineral Meadow Marsh
CUP1-3	Black Walnut Deciduous Plantation
FOD7-3	Fresh-Moist Willow Low land Deciduous Forest
SAF1-3	Duckweed Floating-leaved Shallow Aquatic
MAM2-2	Reed Canary Grass Mineral Meadow Marsh
FOD5-1	Dry-Fresh Sugar Maple Deciduous Forest
SWD4-1	Willow Mineral Deciduous Swamp
FOD2	Dry-Fresh Oak-Maple-Hickory Deciduous Forest

Legend

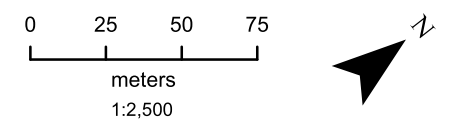
- Species At Risk
- Amphibian Calling Station
- Fish Species at Risk within Road ROW
- Fish use within Road ROW
- Fish use potential in Road ROW (unconfirmed)
- Gabion basket
- Pond outfall (storm)
- Drop structure/Storm grate/Catch basin
- Vegetation Community
- Culvert
- Long Section of Enclosed Channel/Culvert
- Permanent Flow
- Flow
- Intermittent Flow
- Permanent Waterbody
- Provincially Significant Wetland
- Other Evaluated Wetland
- Unevaluated Wetland
- Grading Limit
- Right-of-Way

Environmental Designations and Policy Plan Areas

- Area of Natural and Scientific Interest
- Greenbelt Plan Area
- Bronte Creek Provincial Park
- Natural Heritage System Area
- Conservation Halton Regulation Limits
- Niagara Escarpment Plan Boundary

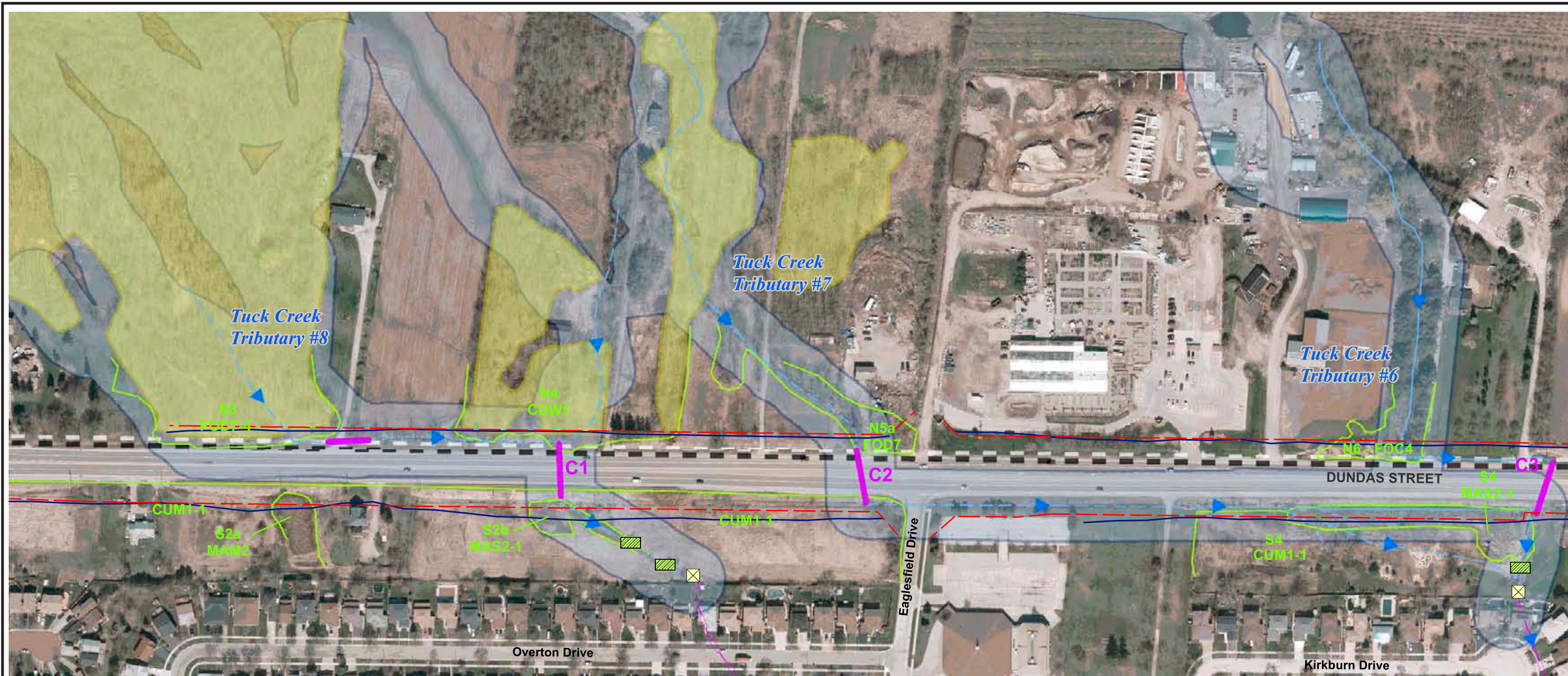


DUNDAS STREET CLASS EA STUDY
Brant Street to Bronte Road



NATURAL
HERITAGE FEATURES

Exhibit
3-3a



ELC Code	ELC Community Name
CUT1	Mineral Cultural Thicket
CUW1	Mineral Cultural Woodland
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FOD7-4	Fresh-Moist Black Walnut Low land Deciduous Forest
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CUM1-1	Dry-Moist Old Field Meadow (Cultural Meadow)
MAS2-1	Cattail Mineral Shallow Marsh
MAM2	Mineral Meadow Marsh
FOM4	Dry-Fresh White Cedar Mixed Forest
FOD5-3	Dry-Fresh Sugar Maple-Oak Deciduous Forest
MAM2-10	Forb Mineral Meadow Marsh
CUP1-3	Black Walnut Deciduous Plantation
FOD7-3	Fresh-Moist Willow Low land Deciduous Forest
SAF1-3	Duckweed Floating-leaved Shallow Aquatic
MAM2-2	Reed Canary Grass Mineral Meadow Marsh
FOD5-1	Dry-Fresh Sugar Maple Deciduous Forest
SWD4-1	Willow Mineral Deciduous Swamp
FOD2	Dry-Fresh Oak-Maple-Hickory Deciduous Forest

Legend

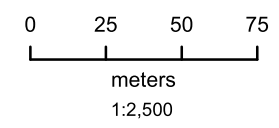
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DUNDAS STREET CLASS EA STUDY
Brant Street to Bronte Road



NATURAL
HERITAGE FEATURES

Exhibit
3-3b



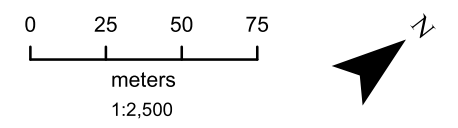
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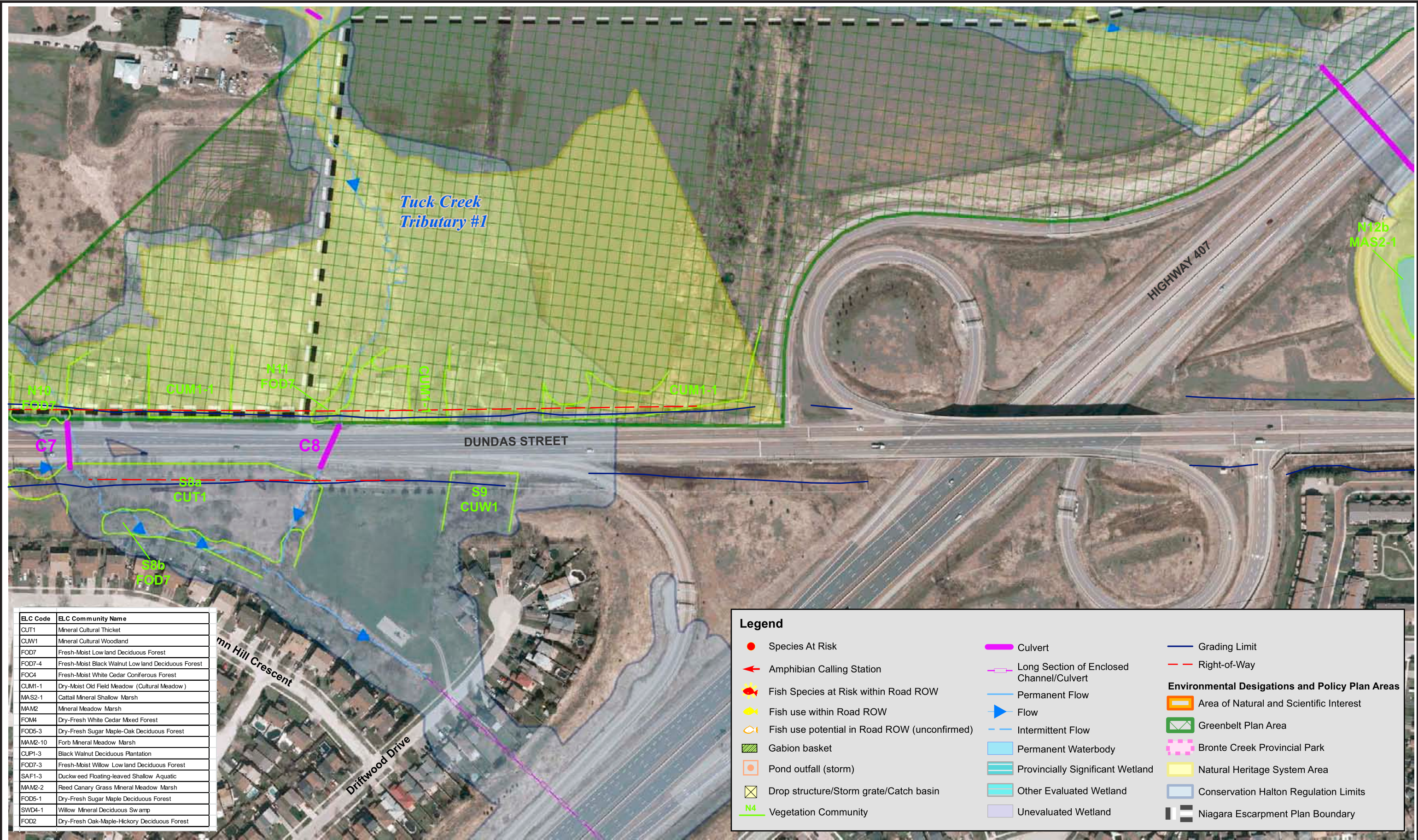
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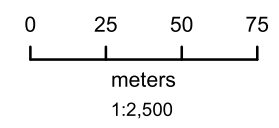
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FOD5-3	Dry-Fresh Sugar Maple-Oak Deciduous Forest
MAM2-10	Forb Mineral Meadow Marsh
CUP1-3	Black Walnut Deciduous Plantation
FOD7-3	Fresh-Moist Willow Low land Deciduous Forest
SAF1-3	Duckweed Floating-leaved Shallow Aquatic
MAM2-2	Reed Canary Grass Mineral Meadow Marsh
FOD5-1	Dry-Fresh Sugar Maple Deciduous Forest
SWD4-1	Willow Mineral Deciduous Swamp
FOD2	Dry-Fresh Oak-Maple-Hickory Deciduous Forest

Legend

- Species At Risk
- Culvert
- Grading Limit
- ← Amphibian Calling Station
- Long Section of Enclosed Channel/Culvert
- - Right-of-Way
- 🐟 Fish Species at Risk within Road ROW
- Permanent Flow
- 📄 Environmental Designations and Policy Plan Areas
- 🐟 Fish use within Road ROW
- ▶ Flow
- 📄 Area of Natural and Scientific Interest
- 🐟 Fish use potential in Road ROW (unconfirmed)
- Intermittent Flow
- 📄 Greenbelt Plan Area
- 🧺 Gabion basket
- Permanent Waterbody
- 📄 Bronte Creek Provincial Park
- 📄 Pond outfall (storm)
- Provincially Significant Wetland
- 📄 Natural Heritage System Area
- 📄 Drop structure/Storm grate/Catch basin
- Other Evaluated Wetland
- 📄 Conservation Halton Regulation Limits
- 🌿 N4 Vegetation Community
- Unevaluated Wetland
- 📄 Niagara Escarpment Plan Boundary

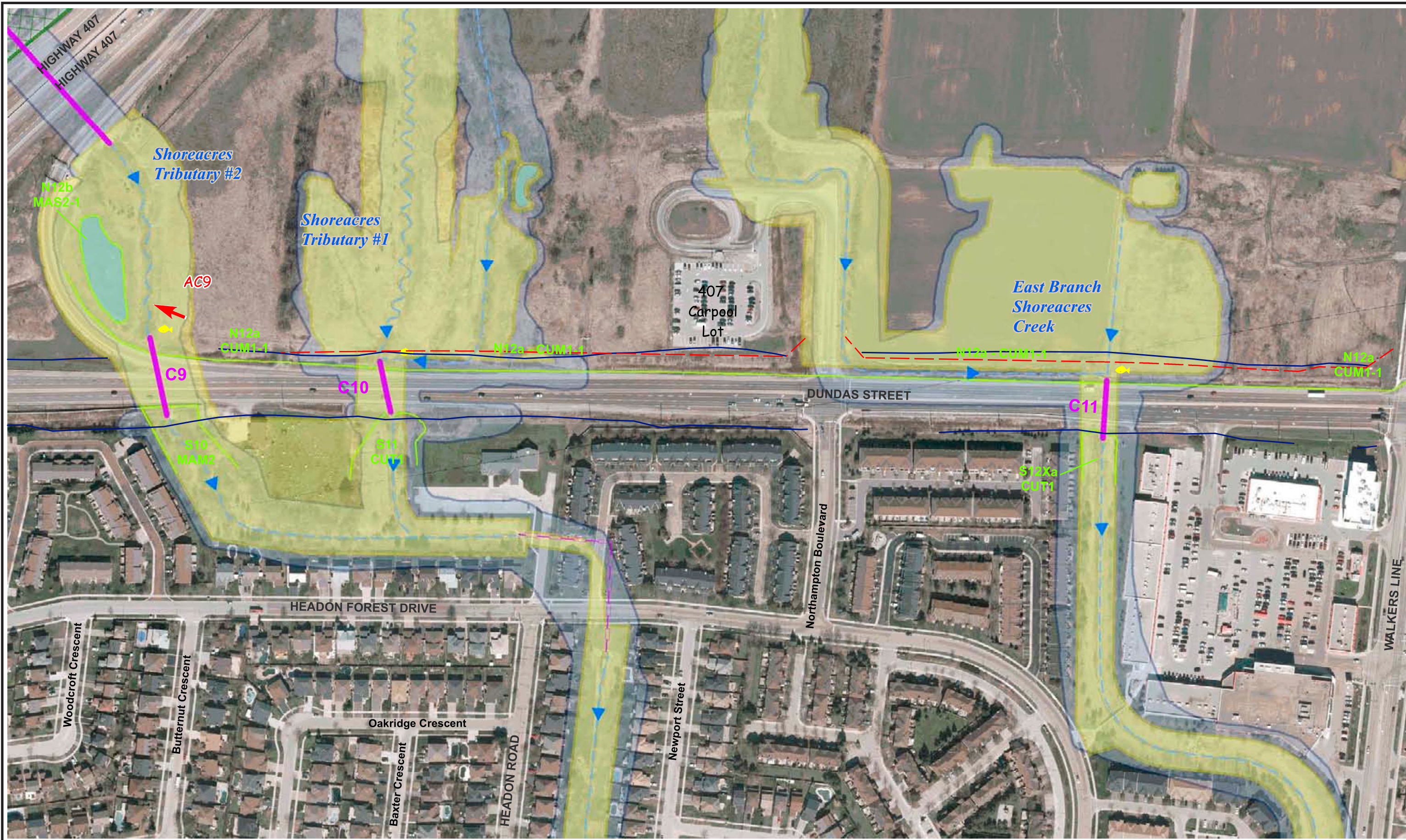


DUNDAS STREET CLASS EA STUDY
Brant Street to Bronte Road

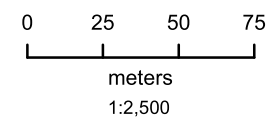


NATURAL
HERITAGE FEATURES

Exhibit
3-3d

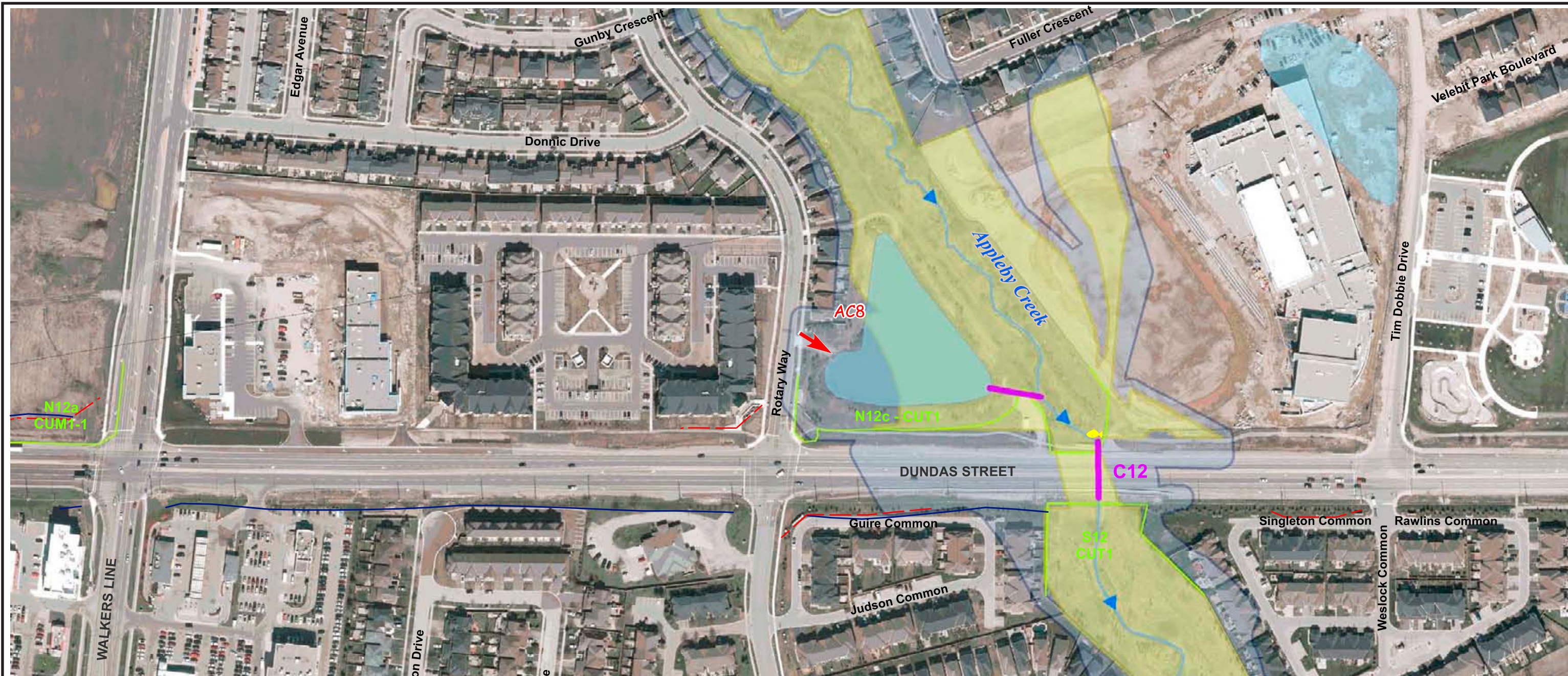


DUNDAS STREET CLASS EA STUDY
Brant Street to Bronte Road



NATURAL
HERITAGE FEATURES

Exhibit
3-3e



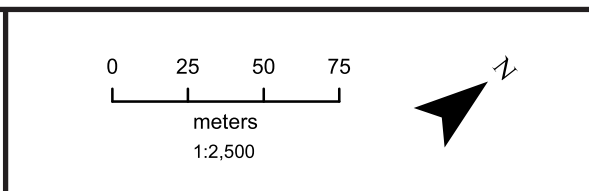
ELC Code	ELC Community Name
CUT1	Mineral Cultural Thicket
CUM1	Mineral Cultural Woodland
FOD7	Fresh-Moist Low land Deciduous Forest
FOD7-4	Fresh-Moist Black Walnut Low land Deciduous Forest
FOC4	Fresh-Moist White Cedar Coniferous Forest
CUM1-1	Dry-Moist Old Field Meadow (Cultural Meadow)
MAS2-1	Cattail Mineral Shallow Marsh
MAM2	Mineral Meadow Marsh
FOM4	Dry-Fresh White Cedar Mixed Forest
FOD5-3	Dry-Fresh Sugar Maple-Oak Deciduous Forest
MAM2-10	Forb Mineral Meadow Marsh
CUP1-3	Black Walnut Deciduous Plantation
FOD7-3	Fresh-Moist Willow Low land Deciduous Forest
SAF1-3	Duckweed Floating-leaved Shallow Aquatic
MAM2-2	Reed Canary Grass Mineral Meadow Marsh
FOD5-1	Dry-Fresh Sugar Maple Deciduous Forest
SWD4-1	Willow Mineral Deciduous Swamp
FOD2	Dry-Fresh Oak-Maple-Hickory Deciduous Forest

Legend

- Species At Risk
- ➔ Amphibian Calling Station
- 🐟 Fish Species at Risk within Road ROW
- 🐟 Fish use within Road ROW
- 🐟 Fish use potential in Road ROW (unconfirmed)
- 🧺 Gabion basket
- 🚰 Pond outfall (storm)
- 🗑️ Drop structure/Storm grate/Catch basin
- 🌿 N4 Vegetation Community
- 🟡 Culvert
- 📏 Long Section of Enclosed Channel/Culvert
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- 🟦 Provincially Significant Wetland
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- 🟪 Unevaluated Wetland
- 📏 Grading Limit
- 📏 Right-of-Way

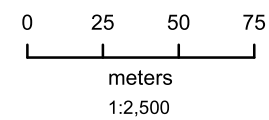
Environmental Designations and Policy Plan Areas

- 🟡 Area of Natural and Scientific Interest
- 🟩 Greenbelt Plan Area
- 🟩 Bronte Creek Provincial Park
- 🟡 Natural Heritage System Area
- 🟦 Conservation Halton Regulation Limits
- 🟩 Niagara Escarpment Plan Boundary





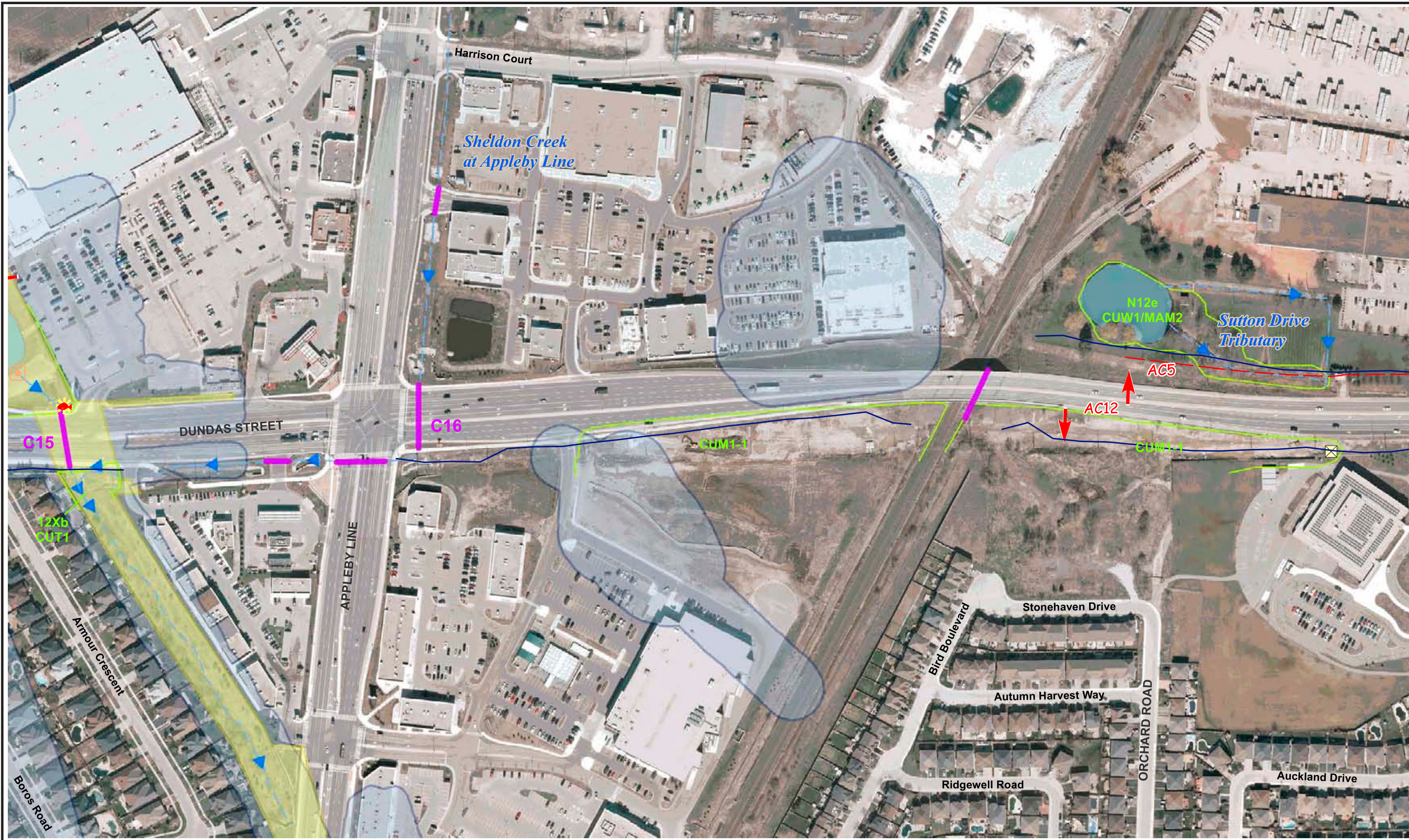
DUNDAS STREET CLASS EA STUDY
Brant Street to Bronte Road



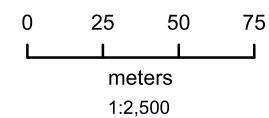
NATURAL
HERITAGE FEATURES

Exhibit

3-3g



DUNDAS STREET CLASS EA STUDY
Brant Street to Bronte Road



NATURAL
HERITAGE FEATURES

Exhibit
3-3h



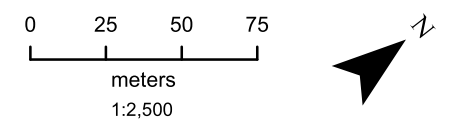
ELC Code	ELC Community Name
CUT1	Mineral Cultural Thicket
CUW1	Mineral Cultural Woodland
FOD7	Fresh-Moist Low land Deciduous Forest
FOD7-4	Fresh-Moist Black Walnut Low land Deciduous Forest
FOD4	Fresh-Moist White Cedar Coniferous Forest
CUM1-1	Dry-Moist Old Field Meadow (Cultural Meadow)
MAS2-1	Cattail Mineral Shallow Marsh
MAM2	Mineral Meadow Marsh
FOM4	Dry-Fresh White Cedar Mixed Forest
FOD5-3	Dry-Fresh Sugar Maple-Oak Deciduous Forest
MAM2-10	Forb Mineral Meadow Marsh
CUP1-3	Black Walnut Deciduous Plantation
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MAM2-2	Reed Canary Grass Mineral Meadow Marsh
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SWD4-1	Willow Mineral Deciduous Swamp
FOD2	Dry-Fresh Oak-Maple-Hickory Deciduous Forest

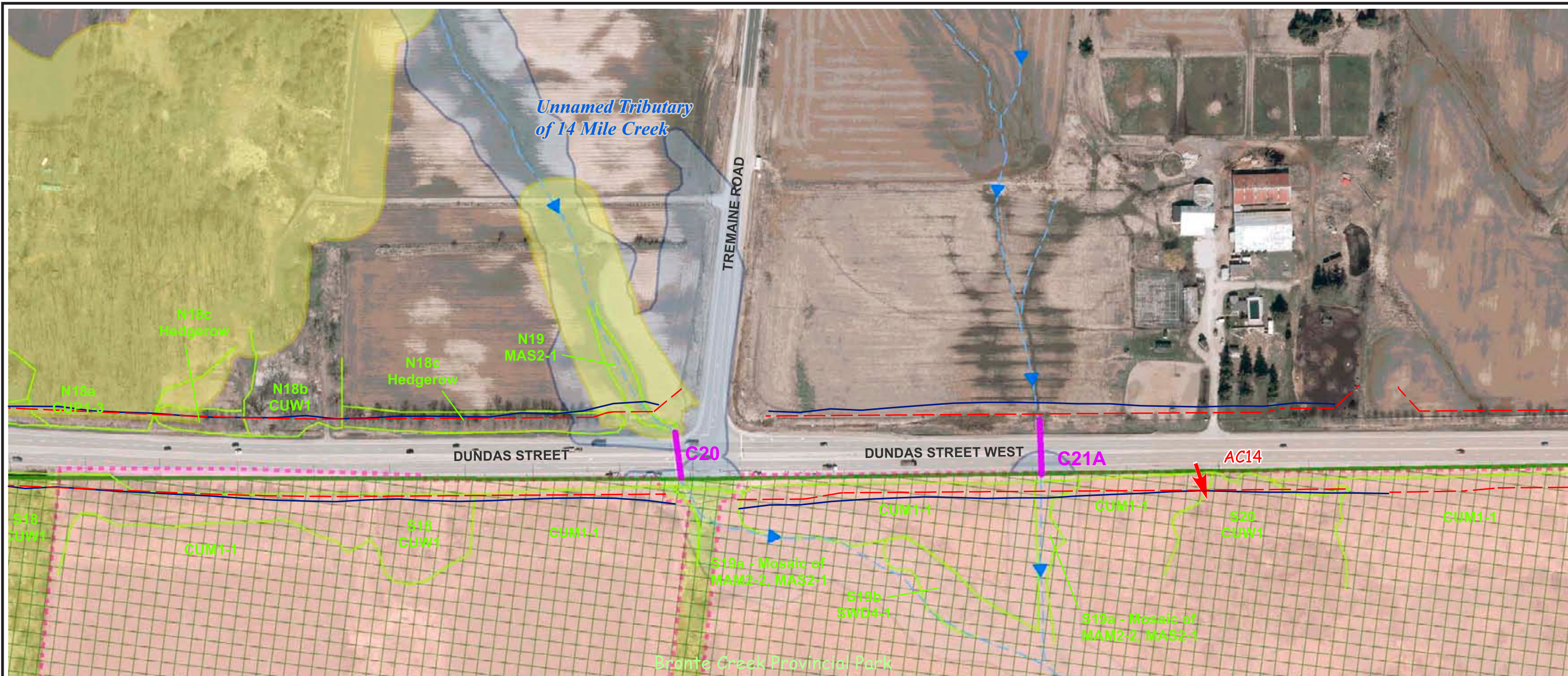
Legend

- Species At Risk
- Amphibian Calling Station
- Fish Species at Risk within Road ROW
- Fish use within Road ROW
- Fish use potential in Road ROW (unconfirmed)
- Gabion basket
- Pond outfall (storm)
- Drop structure/Storm grate/Catch basin
- Vegetation Community
- Culvert
- Long Section of Enclosed Channel/Culvert
- Permanent Flow
- Flow
- Intermittent Flow
- Permanent Waterbody
- Provincially Significant Wetland
- Other Evaluated Wetland
- Unevaluated Wetland
- Grading Limit
- Right-of-Way

Environmental Designations and Policy Plan Areas

- Area of Natural and Scientific Interest
- Greenbelt Plan Area
- Bronte Creek Provincial Park
- Natural Heritage System Area
- Conservation Halton Regulation Limits
- Niagara Escarpment Plan Boundary





ELC Code	ELC Community Name
CUT1	Mineral Cultural Thicket
CUW1	Mineral Cultural Woodland
FOD7	Fresh-Moist Low land Deciduous Forest
FOD7-4	Fresh-Moist Black Walnut Low land Deciduous Forest
FOC4	Fresh-Moist White Cedar Coniferous Forest
CUM1-1	Dry-Moist Old Field Meadow (Cultural Meadow)
MAS2-1	Cattail Mineral Shallow Marsh
MAM2	Mineral Meadow Marsh
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FOD5-1	Dry-Fresh Sugar Maple Deciduous Forest
SWD4-1	Willow Mineral Deciduous Swamp
FOD2	Dry-Fresh Oak-Maple-Hickory Deciduous Forest

Legend

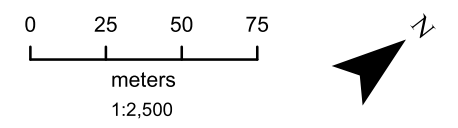
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- 🔵 Flow
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DUNDAS STREET CLASS EA STUDY
Brant Street to Bronte Road



NATURAL
HERITAGE FEATURES

Exhibit
3-3j



ELC Code	ELC Community Name
CUT1	Mineral Cultural Thicket
CUM1	Mineral Cultural Woodland
FOD7	Fresh-Moist Low land Deciduous Forest
FOD7-4	Fresh-Moist Black Walnut Low land Deciduous Forest
FOC4	Fresh-Moist White Cedar Coniferous Forest
CUM1-1	Dry-Moist Old Field Meadow (Cultural Meadow)
MAS2-1	Cattail Mineral Shallow Marsh
MAM2	Mineral Meadow Marsh
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FOD5-1	Dry-Fresh Sugar Maple Deciduous Forest
SWD4-1	Willow Mineral Deciduous Swamp
FOD2	Dry-Fresh Oak-Maple-Hickory Deciduous Forest

Legend

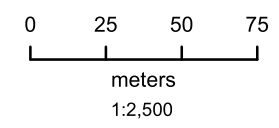
- Species At Risk
- Amphibian Calling Station
- Fish Species at Risk within Road ROW
- Fish use within Road ROW
- Fish use potential in Road ROW (unconfirmed)
- Gabion basket
- Pond outfall (storm)
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DUNDAS STREET CLASS EA STUDY
Brant Street to Bronte Road



NATURAL
HERITAGE FEATURES

Exhibit
3-3k



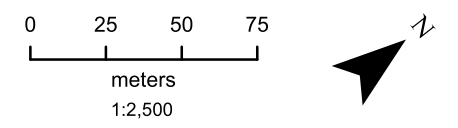
ELC Code	ELC Community Name
CUT1	Mineral Cultural Thicket
CUW1	Mineral Cultural Woodland
FOD7	Fresh-Moist Low land Deciduous Forest
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CUM1-1	Dry-Moist Old Field Meadow (Cultural Meadow)
MAS2-1	Cattail Mineral Shallow Marsh
MAM2	Mineral Meadow Marsh
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FOD5-3	Dry-Fresh Sugar Maple-Oak Deciduous Forest
MAM2-10	Forb Mineral Meadow Marsh
CUP1-3	Black Walnut Deciduous Plantation
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FOD5-1	Dry-Fresh Sugar Maple Deciduous Forest
SWD4-1	Willow Mineral Deciduous Swamp
FOD2	Dry-Fresh Oak-Maple-Hickory Deciduous Forest

Legend

- Species At Risk
- Amphibian Calling Station
- Fish Species at Risk within Road ROW
- Fish use within Road ROW
- Fish use potential in Road ROW (unconfirmed)
- Gabion basket
- Pond outfall (storm)
- Drop structure/Storm grate/Catch basin
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- Culvert
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Environmental Designations and Policy Plan Areas

- Area of Natural and Scientific Interest
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Habitat surveys were conducted within the regional road right-of-way, as well as approximately 100 m upstream and downstream of the crossings. Information collected encompassed the following aquatic habitat parameters:

- Aquatic habitat mapping;
- Channel dimensions through the structures, general gradient and profile, bank character (e.g. height and erosion);
- General flow characteristics (permanent, intermittent, dry, pooling) including evidence of groundwater discharge;
- General morphology (flats, pools, riffles);
- Substrates;
- Instream/overhead cover opportunities (e.g. woody debris, undercut banks, boulders, vegetation);
- Riparian vegetation;
- Physical barriers to fish movement in the vicinity of the crossing;
- Identification of potential critical or specialized habitat areas or features (i.e. potential spawning areas, nursery cover);
- Observations of habitat alterations / land use (e.g. channel modification, potential pollutant point sources);
- Potential habitat enhancement opportunities.

All crossings assessed were documented and photographs were taken. Representative photographs of all watercourse crossings that support, have the potential to support, or contribute indirect functions to a fishery, are on file at MMM.

3.4.1.3 Vegetation Survey Approach

Vegetation surveys were conducted within the study limits, between Brant Street and Bronte Road, in fall 2008, summer and fall 2009, and late spring of 2014. These surveys focused on documenting natural and culturally influenced vegetation communities occurring along both sides of Dundas Street, within the right-of-way and approximately 50 m beyond the right-of-way. Street trees and planted landscape features adjacent to Dundas Street were not specifically assessed during these field visits.

Vegetation field work and associated data assessment involved:

- Preparing a working vascular plant species list;
- Classifying and mapping vegetation communities according to the Ecological Land Classification (ELC) System for Southern Ontario (Lee et. al., 1998);
- Evaluating the sensitivity and significance of vegetation species and vegetation communities using the MNRF's NHIC database and SAR websites (updated

periodically) and the Halton Region rare species list from The Distribution and Status of the Vascular Plants of the Greater Toronto Area (Varga et al. 2000)³;

- Evaluating habitat potential for vegetation Species of Conservation Concern (SCC), and in particular, SAR known or thought to exist in the general vicinity of the study limits; and
- Noting general vegetation characteristics including age, general habitat features, drainage conditions, as well as any anthropogenic disturbance.

All terrestrial natural areas were documented and photographs were taken. Representative photographs of all vegetation communities assessed are on file at MMM.

3.4.1.4 Wildlife Survey Approach

A general field assessment of existing habitat conditions and wildlife use within the study limits was conducted in conjunction with the aquatic and vegetation field surveys. All wildlife sightings and wildlife signs, including browse, track/trails, scat, nests, burrows, tree cavities, excavated holes and vocalizations were recorded during the field investigations. These surveys provide supplementary data to the secondary source information.

In addition to the general wildlife and habitat assessments, habitats along the study corridor were assessed specifically in relation to their potential to support species of conservation concern (SCC) known to be present in the general area. This information is incorporated in a SCC habitat screening assessment, as discussed further in **Section 3.4.2.8**.

All observations of birds and other wildlife, including SCC were recorded during the field work. Culverts were specifically inspected for nesting migratory bird species, including Barn Swallow (listed as Threatened under the ESA). Specific targeted surveys for other SCC were not undertaken as part of this project, given the scope of the project as a widening of an existing, highly disturbed transportation corridor, and the transitional nature of the adjacent landscape. However, based on the habitat characteristics and expectations, it is possible that targeted surveys for SCC (including Bobolink, Eastern Meadowlark, and Barn Swallow) may be required during the detailed design phase, as discussed in **Section 6.4.3.7**.

In addition to the general wildlife records compiled during aquatic and vegetation surveys, an Amphibian Calling survey was carried out on April 21, 2014 to address the potential for breeding Chorus Frog (*Pseudacris triseriata*) (listed as Threatened under the ESA) within the study area. Amphibian calling activity was assessed in accordance with the Marsh Monitoring Program (MMP) amphibian calling survey protocol (Bird Studies Canada 2003). The survey was conducted by qualified, experienced staff under appropriate conditions (i.e. dusk/evening survey with suitable air temperatures and wind strength).

³ Varga, S., et. al. 2000. The Distribution and Status of the Vascular Plants of the Greater Toronto Area. Ontario Ministry of Natural Resources, Aurora, ON. 103 pp.

In accordance with guidelines of the MMP for early season surveys (i.e., survey dates that would capture early breeding species, such as Chorus Frog), the night time air temperature was greater than 5°C. Each calling station was surveyed for 3 minutes and surveys started one half hour after sunset and were completed before midnight. Amphibian calling activity was rated using three levels: Level 1 (individual calls can be counted with no overlap), Level 2 (some calls can be counted or estimated, some overlap) or Level 3 (calls continuous and overlapping, individuals not distinguishable). Refer to **Exhibits 3-3a to 3-3I** for amphibian survey station locations.

3.4.2 Existing Conditions

Existing natural environmental features are shown on **Exhibits 3-3a to 3-3I**, including reference to culvert locations.

3.4.2.1 Environmental Designations

Policy Plan Areas

The Study Area between Brant Street and Bronte Road falls partially within the Niagara Escarpment Plan Area and the Greenbelt Plan Area:

Niagara Escarpment Plan Area – To the west of Brant Street (i.e., Cedar Springs Road), the land both north and south of Dundas Street falls within this designated plan area. To the east of Brant Street, easterly to Guelph Line, the land north of Dundas Street is within this designated plan area. The majority of the Niagara Escarpment Plan lands in the study area are designated ‘Escarpment Protection Area’. In addition, a small area associated with Tuck Creek Tributary #2, near the intersection of Dundas Street and Guelph Line is designated ‘Escarpment Natural Area’.

Greenbelt Plan Area – The land north of Dundas Street west of Highway 407 and the land along Bronte Creek Valley, both north and south of Dundas Street falls within the Greenbelt Plan Area. The features west of Guelph Line are referenced back to their associated designations under the Niagara Escarpment Plan (as outlined above), while the lands east of Guelph Line, including Bronte Creek Valley, are designated as both ‘Protected Countryside’ and ‘Natural Heritage System’ areas.

Provincially Designated Features

There are three provincially designated features along the Dundas Street study area between Brant Street and Bronte Road (or with surface flow connections to features in the study area), a Provincially Significant Wetland (PSW), an Area of Natural and Scientific Interest (ANSI) and a Provincial Park:

North Oakville-Milton West Wetland Complex PSW – located north of Dundas Street in scattered pockets between Tremaine Road and Sixteen Mile Creek (i.e., east of study area). This PSW is connected to Fourteen Mile Creek West Tributary (C22) (~0.5km north of Dundas Street), and to Fourteen Mile Creek (C23) (~1km north of Dundas Street).

Bronte Creek Provincial Park Nature Reserve Life Science ANSI – Located south of Dundas Street (adjacent to the right-of-way), encompassing this portion of the Bronte Creek Valley.

Bronte Creek Provincial Park – Located south of Dundas Street (adjacent to the right-of-way), east of Bronte Creek, extending east to the edge of the adjacent developed land. It should be noted that Ontario Parks is planning to expand the Bronte Creek Provincial Park to north of Dundas Street. The proposed expansion has yet to formalize but a proposed boundary plan has been prepared and was made available for public review. The expansion of the Provincial Park will require an amendment to the Regulation.

Regional and Municipal Designated Features

Regionally and municipally designated features include those features identified as Regionally or Locally Significant in the Halton Region and / or the Town of Oakville Official Plans. Regionally and municipally designated features identified within the study area are as follows:

Natural Heritage System Area (NHSA) – The North Oakville Secondary Plan (as shown on **Exhibit 3-2**) identifies the NHSA in the area north of Dundas Street. The NHSA is now designated in the Official Plan, and includes the Halton Region ‘Greenlands System’ and ‘Natural Areas’ as outlined in the Town of Oakville Official Plan (Livable Oakville). These areas include floodplain areas, wetlands, fish habitat, ESAs, ANSIs, valleylands, significant woodlands and significant wildlife habitat. Portions of the NHSA are located directly adjacent to Dundas Street, generally associated with watercourses present in the study area. Two of the watercourses that cross the study area (Fourteen Mile Creek West and tributary at culverts C22 and C23) are identified as ‘high constraint stream corridors’ (to remain in place with enhancement potential) in the NHSA. Descriptions of the vegetation associated with these features are provided in **Section 3.4.2.6**.

Nelson Escarpment Woods and Extensions (ESA #6) – includes a section of the Niagara Escarpment and a large wooded area below the main Escarpment slopes within the City of Burlington. One lobe of this ESA extends into the study area along Tuck Creek Tributary # 8.

Bronte Creek Valley and Extensions (ESA #10) – Located in the Bronte Creek Valley. This ESA overlaps with the Provincially Significant Life Science ANSI, listed above.

3.4.2.2 Physiography and Soils

The Study Area along Dundas Street between Brant Street and Bronte Road traverses an area of drumlinized till plain and till moraine. The west end of the study area is located in the Niagara Escarpment physiographic region (Chapman & Putnam 1984).

Soils mapping for Halton County (Gillespie, Wicklund & Miller 1972) indicates that soils in the study area are a mosaic of well to imperfectly drained Oneida and Chinguacousy clay loams, with poorly drained Jeddo clay loam occupying depressional areas and minor watercourse features. Generally, to the north of the study area the Trafalgar Moraine forms a hilly landscape with stony soils that are relatively well drained, while the lands to the south tend to be relatively flat with gentle slopes and poor drainage.

3.4.2.3 Aquatic Resources and Fisheries

At a landscape level, the study area traverses several watersheds and subwatersheds, specifically, Bronte Creek, Tuck Creek, Fourteen Mile Creek, Shoreacres Creek, Sheldon Creek, Appleby Creek and Roseland Creek. All of these major watercourses flow in a southerly direction, eventually outletting to Lake Ontario. The majority of these watercourses originate from the base of the Niagara Escarpment, flow through mainly agricultural fields and natural areas upstream of Dundas Street, and residential development south of Dundas Street to their outlets.

The largest watercourse is Bronte Creek, which originates as agricultural drainage and groundwater influx north of Highway 401 near the Town of Campbellville. It flows through mainly agricultural fields and natural areas north of Dundas Street, through Bronte Creek Provincial Park south of Dundas Street to the Queen Elizabeth Way, and then through local public parks and natural areas towards its outlet at Lake Ontario near Bronte Harbour Park. A deep, well-defined valley develops south of the highway, along which the channel flows through the Dundas Street crossing. The study reaches of Bronte Creek support a diverse resident warm/cool water fish community with migratory coldwater species, including Smallmouth Bass, migratory Rainbow Trout, Lake-run Brown Trout, and Chinook Salmon. Silver Shiner, a Species of Conservation Concern (SCC), is also present within the right-of-way reaches as discussed further in **Section 3.4.2.6**.

There are 26 culvert crossings and one bridge crossing (Tansley Bridge over Bronte Creek Valley) along the project limits. In addition to Bronte Creek, nine of the watercourses support direct fish use (at least seasonally) within the right-of-way reaches. These watercourses are relatively small, and support warm/coolwater bait and forage fish species.

Of the remaining ‘watercourses’ crossed along the project limits, nine are minor, seasonal drainage features, the majority of which outlet to storm sewers or are piped immediately south of Dundas Street. Culvert C17 conveys flows along the rail line west of Bronte Creek. The remaining six were identified as supporting only very limited contributing functions (e.g., seasonal flow) to receiving watercourses further downstream of Dundas Street via the storm sewer system or ditchline drainage.

A summary of the existing conditions associated with each of the 26 watercourses/drainage features is presented in **Appendix D, Table 1**.

3.4.2.4 Vegetation Resources

Vegetation within and adjacent to the existing Dundas Street right-of-way is dominated by culturally derived communities and disturbance tolerant plant species. Land uses along the north side of Dundas Street include rural residential, agricultural and isolated commercial. Lands south of Dundas Street are predominantly residential subdivisions. The Bronte Creek Valley is the main natural feature in the study area. It extends north and south of Dundas Street, and has several associated environmental designations, as discussed in **Section 3.4.2.1**.

Other natural and semi-natural vegetation features are limited to small patches of forest and cultural woodland scattered along the study limits, mainly associated with rural residences along the north side of Dundas Street, hedgerows and narrow bands of riparian and floodplain vegetation along the minor watercourse features; some of these features are included in the NHSA. Details of the vegetation species and communities in the Study Area are presented in the following sections, and detailed in **Appendix D, Table 2**.

Flora Overview

A vascular plant species checklist is provided in **Appendix D, Table 2**. During the course of MMM field surveys conducted in 2008, 2009 and 2014, a total of 181 plant species were identified within the study area. An additional 26 plants were identified to genus only.

Of the 181 species recorded, 74 (41%) are non-native. Many of these non-native species are typical of old fields and disturbed areas. These species are generally widespread and abundant within the existing Dundas Street right-of-way and adjacent cultural habitats.

Most of the 107 native species have a provincial ranking of S4 or S5 (apparently secure (S4) or secure (S5) in Ontario). One species recorded has a **provincial ranking of S2** (imperiled):

- Honey Locust (*Gleditsia triacanthos*) – Units S7 and S8. This species is commonly planted as a roadside landscape tree and is not naturally occurring in these units. Therefore, these particular trees are not considered to be of conservation concern for the purposes of this study.

Five native species considered **regionally rare** in Halton Region (per Varga et al. 2000) were recorded by MMM during field surveys:

- Cow Parsnip (*Heracleum maximum*) – Units N15 and S14;
- Eastern Red Cedar (*Juniperus virginiana*) – Units N3, N8 and S16;
- Fragrant Sumac (*Rhus aromatica*) – Unit N12. This species was found to be of planted origin – it was planted as part of the restoration efforts in the vicinity of Appleby Creek.
- Smooth Goldenrod (*Solidago gigantea*) – Unit N8; and
- Swamp White Oak (*Quercus bicolor*) – Unit N17.

Nine native species considered **regionally uncommon** in Halton Region (per Crins et al 2006 and Varga et al. 2000) were recorded:

- Yellow Avens (*Geum aleppicum*) – Unit N8 and S13;
- Yellow Pimpernell (*Taenidia integerrima*) – Units N16 and S15;
- Jerusalem Artichoke (*Helianthus tuberosus*) – Units N15 and S14;
- Panicked Aster (*Symphotrichum lanceolatum ssp. lanceolatum*) – Units N4, N6, N7, N10, N12, N20, S6, S8 and S9;

- Shagbark Hickory (*Carya ovata*) - Units N16, S15, S22 and S24;
- White Spruce (*Picea glauca*) – Units N3, N4, N11, and S12;
- Rice Cutgrass (*Leersia oryzoides*) – Units N6 and S6;
- Round-lobed Hepatica (*Hepatica nobilis var. obtusa*) – Units N16 and S15; and
- Cleavers (*Galium aparine*) – Units N5, N8, N18 and S6.

The units listed above, along with their corresponding vegetation classification community type, are shown in **Exhibit 3-3a to 3-3l**.

Vegetation Communities Overview

Seventeen distinct vegetation community types as classified using the ELC system were delineated along the study corridor, as mapped in **Exhibit 3-3a to 3-3l**. These community types are:

- Dry-Moist Old Field Meadow (CUM1-1);
- Mineral Cultural Thicket (CUT1);
- Mineral Cultural Woodland (CUW1);
- Black Walnut Deciduous Plantation (CUP1-3);
- Fresh-Moist White Cedar Coniferous Forest (FOC4);
- Dry-Fresh White Cedar Mixed Forest (FOM4);
- Dry-Fresh Oak – Maple – Hickory Deciduous Forest (FOD2);
- Dry-Fresh Sugar Maple Deciduous Forest (FOD5-1);
- Dry-Fresh Sugar Maple – Oak Deciduous Forest (FOD5-3);
- Fresh-Moist Lowland Deciduous Forest (FOD7);
- Fresh-Moist Willow Lowland Deciduous Forest (FOD7-3);
- Fresh-Moist Black Walnut Lowland Deciduous Forest (FOD7-4);
- Willow Mineral Deciduous Swamp (SWD4-1);
- Mineral Meadow Marsh (MAM2);
- Reed Canary Grass Mineral Meadow Marsh (MAM2-2);
- Forb Mineral Meadow Marsh (MAM2-10);
- Cattail Mineral Shallow Marsh (MAS2-1);

No federally designated vegetation communities were recorded along the study corridor.

One provincially designated vegetation community (S2S3 - imperiled to vulnerable) was recorded in two locations in the study corridor. This community, Fresh-Moist Black Walnut Lowland Deciduous Forest (FOD7-4) occurs in Units N3 (north along Tuck Creek) and S22b (south along Fourteen Mile Creek West Tributary).

Each of the ELC vegetation communities is described in detail in **Appendix D, Table 2**.

Vegetation Present in the Right-of-Way

Vegetation present in the right-of-way throughout the Study Area is generally limited to old field meadow communities comprised of tolerant roadside species that are common throughout the broader landscape. Species include frequent Smooth Brome (*Bromus inermis* ssp *inermis*), Kentucky Bluegrass (*Poa pratensis*), Canada Thistle (*Cirsium arvense*), Canada Goldenrod (*Solidago canadensis*), Common Teasel (*Dipsacus fullonum* ssp *sylvestris*) and Queen Anne’s Lace (*Daucus carota*), with occasional Annual Ragweed (*Ambrosia artemisifolia*), Common Milkweed (*Asclepias syriaca*), Common Yarrow (*Achillea millefolium* ssp *millefolium*), New England Aster (*Aster novae-angliae*), and Common Dandelion (*Taraxacum officinale*). This group of species is hereafter referred to as “typical old field species.” Scattered planted and regenerating tree and shrubs are also present in old field meadow habitats throughout the study area. Typical old field species are also present in many of the semi-natural communities that dominate the landscape along and adjacent to the right-of-way (e.g., in fallow fields / cultural meadows, cultural thickets, cultural woodlands and edges of some forested communities).

Some common wetland species are also present in the right-of-way, generally associated with roadside ditches. Species include Narrow-leaved Cattail (*Typha angustifolia*), Broad-leaf Cattail (*Typha latifolia*), Reed Canary Grass (*Phalaris arundinacea*) and Common Reed (*Phragmites australis*).

Vegetation Associated with the NHSA

A number of features designated as part of the NHSA are present in the Study Area. These features are generally associated with watercourses (i.e., including the riparian and floodplain vegetation, as well as contiguous adjacent upland habitats). In some locations, the NHSA extends into the right-of-way. Vegetation units associated with the NHSA are detailed in **Appendix D, Table 2**. Watercourses and vegetation units associated with the NHSA are:

- Tuck Creek Tributary #8 – Unit N3;
- Tuck Creek Tributary #7 (C1) – Unit N4;
- Tuck Creek Tributary #2 (C7) – Units N9 and N10;
- Tuck Creek Tributary #1 (C8) – Unit N11;
- Shoreacres Tributary #2 (C9) – Units N12b and S10;
- Shoreacres Tributary #1 (C10) – Units N12a and S11;
- East Branch Shoreacres Creek (C11) – Units N12a and S12Xa;
- Appleby Creek (C12) – Units N12c and S12;
- W#2 Tributary of Sheldon Creek (C13) – Unit 12d;
- Sheldon Creek (C15) – Unit 12d and 12Xb;

- Bronte Creek (C18 and Bronte Creek Valley Bridge) – Units N13, N14, N15, N16, N17a, N17b, S13, S14, S15 and S16;
- Bronte Creek Provincial Park (i.e., designated lands in addition to those associated with Bronte Creek and other watercourses) – Units N18, S17, S18, S20 and S21;
- Unnamed Tributaries of 14 Mile Creek (C20 and C21) – Units N19, S19a and S19b;
- Fourteen Mile Creek West Tributary (C22) – Units N20, S22a and S22b;
- Fourteen Mile Creek (C23) – Units N21 and S24.

These vegetation units include a number of natural and semi-natural community types, including cultural thickets, cultural woodlands, meadow marshes, shallow marshes, lowland and upland forests, and swamps. In addition, a number of cultural meadow areas (which do not have associated Unit numbers) are present within the NHSA, as shown in **Exhibit 3-3a to 3-3l**.

Vegetation in the Bronte Creek Valley

The Bronte Creek Valley is the largest and most significant natural feature within the study area, and portions of it fall under a number of designations: Greenbelt, Bronte Creek Provincial Park Nature Reserve Life Science ANSI, Bronte Creek Valley ESA and the NHSA. In the vicinity of Dundas Street, the valley contains a number of natural and semi-natural vegetation communities, including cultural meadows, thickets and woodlands, mixed forests, deciduous forests, and meadow marshes.

The Bronte Creek Valley in general is known to provide habitat for a number of SCC, including some SAR. Suitable habitat for some of these species is present in the study area, as discussed in **Section 3.4.2.6**. However, none was confirmed by MMM during field investigations.

3.4.2.5 Wildlife Resources

Habitat features present within the Study Area and broader landscape include urban / sub-urban environments, agricultural fields, semi-natural vegetation features (e.g., cultural meadows, thickets and woodlands) and natural vegetation features (e.g., valley systems, forested areas); however, the study area is dominated by urban / sub-urban and semi-natural / cultural habitat types. Habitat within the Study Area shows varying levels of human maintenance and historical disturbances, providing habitat conditions that are more dynamic (changing) in nature, as regenerating areas advance in age, or are periodically managed. The suite of wildlife species typically found in such habitats is usually ‘opportunistic’, typical of open field habitats and smaller, more isolated natural / semi-natural habitat patches.

Natural habitat features, including wetlands and forests, are generally limited to the riparian and floodplain habitats associated with watercourses, and are included in the NHSA and other designated natural areas, as described in **Section 3.4.2.1**.

A total of 20 wildlife species were observed directly or identified indirectly through sign (e.g., auditory, track evidence) during MMM field investigations conducted in the study area between 2008 and 2014. One SAR bird was recorded, as discussed below. All other wildlife species recorded are considered common or secure / apparently secure (S-Ranks of S5, S5B, S5N, S4, or S4B). The wildlife species recorded include 13 birds, four mammals, two herpetiles and one insect. These species are listed in **Appendix D, Table 3** and discussed in the sections below.

Birds

The birds recorded in the study area are generally common species, tolerant of urban environments and edge habitats, such as American Robin (*Turdus migratorius*), Black-capped Chickadee (*Poecile atricapillus*), Blue Jay (*Cyanocitta cristata*), Red-winged Blackbird (*Agelaius phoeniceus*) and Yellow Warbler (*Dendroica petechia*). A number of other bird species with similar habitat requirements will also be present in the vicinity of the study area. A greater variety of bird species have been previously recorded in Bronte Creek Valley generally (LGL 2009, Dwyer 2006)⁴.

None of the birds recorded along the study area is deemed “area sensitive” by the MNR (2000)⁵, as expected given the nature of the habitat features present. The Bronte Creek Valley is the only location within the study area that provides large enough contiguous habitat that is likely to be suitable for area sensitive bird species.

One SAR bird – Bank Swallow (*Riparia riparia*) – was recorded, as discussed further in **Section 3.4.2.6** and **Appendix D, Table 4**. The study area and surrounding landscape have potential to support a number of other SAR birds, including Barn Swallow, Eastern Meadowlark, Bobolink, and Chimney Swift, as discussed further in **Section 3.4.2.6** and **Appendix D, Table 4**.

Mammals

Four mammal species were recorded and are likely to be common throughout the study area and broader landscape: Eastern Chipmunk (*Tamias striatus*), Eastern Cottontail (*Sylvilagus floridanus*), Raccoon (*Procyon lotor*), and White-tailed Deer (*Odocoileus virginianus*). Habitat conditions are expected to support a number of other common urban-adapted, open country and forest edge mammals, including Striped Skunk (*Mephitis mephitis*), Woodchuck (*Marmota monax*), Grey Squirrel (*Sciurus carolinensis*) and small mammals such as Meadow Vole (*Microtus pennsylvanicus*), White-footed Mouse (*Peromyscus leucopus*) and Deer Mouse (*Peromyscus maniculatus*).

There is some potential for several SAR mammals, including Woodland Vole (*Microtus pinetorum*), Little Brown Bat (*Myotis lucifugus*) and Northern Long-eared Bat (*Myotis septentrionalis*), to be present in the vicinity of the study area, as discussed further in **Section 3.4.2.6**.

⁴ Dwyer, J.K. 2006. Halton Natural Areas Inventory. Volume 1: Site Summaries.

⁵ Ministry of Natural Resources (MNR). 2000. Significant Wildlife Habitat Technical Guide. Fish and Wildlife Branch, Wildlife Section. Science Development and Transfer Branch, Southcentral Science Section. 151pp. + appendices.

Herpetiles

During the early season amphibian calling survey undertaken in April 2014, two amphibian species were recorded – Spring Peeper (*Pseudacris crucifer*) and American Toad (*Bufo americanus*). Spring Peepers were heard calling at Stations AC2, AC4, AC5, AC10, AC11, AC13, AC14 and AC15, and American Toad was heard calling at AC3, AC10, AC12 and AC14, as shown in **Exhibit 3-3a to 3-3l**.

This survey was targeted at Chorus Frog, a SAR with some known breeding sites in the broader landscape. Since Chorus Frog breeds early in the season and was not detected during the April 2014 survey, no further surveys were undertaken. Wetlands present in the study area, including some natural wetlands and some storm water management ponds, are expected to support other common amphibian species such as Green Frog (*Lithobates clamitans*) and Northern Leopard Frog (*Lithobates pipiens*).

No snake species were recorded by MMM during field surveys. However, the study area and broader landscape potentially support common snake species such as Eastern Gartersnake (*Thamnophis sirtalis sirtalis*), Dekay's Brownsnake (*Storeria dekayi*) and Red-bellied Snake (*Storeria occipitomaculata*). Eastern Gartersnake is a habitat generalist and is commonly found associated with near-urban landscapes. Dekay's Brownsnake prefers edge habitat and some open field with suitable cover, but will also use near-urban landscapes as well. Red-bellied Snake is more habitat-specific, generally occurring in close proximity to forested areas, but can also be found in near-urban areas as well. Habitat opportunities for all three snake species are available in the immediate vicinity of the study area, associated with the watercourse valley and riparian/floodplain systems, old-field areas, woodlands and edges, and some structures (e.g. abandoned buildings).

In addition, several herpetile SAR are potentially present in the vicinity of the study area and broader landscape: Eastern Ribbonsnake (*Thamnophis sauritus*), Milksnake (*Lampropeltis triangulum*), Northern Map Turtle (*Graptemys geographica*) and Snapping Turtle (*Chelydra serpentina*), as discussed further in **Section 3.4.2.6**.

3.4.2.6 Species of Conservation Concern

For the purposes of this report, SCC includes: SAR – those species listed under the Species at Risk Act (SARA) and / or listed on the Species At Risk in Ontario (SARO) List (Ontario Regulation 230/08) and protected under Ontario's Endangered Species Act, 2007 (ESA 2007); species designated by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and/or species designated by the Committee on the Status of Species at Risk in Ontario (COSSARO) and provincially rare species (MNRF S-Rank of S1 to S3).

Prior to field surveys, a screening of SCC with potential to be present within the immediate vicinity of the study area was completed. A 'long list' of 59 SCC was compiled for the screening based on background resources (i.e., previous reports from the area, NHIC records and MNRF / CH consultation). This list included SAR known to occur within Halton Region generally, and records of other SCC reported in the vicinity of the study area. Specific fish SCC information was available from MNRF for the study area watercourses. For vegetation and wildlife species, an initial desktop screening of the

long list was completed and those species that were considered to have at least some potential to occur in the general vicinity of the study area were surveyed for generally (subject to time of year) during the field investigations, and habitat conditions were assessed in terms of potential suitability.

Following field investigations, this table was refined to identify the species with potential to occur based on presence of suitable habitat within the immediate vicinity of the study area, as presented in **Appendix D, Table 4-1**. This table provides a summary of their habitat requirements, identifies observations and records of these species within or close to the study area, and summarizes potential for the local habitats along the study corridor to support them. **Table 4-2** lists the additional species compiled on the general long list from the above-noted information sources, for which no suitable habitat exists in the immediate vicinity of the study area, providing a brief description of the reasoning for this decision.

SCC Confirmed in the Area

Field surveys by MMM in 2008, 2009 and 2014 confirmed the presence of three SCC within the study area, a bird and two fish:

- **Bank Swallow** (*Hirundo rustica*) – designated as Threatened by COSEWIC and listed as Threatened under the ESA (2007). A number of Bank Swallows were observed using holes in the cliff located along the Bronte Creek Valley, approximately 100 m north of Dundas Street.
- **Silver Shiner** (*Notropis photogenis*) – designated as Threatened by COSEWIC, but listed as Special Concern under SARA (Schedule 3), designated as Threatened by COSSARO, and listed under Schedule 5 of the ESA (2007). MNR and CH confirmed the presence of Silver Shiner within the ROW reaches of Bronte Creek
- **Redside Dace** (*Clinostoma elongatus*) – designated as Endangered by COSEWIC but listed as Special Concern under SARA (Schedule 3), designated as Endangered by COSSARO and listed under Schedule 4 of the ESA (2007). MNR and CH confirmed the presence of Redside Dace in the upstream of the right-of-way reaches of 14 Mile Creek West and its Tributary (culverts C22 and C23).

DFO SAR distribution mapping also shows both tributaries of Sheldon Creek (culverts C15 and C16) as supporting potential habitat for either Silver Shiner or Redside Dace. However, through consultation with MNR, it was confirmed that neither of these species occur in either of these watercourses.

SCC with Potential to Occur

As detailed in the SCC screening table (**Appendix D**), several additional SCC could be present in the vicinity of the study area. However, none of these species was recorded during the field surveys (at least some would have been found, such as many of the plants, had they been present), and several species have very restricted ranges. Therefore, despite the presence of potentially suitable habitat conditions for some additional species, only the following SAR were identified as having reasonable potential to occur in the vicinity of the study area (details for which are provided in **Appendix D, Table 1**):

- **Flowering Dogwood** – designated as Endangered by COSEWIC and listed as Endangered under the ESA (2007) and Schedule 1 of SARA.
- **Barn Swallow** – designated as Threatened by COSEWIC and listed as Threatened under the ESA (2007).
- **Bobolink** – designated as Threatened by COSEWIC and listed as Threatened under the ESA (2007).
- **Chimney Swift** – designated as Threatened by COSEWIC and listed as Threatened under the ESA (2007) and Schedule 1 of SARA.
- **Common Nighthawk** – designated as Threatened by COSEWIC and listed as Special Concern under the ESA (2007) and as Threatened under Schedule 1 of SARA.
- **Eastern Meadowlark** – designated as Threatened by COSEWIC and listed as Threatened under the ESA (2007).
- **Hooded Warbler** – listed as Special Concern under the ESA (2007) and as Threatened under Schedule 1 of SARA.
- **Eastern Small-footed Myotis and Northern Long-eared Bat** – both designated as Endangered by COSEWIC and listed as Endangered under the ESA (2007).
- **Eastern Ribbonsnake** – designated as Special Concern by COSEWIC and listed as Special Concern under the ESA (2007) and Schedule 3 of SARA.
- **Milksnake** – designated as Special Concern by COSEWIC and listed as Special Concern under the ESA (2007) and Schedule 1 of SARA.
- **Map Turtle** – designated as Special Concern by COSEWIC and listed as Special Concern under the ESA (2007) and Schedule 3 of SARA.
- **Snapping Turtle** – designated as Special Concern by COSEWIC and listed as Special Concern under the ESA (2007) and Schedule 3 of SARA.
- **West Virginia White** – listed as Special Concern under the ESA (2007).
- **Monarch** – designated as Special Concern by COSEWIC and listed as Special Concern under the ESA (2007) and Schedule 3 of SARA.

Several of these species are very unlikely to use habitat directly within the right-of-way. The birds are unlikely to nest in the right-of-way, with the possible exception of Barn Swallow potential to nest on the bridge, and the bats are unlikely to forage within the right-of-way, particularly given the heavy use of this roadway. Birds such as Bobolink and Eastern Meadowlark may use the larger intact meadow or agricultural fields (depending on crop use) in the broader landscape north of the road as habitat; however, the cultural meadow communities present just north of Dundas Street are small, isolated patches surrounded by urban development and active row crops and therefore do not provide ideal habitat for either species.

There are no habitat features that might be used specifically in the right-of-way by the herpetofauna, although it is possible they could move through the right-of-way most likely along the larger watercourses. There is good potential for Monarch to use the old field habitats along and within the study area, which often extend into the right-of-way, but much less potential for West Virginia White, which is limited by the availability of its only larval food source – Toothwort (*Cardamine* sp.) – which has only been recorded in

Bronte Creek Valley (LGL 2009), and has limited potential to occur in some of the other woodlands in the study area and broader landscape.

It is possible that other bird SCC may forage within the right-of-way as part of their broader foraging habitat to the north of the study area; however, there is no suitable nesting habitat or any unique habitat elements within the study area for any of these species other than Barn Swallow and Chimney Swift, as discussed in **Appendix D, Table 1**. Potential for the remaining SCC for which potentially suitable habitat is available generally in the vicinity of the bridges to be present in the study area is considered low for the reasons outlined in the SCC screening table (see Conclusion column).

3.5 Stormwater Management

3.5.1 Background Description and Approach

In terms of drainage patterns within the Study Area, the existing alignment of Dundas Street between Brant Street and Bronte Road is significant in that the roadway is more or less parallel to Lake Ontario which is approximately 7 km to the south. As a result of its positioning and topography, the roadway does not generally follow alongside any watercourses but instead crosses many different watercourses. Despite a length of approximately 10.5 km within the Study Area, Dundas Street crosses six (6) separate named creeks and its tributaries in twenty six (26) culverts and one (1) bridge on Bronte Creek. The relative numerous crossings per length are generally true of Dundas Street throughout the City of Burlington and in the Town of Oakville. All crossings within the EA Study limits convey the flows southerly towards Lake Ontario.

In the City of Burlington, development to the south of Dundas Street, within the Study Area (Brant Street to Tremaine Road), and to the north of Dundas Street between Walkers Line and Bronte Cree bridge, is mostly complete. Development east of Bronte Creek bridge in the proximity of Tremaine Road is to be determined. There are no ongoing plans for development to the north of Dundas Street, west of 407 ETR. Therefore, the land use catchment characteristics for Tuck Creek, Sheldon Creek and Bronte Creek will not be modified in the near future. However, there are ongoing discussions regarding the development within the Shoreacres Creek catchment area (between Highway 407 and Walker's Line, north of Dundas Street). One of the development proposals considered the realignment of Shoreacres Creek East Branch, located west of Walkers Line. The potential for the realignment is subject to review during the development application process.

In the Town of Oakville, development to the south of Dundas Street, within the study area (Tremaine Road to Bronte Road) is mostly complete; however, there are ongoing plans for development to the north. A portion of land to the north of Dundas Street, between approximately 430 m east of Tremaine Road and approximately 120 m west of Zenon Drive, within the Fourteen Mile Creek watershed is proposed to be developed and the Environmental Implementation Report / Functional Servicing Study (EIR/FSS) is under review by various approval agencies. Therefore, the land use catchment characteristics for Fourteen Mile Creek West Tributary and Fourteen Mile Creek Main Tributary within the EA Study Area are proposed to be modified by others.

Planning for Dundas Street to the west of the current EA study limit was completed as part of the Waterdown Aldershot Transport Master Plan Study (East-West Road Class EA – Phases 3&4). Widening of the Dundas Street / Brant Street intersection is currently undergoing detailed design. Dundas Street to the east of the current EA Study limit, from Bronte Road to Proudfoot Trail is currently under construction for widening from four (4) lanes to six (6) lanes.

Each of the watercourse crossings in the EA Study Area are briefly outlined in its own sub-section. Existing drainage characteristics and physical properties are provided, including the following:

- Hydraulics and capacity;
- Existing overtopping potential;
- Upstream flow regime and infrastructure;
- Roadway drainage;
- Downstream conditions;
- Physical crossing characteristics and condition;
- Improvements to existing flooding situations;
- Prevention of inter-basin spills; and
- Drainage implications of future land use planning in the vicinity.

Each creek crossing within the Study Area is unique, and an explanation of the relevant issues as a result of the proposed improvements of Dundas Street is provided in **Sections 3.5.2 to 3.5.4**.

3.5.2 Potential Drainage Impacts

It is generally recognized that any road expansion projects would have the potential to affect drainage patterns and watercourse characteristics in the following ways:

- Increased discharge of runoff due to more impervious surface, both in terms of overall volume, peak flow rate and also a receiving watercourse's erosivity potential.
- Increased pollutant and sediment loading within storm and melt water runoff.
- Physical changes to watercourses required as a result of culvert extensions and replacements and also from expanded roadway works themselves.
- Physical changes to overall drainage boundaries (e.g. changing an outlet location or altering overland flow patterns).
- Physical changes to various hydrologic features such as nearby existing ponding areas, dams or zones of infiltration.

These effects alone or integrated have some potential to impact upstream and downstream watercourse morphology, base flows, flooding levels and overall water quality (i.e. through nutrient and sediment loading) as well as decreased infiltration.

Existing watercourse and crossing descriptions will be framed within the context of these specific and more global potential impacts.

3.5.3 Stormwater Management Criteria

Dundas Street, within the Study Area traverses through the City of Burlington (from Brant Street to Tremaine Road) and Town of Oakville (from Tremaine Road to Bronte Road). Therefore, the stormwater management criteria depend on the requirements of the respective municipality.

City of Burlington

The following reports provided information on the stormwater management criteria for Dundas Street within the City of Burlington:

1. *Northeast Alton Community Stormwater Management Master Plan (2008)*
2. *Tuck, Shoreacres, Appleby and Sheldon Creeks Watershed Study (1985)*
3. *Draft Tremaine and Dundas Secondary Plan Subwatershed Study;*
4. *City of Burlington Stormwater Management Master Plan Study (ongoing).*

These documents and other approved stormwater management reports provide information regarding the quality, quantity and erosion control requirements for the Dundas Street widening project.

In addition, Conservation Halton provided direction on the stormwater management criteria, including Quality, Erosion and Quantity control, for various creek crossings within the City of Burlington via letters dated April 15, 2010 and June 12, 2008.

Town of Oakville

The *North Oakville Creeks Subwatershed Study* (NOCSS) was completed by the Town of Oakville in 2007 and currently defines drainage policies in the Town for areas located north of Dundas Street, from Ninth Line to Tremaine Road. The NOCSS is important to the Dundas Street EA as the existing roadway abuts the southern boundary of the NOCSS. All the major culverts conveying the flows from Fourteen Mile Creek and its tributaries flow across the Dundas Street EA study area and are identified in the NOCSS.

Due to the changes associated with development upstream of Dundas Street, some changes to existing drainage boundaries have been proposed, by others. Since the development application is under review by various approval agencies, the recommendations under the NOCSS study are considered.

The Dundas Street drainage areas themselves are indicated only on post development exhibits located in **Section 6.1.6**.

One of the most important aspects of the NOCSS is its stipulation of the allowable unit flow rates for the upstream side of the various culverts crossing Dundas Street. Extensive hydrologic modelling in the NOCSS defined what the expected existing flow rates were at each culvert for various return period storms (i.e. the 2 year through 100 year return period storms, and also the Hurricane Hazel Regional Storm event). Any development

upstream of Dundas Street is required to control its flows through stormwater management measures such that its allowable proportion of existing flow by area is not exceeded. Through this rule, the allowable peak flows upstream at each Dundas Street culvert will be preserved going forward.

The unit flow rate stipulations in the NOCSS were adopted to preserve existing watercourses, both north and south of Dundas Street. Other important criteria in the NOCSS include preservation of downstream watercourse erosive potential and preservation of overall contributing area.

The unit flow rates stipulated in the NOCSS were updated by the Ontario Municipal Board (OMB) mediated flows, as indicated in the North Oakville Creeks Subwatershed Management Strategy (NOCSMS), July 2007.

The NOCSS also outlines that control of stormwater runoff for thermal pollution, total phosphorus, and total suspended solids entering watercourses be considered together along with infiltration goals.

The NOCSS stipulates flow regimes to the upstream side of the various Dundas Street culverts, specifically at the point where flows cross the Dundas Street property boundary.

Located between the NOCSS areas to the north and existing Stormwater Management (SWM) report areas to the south, no site specific policies currently exist for Dundas Street itself. Accordingly, without specific policies in place, a logical and environmentally sound approach is required to address the various potential drainage impacts identified in **Section 3.5.2** that could result from proposed roadway expansion. The proposed approach must:

- Recognize the intent of principles contained in the NOCSS, including targets for water quality and quantity.
- Ensure downstream watercourse and SWM plan requirements are met.
- Logically integrate drainage works into existing downstream drainage infrastructure and capacity.
- Culvert extension and replacement designs are based on geomorphologic input / assessment.
- For Fourteen Mile Creek Stormwater Best Management Practices as outlined in *Guidance for Development Activities in Redside Dace Protected Habitat* to minimize impacts to water quality and increase in water temperature.

The overall goal of drainage criteria will be to protect upstream and downstream morphology/stability, base flows, flooding levels and overall water quality within each of the potentially affected watercourses in the Study Area.

Each of the existing watercourse descriptions outlined in the following section also include discussion of proposed drainage criteria based on guidelines specific to that system. Integration of the proposed development plan into existing Dundas Street drainage is outlined specifically. Allowances made for flexibility in future Dundas Street drainage planning are also outlined.

3.5.4 Existing Watercourse and Culvert Descriptions

Each of the creek systems is outlined, proceeding from the west boundary (Brant Street) of the EA Study Area to the east (Bronte Road). Details of the existing culverts on Dundas Street within the Study Area are described in Sections 3.5.4.1 to 3.5.4.6 and also listed in Table 3-2.

Hydraulic models (HEC-2 or HEC-RAS) were obtained from Conservation Halton (CH) for various creek crossings at Dundas Street within the study area. It is noted that not all culvert crossings at Dundas Street are regulated by CH. Therefore, hydraulic models were not available for all the culvert crossings. For the crossings where the hydraulic models were not available, the culverts were analyzed using the CulvertMaster computer program.

Where applicable, the available hydraulic models were converted from HEC-2 to HEC-RAS as per the latest topographic information and where needed, the flows were also updated.

Table 3-2: Details of Existing Culverts on Dundas Street (Brant Street to Bronte Road)

Name of Creek	Culvert ID	Dimensions	Type
City of Burlington			
Tuck Creek Tributary	C1	900 mm diameter	CSP
Tuck Creek Tributary	C2	1520 mm x 970 mm	CSP Arch
Tuck Creek Tributary	C3	1830 mm x 1220 mm	CSP Arch extension.
Tuck Creek Tributary	C4	825 mm diameter	CSP
Tuck Creek Tributary	C5	600 mm diameter	HDPE Lined CSP
Tuck Creek Tributary	C6	525 mm diameter	HDPE Lined CSP
Tuck Creek	C7	1520 mm x 1220 mm	Open Bottom Concrete
Tuck Creek	C8	1830 mm x 910 mm	Open Bottom Concrete
Shoreacres Creek	C9	2440 mm x 1830 mm	Concrete Box
Shoreacres Creek	C10	1830 mm x 1600 mm	Concrete Box
Shoreacres Creek East Branch	C11	3050 mm x 1520 mm	Open Bottom Concrete
Appleby Creek	C12	2440 mm x 1520 mm	Open Bottom Concrete
West Sheldon Creek	C13	2440 mm x 1520 mm	Concrete Box
Sheldon Creek (Local drainage)	C14	2440 mm x 1520 mm	Concrete Box
Sheldon Creek Tributary	C15-1	1830 mm x 1520 mm	Concrete Box
	C15-2	3660 mm x 1520 mm	Concrete Box
Sheldon Creek Tributary	C16	2440 mm x 1220 mm	Concrete Box
Sheldon Creek (Local drainage)	C17	910 mm x 910 mm	Concrete Box

Name of Creek	Culvert ID	Dimensions	Type
Bronte Creek	B1	213 m span	Bridge
Bronte Creek (Local drainage)	C18	825 mm diameter	CSP
Town of Oakville			
Fourteen Mile Creek Tributary (Local Drainage)	C19	750 mm diameter	HDPE Lined CSP
Fourteen Mile Creek Tributary	C20	900 mm diameter	CSP
Fourteen Mile Creek Tributary	C21A	825 mm diameter	CSP
Fourteen Mile Creek Tributary	C21B	600 mm diameter	CSP
Fourteen Mile Creek	C22	3660 mm x 2440 mm	Concrete Box
Fourteen Mile Creek Tributary	C22A	750 mm diameter	CSP
Fourteen Mile Creek Tributary	C22B	750 mm diameter	CSP
Fourteen Mile Creek Main	C23	4570 mm x 2440 mm	Open Bottom Concrete

3.5.4.1 Tuck Creek

Under existing conditions, Tuck Creek and its tributaries drain the lands to the north of Dundas Street through eight (8) culverts. The drainage areas for the various tributaries of Tuck Creek were delineated using the latest topographic information obtained from Halton Region. The flows through the culverts were estimated using SWMHYMO using the 24 hour Chicago distribution, a Town of Oakville standard.

The hydraulic models for Culverts C7 and C8 were obtained from Conservation Halton. For the remaining culverts, i.e. C1, C2, C3, C4, C5, and C6, hydraulic analysis was conducted using CulvertMaster. The flows for the 50year, 100year and Regional Storm events were used for the hydraulic analysis.

Culvert C1 is a 900 mm diameter CSP culvert, which conveys the flows from approximately 24.00ha area north of Dundas Street. The flows through the culvert drain to an existing storm inlet approximately 100m downstream of Culvert C1.

The culvert inspection conducted by MMM in 2011 indicated that the culvert is in poor condition. The bottom of the culvert on the upstream end is corroded and downstream end is clogged.

Hydraulic analysis results indicate that the runoff from the area north of Dundas Street draining to Culvert C1 overtops Dundas Street for storm events equal to or greater than the 50 year storm.

Culvert C2 is a 1520 mm by 970 mm CSP arch culvert, which conveys the flows from approximately 28.75 ha area north of Dundas Street. The flows through Culvert C2 drain along Dundas Street for approximately 440m before draining to an existing storm inlet located approximately 50 m south of Culvert C3.

The culvert inspection conducted by MMM in 2011 indicated that the culvert is in good condition.

Hydraulic analysis results indicate that the runoff from the area north of Dundas Street draining to Culvert C2 overtops Dundas Street for storm events equal to or greater than the 50year storm.

Culvert C3 is an 1830 mm by 1220 mm concrete box with a CSP arch extension, which conveys the flows from approximately 42.23ha area north of Dundas Street. The flows through the culvert are conveyed to an existing storm inlet approximately 50m downstream of Culvert C3.

The culvert inspection conducted by MMM in 2011 indicated that the culvert is in good condition.

Hydraulic analysis results indicate that the runoff from the area north of Dundas Street draining to Culvert C3 overtops Dundas Street for storm events equal to or greater than the 50 year storm.

Culvert C4 is an 825 mm diameter CSP culvert, which conveys the flows from approximately 5.30ha area north of Dundas Street. The flows through the culvert are conveyed to an existing storm inlet approximately 60m downstream of Culvert C4.

The culvert inspection conducted by MMM in 2011 indicated that the culvert is in poor condition with downstream end severely bent and clogged.

Hydraulic analysis indicates that Culvert C4 have the capacity to convey the flows from storm events including the Regional Storm without overtopping Dundas Street.

Culvert C5 is a 600 mm diameter HDPE lined CSP culvert, which conveys the flows from approximately 16.85ha area north of Dundas Street. The flows through the culvert are conveyed to an existing storm inlet approximately 100m downstream of Culvert C5.

The culvert inspection conducted by MMM in 2011 indicated that the culvert is in good condition.

Hydraulic analysis results indicate that the runoff from the area north of Dundas Street draining to Culvert C5 overtops Dundas Street for storm events equal to or greater than the 50 year storm.

Culvert C6 is a 525 mm diameter HDPE lined CSP culvert, which conveys the flows from approximately 22.74ha area north of Dundas Street.

Culvert C6 is connected to an inlet located on the St. John Anglican Church property. From the inlet the flows are conveyed by an existing storm sewer system to an open area, where it flows overland to another existing storm inlet located approximately 100m south of Dundas Street. It was reported by the management of the church that the

parking lot was flooded. The inspection carried out by MMM in 2010 indicated that the downstream storm sewer located within the church property is almost completely clogged with debris and sedimentation. The inadequate capacity of the downstream storm sewer system may have caused the parking lot.

The culvert inspection for Culvert C6, conducted by MMM in 2011 indicated that the culvert is in good condition.

Hydraulic analysis results indicate that the runoff from the area north of Dundas Street draining to Culvert C6 overtops Dundas Street for storm events equal to or greater than the 50 year storm

Culvert C7 is a 1520 mm by 1220 mm open bottom concrete culvert, which conveys the flows from approximately 79.3ha area north of Dundas Street. The flows through the culvert are conveyed to an existing storm inlet approximately 130 m downstream of Culvert C8.

The culvert inspection conducted by MMM in 2011 indicated that the culvert is in good condition.

Hydraulic analysis results indicate that Culvert C7 can convey the 50 year and 100 year flows without overtopping Dundas Street. However, overtopping of Dundas Street will occur during the Regional Storm flow.

Culvert C8 is an 1830 mm by 910 mm open bottom concrete culvert, which conveys the flows from approximately 130.79 ha area north of Dundas Street. The flows through the culvert are conveyed to an existing storm inlet approximately 130 m downstream of Culvert C8.

The culvert inspection conducted by MMM in 2011 indicated that the culvert is in good condition.

Hydraulic analysis results indicate that Culvert C8 can convey the 50 year and 100 year flows without overtopping Dundas Street. However, overtopping of Dundas Street will occur during the Regional Storm flow.

3.5.4.2 Shoreacres Creek

Under existing conditions, Shoreacres Creek and its tributaries drain the lands to the north of Dundas Street through three (3) culverts. The drainage area for various tributaries of Shoreacres Creek was delineated using the latest topographic information from Halton Region. The flows through the culverts were estimated using SWMHYMO using the 24 hour Chicago distribution for the 50 year, 100 year and Regional Storm events. The hydraulic analysis was conducted using CulvertMaster for Culvert C9 and HEC-RAS model for Culverts C10 and C11. The HEC-RAS model was obtained from Conservation Halton and was updated.

Culvert C9 is a 2440 mm by 1830 mm concrete box culvert, which conveys the flows from approximately 131.40 ha area north of Dundas Street. Culvert C9 conveys the flows to an existing inlet located to the west of Headon Road, approximately 100 m south of Dundas Street, via a naturalized channel.

The culvert inspection conducted by MMM in 2011 indicated that the culvert is in good condition with minor bank erosion on the west side of the culvert.

Hydraulic analysis results indicate that Culvert C9 can convey the 50 year and 100 year flows without overtopping Dundas Street. However, overtopping of Dundas Street will occur during the Regional Storm flow.

Culvert C10 is an 1830 mm by 1600 mm concrete box culvert, which conveys the flows from approximately 156.00ha area north of Dundas Street. The flows are conveyed to the same inlet which receives the flows from Culvert C9.

The culvert inspection conducted by MMM in 2011 indicated that the culvert is in good condition.

Hydraulic analysis results indicate that Culvert C10 can convey the 50 year and 100 year flows without overtopping Dundas Street. However, overtopping of Dundas Street will occur during the Regional Storm flow.

Culvert C11 is a 3050 mm by 1520 mm open bottom concrete culvert, which conveys the flows from approximately 123.85ha area north of Dundas Street. The flows are conveyed to a watercourse downstream.

The culvert inspection conducted by MMM in 2011 indicated that the culvert is in good condition.

Hydraulic analysis results indicate that the culvert can convey the flows for the storm events including the Regional Storm without overtopping Dundas Street.

3.5.4.3 Appleby Creek

Appleby Creek **Culvert C12** is a 2440 mm by 1520 mm open bottom concrete culvert which drains approximately 327.00 ha area to the north of Dundas Street.

The culvert inspection conducted by MMM Group in 2011 indicates that the culvert is in good condition.

Hydraulic analysis results indicate that the runoff from the area north of Dundas Street draining to Culvert C12 overtops Dundas Street for storm events equal to or greater than the 50 year storm.

3.5.4.4 Sheldon Creek

The catchment area of Sheldon Creek and its tributaries between Dundas Street and 407 ETR have been developed and the flows are conveyed across Dundas Street in Culvert C13, Culvert C14, Culvert C15 and Culvert C16. Hydraulic models obtained from Conservation Halton for Culverts C13 and C15 were updated for the sizes of the culverts and invert elevations. Culvert C16 was analyzed using CulvertMaster for the 50 year, 100 year and Regional Storm events.

Culvert C13 is a 2440 mm by 1520 mm concrete box culvert, which conveys the flows discharged from an online pond on Sheldon Creek W2 Tributary; the approximate drainage area of the online pond is 236.00 ha.

The culvert inspection conducted by MMM in 2011 indicated that the culvert is in good condition.

Hydraulic analysis results indicate that the culvert can convey the 50 year and 100 year flows but the Regional Storm flow will overtop Dundas Street.

Culvert C14 is a 2440 mm by 1520 mm concrete box culvert. Due to the development north of Dundas Street, C14 conveys the local drainage flows only.

The culvert inspection conducted by MMM in 2011 indicated that the culvert is in good condition. It is noted that Culvert C14 will be abandoned.

Culvert C15 consists of an 1830 mm by 1520 mm concrete box culvert and a 3660 mm by 1520 mm concrete box culvert. The two box culverts convey flows discharged from an online pond upstream of Culvert C15; the approximate drainage area is 192.00 ha north of Dundas Street.

The culvert inspection conducted by MMM in 2011 indicated that the culvert is in good condition.

Hydraulic analysis results indicate that the culverts can convey the 50 year, 100 year and Regional Storm flows without overtopping Dundas Street.

Culvert C16 is a 2440 mm by 1220 mm concrete box culvert, which conveys the flows from approximately 31.88 ha area north of Dundas Street. The flows from the culvert are conveyed to a roadside ditch along Dundas Street, from where it discharges to Sheldon Creek Tributary W1/W2, downstream of Culvert C15.

The culvert inspection conducted by MMM in 2011 indicated that the culvert is in good condition.

Hydraulic analysis results indicate that Culvert C16 can convey the 50year, 100year and Regional Storm flows without overtopping Dundas Street.

Culvert C17 is a 910 mm by 910 mm concrete box culvert, located along the CN Railway. However, this culvert could not be located in field during site visit in 2014. The culvert may have been removed by CNR.

3.5.4.5 Bronte Creek

Under existing conditions, Bronte Creek drains to the north of Dundas Street through a 213 m span bridge. The bridge does not impact the Bronte Creek floodplain (see **Section 3.7.1** for a description of the existing Bronte Creek structure).

Culvert C18 is an 825 mm diameter CSP culvert, which conveys the flows from approximately 0.89 ha localized area north of Dundas Street.

The culvert inspection conducted by MMM in 2011 indicated that the culvert is in poor condition with corrosion at the bottom. Culvert inspection carried out by MMM in 2014 indicated recent installation of erosion control works downstream of Culvert C18.

Hydraulic analysis results indicate that the culvert can convey the 50 year, 100 year and Regional Storm flows without overtopping Dundas Street.

3.5.4.6 Fourteen Mile Creek

Fourteen Mile Creek and its tributaries convey the flows from the area north of Dundas Street through eight (8) culverts. Culverts C19 and C20 fall outside the *North Oakville Creeks Subwatershed Study* (NOCSS). However, similar to the NOCSS unit flow rates, the *Tremaine and Dundas Secondary Plan Subwatershed Study* (TDSPSS) provide the unit flow rates for the drainage areas. For the remaining Fourteen Mile Creek Tributary culverts within the Town of Oakville, the flows were based on the NOCSS unit flow rates.

Hydraulic analysis was conducted using CulvertMaster for Culverts C19, C20, C21A, C21B, C22A and C22B. HEC-RAS models were obtained from Conservation Halton for the Culverts C22 and C23.

Culvert C19 is a 750 mm HDPE-lined CSP culvert, which conveys the flows from approximately 4.07 ha area north of Dundas Street. The flows through the culvert were estimated based on the unit flow rate provided in the *Draft Tremaine and Dundas Secondary Plan Subwatershed Study*.

The culvert inspection conducted by MMM in 2011 indicated that the culvert is in good condition.

Hydraulic analysis results indicate that the culvert can convey the 50 year, 100 year and Regional Storm flows without overtopping Dundas Street.

Culvert C20 is a 900 mm diameter CSP culvert, which conveys the flows from approximately 27.31 ha area north of Dundas Street.

The culvert inspection conducted by MMM in 2011 indicated that the culvert is in poor condition with corroded bottom.

Hydraulic analysis results indicate that Culvert C20 can convey the flows for the 50 year and 100 year storm events without overtopping Dundas Street. However, overtopping of Dundas Street will occur during the Regional Storm flow.

Culvert C21A is an 825 mm CSP culvert, which conveys the flows from approximately 46.56 ha area north of Dundas Street.

The culvert inspection conducted by MMM in 2014 indicated that the culvert is in good condition with stagnant water on the upstream end due to sedimentation vegetation growth.

Hydraulic analysis results indicate that Culvert C21A can convey the 50 year and 100 year flows without overtopping Dundas Street. However, overtopping of Dundas Street will occur during the Regional Storm flow.

Culvert C21B is a 600 mm CSP culvert, which conveys the flows from approximately 11.71 ha area north of Dundas Street.

The culvert inspection conducted by MMM in 2014 indicated that the culvert is in good condition with stagnant water on the upstream end due to sedimentation vegetation growth.

Hydraulic analysis results indicate that Culvert C21B can convey the 50 year and 100 year flows without overtopping Dundas Street. However, overtopping of Dundas Street will occur during the Regional Storm flow.

Culvert C22 is a 3660 mm by 2440 mm concrete box culvert, which conveys the flows from approximately 423.70 ha area north of Dundas Street. Discussions are ongoing to develop the area upstream of C22. The Environmental Implementation / Functional Service Study associated with the development area upstream is under review by various approval agencies.

Culvert inspection conducted by Halton Region indicated that the culvert was constructed in 1920 with major rehabilitation carried out in 1970. The culvert is in good condition and requires minor repairs.

The culvert is connected to a concrete lined channel on the upstream side. Hydraulic analysis results indicate that the culvert can convey the 50 year and 100 year flows including the Regional Storm flow without overtopping Dundas Street.

Culvert C22A is a 750 mm diameter CSP culvert, which conveys the flows from approximately 8.0 ha area north of Dundas Street.

The culvert inspection conducted by MMM in 2014 indicated that the culvert is in good condition.

The hydraulic analysis results indicate that Culvert C22A can convey the 50 year and 100 year flows including the Regional Storm flow without overtopping Dundas Street.

Culvert C22B is a 750 mm diameter CSP culvert, which conveys the flows from approximately 5.87 ha area north of Dundas Street including the outflows from the SWM Pond constructed by the Forestview Church.

The culvert inspection conducted by MMM in 2014 indicated that the culvert is in good condition.

Hydraulic analysis results indicate that Culvert C22B can convey the flows for the 50year, 100year and Regional Storm without overtopping Dundas Street.

The flows from Culverts 22A and 22B drain to a downstream storm sewer which discharges downstream of Culvert C23.

Culvert C23 is a 54.1 m long, 4570 mm by 2440 mm open bottom concrete culvert, which conveys the flows from approximately 340 ha area (as per NOCSS) north of Dundas Street.

Culvert inspection conducted by Halton Region indicated that the culvert was constructed in 1940 with major rehabilitations carried out in 1980. The culvert is in good condition and requires minor repairs.

Hydraulic analysis results indicate that the culvert can convey the 50 year, 100 year and Regional Storm flows without overtopping Dundas Street.

3.6 Fluvial Geomorphology

Fluvial geomorphology is *the study of sediment sources, fluxes and storage within the river catchment over short, medium and longer timescales and of the resultant channel and floodplain morphology* (Sear and Newson, 1993). Roads schemes have the potential to impact geomorphological features and processes of erosion and deposition. It is important to consider these potential impacts and the impact that fluvial processes may have on infrastructure in terms of erosion risk.

The fluvial geomorphology assessment carried out as part of the Dundas Street Class EA Study is closely linked to other specialist assessments that are also being undertaken for the EA Study, in particular the fisheries assessment and the drainage and stormwater management assessment.

This section documents the existing fluvial geomorphological baseline conditions for watercourses that could potentially be impacted by the proposed Dundas Street widening between Brant Street and Bronte Road. Creek crossings within the Study Area are listed in **Table 3-3**. A number of minor crossings were not visited as they were not anticipated to pose any erosion issues. Screening out of minor crossings was based on interpretation of aerial photographs and discussions with other specialists and Conservation Halton. These included low-discharge swales (such as several Tuck Creek tributaries) and streams that have been developed into SWM ponds (such as tributaries to Sheldon Creek). Further, some reaches were screened out where no works are proposed, this is particularly true where these reaches were not readily accessible. Reaches downstream of C7 and C8 were not assessed as no works are proposed in these locations.

Table 3-3: Creeks Crossing Dundas Street within Study Area

Creek Name	No. of Crossings	Culvert No.(s)
Tuck	5	C1, C2, C3, C7, C8
Shoreacres	3	C9, C10, C11
Appleby	2	C12, C13
Bronte	1	N/A
Fourteen Mile Creek (West) Tributary	2	C22, C23

3.6.1 Methodology

Reaches are geomorphologically similar lengths of watercourses. In most cases, separate reaches were classified upstream and downstream of the Dundas Street crossings. In Bronte Creek, where there was no distinct change in fluvial processes, the same reach extended up and downstream of Dundas Street.

Existing baseline conditions for each creek are presented in the reach descriptions in this section of the ESR. These descriptions are based on Rapid Geomorphic Assessments and the Stability Index for each site is reported. Surveying took place on August 18 and 30, 2011, December 2 and 8, 2011, January 11, 2012, September 16, 26, 2014 and on

November 27 and 30, 2014. In addition, the dominant reach processes, reach function and conservation status is given.

Where channels have been assigned a moderate or high conservation status, their sensitivity to proposed development in terms of impact on natural fluvial processes should be carefully considered. Where conservation status is low, there may be potential for enhancement of fluvial processes as part of the proposed development. Existing erosion risks are also given for each site. This is important to enable assessment of potential erosion risks to new and existing infrastructure. Geomorphic classification tables are provided in **Appendix E**.

Aerial photograph interpretation including historic photographs from 1954 and 1978 was undertaken for Bronte Creek, Fourteen Mile Creek and Shoreacres Creek. As well, relevant existing reports were reviewed for background information.

Note that all references to left or right bank are based on a view downstream. As well, the location listed in the reach description tables refer to upstream (north) and downstream (south) of Dundas Street.

3.6.1.1 Limitations and Assumptions

The data collected in the field reflects conditions at the time of survey. Seasonal changes in flow and sediment conditions, vegetation growth or routine maintenance operations have thus not been directly taken into account. Surveying took place in summer, fall and winter conditions. During the winter site visits flows were moderately high but did not exceed bankfull margins. In contrast, the flows observed during the summer site visit were lower. Stream banks (and sometimes beds) were more obscured by vegetation during the summer visit than during the winter. As such, the opportunity to observe features on the channel bed and banks varied among site visits.

Due to connectivity in the fluvial system, impacts arising from development potentially occur over a wide area, especially in the downstream direction. The geomorphological survey encompassed short sections upstream and downstream of the potential points of impact (that is at the creek crossings of Dundas Street).

3.6.2 Review and Description of Existing Geomorphic Conditions

Streams within the Study Area share many catchment characteristics. In general, the streams drain low-gradient farmland north of Dundas Street and flow through residential and commercial developments south of Dundas Street. Where present, riparian vegetation is often deciduous woodland, shrubs or tall grasses. Most streams have been modified through either historical ditch-digging for agricultural purposes or by recent realignment (some using elements of natural channel design) within suburban developments. As a result, many channels have been straightened. Valleys are absent or poorly defined, and most streams are small (bankfull width generally less than 5m). Channel substrates, where natural, are derived from predominantly fine-grained till. The existing Dundas Street culverts are oriented northwest-southeast while most streams run approximately east-west, resulting in awkward alignments at many stream crossings.

The main exception to this is Bronte Creek which is located within a deep valley and has an average bankfull width of 20 m.

On August 4, 2014, heavy rainfall resulted in significant flooding in Burlington, Ontario. Digital videos of the flood were provided by Conservation Halton, for review. These videos show significant flooding North and South of Dundas Street West between Brant Street and Walkers Line. Swelling is identified in Roseland Creek, Tuck Creek, and Shoreacres Creek, resulting in the Inundation of many major roads, including Dundas Street West, Guelph Line, and Walkers Line.

Shoreacres Creek

Historic Air Photography Interpretation – Exhibit 3-4 shows the historic photos of Shoreacres Creek. Land use within the catchment upstream of Dundas Street has not altered significantly since 1954 and remains predominantly agricultural (with the exception of the construction of Highway 407). Since 1978 a car share car park was constructed. The riparian vegetation does not appear to have changed significantly during this period, although upstream of the reach the riparian corridor has widened and matured.

Upstream of the Dundas Street right-of-way, where the channel is now adjacent to the car pool lot access, the channel had a fairly sinuous planform in the 1978 aerial photograph (the planform cannot be discerned in the 1954 photograph). By 2006, the channel had been realigned into a straight drainage ditch. Within the Dundas Street ROW, the creek had been realigned to a roadside ditch by 1954. Since that time the channel appears to have been relocated to the north to accommodate road widening.

Downstream of Dundas Street, the channel had been straightened by 1954. The channel ran between farm fields and had almost no riparian buffer. By 1978 the channel appears to have gained some sinuosity. By 2006 the stream had been realigned and the surrounding area was developed into a residential neighborhood.

Appleby Creek

The 1997 Alton Community Secondary Plan – Subwatershed Impact Study was reviewed. That study defines Appleby Creek north of Dundas Street as well defined, with portions of the channel having been relocated along the east side of Walkers Line. Substrates are typically fine with occasional pockets of gravel, shale, rubble, and scattered boulders. Small pools are present within the channel, as well as point and side bars.



1954



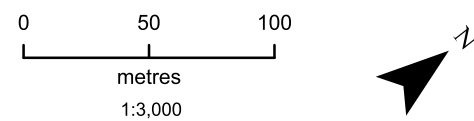
1978



2011

Legend

- Reach Locations
- Watercourse



Sheldon Creek

As part of the Central Alton Community development, the realignment and naturalization of Western Sheldon Creek was proposed. The West Sheldon Creek Channel Realignment and Crossing Design Report (2006), was reviewed. That report summarizes the design of the Western Sheldon Creek realignment, between Cornerstone Drive and an existing stormwater retention pond, located on the upstream side of Dundas Street. The Natural Channel Design Brief for West Sheldon Creek (2006) was also reviewed. That report summarizes the design of the proposed watercourse realignment between Cornerstone Drive and 407 ETR. Both reports propose a pool riffle system with the same profile, cross-sectional, and plan geometry. The proposed drainage corridor for both designs was proposed to be on average 30 m wide and 2.4 m deep, with a 4.0 m wide, 0.75 m deep low flow channel.

Bronte Creek

Historic Air Photography Interpretation – Exhibits 3-5a to 3-5c shows that the Creek runs through a well forested, wide riparian corridor set within the valley. There has been some fluctuation in the extent of the corridor between 1954 and present. Generally where there have been changes the width of the corridor has increased. A notable exception to this is an area on the right bank which was cleared for aggregate extraction between 1954 and 1978. Changes to infrastructure between 1978 and 2006 include the construction of H407 and the widening of Dundas Street. There was extensive urbanization of the catchment between 1978 and 2006.

Bronte Creek is situated within a steep valley which confines any lateral migration. There appears to have been more channel adjustment between 1954 and 1978 than between 1978 and 2006 (see **Exhibit 3-5**). Between the two earlier photographs the creek appears to have increased in sinuosity upstream and in the location of the Dundas Street crossing. There has also been a change in the amount of sediment stored within the system in this location. In particular, the frequency and size of mid-channel bars decreased significantly between 1954 and 2006 with most of the change occurring between 1954 and 1978. Along with this reduction in sediment load, it appears that the average channel width has narrowed. It should be noted that Hurricane Hazel was in October 1954 and this extreme event would have affected the changes observed. All of these channel adjustments are confined within the steep river valley.

Field Investigation - Bronte Creek in the vicinity of Dundas Street is a semi-confined channel located within a deep valley. The channel meanders across the valley floor making contact with the toe of the valley slope in several locations. The Bronte Creek floodplain is often present on only one side of the channel, and where present it varies in width. The floodplain and valley slopes are generally well vegetated.







The channel is considered to be laterally migrating, however due to the confined nature of the valley lateral adjustment of the creek would be limited over time. The reach has pool-riffle morphology and a moderate slope. Bankfull width varies from 17 to 25 m with an average of 20 m. Bank heights range from 0.2 to 1.5 m where unconfined. A cut-off channel was observed on the eastern floodplain on the meander upstream of Dundas Street.

There is a large supply of sediment to the system both from upstream and colluvial sources within the study reach (notably the exposed shale valley slopes). Numerous depositional features have formed which include point bars, mid channel bars and side bars comprised of material ranging from fines to cobble. These depositional features appear to be quite mobile based on site observations made in 2011 and 2014; for instance, the point bar located upstream of Tansley Bridge appears to have lost material since 2011, and the shape and extent of the upstream riffle has changed. The sediment supply appears to be well-balanced with material leaving the system through transport and erosion. Bank erosion was observed on the outer banks of meanders as is typical of a meandering system. Overall the reach functions as an exchange for sediment.

The bridge and heritage piers cross Bronte Creek on a meander. The existing Tansley Bridge has a minimal impact on the system as the piers are set well outside of the bankfull channel. Immediately upstream of the bridge the east bank (which is located on the outside of the meander) is actively eroding, while beneath the bridge erosion has been prevented by installing riprap and buried stone protection. The interface of the rip rap bank protection and the natural bank upstream is a weak point in the bank where erosion is exacerbated. The change in bank shape and hardness appears to deflect the thalweg toward the opposite bank, causing scour around the base of the heritage pier which is within the bankfull channel near the west bank.

The valley cross section under Tansley Bridge has been modified by the placement of fill between the bridge piers. The east stream bank is steep and slopes into the valley wall while to the west stream bank has a gentler slope. The floodplain under the bridge on the west side has been partially filled to create a moderate slope from the top of bank to the western Tansley Bridge pier. This slope grades into the low-lying western floodplain upstream and downstream of the bridge. The pool-riffle channel morphology continues beneath the bridge and includes the end of the meander pool on the east bank followed by a riffle which spans the width of the channel. Just downstream of the riffle, a scour pool is developing at the base of the heritage pier. Acknowledging these local modifications, overall the channel appears to be in dynamic equilibrium.

Fourteen Mile Creek West

Historic Air Photography Interpretation - Historic photographs of the Fourteen Mile Creek West Tributary were only available for 1978 (**Exhibit 3-6**). No significant alterations to the catchment, floodplain or riparian zone have occurred in the upstream reaches since this time. Likewise there has been no notable change in the channel planform. By 1978, the concrete channel had been built immediately upstream of Dundas Street in Reach FW02.



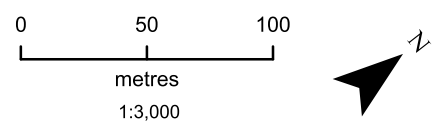
1978



2011

Legend

- Reach Locations
- Watercourse



Downstream of Dundas Street, land use has changed considerably. In 1978, the land surrounding the river corridor consisted of plowed fields, a pond and a farmstead, while today it is a suburban residential neighbourhood. As well, the bridge crossing Colonel Williams Parkway was constructed at the downstream extent of FW03 since 1978. The overall width of the riparian corridor has not changed since 1978 but the valley sides and floodplain have become more forested. Much of the channel is obscured by trees in both the current and historic photograph. The visible channel segments do not appear to have been altered or undergone significant lateral migration in this period.




The 2006 North Oakville Creeks Subwatershed Study (NOCSS) was reviewed. Fourteen Mile Creek West crosses Dundas Street West at two locations (14W-12 and 14W-1) between Bronte Road and Tremaine Road, in the Town of Oakville. The NOCSS defines Fourteen Mile Creek West (14W-12) as high constraint under the reach-scale riparian corridor classification scheme. In this area, the meander belt width was 25 m and the corridor width (meander belt + factor of safety and access setback) was 46 m. The channel was classified as transitional based on a Rapid Geomorphic Assessment (RGA) and in low condition based on the Rapid Stream Assessment Technique (RSAT).



The NOCSS also defines Fourteen Mile Creek West (14W-1) as high constraint under the reach-scale riparian corridor classification scheme. In this area, the meander belt width was 40 m and the corridor width (meander belt + factor of safety and access setback) was 63 m. The channel was classified as in adjustment based on a Rapid Geomorphic Assessment (RGA) and in moderate condition based on the Rapid Stream Assessment Technique (RSAT).

The 2012 Environmental Implementation Report / Functional Servicing Study for Fourteen Mile Creek West and the Lazy Pat Farm Property, was reviewed. That report refines the meander belt widths and corridor widths for high and medium constraint reaches (including 14W-12 (C22)) within the proposed Lazy Pat Farm development area, based on the results of the NOCSS. Reach 14W-1 was not reassessed as it is not within the subject property. The meander belt width and stream corridor width for 14W-12 (C22) was estimated based on two empirical methods (Parish Geomorphic Ltd. (2004) and Annable (1996)). The final belt width for Fourteen Mile Creek between Dundas Street and future Burnhamthorpe Road extension is 57.4 m which includes the allowances for hydrologic regime change in post development conditions. Additionally, the report proposes modifications to a number of Fourteen Mile Creek West tributaries. This includes the realignment of two medium constraint tributaries, the rehabilitation of one medium constraint tributary, and the elimination of one low constraint tributary within the study area. Conceptual channel design was developed based on the principles of “Natural Channel Design” and NOCSS requirements.

3.6.2.1 Reach Descriptions

A summary of the existing conditions for each reach included in the geomorphology assessment is included in this section. See **Appendix E** for a complete list of the definition of “Reach Function”, “Conservation Status”, “Field Indicators for Instability and Stability – Reach Process”, and “Rapid Geomorphic Assessment”.

Watercourse	Tuck Creek Tributary	
Culvert ID	C1	
Location	Upstream	
Function	Source	
Process	Lateral adjustment with incision	
Stability Index	0.31	Transitional
Conservation status	3	
Bankfull width (m)	1.3	
Channel geometry	Straight	
<p>The channel runs parallel to the north side of Dundas Street from west of the 2111 Dundas Street driveway to the C1 inlet.</p> <p>The channel has a modified cross section, moderate to high gradient, straight planform and poor floodplain connectivity. The right channel bank is confined by the Dundas Street road embankment. Upstream of the 2111 Dundas Street driveway the channel is a grassy ditch which is not deeply entrenched. The driveway culvert is slightly perched. Downstream of the driveway is a 0.65 m high knickpoint which has been protected with riprap. A second knickpoint (0.55 m high) is located farther downstream.</p> <p>The channel gradually becomes more entrenched downstream and is recovering sinuosity through lateral adjustment. Bank erosion is extensive. Channel dimensions vary throughout the reach (bankfull width ranging from 0.6-1.6 m and depth 0.3-0.55 m). A more representative bankfull width of 1.3 m was measured in the lower portion of the reach where adjustment has occurred. The bed and banks are composed primarily of silt and clay.</p>		
		
		
		
Erosion Risk	Moderate	

Watercourse	Tuck Creek Tributary				
Culvert ID	C1				
Location	Downstream	 <p data-bbox="1073 569 1360 621" style="text-align: center;">View downstream</p>			
Function	Transfer				
Process	Stable				
Stability Index	N/A				
Conservation status	3				
Bankfull width (m)	1.0				
Channel geometry	Straight				
<p data-bbox="183 573 760 789">Downstream of Dundas Street is a short reach which traverses a grassy area and ends at a drop structure near a housing development. The outlet of C1 was submerged by ponded water at the time of survey.</p> <p data-bbox="183 831 743 1192">In the Dundas Street right-of-way, the tributary consists of a stable reed choked swale with no defined channel. Midway between Dundas Street and the drop structure is a riprap drop downstream of which is a defined channel with several knickpoints. Where defined the channel is 1.0 m wide and 0.2 m deep on a run, but channel dimensions appear to vary with slope.</p>				 <p data-bbox="854 695 1052 741" style="text-align: center;">Riprap drop</p>	
Erosion Risk	<p data-bbox="792 1346 1000 1377">Low-Moderate</p> <ul style="list-style-type: none"> <li data-bbox="792 1381 1333 1413">-Stable within Dundas Street right-of-way <li data-bbox="792 1417 1414 1520">-Disturbance of riprap grade control could allow knickpoint to migrate toward Dundas Street in the future 				



Watercourse		Tuck Creek	
Culvert ID	C2		
Location	Upstream		
Function	Exchange		
Process	Lateral adjustment with incision		
Stability Index	0.11	In regime	
Conservation status	4		
Bankfull width (m)	2.5		
Channel geometry	Straight		
<p>The channel is modified and has a moderate gradient. The reach appears to be undergoing very gradual lateral adjustment but is stabilized by constraints such as imported stones, erosion-resistant banks and tree roots. The stream bed is composed of gravel and cobble. Bankfull width ranges from 2.2-2.7 m and is modified. Banks are generally well vegetated and are 0.7-1.0 m high. Some bank erosion was observed. A deciduous riparian strip (approximately 10 m wide) lines the creek.</p> <p>A knickpoint is located approximately 1 m upstream of the culvert inlet. Knickpoint migration appears to be checked by several imported stones (approximately 0.5 m in diameter). The culvert inlet is not perched.</p>			
Erosion Risk		<p>Low-moderate</p> <ul style="list-style-type: none"> - Adjustment rate appears to be slow - Disturbing stones at knickpoint could lead to instability 	



Knickpoint (2011)



Channel upstream of knickpoint

Watercourse	Tuck Creek	
Culvert ID	C2	
Location	Downstream	
Function	N/A	
Process	N/A	
Stability Index	N/A	
Conservation status	2	
Bankfull width (m)	1-3 (ditch width) 0.5 (previous adjusted width)	
Channel geometry	Straight	
<p>From the culvert outlet the creek turns east at a 90 degree angle to cross Eaglesfield Drive to run parallel to Dundas Street. Until the fall of 2014, the channel downstream of Eaglesfield Drive was recovering a sinuous planform through lateral adjustment. The channel had a narrow cross section with a bankfull width of approximately 0.5 m. Banks were vertical to undercut with some bank slumping, and the bed was composed of well-sorted gravel and cobble.</p> <p>As of the November 30 2014 site visit, this reach had been dug into a straight, entrenched ditch with bare silt and clay banks and a moderate slope. The ditch width is approximately 1-3 m. Scattered riprap lines the bed in areas. The channel is too recently modified for adjustment processes to have begun.</p>		 <p>View looking upstream to Eaglesfield Drive, November 30 2014.</p>  <p>Previous view looking downstream from Eaglesfield Drive</p>
Erosion Risk		Low

Watercourse	Tuck Creek Tributary	
Culvert ID	C3	
Location	Upstream	
Function	Source	
Process	Lateral adjustment	
Stability Index	0.13	In Regime
Conservation status	3	
Bankfull width (m)	0.5	
Channel geometry	Straight with developing sinuosity	

Upstream of the Dundas right-of-way, the channel flows through a woodlot and has a modified trapezoidal cross section. Within the right-of-way the tributary runs parallel to the north side of Dundas Street in a straight, grassy ditch. The channel has a moderate slope and no riparian area. A narrow low flow channel has developed which is approximately 0.5 m wide and 0.25 m deep.

The bed is composed of gravel and the banks are silt and clay. The channel is undergoing lateral adjustment as it begins to recover a sinuous planform. Bank slumps are frequent.

The inlet of the C3 culvert is connected to the driveway culvert to the west. There is a visible drop within the C3 culvert.




View inside C3 looking downstream



Typical view upstream

Erosion Risk

Moderate
 -Channel poses low erosion risk
 -Drop within C3 culvert must be considered in design; slope and velocity could be an issue

Watercourse	Tuck Creek Tributary	 <p>Typical view downstream</p>
Culvert ID	C3	
Location	Downstream	
Function	Source	
Process	Incision	
Stability Index	N/A	
Conservation status	2	
Bankfull width (m)	No representative width Modified: 1.5-5.0	
Channel geometry	Straight	
<p>At the outlet of C3, the C2 channel joins the creek from the west. The reach ends at a drop structure near a housing development. The channel has a straight planform and an entrenched, modified cross section of approximately 1.5-5.0 m wide. The banks are 0.5-1.5 m high. The Rapid Geomorphic Assessment (RGA) was not completed as the channel bed and banks are lined with riprap. The channel has a high gradient. One knickpoint is located downstream of the Dundas Street right-of-way. The dominant process is incision which is slowed by the bed and bank protection.</p>		
Erosion Risk		<p>Low-moderate -Channel has been stabilized -Incision could occur if erosion protection is disturbed</p>

Watercourse	Tuck Creek Tributary	
Culvert ID	C7	
Location	Upstream	
Function	Source	
Process	Incision and widening	
Stability Index	0.29	Transitional
Conservation status	2	
Bankfull width (m)	2.7 (upstream of footbridge, modified)	
Channel geometry	Straight	


This reach is in very poor condition and has undergone several types of disturbance. On the property upstream of Dundas Street, the channel begins as a wide, shallow depression flowing through a forested riparian strip. This has been channelized midway along the property into a 2.7 m wide and 0.8 m deep trapezoidal channel which is protected with riprap. This appears connected to the floodplain based on the surrounding floodplain deposits. Near the existing parking lot the channelized section ends and a footbridge crosses the creek. The bridge footings are scoured and debris from a high flow event was caught in the railings at the time of the site visit.

Downstream of the bridge the creek flows through a failed concrete channel which appears to have originally acted as a drop structure. The channel is 1.6 m wide and 1.1 m deep. The concrete bed has failed, with a 0.5 m drop to the natural bed below.

The structure ends approximately 6 m upstream of the Dundas Street culvert inlet. Between the structure and the culvert wingwalls both banks are badly eroded. Riprap has piled up on the bed which is likely failed bank protection. This forms a 0.6 m drop in bed elevation at the culvert inlet.

Based on photographs from 2010, there



<p>appears to be some transport of riprap through the culvert. It is not known whether the bed has cut down within the culvert.</p> <p>The extensive erosion and the elevation of high flow debris indicate that the creek is subject to flashy flows.</p>	 <p style="text-align: center;">Reprofiled channel upstream of footbridge</p>
<p>Erosion Risk</p>	<p>High</p> <ul style="list-style-type: none"> -Significant scour at inlet -Failed bank and bed protection of several types -Evidence of flashy flows

Watercourse	Tuck Creek Tributary	
Culvert ID	C8	
Location	Upstream	
Function	Exchange	
Process	Lateral adjustment	
Stability Index	0.33	Transitional
Conservation status	2	
Bankfull width (m)	1.5 (modified)	
Channel geometry	Straight	
<p>The reach runs along the edge of a residential property north of Dundas Street. A drainage ditch joins the channel from the west at the culvert inlet. The culvert is skewed to the left bank of the channel.</p> <p>The channel is straightened and has a high gradient. The channel is 1.5 m wide within an estimated 3 m wide embanked corridor. The banks are protected by riprap and brick walls, and the bed is composed of riprap with deposited gravel. Debris jams partially obscured the culvert inlet at the time of survey. These indicate that the channel is subject to high flows.</p> <p>The reach appears to have undergone historic incision based on the presence of knickpoints and elevated tree roots (set 0.7 m above the current bed). The incision was likely caused by channel straightening and steepening. The incision appears to be historic because the Dundas Street culvert foot matches the incised bed elevation.</p> <p>The channel is beginning to laterally adjust, although it retains a straight planform overall.</p>		
<p>Erosion Risk</p>	<p>High</p> <ul style="list-style-type: none"> -Reach subject to historic incision -High gradient channel -Could become susceptible to ongoing incision if erosion protection is disturbed - Angle of culvert is not aligned with channel 	



Watercourse	Shoreacres Creek	
Culvert ID	C9	
Location	Upstream	
Function	Sink	
Process	Aggrading	
Stability Index	0.14	In Regime
Conservation status	3	
Bankfull width (m)	2.0-2.5 (realigned) 0.6 (adjusted)	
Channel geometry	Regular meandering	
<p>C9 crosses Dundas Street near the onramp of 407 ETR. The reach is located between berms to the east and west. The channel is lined by a buffer strip of reeds.</p> <p>The reach has a sinuous realigned planform. The reach is acting as a sediment sink as it aggrades. Within the upper portion of the reach, the channel has narrowed to 0.6 m bankfull width. The aggraded channel is poorly defined and is very well connected to the floodplain. Near the C9 inlet, the channel is still in the process of aggrading and the realigned channel cross section is in place. The realigned channel width is 2.0-2.5 m and was ponded at the time of survey.</p> <p>Scour has occurred at the culvert inlet. Organic debris has deposited on top of the culvert, which is indicative of high flows.</p>		
Erosion Risk	<p>Low</p> <ul style="list-style-type: none"> -No erosion concerns under normal flows -Evidence of flashy flows 	

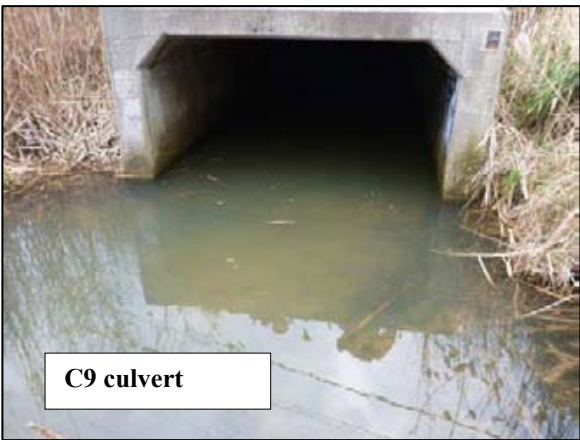


View upstream from western



View upstream from C9

Watercourse		Shoreacres Creek	
Culvert ID	C9		
Location	Downstream		
Function	Exchange		
Process	Lateral adjustment		
Stability Index	0.18	In regime	
Conservation status	4		
Bankfull width (m)	2.0		
Channel geometry	Regular meandering		
<p>C9 outlets to a scour pool partially lined with riprap. The culvert walls have been outflanked by 1.0 m and 1.4 m. The channel flows through a shallow valley with graded valley slopes. Riparian vegetation includes semi-continuous deciduous riparian strip and tall reeds and grasses.</p> <p>The channel has a sinuous planform with a moderate slope. Representative bankfull width is 2.0 m and bankfull depth is 0.5 m. The dominant process is lateral adjustment, and bank erosion is limited to the outside of bends. Overbank flow paths have developed within the floodplain vegetation indicating good floodplain connectivity.</p>			
Erosion Risk		<p>Low -Channel is in phase, some scour at existing culvert outlet</p>	



C9 culvert



Scour pool

Watercourse		Shoreacres Creek	
Culvert ID	C10 Ditch		
Location	Upstream		
Function	Source		
Process	Incision (where defined)		
Stability Index	0.37	In regime	
Conservation status	3		
Bankfull width (m)	0.9 (where defined)		
Channel geometry	Straight		
<p>This reach is a secondary channel east of the main C10 channel. Upstream of the Dundas Street right-of-way the feature appears to be a former farm ditch. In this area the channel is poorly defined, has stable, vegetated bed and banks, a straight planform and flows through a forested riparian area. The reach turns west to run parallel to Dundas Street. Along most of this length the channel is a stable, reed-choked swale with a modified bankfull width of 1.5 m. Flows appear to be frequently diverted over the floodplain and large reed accumulations indicate these flowpaths.</p> <p>Approaching the culvert inlet, the channel becomes defined. The bankfull channel is 0.9 m wide and 0.25 m deep and has a moderate slope. Several knickpoints are present which have been checked by riprap bed protection; these indicate that the reach is incising. The eastern culvert wall has been outflanked by 1.5 m where this reach joins the main C10 channel.</p>			
Erosion Risk		Low-moderate	



Poorly defined channel



Defined channel near C10 inlet



View toward C10 inlet of channel parallel to Dundas Street

Watercourse	Shoreacres Creek	
Culvert ID	C10	
Location	Upstream	
Function	Sink	
Process	Aggrading	
Stability Index	0.17	In regime
Conservation status	3	
Bankfull width (m)	0.5	
Channel geometry	Regular meandering	
<p>The creek flows south toward Dundas Street between two berms. The channel has a regularly meandering planform which has been previously realigned. Riparian vegetation includes tall herbs, grasses and reeds with scattered trees.</p> <p>The channel is reed-choked and in the process of aggrading. In the upper portion of the reach the channel retains its realigned cross section which is approximately 1.0 m wide and 0.25 m deep. In this area the channel is reed-choked and contains loose silt deposits. Near the right-of-way the channel has narrowed to 0.5 m wide and 0.1 m deep with gentle, poorly defined banks and less in-channel silt deposition. Here, the channel functions as a wetland with water out of bank under low flows.</p> <p>A 0.5 m high knickpoint is located approximately 5 m upstream of the C10 inlet. This is likely from construction rather than fluvial process as the reach is aggrading rather than downcutting and it is protected by riprap to act as a grade control. At the culvert inlet, the right bank has eroded and both culvert walls have been outflanked. The culvert foot is slightly scoured. Elevated reed accumulations on top of the culvert and on the floodplain indicate high floodplain flows.</p>		
Erosion Risk	<p>Low-moderate</p> <ul style="list-style-type: none"> -Limited erosion concerns under normal flows -Culvert is outflanked -Evidence of flashy flows 	



View of channel and floodplain looking west. Note floodplain reed deposits.



C10 inlet



Channel

Watercourse		Shoreacres Creek	
Culvert ID	C10		
Location	Downstream		
Function	Stable		
Process	Transfer		
Stability Index	0.07	In Regime	
Conservation status	4		
Bankfull width (m)	3		
Channel geometry	Straight		
<p>The culvert outlets to an artificial scour pool (approximately 4 m wide). Within the Dundas Street right-of-way, the valley floor is protected by a concrete apron. This is overlain by riprap, soil and reeds. The apron forms a 0.5 m drop at its downstream extent. Beyond the apron the reach has been realigned and embanked on both sides. The channel has a two stage cross section including a narrow low flow channel and a wider vegetated bankfull channel. The realigned channel section appears to be well adjusted to the flow regime as no erosion was noted and the low flow channel is clear of reeds and silt deposits.</p>			
Erosion Risk		<p>Low -Stable channel with erosion protection near C10</p>	



Watercourse	Shoreacres Creek	
Culvert ID	C11	
Location	Upstream	
Function	Transfer	
Process	Stable	
Stability Index	0.07	In regime
Conservation status	3	
Bankfull width (m)	1.5-2.0	
Channel geometry	Straight	

Upstream of the parking lot, the channel consists of a shallow depression with good floodplain connection running through a forested buffer strip.

The channel has been realigned along the eastern edge of the parking lot driveway, turning 90° at Dundas Street to runs parallel to the road. These realignments have lengthened the channel, reducing the channel gradient and in-channel velocities. This has resulted in siltation and infilling by reeds in the channel along Dundas Street. Local bank erosion has occurred in the channel adjacent to the carpool lot access which may indicate flashy flows. Within the Dundas Street right-of-way, the channel was obscured by vegetation but the channel appears stable. No erosion protection was observed. The channel has not recovered a more natural cross section or planform since realignment.

The culvert inlet is skewed to the channel by over 90°. A secondary channel flowing south through the northern farm field also flows through the culvert. There is no evidence of erosion at the inlet.

During the August 2014 floods, overland flows appear to have created a channel that runs parallel to Shoreacres Creek for part of the length between the parking lot driveway and the C11 inlet.




Bank erosion in channel adjacent to carpool lot driveway






Channel running parallel to Dundas Street (looking west)



Culvert inlet (flow direction)

	 <p data-bbox="824 569 1344 646">Channel running parallel to Shoreacres Creek after August 2014 Floods</p>
Erosion Risk	Low -Channel stable within realignment area parallel to Dundas Street


Watercourse	Shoreacres Creek	
Culvert ID	C11	
Location	Downstream	
Function	Transfer	
Process	Stable	
Stability Index	0.00	In regime
Conservation Status	3	
Bankfull width (m)	1.0-2.0 (where defined)	
Channel Geometry	Straight	
<p>The channel flows through a shallow regarded valley. The culvert outlets to a short artificial scour pool. A concrete apron extends approximately 20 m downstream from the culvert. Sedimentation has occurred on the concrete apron, and a 1.0-2.0 m wide and 0.4 m deep channel has developed which has a concrete bed and silty banks.</p> <p>The channel is reedy and less defined downstream of the concrete apron. Both the bank and bed materials are predominantly composed of silt and the channel is densely vegetated. This reach has few natural features or active fluvial processes and appears to be stable.</p>		
 <p>A photograph showing a concrete culvert structure with water flowing through it. The surrounding area is overgrown with grass and weeds.</p>		
 <p>A photograph showing a concrete apron extending downstream from the culvert. The apron is partially covered with sediment and surrounded by dense vegetation.</p>		
 <p>A photograph showing a typical view of the channel downstream, characterized by dense, tall grasses and reeds growing in the water.</p>		
Erosion Risk	<p>Low -Stable channel with erosion protection near C10</p>	


Watercourse		Appleby Creek	
Culvert ID	C12		
Location	Upstream		
Function	Transfer		
Process	Stable		
Stability Index	0.07	In regime	
Conservation Status	4		
Bankfull width (m)	1.5		
Channel geometry	Straight		
<p>The straight planform and riparian trees of uniform age indicate that this reach was historically realigned. In adjusted sections the bankfull width is approximately 1.5 m but the channel is locally overwidened to 3.6 m near the inlet. Banks are 0.5 m high.</p> <p>The channel appears to be stable in general. The reach has a low gradient. Bank erosion is minimal and the banks are generally vegetated. The bed is composed of cobble and silt with moderate sorting, and deeper silt deposits are found in pools. Flow was sluggish during both site visits.</p> <p>The culvert inlet is well aligned with the channel and is not scoured or outflanked. A SWM pond outfall joins channel upstream of the Dundas Street right-of-way.</p>			
Erosion Risk		<p>Low-moderate -Channel is stable with minimal bank erosion</p>	



Watercourse		Appleby Creek	
Culvert ID	C12		
Location	Downstream		
Function	Transfer		
Process	Stable		
Stability Index	0.00	In regime	
Conservation Status	4		
Bankfull width (m)	1.0 (near Dundas) 3.5 (downstream)		
Channel geometry	Straight		
<p>The Dundas Street culvert outlets to a stone-lined scour pool that is 4 m wide and 4 m long. Within the Dundas Street right-of-way, the floodplain is protected with riprap and the channel is 1.0 m wide, 0.2 m deep and straight.</p> <p>Downstream, the channel widens to more natural cross section with variable width and bank height (1.5-3.5 m and 0.5-1.0 m respectively) and a cobble bed. The stream gradient is moderate and floodplain connectivity is good. Local erosion is present but overall the channel appears to be stable.</p>			
Erosion Risk		<p>Low -Channel is stable overall</p>	



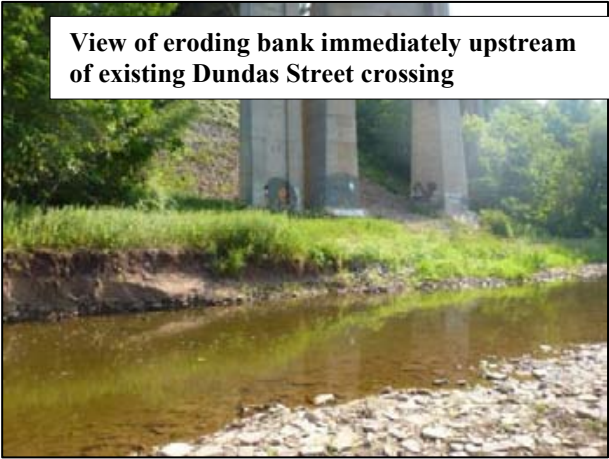
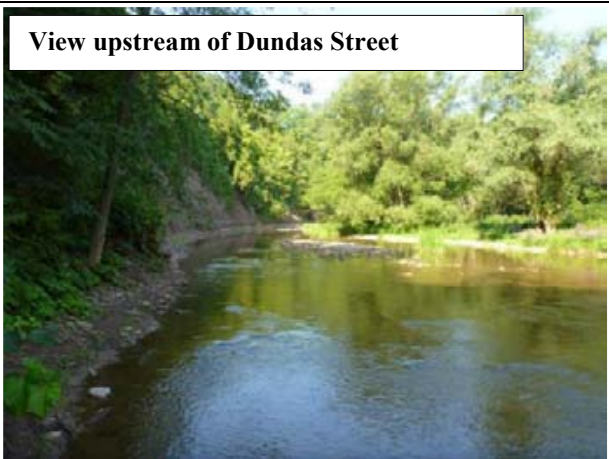
Watercourse	Sheldon Creek	
Culvert ID	C13	
Location	Upstream	
Bankfull width (m)	N/A	
SE01 is a short segment of modified channel which connects the SWM pond outlet to the Dundas Street crossing. The channel is stable. Banks are protected with rounded river stone and both bed and banks are vegetated. No evidence of erosion was observed.		
Erosion Risk	Low -Stable channel with erosion protection	

Watercourse	Sheldon Creek		
Culvert ID	C13		
Location	Downstream		
Function	Transfer		
Process	Stable		
Stability Index	0.04	In regime	
Conservation Status	5		
Bankfull width (m)	1.5 (adjusted)		
Channel geometry	Straight		
The existing culvert outlets to a modified road right-of-way past a wooden fence and into a golf course. The channel is locally over-widened at the culvert outlet to 2.5 m. This area has stable banks lined with rounded river stone and deposition is occurring on the bed. The culvert is well aligned with channel.			
Downstream of the fence line the planform has been straightened, but small-scale sinuosity is developing as the channel adjusts. The channel has pool-riffle morphology. The bankfull width is 1.2-1.7 m which appears to have narrowed since the realignment. Banks are 0.25 m high and have a gentle slope. The bed is composed of gravel and the banks are gravel and earth. Currently, the reach appears to be stable.			
Erosion Risk	Low -Stable channel with erosion protection		



Reach ID	BR001	
Location	Bronte Creek at Dundas Street	
Function	Exchange	
Process	Laterally Adjusting (within confined valley)	
Stability Index	0.17	In regime
Conservation Status	8	
Bankfull width (m)	20	
Channel geometry	Irregularly meandering	

Bronte Creek in the location of Dundas Street is confined by steep valley sides. Its planform is irregularly sinuous. The shale valley sides often form the river banks but in some locations are banks that formed within the valley as a result of glacial deposition. The bank in the proposed pier location (immediately upstream of the existing Dundas Street crossing) was formed through deposition of a layer of relatively large till material at its base and covered by finer clay material. The till in this bank is fragmented limestone as opposed to the shale which comprises the valley walls. It is also more rounded and consists of varying imbrication.

There is a high supply of sediment to the system both from upstream and colluvial sources within the study reach. There are numerous depositional features in the vicinity of Dundas Street. These include point bars, mid channel bars and side bars comprised of material ranging from fines to cobble size. These depositional features are semi-permanent in nature, they are typically partly vegetated and the larger gravel to cobble sized material is made cohesive with fine material. Due to the confined nature of the valley lateral adjustment of the creek would be limited over time, however, immediately upstream of the existing road crossing the bank is actively eroding. The existing bridge structure has minimal impact on the system. There is scour



Eroding bank comprised of glacial till and clay layers

<p>present around the pier of the watermain bridge.</p> <div data-bbox="191 306 792 359" style="border: 1px solid black; padding: 2px;"> <p>View downstream of Dundas Stream</p> </div> 	 <div data-bbox="911 716 1354 793" style="border: 1px solid black; padding: 2px;"> <p>View upstream to Dundas Street crossing</p> </div>
<p>Erosion Risk</p>	<p>Moderate -Actively eroding bank immediately upstream of existing Dundas Street crossing - Not high risk as is located in confined valley</p>

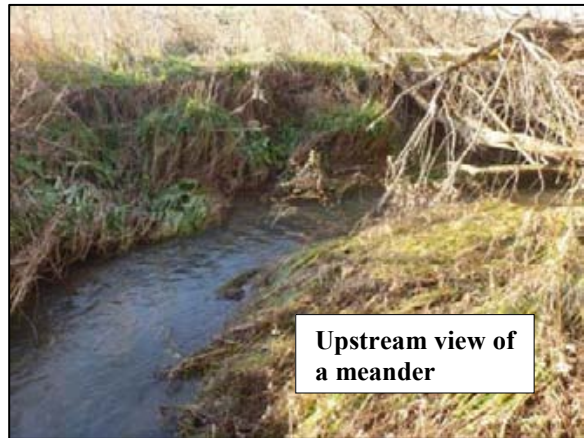
Watercourse	Tributary to Fourteen Mile Creek	
Culvert ID	C20	
Location	Upstream	
Function	N/A	
Process		
Stability Index		
Conservation Status		
Bankfull width (m)		
Channel geometry		
This reach is a swale with no formal channel.		
Erosion Risk	Low	



Watercourse	Tributary to Fourteen Mile Creek	
Culvert ID	C20	
Location	Downstream	
Function	Transfer	
Process	Stable	
Stability Index	0.07	In regime
Conservation Status	2	
Bankfull width (m)	1.5	
Channel geometry	Straight	
Downstream of C20 is a poorly defined channel partially choked with reeds. The channel is 1.5 m wide and 0.15 m deep, with gentle banks composed of silt and clay. The reach is stable. At the time of survey, the water contained yellow algae although it was not stagnant.		
Erosion Risk	Low	



Watercourse	Fourteen Mile Creek West Tributary	
Culvert ID	C22	
Location	Upstream of Dundas ROW	
Function	Exchange	
Process	Lateral adjustment	
Stability Index	0.24	Transitional
Conservation Status	7	
Bankfull width (m)	3.0	
Channel geometry	Irregularly meandering	
<p>Located immediately approximately 50 m upstream of Dundas Street (upstream of the reach adjacent to the C22 inlet) this reach retains many natural features and fluvial processes.</p> <p>The channel has an irregularly meandering planform and is well connected to the floodplain, particularly on the left bank where a back water channel has developed. The reach is located in a shallow V-shaped valley and has a well-established riparian corridor with large woody debris and overhanging vegetation. The stream gradient is moderate.</p> <p>The reach has pool-riffle morphology and is laterally adjusting. The channel bed is composed of gravel and cobbles while banks are composed of shale, cobble and clay. The cross section of the channel varies with planform; on the inside of bends banks are gentle (bank height is 0.4 m) while the on the outside of the bend banks are steep (bank height is 0.8 m). This reach would be a suitable reference reach for the reach adjacent to the C22 inlet.</p> <p>At the downstream extent of the reach the channel has outflanked the start of the concrete wall bank protection by approximately 2 m. The natural bank materials include fine-grained till with fragments of weathered shale. The outflanking has occurred on the outside of a</p>		

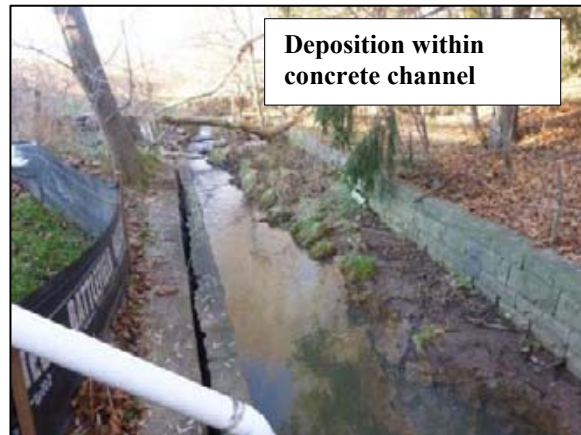



meander and therefore is in keeping with the natural fluvial processes upstream.	
Erosion Risk	Moderate - Reach is laterally adjusting but is upstream of the proposed works



Watercourse	Fourteen Mile Creek West Tributary	
Culvert	C22	
Location	Upstream	
Function	Exchange	
Process	Lateral adjustment	
Stability Index	0.30	Transitional
Conservation Status	3	
Bankfull width (m)	3.0 (modified)	
Channel geometry	Straight	

This reach is located immediately upstream of Dundas Street. The channel has been realigned into a straight concrete channel. Several concrete blocks are missing and both walls show signs of losing structural integrity. At the upstream extent of the reach, the concrete wall lining the right bank has been outflanked. Concrete bank height varies from approximately 1.0 m at the upstream extent to 1.8 m near the culvert due to change in the elevation of the stream bed (the channel gradient is fairly high). The bed is lined with concrete and partially covered with deposited sediment.

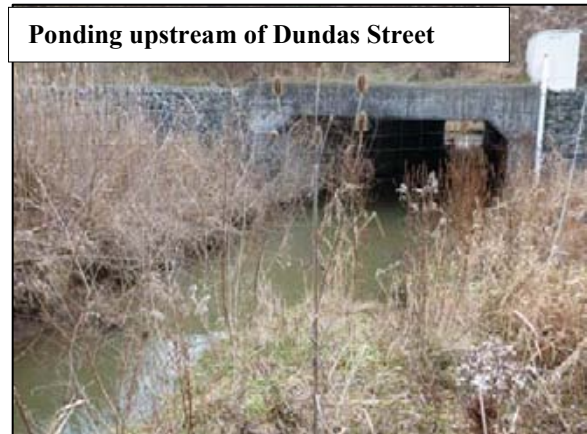
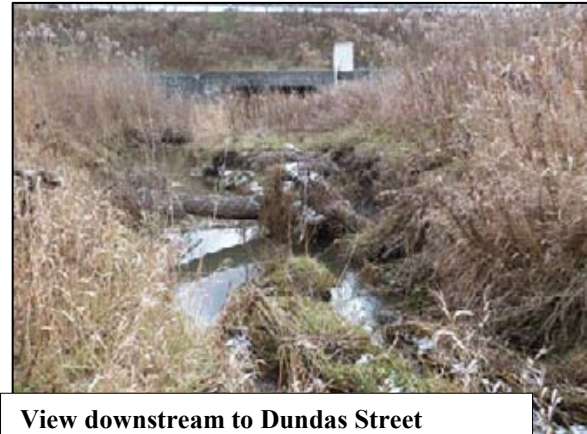
A 20 m long partly vegetated bar has developed along the left (east) bank in the concrete channel. This deposit appears to be semi-permanent indicating that the concrete channel is likely over wide for the flow and sediment regime. The concrete channel is over-wide compared to the natural channel upstream. In the larger context of the meander pattern this deposit would be a point bar. Along the right bank, which is the natural direction of lateral migration, the stream bed is scoured and the wall is undercut by over 0.2 m. As such the reach is attempting to adjust laterally through



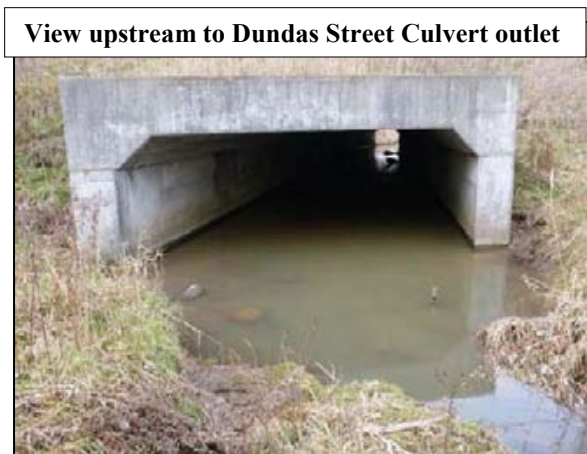
<p>deposition on the left bank and erosion on the right bank. Due to the hard bed and bank this process is very slow. The depositional bar feature has created a narrower low flow channel.</p> <p>The existing culvert angle is out of alignment with the channel's course and the channel turns abruptly south to flow under Dundas Street.</p>	
<p>Erosion Risk</p>	<p>High -Possibility of outflanking/ undercutting new structures</p>

Watercourse	Fourteen Mile Creek Tributary West	
Culvert ID	C22	
Location	Downstream	
Function	Exchange	
Process	Lateral adjustment	
Stability Index	0.18	In regime
Conservation Status	4	
Bankfull width (m)	6.0 (modified) 3.0 (representative)	
Channel geometry	Straight with developing sinuosity	
<p>This reach extends from Dundas Street to the Colonel William Parkway bridge. The channel lies within a steep, asymmetric forested valley and is constrained by a very steep right bank and a moderately steep left bank near Dundas Street. Near the Colonel William Parkway bridge, the channel has better floodplain connectivity on the left bank. The channel has been realigned.</p> <p>The culvert outlet is perched by approximately 0.3 m. Near Dundas Street, the channel appears to have been widened (up to 6 m wide) and straightened and has yet to recover a more natural planform and cross section. Near the bridge the channel contains vegetated mid-channel bars and silt deposits and appears to be narrowing. Beneath the bridge flow is split. The main channel, where present, is 2.5-3.5 m wide. It is actively adjusting and has a meandering planform, undercut banks and a moderate gradient. The substrate includes gravel, silt and shale fragments.</p>		
 <p>View beneath Colonel Williams Parkway</p>  <p>View downstream from C22 outlet</p>		
Erosion Risk	Moderate	

Watercourse	Fourteen Mile Creek	
Culvert ID	C23	
Location	Upstream	
Function	Source	
Process	Incision and widening	
Stability Index	0.49	Adjusting
Conservation Status	5	
Bankfull width (m)	1.8	
Channel Geometry	Irregular meandering	
<p>The channel is not in dynamic equilibrium, it is adjusting to modifications including changes in hydrology. Downcutting and widening are the predominant fluvial processes with frequent bank slumping as a result. This has led to spilt flow in some locations. Typically the channel pattern varies from narrow steeper sections (often with slumped banks) to wide pools. Banks are often undercut and are composed of clay. The bed is a mixture of gravel, sand and silt. Several knickpoints are present through the reach.</p> <p>The riparian corridor is fragmented with scattered trees lining the channel. In places large woody debris is influencing fluvial processes and pools are present as a result. The channel is generally confined, especially on the left bank.</p> <p>The existing Dundas Street culvert is influencing the channel. It is causing ponding upstream. There is no low flow channel through the culvert.</p>		
Erosion Risk	<p>Low – moderate -The channel is adjusting and erosion is present, however, immediately upstream of the culvert the channel is ponded</p>	



Watercourse	Fourteen Mile Creek	
Culvert ID	C23	
Location	Downstream	
Function	Source	
Process	Lateral adjustment	
Stability Index	0.39	Transitional
Conservation Status	5	
Bankfull width (m)	1.8	
Channel geometry	Regular meandering	
<p>Downstream of the culvert a scour pool has formed and the culvert is outflanked by approximately 0.5 m on both banks. It appears that the stone protection placed in the scour pool is mobile.</p> <p>The channel is transitional and areas of split flow are frequent. Bank material is predominantly clay with some silt. Bank slumps occur throughout the reach and banks are often held together by grass roots. Bed material is a mixture of gravels, cobble and sand.</p> <p>The channel is well connected to the floodplain and evidence of overbank flows was observed throughout the reach. The riparian corridor is fragmentary with very few trees.</p>		
Erosion Risk	<p>Low – Moderate -Erosion is frequent but channel is well connected to the floodplain</p>	



3.7 Structural Review

3.7.1 Tansley Bridge (Bronte Creek)

The Tansley Bridge, located on Dundas Street west of Tremaine Road at Bronte Creek comprises two independent yet adjacent structures. The older structure was completed in 1948 by MTO and comprises a steel deck truss superstructure (now the eastbound structure). The truss deck was modified and a steel girder type bridge added on the north side of the crossing in 1978 to facilitate the widening of Highway 5 (now Dundas Street) from two to the current four lanes of traffic by MTO (now the westbound structure). The two superstructures act independently of each other and are separated by a 25 mm wide longitudinal joint located in the median. The substructures for each structure are essentially independent of each other.

The eastbound structure comprises three multi-span continuous deck trusses supporting a concrete deck. The four spans are symmetrical about the midspan of the structure, being 45.72±m, 60.96±m, 60.96±m, 45.72±m, from east to west respectively. The substructure comprises reinforced concrete abutments and piers founded on shale bedrock. Due to the steep valley of Bronte Creek, the piers vary in height from approximately 15.2 m to 27.4 m above the founding rock.

The westbound structure is 9.905 m wide with four continuous span (50.29±m, 60.96±m, 60.96±m, 50.29±m). The girders are not coated and comprise atmospheric corrosion resistant structural steel. The girders are composite with concrete deck, and an asphalt wearing surface is provided. The pier footings were founded on shale bedrock. The abutment footings were constructed on compacted granular fill and founded on steel H-piles to bedrock.

As part of the EA Study, a Structural Evaluation Report and a Condition Survey Report have been prepared and can be found in **Appendix F**.

3.7.2 CN Railway Structure

Dundas Street is currently grade separated (overpass) with the CN railway (2 tracks) east of Appleby Line. The crossing is two adjacent, yet independent, bridges constructed in 1962; one for westbound traffic and the other for eastbound traffic. Each bridge carries two traffic lanes. The two adjacent decks are separated by a 25 mm longitudinal joint located between the median. It is a three span structure 12.2±m, 17.8±m and 12.2±m with a skew of approximately 26°. The superstructure consists of a reinforced concrete slab on prestressed concrete girders. The reinforced concrete abutments and piers are founded on spread footings. In 2003, the structure was rehabilitated. More recently, bi-annual appraisals have been carried out on the bridge.

As part of the EA Study, a Structural Evaluation Report and a Bridge Deck Condition Survey Report have been prepared and can be found in **Appendix F**.

3.8 Cultural Environment

Archaeological Services Inc. (ASI) was retained by MMM to undertake the cultural heritage assessment including a review of the built heritage resources and cultural heritage landscapes, and a preliminary assessment of the area's archaeological potential.

The reports are provided in **Appendices G and H** respectively, while the key findings are summarized herein. It should be noted that the report has been prepared for the limits of Dundas Street between Brant Street and Trafalgar Road. Cultural heritage features related to Dundas Street between Brant Street and Bronte Road (i.e. current EA Study) have been extracted and summarized in the **Sections 3.8.1 and 3.8.2**.

3.8.1 Built Heritage Resources and Cultural Heritage Landscapes

A cultural heritage resource is used to describe cultural heritage landscapes and built heritage resources. A cultural landscape is perceived as a collection of individual built heritage features and other related features that together form farm complexes, roadsides and nucleated settlements. Built heritage features are typically individual buildings or structures that may be associated with a variety of human activities, such as historical settlement and patterns of architectural development.

A Cultural Heritage Resource Assessment was carried out and is included in **Appendix G**.

Historic research revealed that the study corridor has origins in nineteenth century survey and settlement and that by the third quarter of the nineteenth century, the study corridor was well developed with a number of residences and farmsteads located along Dundas Street.

Field surveys conducted in early May 2008, September 2008 and July 2009 confirmed an altered nineteenth century landscape that maintains some of its rural heritage character and a number of nineteenth and twentieth century cultural heritage resources. While recent subdivision development dominates the landscape, particularly on the south side of Dundas Street, vestiges of early settlement patterns are still extant in close proximity to the current Dundas Street right-of-way.

Within the study limits of the current EA between Brant Street and Bronte Road, there are 11 Built Heritage Resources (BHR) and 15 Cultural Heritage Landscape (CHL), including:

Built Heritage Resources (BHR)	Cultural Heritage Landscape (CHL)
2084 Dundas Street (Residence)	3042 Cedar Springs Road (Farm Complex)
2122 Dundas Street (Residence)	2065 Dundas Street (Farm Complex)
2344 Dundas Street (Residence)	2161 Dundas Street (Remnant Farm Complex)
2373 Dundas Street (Residence)	2437 Dundas Street (Nelson United Church and Cemetery)
2495 Dundas Street (Commercial)	2464 Dundas Street (St. John's Anglican Church and Cemetery)
3049 Guelph Line (Residence)	3075 Dundas Street (Farm Complex)
3015 Dundas Street (Residence)	3318 Dundas Street (St. Paul's Presbyterian Church and Cemetery)
3083 Dundas Street (Residence)	CN Railway east of Appleby Line (Railscape)
4426 Dundas Street (School House)	Bronte Creek (Waterscape)
Bronte Creek – Tansley Bridge	5421 Dundas Street (Farm Complex)
5418 Dundas Street (Residence)	5463 Dundas Street (Farm Complex)
	3445 Dundas Street West (Farm Complex)
	3367 Dundas Street West (Farm Complex)
	3269 Dundas Street West (Farm Complex)

Built Heritage Resources (BHR)	Cultural Heritage Landscape (CHL)
	3114 Dundas Street (St. Luke’s Anglican Church)

Note: 5218, 5226 and 5236 Dundas Street were originally identified as Built Heritage Resources; however, are no longer on the list as they have been removed for future private development.

Of the CHL listed above, 3318 Dundas Street and 3114 Dundas Street are designated under Part IV of the Ontario Heritage Act.

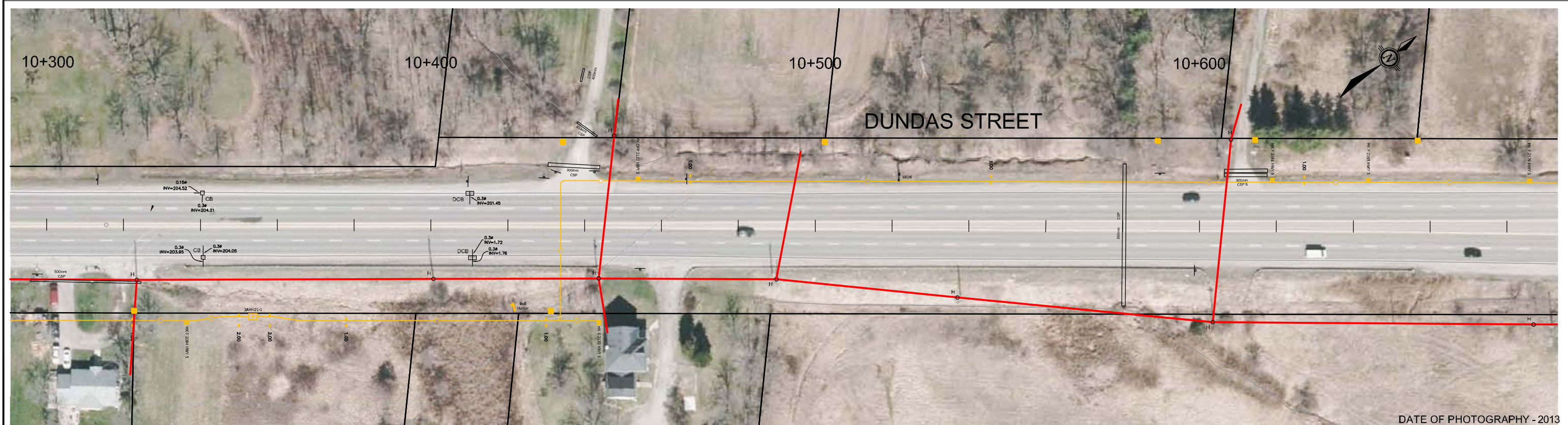
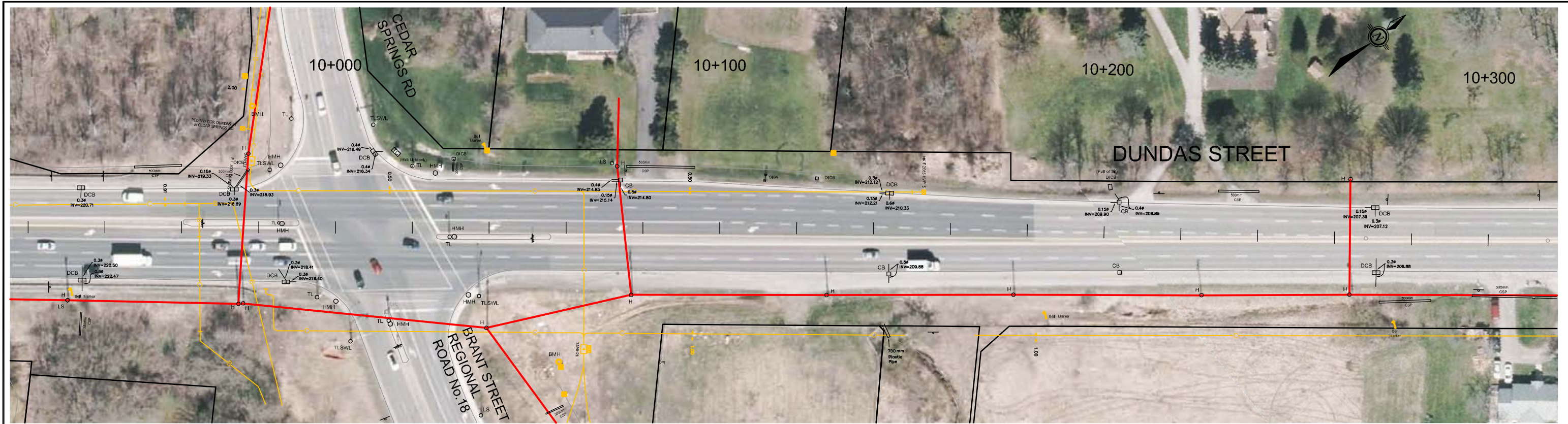
3.8.2 Archaeological Assessment

A Stage 1 archaeology assessment was carried out. Areas adjacent to Dundas Street between Brant Street and 407 ETR (north and south sides) are largely identified as having archaeological potential. Between 407 ETR and Bronte Road, intermittent areas on either north or south sides of Dundas Street have been identified to have archaeological potential. A cemetery investigation is recommended if construction activities are proposed along the existing Dundas Street right-of-way at Nelson Cemetery, St. John’s Cemetery and St. Paul’s Cemetery. Details may be found in **Appendix H – Stage 1 Archaeological Assessment**.

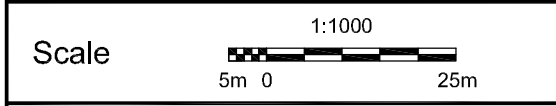
3.9 Utilities

Existing utilities are shown in **Exhibits 3-7a to 3-7n**.

There are a number of existing utilities located along the corridor, including watermain, sanitary sewer, gas main, hydro, and Bell. Most notably, there is a Hydro One corridor that runs in the northeast/southwest direction crossing Dundas Street in the proximity of Millcroft Park Drive.



DATE OF PHOTOGRAPHY - 2013



**DUNDAS STREET - UTILITY PLAN
FROM STA. 10+000 TO STA. 10+680**

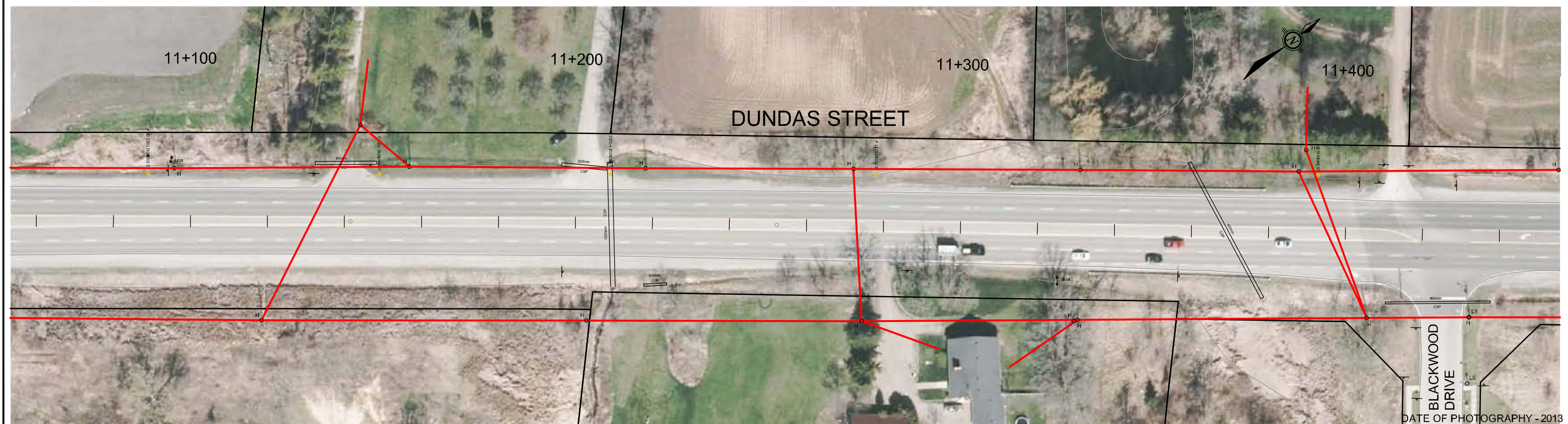
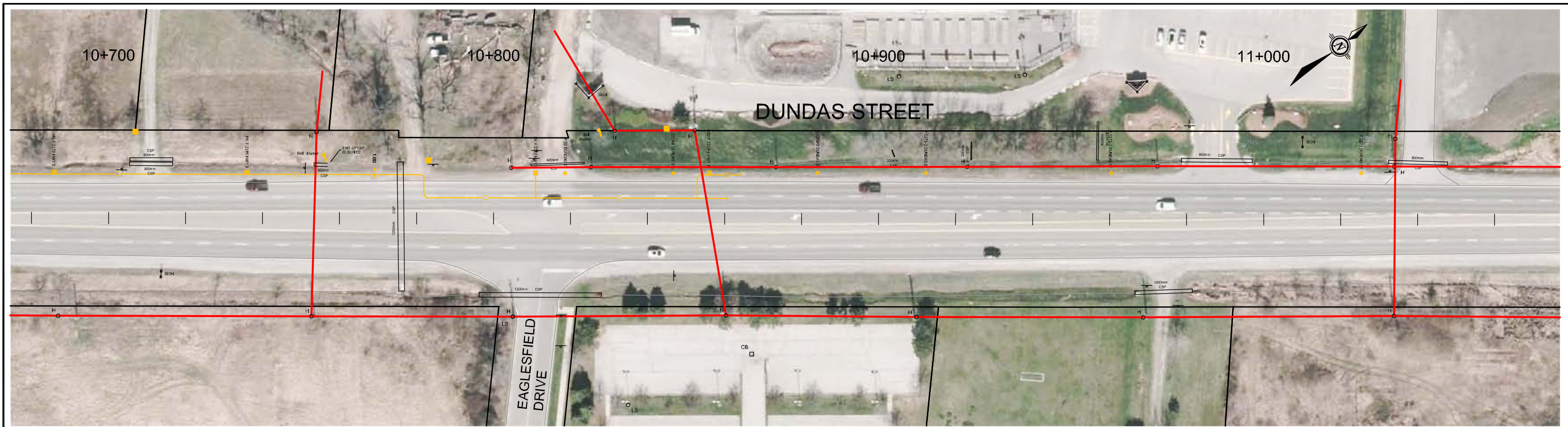
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	EXISTING PROPERTY LINE		GAS
	WATERMAIN		HYDRO
	SANITARY SEWER		PROPOSED BURLINGTON HYDRO
	STORM SEWER		BELL CANADA
			TV

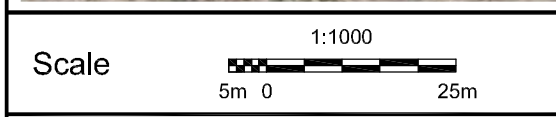
PLATE
3-7a



HALTON REGION
DUNDAS STREET (REGIONAL ROAD 5)
BRANT STREET TO BRONTE ROAD
CLASS ENVIRONMENTAL ASSESSMENT STUDY



DATE OF PHOTOGRAPHY - 2013



DUNDAS STREET - UTILITY PLAN
FROM STA. 10+680 TO STA. 11+440

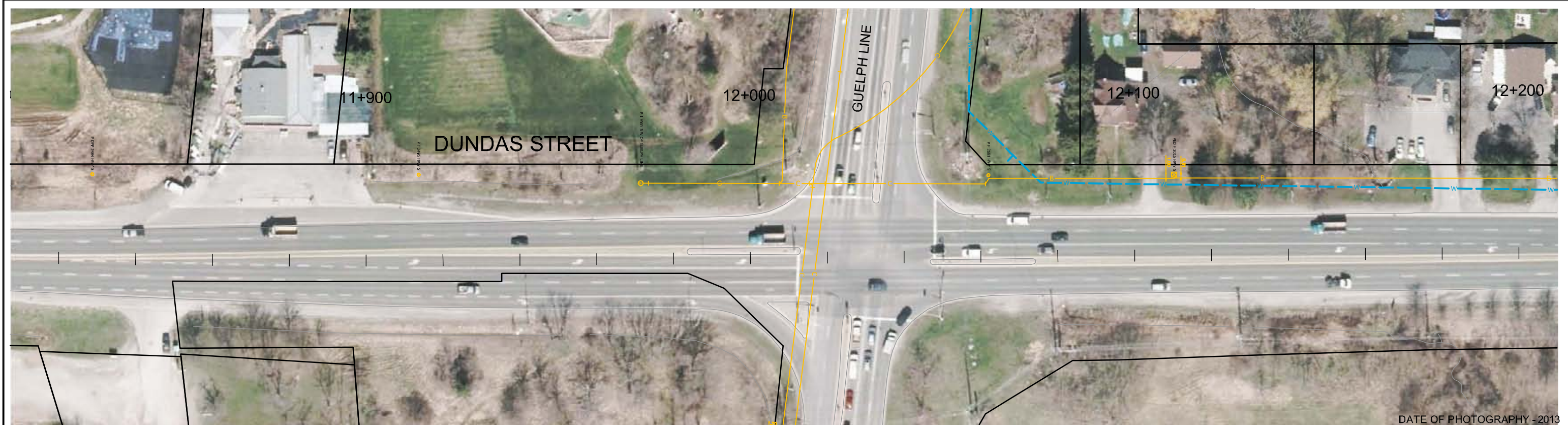
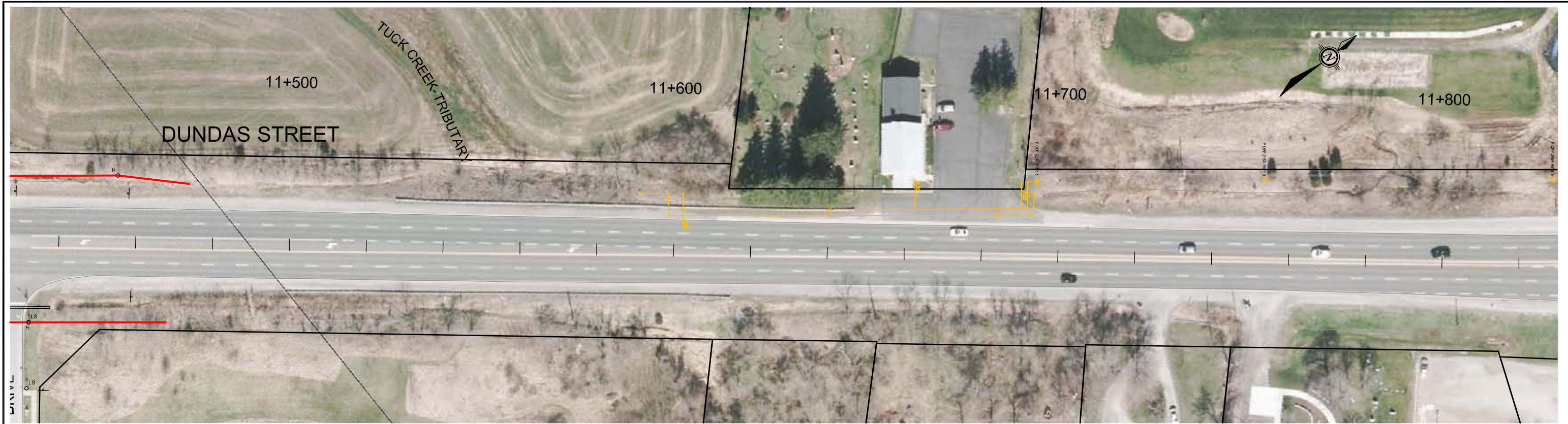
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| | EXISTING PROPERTY LINE | | GAS |
| | WATERMAIN | | HYDRO |
| | SANITARY SEWER | | PROPOSED BURLINGTON HYDRO |
| | STORM SEWER | | BELL CANADA |
| | | | TV |

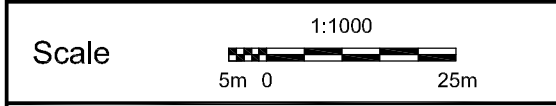
PLATE
3-7b



HALTON REGION
 DUNDAS STREET (REGIONAL ROAD 5)
 BRANT STREET TO BRONTE ROAD
 CLASS ENVIRONMENTAL ASSESSMENT STUDY



DATE OF PHOTOGRAPHY - 2013



**DUNDAS STREET - UTILITY PLAN
FROM STA. 11+440 TO STA. 12+200**

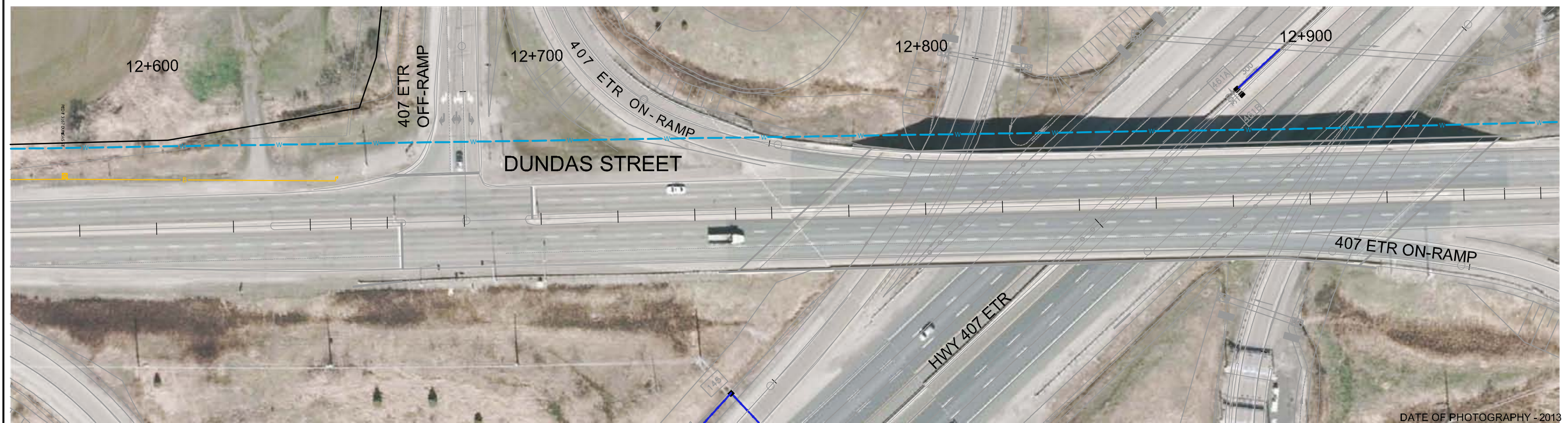
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| | EXISTING PROPERTY LINE | | GAS |
| | WATERMAIN | | HYDRO |
| | SANITARY SEWER | | PROPOSED BURLINGTON HYDRO |
| | STORM SEWER | | BELL CANADA |
| | | | TV |

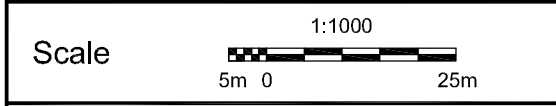


HALTON REGION
DUNDAS STREET (REGIONAL ROAD 5)
BRANT STREET TO BRONTE ROAD
CLASS ENVIRONMENTAL ASSESSMENT STUDY

PLATE
3-7c



DATE OF PHOTOGRAPHY - 2013



DUNDAS STREET - UTILITY PLAN
FROM STA. 12+200 TO STA. 12+960

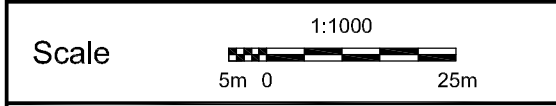
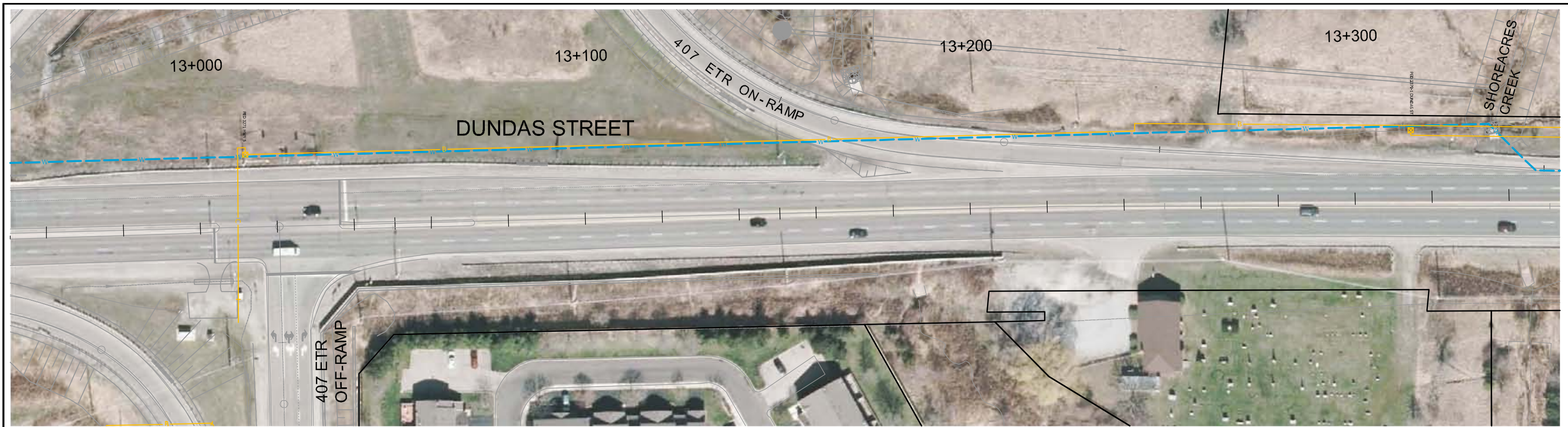
HALTON REGION
 DUNDAS STREET (REGIONAL ROAD 5)
 BRANT STREET TO BRONTE ROAD
 CLASS ENVIRONMENTAL ASSESSMENT STUDY

Legend :

	HYDRO POLE		LIGHT STANDARD
	EXISTING PROPERTY LINE		GAS
	WATERMAIN		HYDRO
	SANITARY SEWER		PROPOSED BURLINGTON HYDRO
	STORM SEWER		BELL CANADA
			TV

PLATE
3-7d





**DUNDAS STREET - UTILITY PLAN
FROM STA. 12+960 TO STA. 13+720**

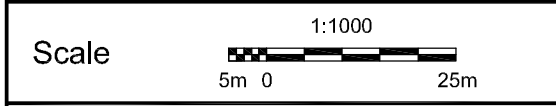
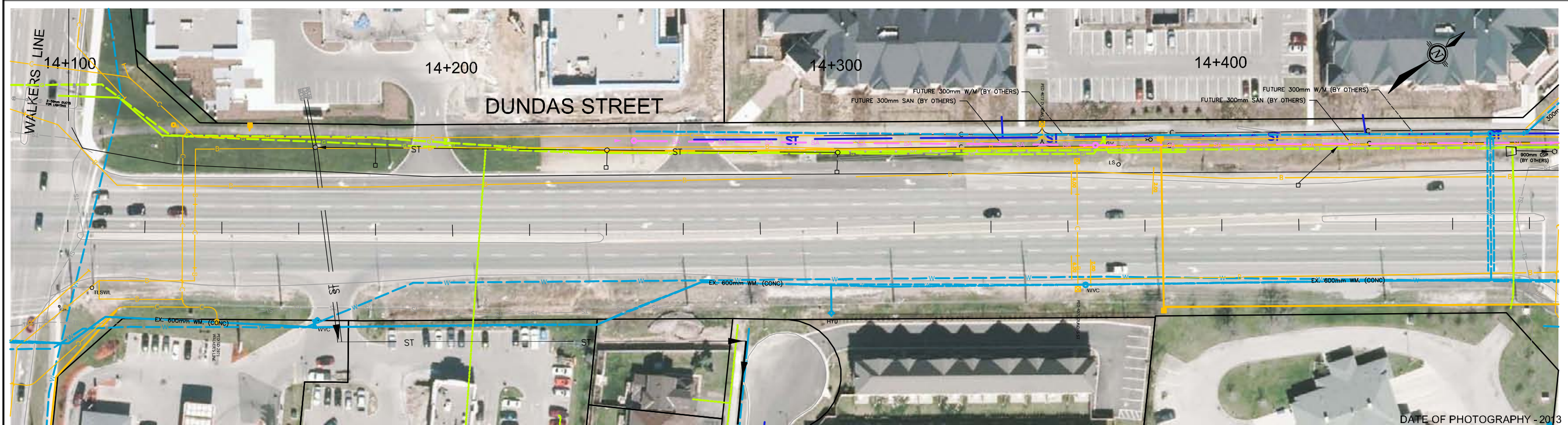
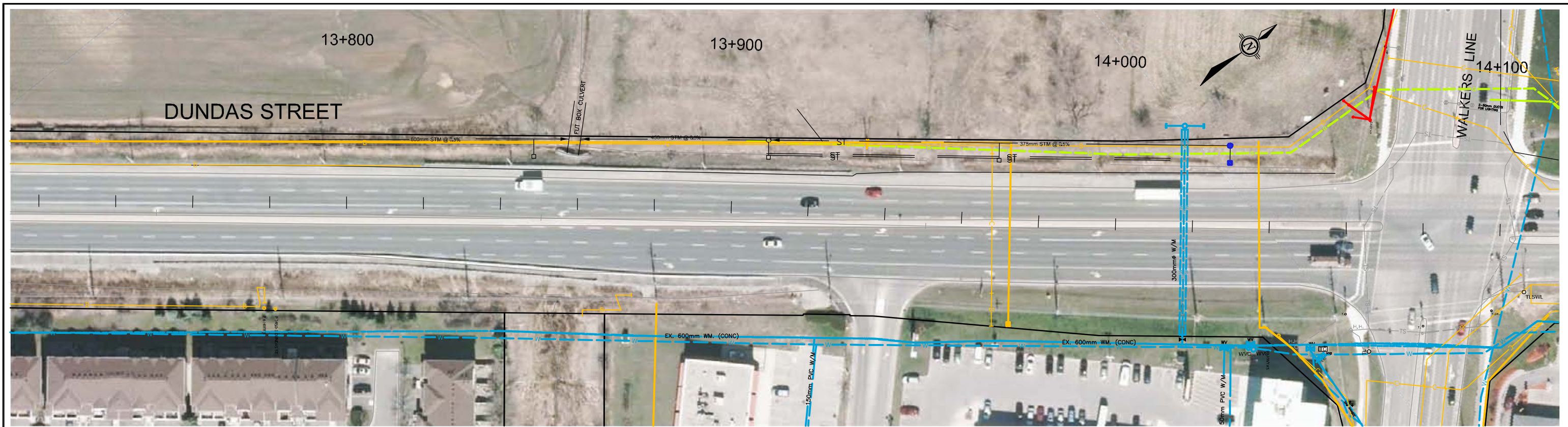
HALTON REGION
DUNDAS STREET (REGIONAL ROAD 5)
BRANT STREET TO BRONTE ROAD
CLASS ENVIRONMENTAL ASSESSMENT STUDY

Legend :

	HYDRO POLE		LIGHT STANDARD
	EXISTING PROPERTY LINE		GAS
	WATERMAIN		HYDRO
	SANITARY SEWER		PROPOSED BURLINGTON HYDRO
	STORM SEWER		BELL CANADA
			TV

PLATE
3-7e





DUNDAS STREET - UTILITY PLAN
FROM STA. 13+720 TO STA. 14+480

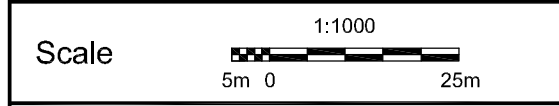
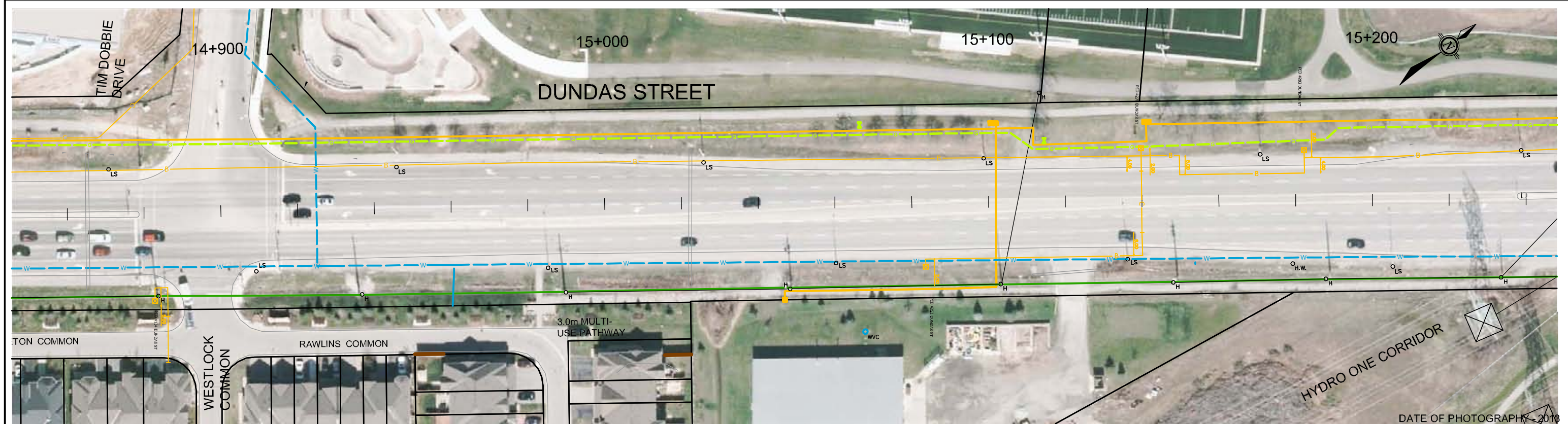
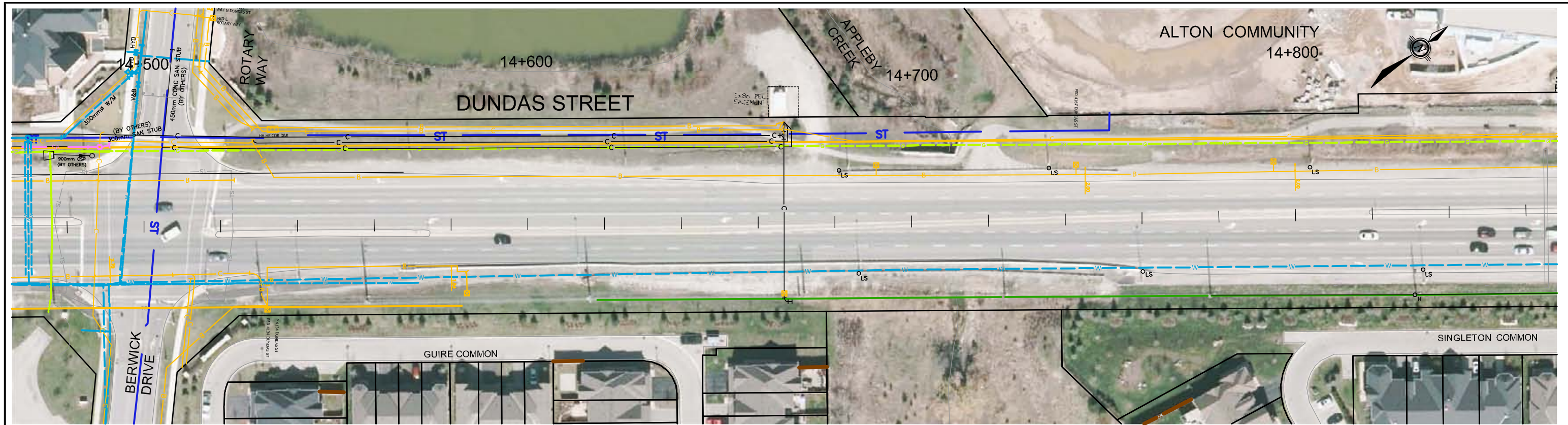
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| | EXISTING PROPERTY LINE | | GAS |
| | WATERMAIN | | HYDRO |
| | SANITARY SEWER | | PROPOSED BURLINGTON HYDRO |
| | STORM SEWER | | BELL CANADA |
| | | | TV |



HALTON REGION
 DUNDAS STREET (REGIONAL ROAD 5)
 BRANT STREET TO BRONTE ROAD
 CLASS ENVIRONMENTAL ASSESSMENT STUDY

PLATE
3-7f



**DUNDAS STREET - UTILITY PLAN
FROM STA. 14+480 TO STA. 15+240**

Legend :

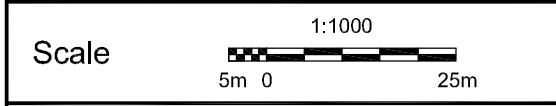
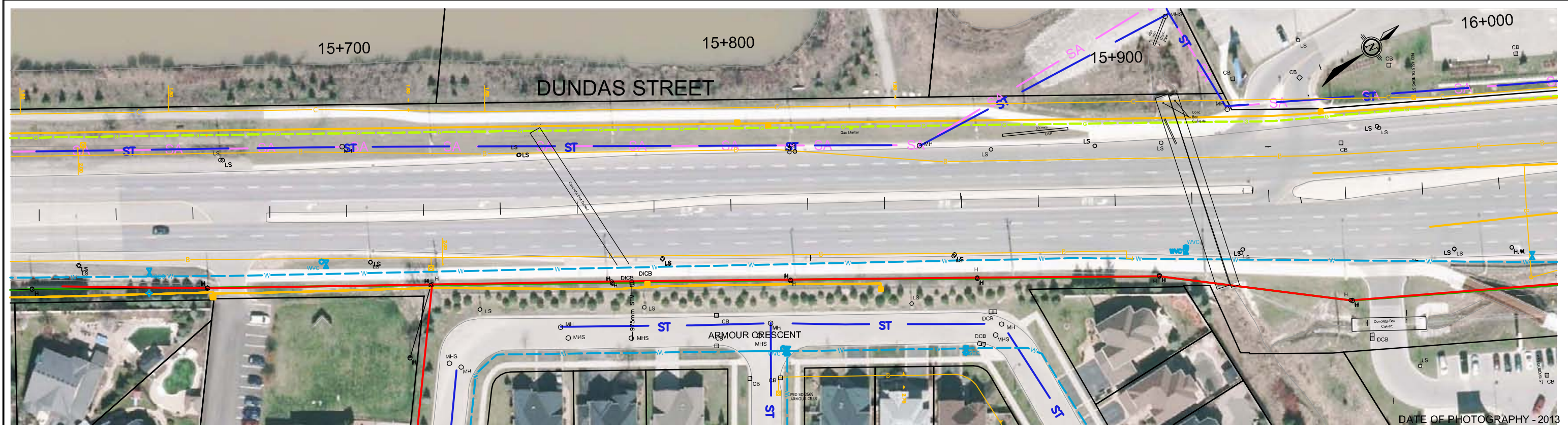
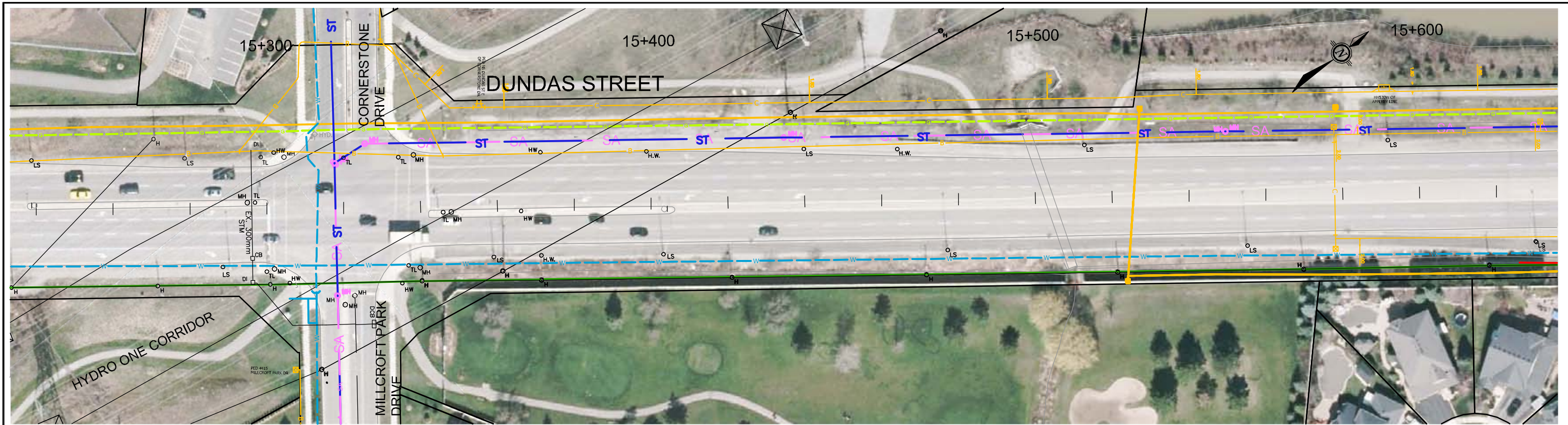
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|--|------------------------|--|---------------------------|
| | HYDRO POLE | | LIGHT STANDARD |
| | EXISTING PROPERTY LINE | | GAS |
| | WATERMAIN | | HYDRO |
| | SANITARY SEWER | | PROPOSED BURLINGTON HYDRO |
| | STORM SEWER | | BELL CANADA |
| | | | TV |

PLATE
3-7g



HALTON REGION
DUNDAS STREET (REGIONAL ROAD 5)
BRANT STREET TO BRONTE ROAD
CLASS ENVIRONMENTAL ASSESSMENT STUDY

DATE OF PHOTOGRAPHY: 2018



DUNDAS STREET - UTILITY PLAN
FROM STA. 15+240 TO STA. 16+000

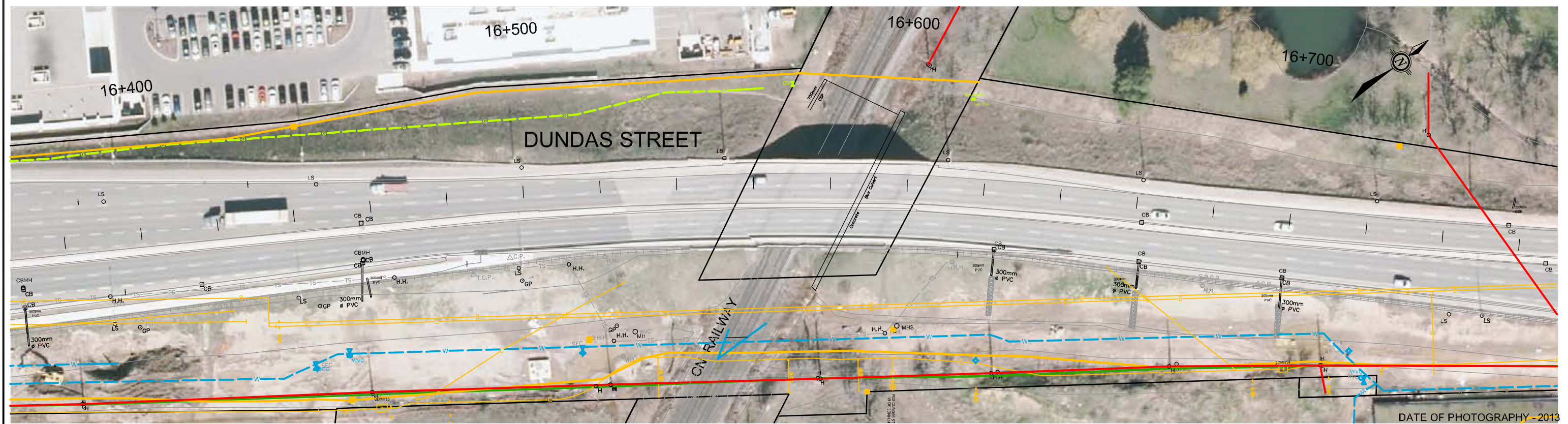
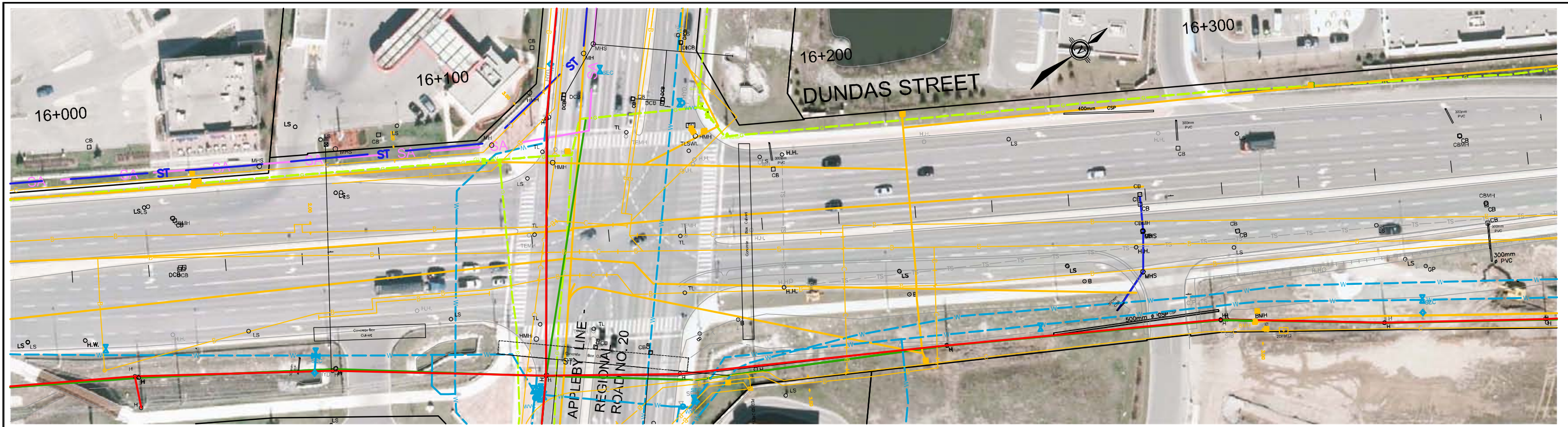
Legend :

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|--|------------------------|--|---------------------------|
| | HYDRO POLE | | LIGHT STANDARD |
| | EXISTING PROPERTY LINE | | GAS |
| | WATERMAIN | | HYDRO |
| | SANITARY SEWER | | PROPOSED BURLINGTON HYDRO |
| | STORM SEWER | | BELL CANADA |
| | | | TV |

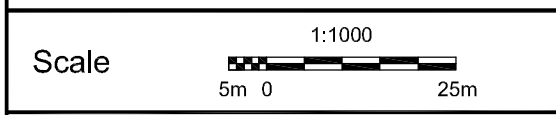
PLATE
3-7h



HALTON REGION
 DUNDAS STREET (REGIONAL ROAD 5)
 BRANT STREET TO BRONTE ROAD
 CLASS ENVIRONMENTAL ASSESSMENT STUDY



DATE OF PHOTOGRAPHY - 2013



**DUNDAS STREET - UTILITY PLAN
FROM STA. 16+000 TO STA. 16+760**

Legend :

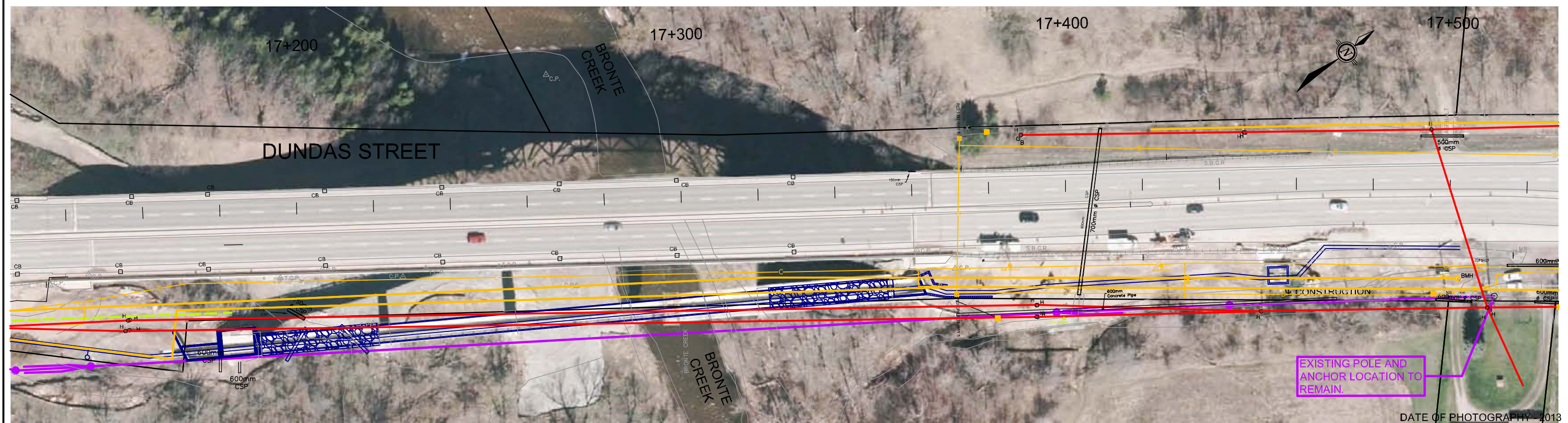
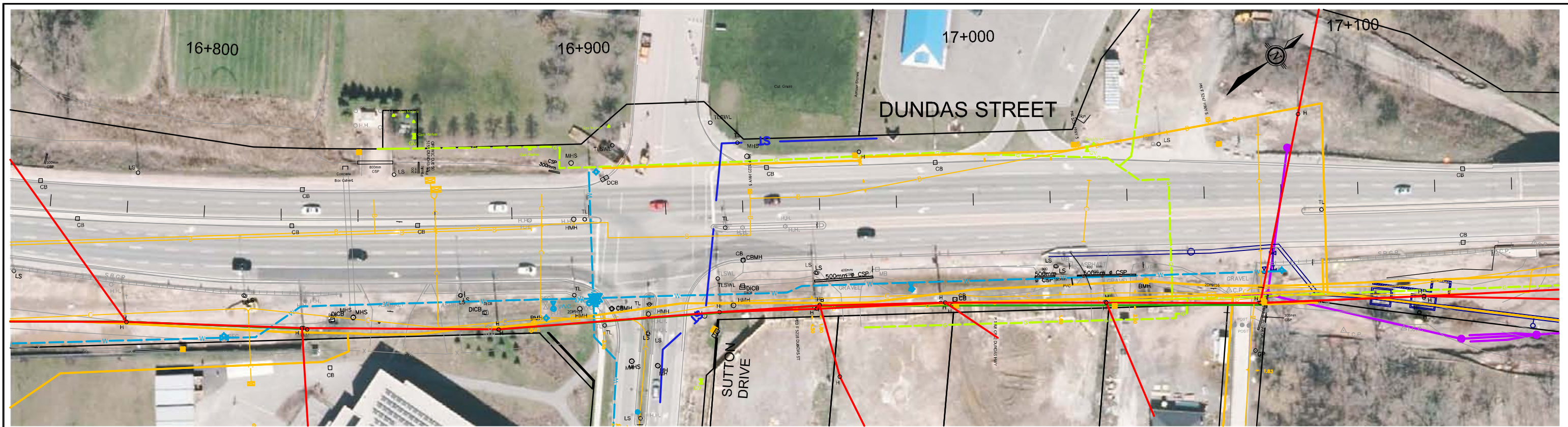
	HYDRO POLE		LIGHT STANDARD
	EXISTING PROPERTY LINE		GAS
	WATERMAIN		HYDRO
	SANITARY SEWER		PROPOSED BURLINGTON HYDRO
	STORM SEWER		BELL CANADA
			TV

PLATE

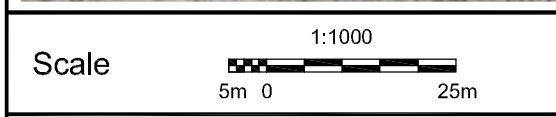


HALTON REGION
DUNDAS STREET (REGIONAL ROAD 5)
BRANT STREET TO BRONTE ROAD
CLASS ENVIRONMENTAL ASSESSMENT STUDY

3-7i



DATE OF PHOTOGRAPHY - 2013



**DUNDAS STREET - UTILITY PLAN
FROM STA. 16+760 TO STA. 17+520**

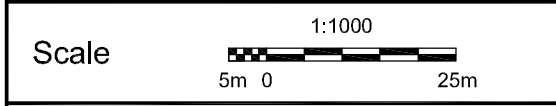
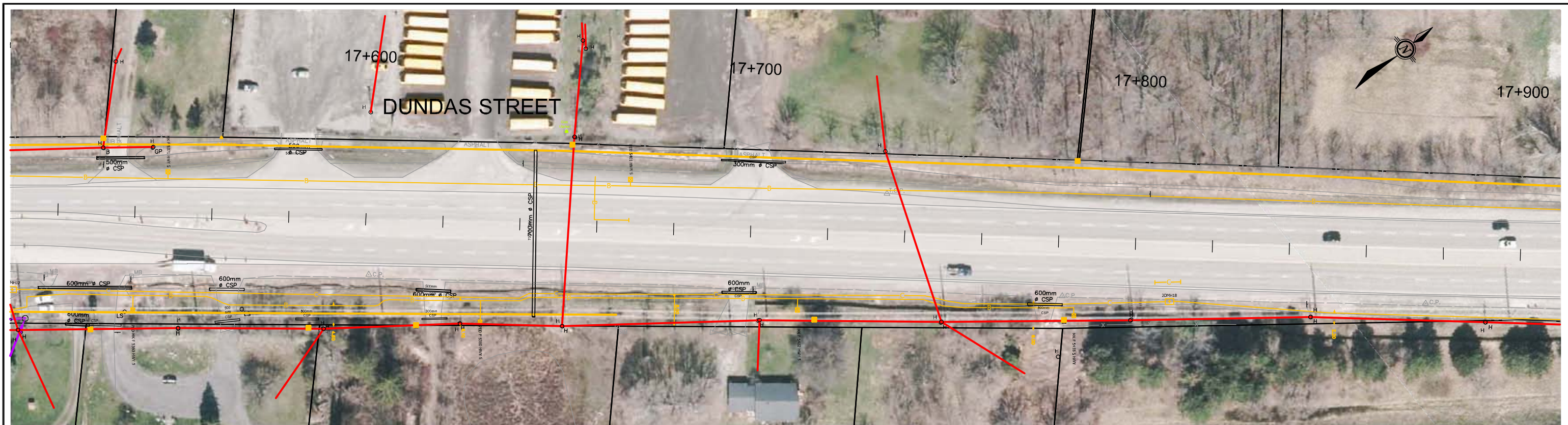
HALTON REGION
DUNDAS STREET (REGIONAL ROAD 5)
BRANT STREET TO BRONTE ROAD
CLASS ENVIRONMENTAL ASSESSMENT STUDY

Legend :

- | | | | |
|--|------------------------|--|---------------------------|
| | HYDRO POLE | | LIGHT STANDARD |
| | EXISTING PROPERTY LINE | | GAS |
| | WATERMAIN | | HYDRO |
| | SANITARY SEWER | | PROPOSED BURLINGTON HYDRO |
| | STORM SEWER | | BELL CANADA |
| | | | TV |



PLATE
3-7j



DUNDAS STREET - UTILITY PLAN
FROM STA. 17+520 TO STA. 18+280

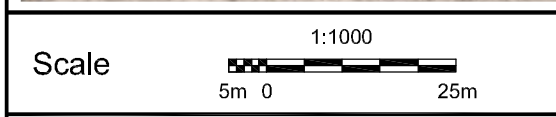
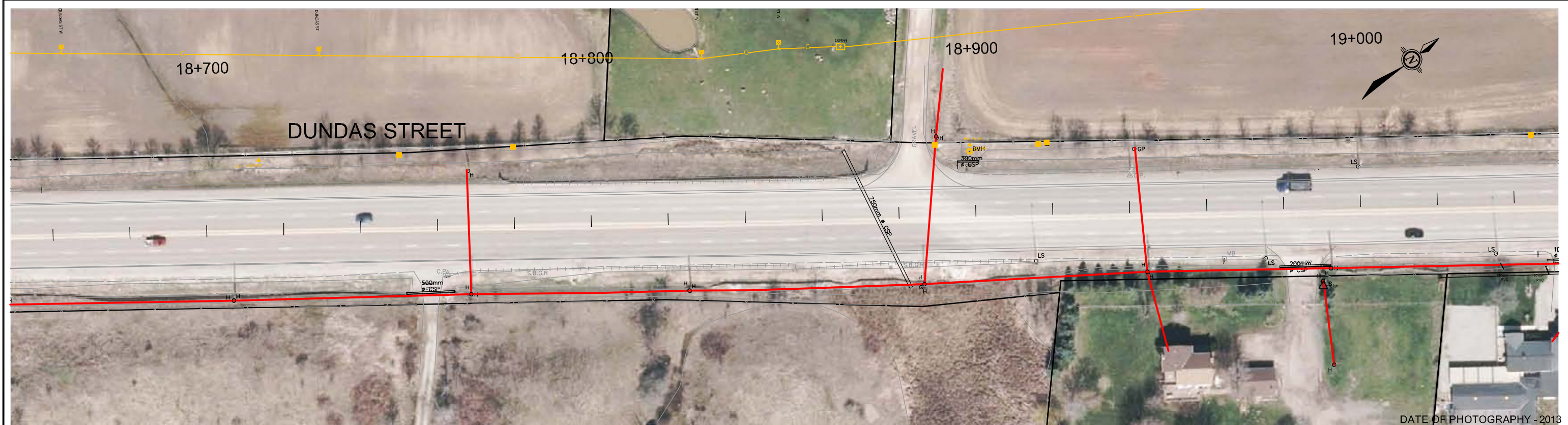
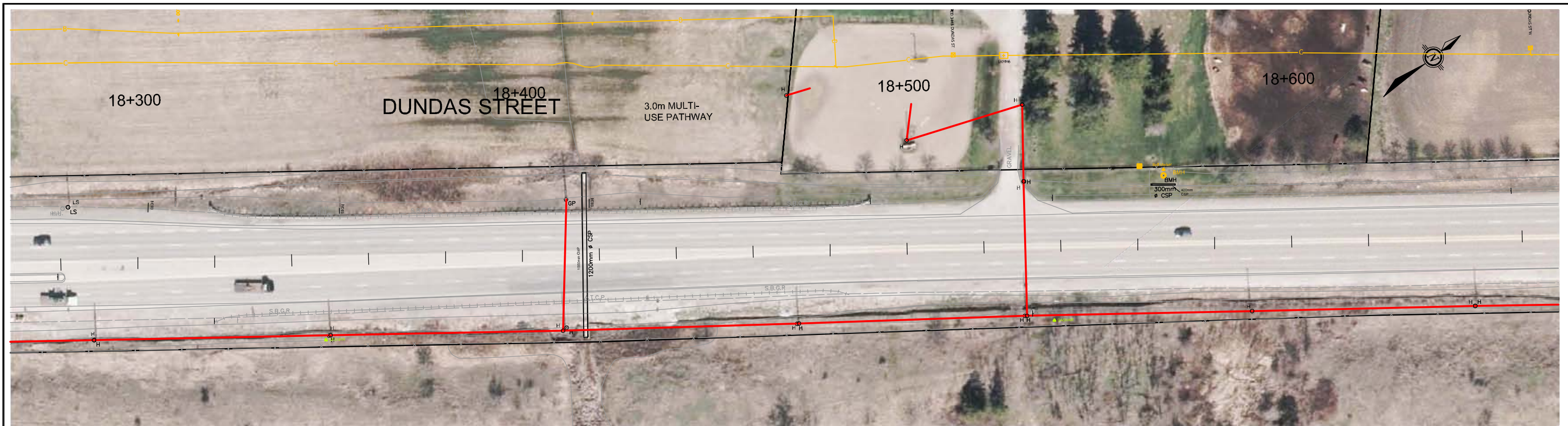


HALTON REGION
 DUNDAS STREET (REGIONAL ROAD 5)
 BRANT STREET TO BRONTE ROAD
 CLASS ENVIRONMENTAL ASSESSMENT STUDY

Legend :

	HYDRO POLE		LIGHT STANDARD
	EXISTING PROPERTY LINE		GAS
	WATERMAIN		HYDRO
	SANITARY SEWER		PROPOSED BURLINGTON HYDRO
	STORM SEWER		BELL CANADA
			TV

PLATE
3-7k



**DUNDAS STREET - UTILITY PLAN
FROM STA. 18+280 TO STA. 19+040**

Legend :

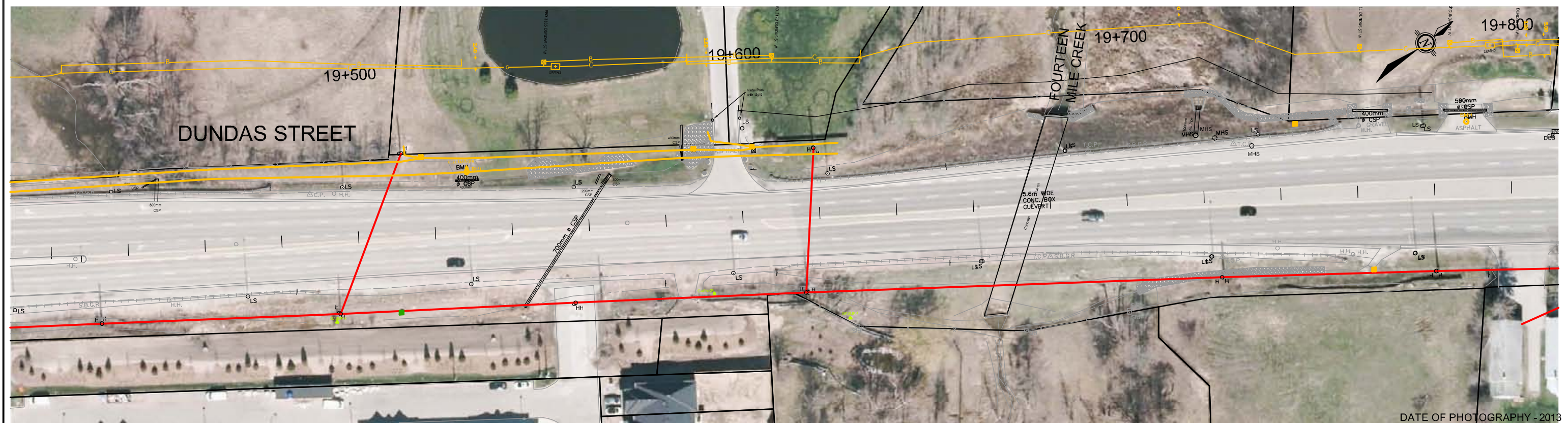
	HYDRO POLE		LIGHT STANDARD
	EXISTING PROPERTY LINE		GAS
	WATERMAIN		HYDRO
	SANITARY SEWER		PROPOSED BURLINGTON HYDRO
	STORM SEWER		BELL CANADA
			TV

PLATE

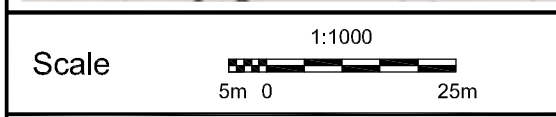


HALTON REGION
DUNDAS STREET (REGIONAL ROAD 5)
BRANT STREET TO BRONTE ROAD
CLASS ENVIRONMENTAL ASSESSMENT STUDY

3-71



DATE OF PHOTOGRAPHY - 2013



DUNDAS STREET - UTILITY PLAN
FROM STA. 19+040 TO STA. 19+800

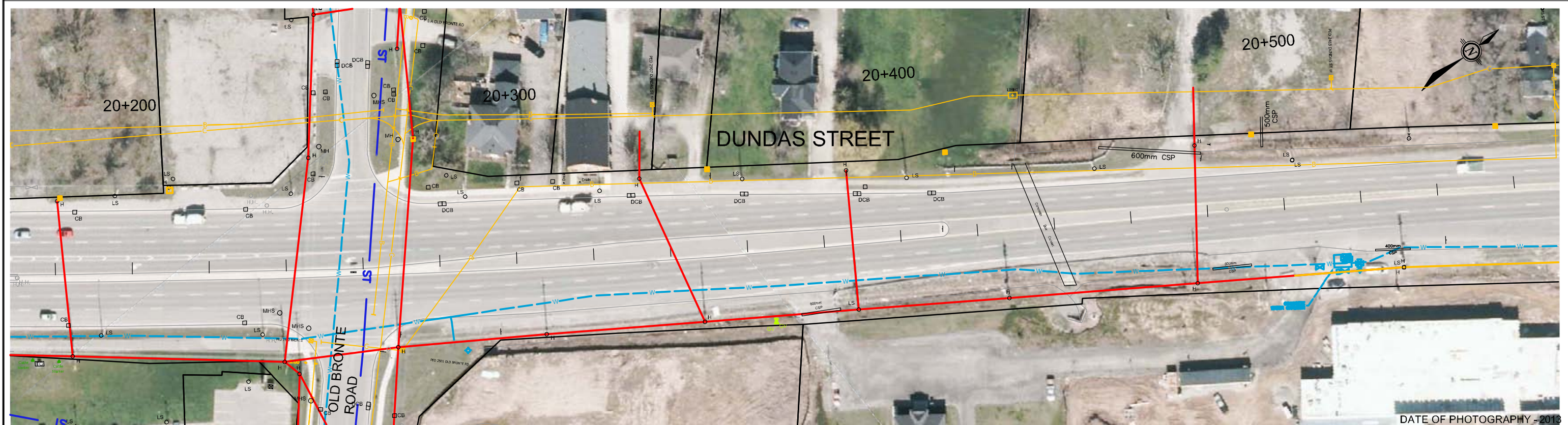
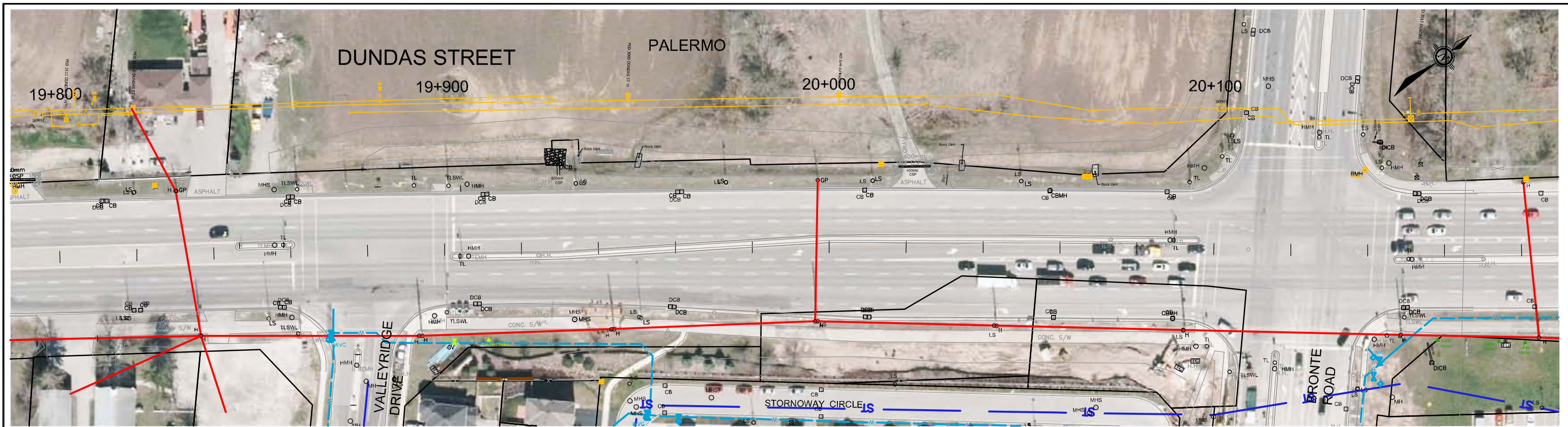
Legend :

OH	HYDRO POLE	LS	LIGHT STANDARD
	EXISTING PROPERTY LINE		GAS
	WATERMAIN		HYDRO
	SANITARY SEWER		PROPOSED BURLINGTON HYDRO
	STORM SEWER		BELL CANADA
			TV

PLATE
3-7m



HALTON REGION
 DUNDAS STREET (REGIONAL ROAD 5)
 BRANT STREET TO BRONTE ROAD
 CLASS ENVIRONMENTAL ASSESSMENT STUDY



Scale 1:1000
5m 0 25m

**DUNDAS STREET - UTILITY PLAN
FROM STA. 19+800 TO STA. 20+560**

Legend :

- | | | | |
|--|------------------------|--|---------------------------|
| | HYDRO POLE | | LIGHT STANDARD |
| | EXISTING PROPERTY LINE | | GAS |
| | WATERMAIN | | HYDRO |
| | SANITARY SEWER | | PROPOSED BURLINGTON HYDRO |
| | STORM SEWER | | BELL CANADA |
| | | | TV |



HALTON REGION
DUNDAS STREET (REGIONAL ROAD 5)
BRANT STREET TO BRONTE ROAD
CLASS ENVIRONMENTAL ASSESSMENT STUDY

PLATE
3-7n