SCOPED ENVIRONMENTAL IMPACT STATEMENT
2060 UPPER JAMES STREET - CITY OF HAMILTON

Prepared for:

Ontario Conference of the Seventh-day Adventist Church

Prepared by:

Colville Consulting Inc.

File: C13068
January 2015

COLVILLE CONSULTING INC.

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1.0 INTRODUCTION

Colville Consulting Inc. was retained by the Ontario Conference of the Seventh-day Adventist Church to prepare an Environmental Impact Statement to assess potential ecological impacts associated with the development of a church on the lands located at 2060 Upper James Street, in the City of Hamilton. An Environmental Constraint Analysis was previously completed for the Subject Property in 2008 by L. Campbell and Associates, with the results of the Constraint Analysis used in the development of the proposed site plan. This EIS has been prepared to build upon the information presented in the Constraints Analysis and assess potential impacts associated with construction of a church on the property. A summary of our assessment is included below.

1.1 Description of the Subject Property

The Subject Property is approximately 13.7 hectares (33.8 acres) in size and known by the municipal address of 2060 Upper James Street, in the City of Hamilton. The property is located south of Twenty Road West between Upper James Street and Glancaster Road (see Figure 1). There are currently no buildings or structures located on the property.

The Subject Property is bisected by a tributary to Twenty Mile Creek and contains a mix of Gray Dogwood Thicket, Meadow Marsh and Cultural Meadow areas. From our assessment of the property, there appears to have been some historical filling and disposal of debris on the eastern portion of the site.

Based on our review of background mapping, a portion of the Subject Property has been included as part of the Upper Twenty Mile Creek Wetland Complex and the majority of the Subject Property has been identified as Linkage in the Natural Heritage System mapping included within the Urban Hamilton Official Plan (UHOP). This Linkage designation appears to include the Cultural Meadow, Thicket and wetland areas. Although the wetland area on this property has been designated as Linkage, we are treating this area as a Core Area to be consisted with the text of the UHOP. The approximate extents of mapped natural heritage features on the Subject Property are illustrated in Figure 2.

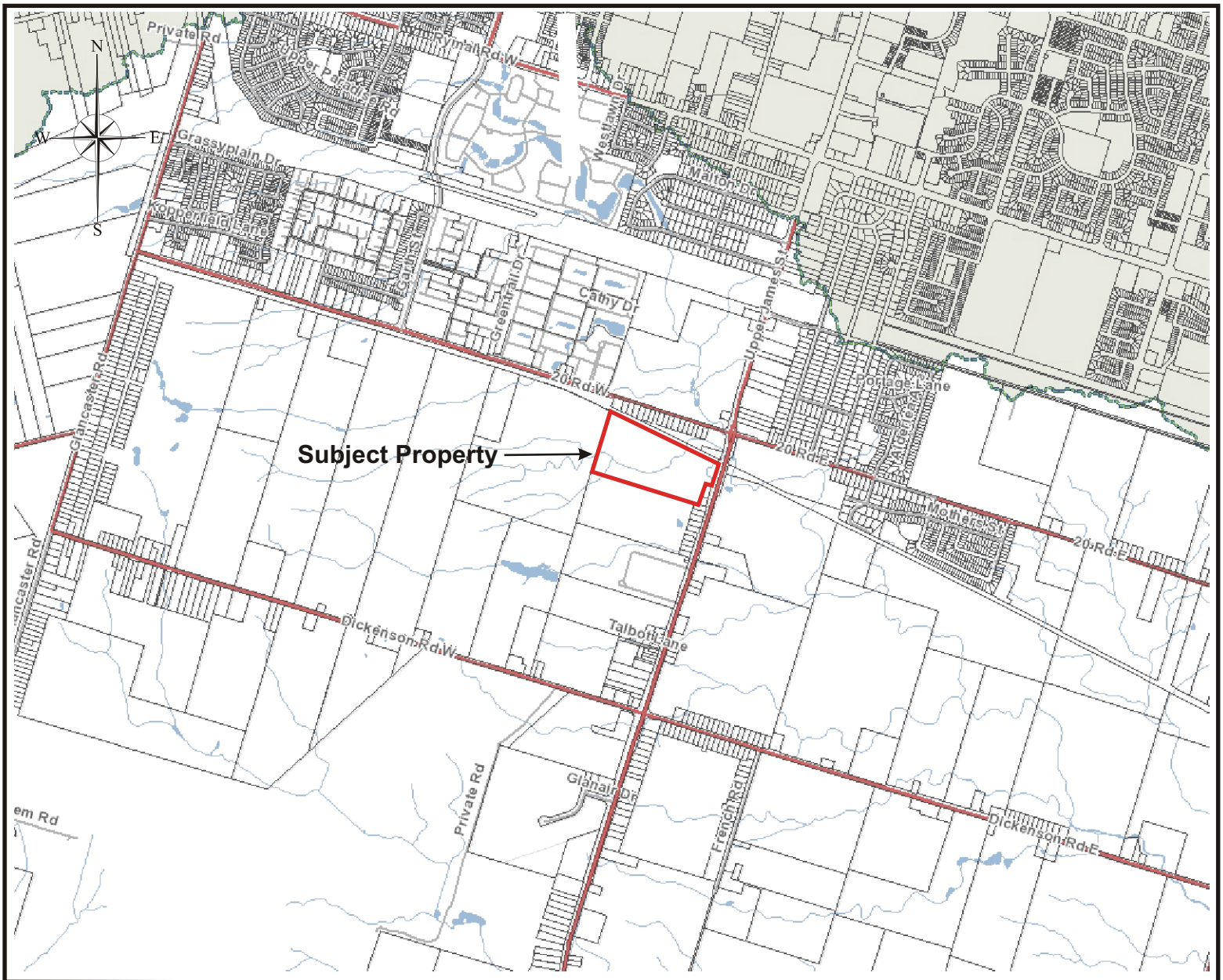
1.2 Description of Proposed Development

The proposed development plan for the Subject Property consists of a church and associated parking areas, however a stormwater management pond and landscaped area are also included in this plan. All development on this property is proposed to occur in the southeast corner of the site, in the areas identified as cultural thicket and cultural meadow. The extent of the proposed development is illustrated in Appendix A, and includes all anticipated amenity areas.

2.0 Environmental Policy

2.1 Provincial Policy Statement

The Provincial Policy Statement (PPS) was issued under Section 3 of the Planning Act, and came into effect on May 22, 1996. The PPS was updated in 1997 and more recently in 2014. It applies to all applications submitted after March 1, 2005 and states that decisions affecting planning matters "shall be consistent with" policy statements issued under the Act. This EIS has been prepared in compliance with Part V, Policy 2.1 of the PPS, which deals specifically with the long term protection and management of natural heritage features and areas.



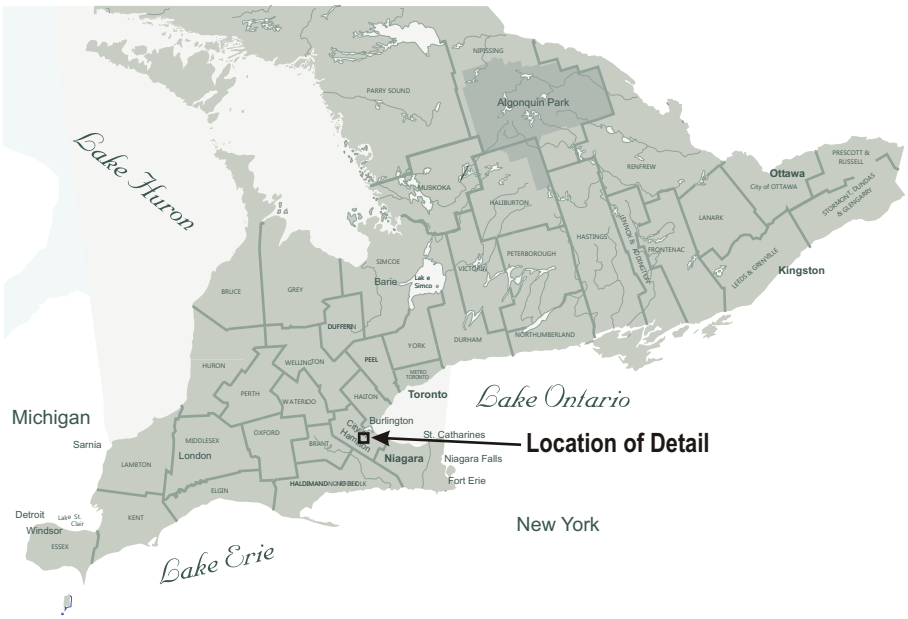


Figure 1
Location of Subject Property

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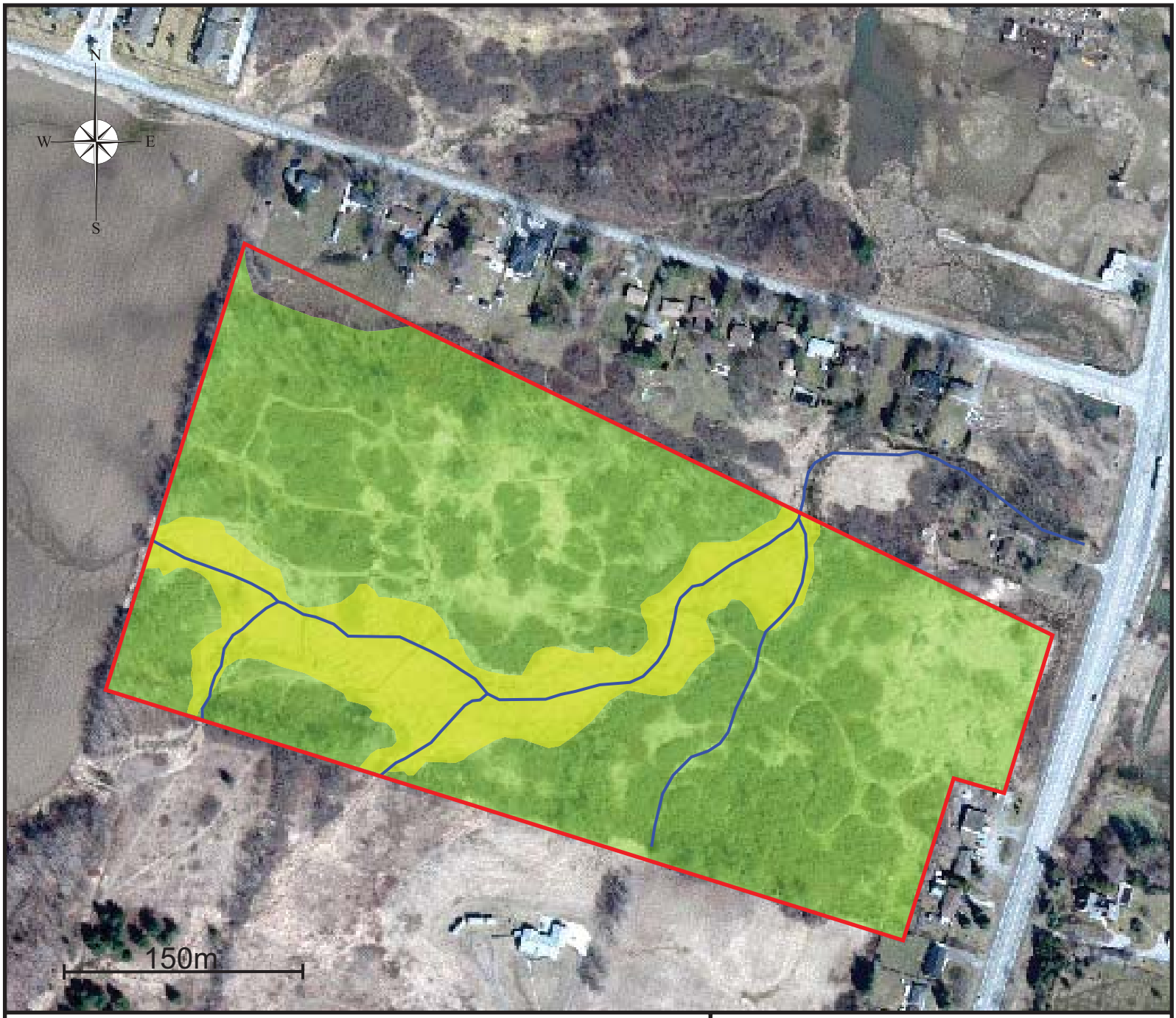

Legend

- Property Boundary
- Linkage Area
- Provincially Significant Wetland (PSW)
- Watercourses

Figure 2
Mapped Natural Heritage Features on the Subject Property

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Natural heritage features and areas are defined in the PPS as those which are important for their environmental and social values as a legacy of the natural landscapes of an area and include: significant wetlands, significant coastal wetlands, fish habitat, significant woodlands south and east of the Canadian Shield, significant valleylands south and east of the Canadian Shield, significant habitat of endangered species and threatened species, significant wildlife habitat and significant areas of natural and scientific interest.

The diversity and connectivity of natural features in an area, and the long-term ecological function and biodiversity of natural heritage systems, should be maintained, restored or, where possible, improved, recognizing linkages between and among natural heritage features and areas, surface water features and ground water features.

Unless it can be demonstrated that there will be no negative impacts on the natural heritage features or their ecological functions, development and site alteration is not permitted in or adjacent to:

- significant habitat of endangered species and threatened species;
- significant wetlands in Ecoregions 5E, 6E and 7E;
- significant coastal wetlands;
- significant woodlands and valleylands south and east of the Canadian Shield;
- significant wildlife habitat;
- significant fish habitat; *and*
- significant areas of natural and scientific interest.

2.2 City of Hamilton - Urban Hamilton Official Plan

The Urban Hamilton Official Plan (UHOP) is the first OP for the amalgamated communities of Ancaster, Dundas, Flamborough, Glanbrook, Hamilton and Stoney Creek (July 2009). This official plan is intended to replace the Region of Hamilton-Wentworth OP and the six OPs representing the former municipalities.

During the preparation of the UHOP, the City of Hamilton has created a Natural Heritage System, which is comprised of Core Areas and Linkages that are recognized as Key Natural Heritage Features, Key Hydrologic Features and Local Natural Areas. Key Natural Heritage Features include features such as significant habitat of endangered, threatened, and special concern species, fish habitat, wetlands, Life Science Areas of Natural and Scientific Interest (ANSIs), significant valleylands, significant woodlands and significant wildlife habitat. Key Hydrologic Features include features such as permanent and intermittent streams, seepage areas and springs, and wetlands.

Within the UHOP are a series of policies relating to the management of natural heritage features and the Natural Heritage System. These policies are contained within Section C2.0 of the UHOP and are intended to achieve the following goals:

- Protect and enhance biodiversity and ecological functions;
- Achieve a healthy, functional ecosystem;
- Conserve the natural beauty and distinctive character of Hamilton's landscape;
- Maintain and enhance the contribution made by the Natural Heritage System to the quality of life of Hamilton's residents; and
- Restore and enhance connections, quality and amount of natural habitat.

To assist in attaining the above goals, the UHOP includes specific policies which relate to the management of natural heritage features. The policy sections relevant to this property are included below.

Section C2.5.2 New development and site alteration shall not be permitted within provincially significant wetlands, significant coastal wetlands or significant habitat of threatened and endangered species.

Section C2.5.3. Indicates new development and site alteration shall not be permitted within fish habitat, except in accordance with provincial and federal requirements.

Section C2.5.5 states new development and site alteration shall not be permitted on adjacent lands to the natural heritage features and areas identified in Section C.2.5.2 to C.2.5.4 unless the ecological function of the adjacent lands has been evaluated and it has been demonstrated that there shall be no negative impacts on the natural features or on their ecological functions.

Section C2.5.7 indicates that streams are mapped in Schedule B of the UHOP and have been separated into two classes, which are Coldwater Watercourses/Critical Habitat and Warmwater Watercourse/Important/Marginal Habitat. If the stream has not been classified as part of an EIS, subwatershed study, or other study, a scoped EIS is required to determine the classification.

Section C2.5.8 states new development or site alteration subject to policies C2.5.3 to C2.5.7 requires, prior to approval, the submission and approval of and Environmental Impact Statement which demonstrates to the satisfaction of the City and the relevant Conservation Authority that:

a) There shall be no negative impacts on the Core Areas or their ecological functions;

b) Connectivity between Core Areas shall be maintained, or where possible, enhanced for the movement of surface and groundwater, plants and wildlife across the landscape; and

c) The removal of other natural heritage features shall be avoided or minimized by the planning and design of the proposed use or site alteration wherever possible.

Section C2.5.9 indicates that an Environmental Impact Statement shall propose a vegetation protection zone has sufficient width to protect the Core Area and its ecological functions from impacts of the proposed land use or site alteration occurring during and after construction, and where possible, restores or enhances the Core Area and/or its ecological functions

Section C2.5.11 Vegetation protection zone widths greater or less than those specified in a) to i) above may be required if ecological features and functions warrant it, as determined through an approved Environmental Impact Statement. Widths shall be determined on a site-specific basis, by considering factors such as the sensitivity of the habitat, the potential impacts of the proposed land use, the intended function of the vegetation protection zone, and the physiography of the site.

Section C2.7 Linkages are natural areas within the landscape that ecologically connect Core Areas. Connections between natural areas provide opportunities for plant and animal movement, hydrological and nutrient cycling, and maintain ecological health and integrity of the overall Natural Heritage System. The City recognizes the importance of Linkages shown on Schedule B – Natural Heritage System in reducing the adverse impacts of habitat fragmentation on natural areas. Habitat fragmentation results in loss of species diversity and reduced ecosystem health and resilience. It is the intent of this policy that Linkages be protected, restored, and enhanced to sustain the Natural Heritage System wherever possible.

Section C2.7.5 Where new development or site alteration is proposed within a Linkage in the Natural Heritage System as identified in Schedule B – Natural Heritage System, the applicant shall prepare a Linkage Assessment. On sites where an Environmental Impact Statement (EIS) is being prepared, the Linkage Assessment can be included as part of the EIS report. Any required Linkage Assessment shall be completed in accordance with Policy F.3.2.1.11 - Linkage Assessments.

Section C2.7.6 Linkage Assessments shall include the following information:

a) identify and assess the Linkage including its vegetative, wildlife, and/or landscape features or functions;

b) assess the potential impacts on the viability and integrity of the Linkage as a result of the development proposal; and,

c) make recommendations on how to protect, enhance or mitigate impacts on the Linkage(s) and its functions through planning, design and construction practices.

2.3 Niagara Peninsula Conservation Authority

In order to administer Ontario Regulation 155/06, the Niagara Peninsula Conservation Authority (NPCA) has created a document titled Policies, Procedures and Guidelines for the Administration of Ontario Regulation 155/06 and Land Use Planning Policy Document (NPCA 2011). The purpose of the document is to provide guidance for development applications that are located in and adjacent to natural heritage features and hazard lands.

Regulated features on the Subject Property are limited to the provincially significant wetland (PSW) and watercourse. NPCA policies related to the protection of watercourses and wetlands are included in Sections 3.15 and 3.24 respectively of the NPCA Land Use Planning Policy Document (NPCA 2011).

3.0 Study Approach

3.1 Background Review

Prior to the commencement of primary field inventories, a review of background material available for the Subject Lands and surrounding area was conducted. Some of the background information reviewed included:

- Urban Hamilton Official Plan (City of Hamilton 2014);
- NPCA Planning & Regulation Policies and Guidelines (NPCA 2011);
- Upper Twenty Mile Creek Wetland Evaluation (MNR 2005);
- Environmental Constraints Report, Living Word Christian Fellowship Church and Community Center (L. Campbell and Associates 2008);
- Ontario Ministry of Natural Resources Hamilton Species at Risk List (MNR 2014);
- Twenty Mile Creek Watershed Plan (NPCA 2006);
- Background data available from the NPCA and MNRF; and
- Nature Counts Project: Hamilton Natural Areas Inventory (Dwyer 2003).

3.2 Field Inventories

In order to ensure all natural heritage features on the properties were assessed adequately, Colville Consulting contacted City of Hamilton and NPCA staff to obtain a scoping for field investigations. Based on this communication, it was suggested that the following assessments and inventories be conducted on the Subject Properties:

1) Breeding bird survey;
2) Three-season botanical inventory;
3) Assessment and description vegetation communities on the properties using the Ecological Land Classification System for Southern Ontario;
4) Amphibian Call Surveys;
5) Documentation of any wildlife species observed on the properties; and
6) An aquatic habitat assessment.

The methods employed for each of the above components are provided in the appropriate sections below and in a Terms of Reference provided in Appendix B.

4.0 Study Findings

4.1 Botanical Inventories and Vegetation Mapping

Field reconnaissance of the Subject Property was conducted on May 31, July 3, August 9 and October 11, 2014. Vegetation communities (ELC units – following Lee et al. 1998) were mapped and described, and a list of botanical species was compiled (see Appendix C). Species status was assessed for Ontario (Oldham and Brinker 2009) and City of Hamilton (Goodban 2003). A site visit was also conducted with Ministry of Natural Resources and Forestry staff on August 8, 2014 to verify the extent of PSW on the property. The results of our observations and assessment are provided below.

4.1.1 Botanical Inventories

A total of 184 taxa were documented on the property during our inventories. Approximately 39% of the recorded flora, are considered non-native and introduced to the City of Hamilton and southern Ontario. No species considered rare in Ontario (Oldham and Brinker 2009) were documented. Four or five stems of Virginia Mountain-mint (*Pycnanthemum virginianum*) plants were observed in unit CUT1-4 within the proposed development area, representing one or two individual plants. These plants are at the edge of a trail through a dense thicket of Gray Dogwood that has formed on piles of fill (see Figure 3). Virginia Mountain-mint has dry to mesic prairie affinities and it does not tolerate shade; the plants at the edge of the trail are being shaded out. This species is considered rare in the City of Hamilton (Goodban 2003) and is the only locally rare species documented on the property. To protect these specimens, it is recommended that these plants be relocated to a suitable area within the vegetation protection zone. More discussion on relocation of this species is provided in Section 8 below.

From our review of the Constraints Analysis, 84 plant taxa were recorded from the Subject Property during inventories conducted by L. Campbell & Associates (L. Campbell and Associates 2008). Three taxa listed by L. Campbell & Associates, namely Wedge-fruited Oval Sedge *(Carex suberecta)*, Elliptic Spike Rush (*Eleocharis elliptica)* and Rough Hawkweed (*Hieracium scabrum)* are considered misidentifications and excluded from the vascular plant checklist provided in Appendix C. None of these species are known to occur in the City of Hamilton and similar, more

common species of each genus which were noted during 2014 were not reported in the 2008 study.

A further five (5) plant taxa recorded by Campbell in 2008 were not recorded in 2014, but are presumed valid records, bringing the total number of taxa recorded to date up to 189. A complete list of species documented on the site is provided in Appendix C.

4.1.2 Vegetation Communities

Vegetation communities on the Subject Property were evaluated May 31, July 3, August 9 and October 11, 2014. The extent of the various vegetation communities are illustrated in Figure 3 and described below. Photos illustrating the vegetation communities on the property are provided in Appendix D.

MAM2-2 Reed Canary Grass Mineral Meadow Marsh Type

Reed Canary Grass (*Phalaris arundinacea*) strongly dominates most of the central wetland on this property. Other commonly occurring species include Tall White Aster (*Aster lanceolatus*), Common Cattail (*Typha latifolia*), Tall Fescue (*Festuca arundinacea*), Purple Loosestrife (*Lythrum salicaria*), Retrorse Sedge (*Carex retrorsa*) and Orange Touch-me-not (*Impatiens capensis*). Small inclusions of thicket swamp also occur within this unit, including Red-osier Dogwood (*Cornus stolonifera*), Silky Dogwood (*Cornus amomum* ssp. *racemosa*), Common Buckthorn, Meadowsweet (*Spiraea alba*) and shrub willows (*Salix* spp.).

MAS2-1 Cattail Mineral Shallow Marsh Type

This small unit is located on the hydro right-of-way just west of Upper James Street and is associated with the ditch on the west side of the road. The main species are Common Cattail, Reed Canary Grass, Common Reed, Tall White Aster and Purple Loosestrife.

CUT1-4 Gray Dogwood Cultural Thicket Type

The main vegetation community on the property is shrub thicket dominated by Gray Dogwood (*Cornus foemina* ssp. *racemosa*) (CUT1-4). Some of the thicket areas have developed on fill material. Common Buckthorn is also common within this community, along with small patches of Red-osier and Silky Dogwood. Scattered young trees include White Elm and Black Walnut. Shrub cover reaches 100% in many areas, however there are also some small old field openings and moister patches of Reed Canary Grass within CUT1-4. Small inclusions of upland forest occur within this unit and include sugar maple (*Acer saccharum ssp. saccharum*), basswood (*Tilia americana*) and red oak (*Quercus rubra*). Some trails have been cut through this unit, although many sections are becoming overgrown.

CUM1-1 Dry-Moist Old Field Meadow Type

The eastern portion of the property is dominated by **D**ry-Moist Old Field Meadow Type (CUM1-1). This area contains a variable mix of old field and weedy species, including Tall Goldenrod (*Solidago altissima*), Kentucky Blue Grass (*Poa pratensis*), Bird Vetch (*Vicia cracca*), Bird's-foot Trefoil (*Lotus corniculatus*), fleabanes (*Erigeron* spp.), New England Aster (*Aster novae-angliae*), Elecampane (*Inula helenium*), Curly Dock (*Rumex crispus*), Crown Vetch (*Coronilla varia*), Teasel (*Dipsacus fullonum* ssp. *sylvestris*), White Sweet-clover (*Melilotus alba*), Wild Madder (Galium *mollugo*), Perennial Sow-thistle (*Sonchus arvensis*), Meadow Goat's-beard (*Tragopogon pratensis* ssp. pratensis), Garlic Mustard (*Alliaria petiolata*), Red Clover (*Trifolium pratense*) and White Vervain (*Verbena urticifolia*). Unit CUM1-1 also includes smaller patches of Gray Dogwood and Common

Legend

Property Boundary	
Watercourses	
CUT1-4	Gray Dogwood Cultural Thicket Type
MAM2-2	Reed Canary Grass Mineral Meadow Marsh Type
CUM1-1	Dry-Moist Old Field Meadow Type
MAS2-1	Cattail Mineral Shallow Marsh Type
Amphibian Monitoring Station	
Location of Virginia Mountain-mint plants	

Figure 3
Vegetation Communities on the Subject Property

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Buckthorn, and clusters of trees including Black Walnut, Black Locust (*Robinia pseudoacacia*) and Manitoba Maple (*Acer negundo*).

4.1.3 Wetland Boundary Delineation

The extent of the wetland boundary on this property was verified by MNRF staff on August 8, 2014 and generally coincides with the Reed Canary Grass Marsh. As this wetland feature appears to be a riverine wetland and is confined by topography on the site, the boundary was easily identifiable. The current wetland boundary does not appear to differ from the mapping included in the Upper Twenty Mile Creek Wetland Complex wetland Evaluation (MNR 2005), and therefore no changes to the wetland evaluation were made by MNRF staff as a result of this site visit. A copy of the Upper Twenty Mile Creek Wetland Complex Wetland Evaluation is included in Appendix E for reference.

4.2 Wildlife and Wildlife Habitat

4.2.1 Breeding Bird Survey

Breeding birds were surveyed on two dates during the peak breeding season, at least 10 days apart, under suitable weather conditions with little wind and no precipitation. Surveys were carried out using a random wandering survey method within 1 hour of dawn and no later than 9:00 am, and were comprised of a thorough search of all habitat types over the property. Survey dates and weather conditions are summarized in Table 1. All birds seen or heard calling were recorded, and breeding evidence was determined in accordance with the criteria of the Atlas of the Breeding Birds of Ontario (Cadman et al., 2007).

Table 1. Breeding Bird Survey Summary Information.

Date	Start Time	End Time	Purpose	Air Temperature (°C)	Wind (Beaufort Scale)	Cloud Cover (%)
June 13, 2014	06:30	07:45	breeding bird survey #1	19	2	20 - 90
July 2, 2014	07:00	08:35	breeding bird survey #2	23	0	100

A total of 21 species of were observed during our surveys on the property, 18 of which were likely to or confirmed to breed on the site (see Table 2). Three species, Mallard, Rock Pigeon, and Barn Swallow, were seen flying or foraging over the site, but no evidence of breeding on site was present. All species observed are considered to be secure (S5 - common, widespread and abundant), apparently secure (S4 - uncommon but not rare) or not native (SNA – exotic) in the province of Ontario. Most are considered to be Common in the City of Hamilton with the exception of Alder Flycatcher, which is considered Uncommon (Conservation Hamilton, 2013). The Barn Swallow is designated as "Threatened" in Ontario (Species at Risk in Ontario) and Canada (Committee on the Status of Endangered Wildlife in Canada), however, no suitable nesting structures were present on site and this species was only observed foraging over the thickets and off-site fields.

An additional 5 species were only observed off-site, and included some species more suited to the residential properties north of the property (Northern Flicker, Chipping Sparrow, Eastern Towhee) and the open meadow habitat to the south (Eastern Meadowlark, Bobolink). Although

most are considered Common in the City of Hamilton, the Eastern Towhee is considered Uncommon (Hamilton Conservation Authority 2013a). Both the Eastern Meadowlark and Bobolink are designated as Threatened provincially and nationally. Both were observed in the open meadow habitat located immediately south of the Subject Property, but were not documented on the site.

No rare or significant bird species were identified as potentially breeding on site during either of the field visits. No wetland-obligate species were observed in the wetland habitat on site. Several Barn Swallows were observed foraging over the site, however no potential nesting structures are located on or immediately adjacent to the property boundaries.

The upland portions of the site support thicket and cultural meadow habitats, which, due to the abundant woody vegetation, is not ideal habitat for grassland birds. However, two Threatened species, Eastern Meadowlark and Bobolink, were observed in the open meadow habitat to the south of the Subject Property. The Bobolink was only observed on the June 13, 2014 visit, when a single male was observed singing from a perch in the large trees in front of the off-site residence. The hayfield on the adjacent property had been mowed prior to the July 2, 2014 visit, and no Bobolinks were observed at that time.

The Eastern Meadowlark was only observed during the July 2, 2014 visit. A male was heard singing south of the site for a period of more than 35 minutes, and was observed occasionally perching in the tallest trees along the southern border of the site. The male was also seen flying into the mowed field, where it joined a second Eastern Meadowlark on the ground. The presence of two Eastern Meadowlarks suggests that they are probable breeders in the field adjacent to the Subject Property, however vegetation on the site is not suitable breeding habitat for this species.

During the 2007 breeding bird surveys of this property (L. Campbell and Associates 2008), a total of 29 species were documented on or adjacent to the site. Fourteen of these species (Spotted Sandpiper, Red-tailed Hawk, Killdeer, Willow Flycatcher, Horned Lark, Orchard Oriole, Indigo Bunting, Downy Woodpecker, Black-capped Chickadee, Purple Martin, Common Grackle, American Woodcock, Field Sparrow and Eastern Kingbird) were not detected during 2014 surveys, however it is assumed that the property may provide at least periodic habitat for these species.

Table 2. Results of breeding bird surveys.

Species	S-Rank	Local Rank *	CUM1-1	CUT1-4	MAM2-2	Offsite	highest breeding evidence **	breeding code***	SARO/ COSEWIC Status
Mallard	S5	C	x	x			X	OBS	
Rock Pigeon	SNA	C	x	x			X	OBS	
Mourning Dove	S5	C		x			P	PR	
Northern Flicker	S4B	C				x	P	PR	
Alder Flycatcher	S5B	U		x	x		T	PR	
Warbling Vireo	S5B	C		x			S	PO	
Blue Jay	S5	C		x			H	PO	
Barn Swallow	S4B	C		x		x	X	OBS	THR
House Wren	S5B	C		x		x	S	PO	
American Robin	S5B	C		x			P	PR	
Gray Catbird	S4B	C		x			A	PR	
European Starling	SNA	C	x	x			CF	CO	
Cedar Waxwing	S5B	C		x		x	P	PR	
Yellow Warbler	S5B	C		x	x		T	PR	
Common Yellowthroat	S5B	C		x	x		S	PO	
Northern Cardinal	S5	C		x			T	PR	
Chipping Sparrow	S5B	C				x	H	PO	
Song Sparrow	S5B	C		x	x		A	PR	
Eastern Towhee	S4B	U				x	S	PO	
Eastern Meadowlark	S4B	C				x	P	PR	THR
Bobolink	S4B	C				x	S	PO	THR
Brown-headed Cowbird	S4B	C	x	x			T	PR	

Table 2 (cont.). Results of breeding bird surveys.

Species	S-Rank	Local Rank *	CUM1-1	CUT1-4	MAM2-2	Offsite	highest breeding evidence **	breeding code***	SARO/ COSEWIC Status
Red-winged Blackbird	S4	C		x	x		P	PR	
Common Grackle	S5B	C		x	x		H	PO	
Baltimore Oriole	S4B	C		x			S	PO	
American Goldfinch	S5B	C		x			T	PR	

* C- common, U- uncommon

** X – observed in its breeding season, no evidence of breeding
H – species observed in its breeding season in suitable nesting habitat
S – singing male present in its breeding season in suitable nesting habitat
T – permanent territory presumed through registration of territorial song at least one week apart
P – pair observed in their breeding season in suitable nesting habitat
A – agitated behaviour or anxiety calls of an adult
CF – adult carrying food for young

*** OBS – observed, no evidence of breeding; PO – possible breeding; PR – probable breeding; CO – confirmed breeding

4.2.2 Amphibian Call Surveys

Amphibian call surveys were conducted on April 24, 2014, May 22, 2014 and June 26, 2014. As amphibian monitoring stations are recommended to be separated by at least 500m to minimize the likelihood of call overlap, one station was established on the property. The location of this station is illustrated on Figure 3. This station was selected to include the only area of standing water observed on the property, which appeared to result from all-terrain vehicles traversing the wetland. The station was surveyed for a period of three minutes, between one half-hour after sunset, and midnight. All species of calling amphibians were recorded along with a calling code (0 – no calling; 1- calls not overlapping, can be discretely counted; 2 – calls overlapping, but numbers of individuals can still be estimated; 3 – full chorus, numbers of individuals cannot be estimated), along with an estimate of the number of individual amphibians where possible.

The amphibian survey conducted on April 24, 2014 commenced at approximately 22:00. Air temperature during the April 24, 2014 survey was 9°C, with partly cloudy conditions and winds estimated to be 1 on the Beaufort Scale. The May 22, 2014 visit was conducted between 21:45 and 21:48, while the air temperature was 16°C, winds were estimated to be 1 on the Beaufort Scale and it was partly cloudy. The final amphibian survey was completed on June 26, 2014, between 22:10 and 22:13. It was partly cloudy, with an air temperature of 18°C and little wind during the June survey.

The results of the amphibian surveys are presented in Table 3. Only one species (Western Chorus Frog) was heard calling during the surveys. As part of the amphibian call surveys, water depth

within the wetland area was noted during each site visit. From our observations, standing water within the wetland area was reduced to a few small isolated pockets by the June 26 visit, and as a result, no calling was documented.

Table 3. Results of amphibian call surveys. Numbers in cells represent (calling code – estimated numbers).

	Station 1		
	Visit 1 April 24	Visit 2 May 22	Visit 3 June 26
Western Chorus Frog	2-8	1-2	-

In addition to the Western Chorus Frogs detected on the property during our surveys, Green Frogs have also been previously observed on the property (L. Campbell and Associates 2008). As this species generally requires permanent water to successfully reproduce, breeding habitat for this species is not present on the property.

4.2.3 Incidental Wildlife Observations

Incidental observations of wildlife were made on each of the site visits, which included searches of debris and potential cover objects on the property. Additional species of wildlife observed included eastern cottontail, raccoon, white-tailed deer, meadow vole, northern red-bellied snake and eastern gartersnake. The only other wildlife species previously documented for this property is grey squirrel (L. Campbell and Associates 2008).

4.3 Aquatic Habitat Assessment

As illustrated on Figure 2, a tributary of Twenty Mile Creek traverses the Subject Property. This watercourse originates approximately 1.8km west of the property and conveys flow to the main channel of Twenty Mile Creek, which is located east of Upper James Street. The watercourse upstream of the property is well defined as it flows through primarily agricultural lands, however the channel across the site is braided and poorly defined through the Reed Canary Grass Marsh. Low-flow channel widths are variable, averaging approximately 30cm in width. The channel substrate consists entirely of silt and clay. Flow in this tributary to Twenty Mile Creek is intermittent, with water being conveyed across the site following precipitation events and snow melt. No areas of groundwater input were noted.

Due to the density of reed canary grass in the channels, fish sampling on site was not possible. As a surrogate, fish community data was obtained from the Niagara Peninsula Conservation Authority, who provided data for Twenty Mile Creek at Upper James Street, which was collected August 2008. Based on this information, fish species in the vicinity of the property include Bluntnose Minnow, Golden Shiner, green sunfish, Black Bullhead and Tadpole Madtom, although not all these species are likely to utilize habitats on the property. In addition to the information provided by the NPCA, it is likely that Grass Pickerel may periodically use habitat provided by the watercourse and wetland on the property, although this species has not been documented in the area.

4.4 Species at Risk Screening

A species at risk screening conducted for the property (included as Appendix F) suggests that suitable habitat for the endangered Yellow-breasted Chat (*Icteria virens*), could possibly be present on the property. The Yellow-breasted Chat breeds in dense thickets around wood edges, riparian areas, and in overgrown clearings (Environment Canada 2011). Eagles (2007) indicates that breeding sites for this species typically include tangles of grape and raspberry; vegetation features which are absent from the property. Although Cadman et al. (2007) identifies this species as a possible breeder in the vicinity of the property, this species was not detected in 2007 (L. Campbell and Associates 2008) or 2014.

In addition to the Yellow-breasted Chat, the species at risk screening completed for this property suggests that habitat for two species of special concern may be located on the property. These species are Eastern Milksnake (*Lampropeltis triangulum*) and Grass Pickerel (*Esox americanus vermiculatus*). A discussion on each is provided in Section 5.1.2 below.

5.0 ASSESSMENT OF SIGNIFICANT NATURAL HERITAGE FEATURES

5.1.1 Significant Habitat of Endangered and Threatened Species

No rare or significant species of wildlife were identified on the site during any of the field visits. Several Barn Swallows, a provincially and nationally threatened species, were observed foraging over the site, however no nests or structures likely to support nests were noted on or adjacent to the property. Based on observations, it appears that Barn Swallows may be nesting on buildings associated with the greenhouses approximately 150m south of the property, however no nests were confirmed within 200m of the property.

Based on the Habitat Description for Barn Swallows, lands between 5 m and 200 m of a nest are considered to be Category 3 lands and are considered to have the highest tolerance to alteration (OMNF 2013a). Barn Swallows depend on this area for various life processes including rearing, feeding, and resting. Although no nests were confirmed within 200m of the property, Barn Swallows were observed foraging over the Subject Property. Based on discussions with MNRF staff regarding potential impacts to this species, it was determined that the proposed development on the Subject Property is not likely to impact Barn Swallow nesting adjacent to the property or foraging over the property.

The upland portions of the site support a mix of cultural thicket and cultural meadow habitats. Our observations indicate that these areas were not being utilized by grassland birds, however Eastern Meadowlark and Bobolink were observed in the open meadow habitat to the south of the Subject Property. The Bobolink was only observed on the June 13 visit, when a single male was observed singing from a perch in the large trees in front of the off-site residence. The hayfield had been mowed prior to the July 2 visit, and no Bobolinks were observed at that time. Based on the reported Ontario egg dates (with the median falling between June 2 and July 12; (Peck and James 1987)), it is likely that any nesting was unsuccessful due to incidental mortality from agricultural operations.

The Eastern Meadowlark was only observed during the July 2 visit. A male was heard singing south of the site for a period of more than 35 minutes on this date, and was observed occasionally perching in the tallest trees along the southern border of the site. The male was also seen flying into the mowed field, where it joined a second Eastern Meadowlark on the ground. The presence

of two Eastern Meadowlarks suggests that they are probable breeders in the field adjacent to the Subject Property.

Although both Eastern Meadowlark and Bobolink were observed adjacent to the Subject Property, neither of these species was documented utilizing the property and suitable habitat for these species is not present on the property. Based on discussions with MNRF staff, it was determined that the proposed development on this property is not likely to impact Bobolink or Eastern Meadowlark.

Based on our inventories and observations, no significant habitat of endangered or threatened plant or wildlife species is present on the property.

5.1.2 Other Potential Species of Conservation Concern

Based on the species at risk screening completed for this property, habitat for two species of special concern may be located on the property. These species are Eastern Milksnake (*Lampropeltis triangulum*) and Grass Pickerel (*Esox americanus vermiculatus*). A discussion on each is provided below.

Eastern Milksnake

The eastern milksnake is considered to be somewhat of a habitat generalist. It may occur in fields, swamps, and open woodlots. In Ontario, it is more common in heavily wooded landscapes than areas with a low percentage of forest cover. It is, however, common in rural pastures and hayfields, and frequently occurs in and around barns, agricultural outbuildings, and houses. Its association with buildings is due to its preferred diet of small mammals, especially young mice, voles, and rats. It also eats young birds, other snake species, and slugs (Fischer 2002).

The milksnake is an egg-laying species, so presence of suitable nesting sites is important. A wide variety of sites may be used for egg laying, including rotting logs, stumps, mammal burrows, manure piles, leaf mounds, compost, sawdust piles, sand or in loose soil (Fischer 2002).

Hibernation sites for milksnakes include mammal burrows, old foundations, crawl spaces and building basements, old wells and cisterns, stone walls, gravel and dirt banks, hollow logs, rotting stumps, and rock crevices (Fischer 2002).

Although searches of the property did not result in any detection of this species on the property, eastern milksnakes are considered common in the City of Hamilton (Hamilton Conservation Authority 2013b). From our observations of the property, there are no features on site that appear to provide significant habitat for the milksnake in the form of egg-laying sites or hibernacula. Therefore, it is likely that if this species occasionally wanders onto the Subject Lands, utilization will likely be associated with foraging or migration. To ensure the proposed development will not impact any eastern milksnakes that may be in the vicinity of the property, mitigation measures are provided in Section 8.0 below.

Grass Pickerel

Grass Pickerel habitat is typically characterized as shallow (< 2m), heavily vegetated, slow moving, lowland streams and overflow ponds of large streams and stream expansions with mud or muck bottoms (organic soils) and clear- to tea-coloured water (Beauchamp et al. 2012). In intermittent watercourse such as Twenty Mile Creek, permanent refuge pools are a critical component of Grass Pickerel habitat.

Based on fish community data provided by the NPCA, Grass Pickerel are not known to occur in the vicinity of the Subject Property, however this species has been documented in the watershed downstream of Miles Road. Refuge pools associated with road crossings downstream of the property may have the potential to provide resident habitat for this species, with wetland area on this property potentially providing foraging and spawning habitat during high flow events.

As the wetland area on the property is proposed to be protected as part of this development and no alteration to hydroperiod in the wetland is anticipated, the proposed project will not impact any Grass Pickerel that may be present in the vicinity of the property.

Based on our assessment, the proposed development is not likely to impact any species of special concern that may be present in the area of the property.

5.2 Significant Wildlife Habitat

5.2.1 Seasonal Concentration Areas

The Significant Wildlife Habitat Technical Guide (SWHTG) identifies 14 types of seasonal concentrations of animals that may be considered significant wildlife habitat. These include, but are not limited to:

- winter deer yards;
- moose late winter habitat;
- colonial bird nesting sites;
- waterfowl stopover and staging areas;
- waterfowl nesting areas;
- shorebird migratory stopover areas;
- landbird migratory stopover areas;
- raptor winter feeding and roosting areas;
- Wild Turkey winter range;
- Turkey Vulture summer roosting areas;
- reptile hibernacula;
- bat hibernacula;
- bullfrog concentration areas; and
- migratory butterfly stopover areas.

Seasonal concentration areas are typically designated as significant wildlife habitat if it supports a species at risk or a large population may be lost if the habitat is destroyed.

None of these types of seasonal concentrations of animals were observed or documented on the Subject Lands.

5.2.2 Rare or Specialized Habitat

Rare habitat includes those vegetation communities with are designated as extremely rare to uncommon in Ontario. Those areas that qualify as rare habitats are assigned an SRank of S1, S2 or S3 by the Natural Heritage Information Center.

The SWHTG defines 14 specialized habitats that may be considered significant wildlife habitat. They are:

- habitat for area-sensitive species;
- forests providing a high diversity of habitats;
- old-growth or mature forest stands;
- foraging areas with abundant mast;
- amphibian woodland breeding ponds;
- turtle nesting habitat;
- specialized raptor nesting habitat;
- moose calving areas;
- moose aquatic feeding areas;
- mineral licks;
- mink, otter, marten, and fisher denning sites;
- highly diverse areas;
- cliffs; and
- seeps and springs.

No rare or specialized habitat was identified on the Subject Lands.

5.2.3 Migration Corridors

The SWHTG defines animal movement corridors as elongated, naturally vegetated parts of the landscape used by animals to move from one habitat to another. To qualify as significant wildlife habitat, these corridors should be a critical link between habitats that are regularly used by wildlife.

Based on the surveys conducted on the Subject Property and from our assessment of air photos and mapping, it does not appear that the property provides a significant corridor function. Further discussion on potential wildlife movement is provided in Section 5.5 below.

5.3 Significant Areas of Natural and Scientific Interest (ANSI)

No Areas of Natural and Scientific Interest are located on or adjacent to the Subject Property.

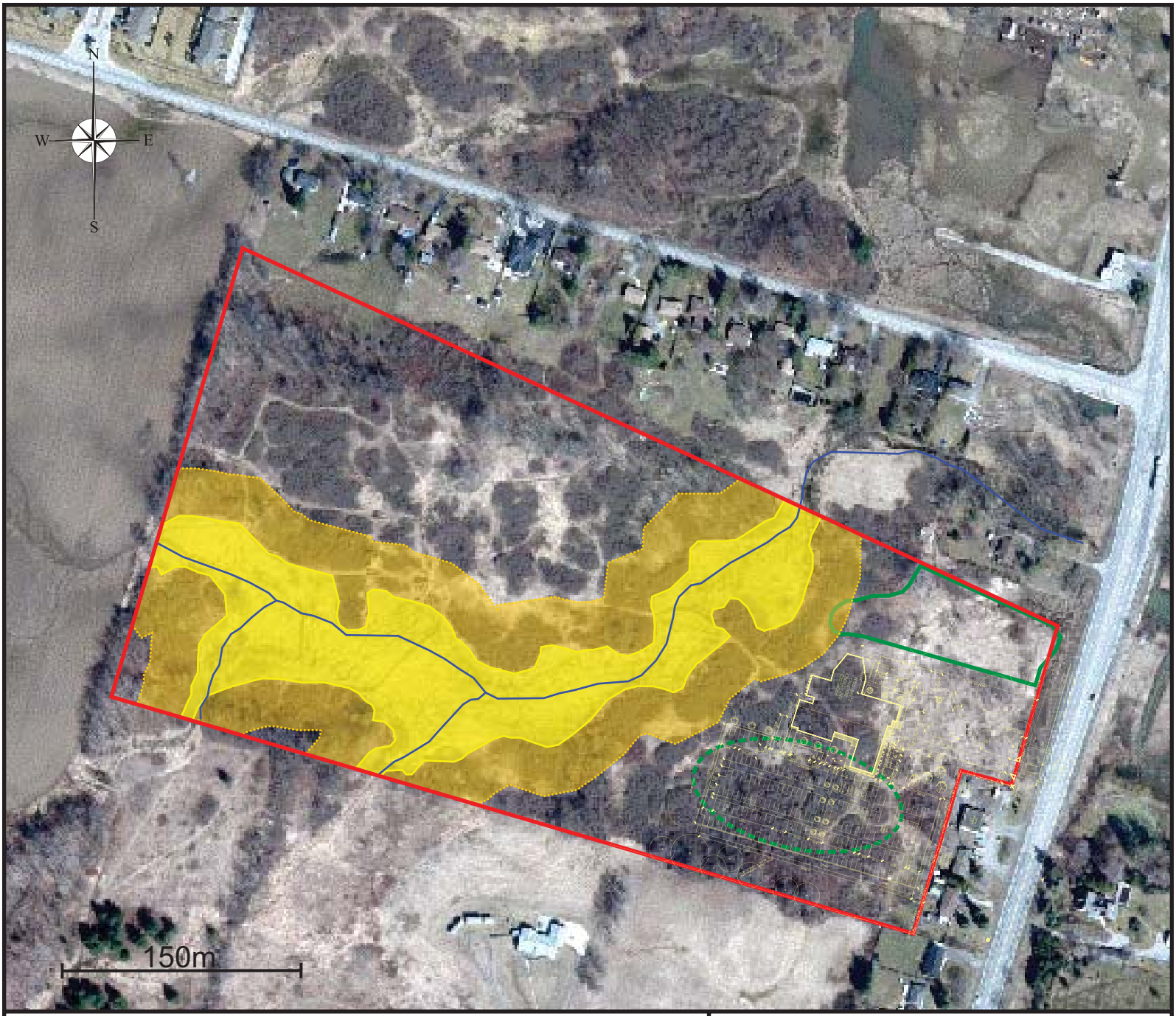
5.4 Core Areas

5.4.1 Provincially Significant Wetlands

The Subject Lands contain a PSW, which is associated with a tributary of Twenty Mile Creek. The extent of the wetland on this property was verified on August 8, 2014 by Ms. Anne Yagi of the Ministry of Natural Resources and Forestry (MNRF). This wetland makes up a Core Natural Area according to Section 2.3.1 of the Urban Hamilton Official Plan.

From our observations, this wetland feature is a riverine wetland, which receives the majority of water from surface runoff from upstream lands. In addition to providing habitat for the plant and wildlife species previously reported, this wetland appears to provide a variety of hydrological functions to the watershed, including flood attenuation, water quality improvement and groundwater recharge.

To protect the ecological integrity of this feature, a Vegetation Protection Zone (VPZ) has been incorporated into the proposed development. As illustrated in Figure 4, the VPZ is variable across the site and ranges in width from approximately 30m to over 70m. From our observations,



Legend

- Property Boundary
- Wetland Boundary
- 30m Vegetation Protection Zone
- Watercourses
- Development Plan
- Potential Linkage Enhancement Area
- Approximate location of source plant material

Figure 4
Development Plan &
Wetland Feature with 30m VPZ

Environmental Impact Statement
2060 Upper James Street - Hamilton

Prepared for: **Ontario Conference of the Seventh-day Adventist Church**

Prepared by: COLVILLE CONSULTING INC.

December 2014 | File: C13068

the wetland on this property appears to provide habitat for a variety of common wildlife species. No obligate wetland bird species were documented on the property and none of the bird species documented on the property are area sensitive. Based on our observations of the bird and wildlife species using this property, it is anticipated that the proposed VPZ will be sufficient to protect the ecological function of the wetland on this property.

In order to protect water quality and maintain water quantity to the wetland and watercourse, a Stormwater Management Plan has been prepared for this property (see Appendix G). As described in this plan, drainage patterns on the property will generally be maintained and runoff from the impervious areas of the property will be treated to a normal standard (70% removal of Total Suspended Solids) using enhanced flat-bottom swales. Runoff from the majority of parking areas will also be directed to an oil/grit separator prior to discharge to the wetland, providing an added level of water quality protection.

Based on our assessment, the proposed development is not likely to have any impact on the ecological or hydrological function of this wetland.

5.4.2 Upper Twenty Mile Creek

As described above, this branch of Upper Twenty Mile Creek is considered to be an intermittent warmwater watercourse, which contributes to the habitat of a resident population of warmwater fish species downstream of the property. No alternation of fish habitat is proposed as part of this project and a VPZ has been proposed which protects the ecological integrity of the watercourse.

Also as described above, a Stormwater Management Plan has been prepared for this property to protect water quality and maintain water quantity to the watercourse (see Appendix G). As water quality and quantity in Twenty Mile Creek are proposed to be protected as part of this project, the proposed development is not likely to have any impact on the hydrology of this tributary to Twenty Mile Creek or the watershed.

5.5 Linkage Assessment

As indicated above, the majority of the Subject Property has been identified as a linkage within the Urban Hamilton Official Plan Natural Heritage System. Section C2.7 of the UHOP defines Linkages as natural areas within the landscape that ecologically connect Core Areas. These connections act as corridors for the movement of animals and propagation of plants, as well as hydrological and nutrient cycling. These connections aid in the maintenance of ecological health and integrity of the natural heritage system.

Based on our observations of the Subject Lands, the portions of the property identified as linkage are comprised of Gray Dogwood Cultural Thicket Type and Dry-Moist Old Field Meadow Type. From our observations, the uninterrupted portion of the Linkage feature on the east side of the property measures approximately 120m in width, including lands in the hydro corridor, and 165m from Upper James Street to the PSW. Residences along the west side of Upper James Street south and east of the property appear to limit the width of this Linkage. Possible connections between the Linkage on the west side of the property and Core areas north of Twenty Road West are limited to openings between residences along the south side of Twenty Road West.

A description of vegetation communities within the Linkages are provided in Section 4.1.2 above. From our observations of wildlife usage of this property, the Core Area and Linkage provides habitat for a variety of wildlife species, which are discussed in more detail in Section 4.2.

From our assessment of the property and review of background mapping, the wetland and watercourse on the property are directly connected to other core areas east and southwest of the property. These Cores areas include portions of the PSW and a Significant Woodland. It is anticipated that the wetland and watercourse likely provides the primary aquatic and semi-aquatic linkage connection to natural areas in the vicinity of the property, however lands adjacent to the wetland may provide some accessory function.

In addition to the linkage function provided by the wetland and watercourse, the thicket and meadow habitats on this property likely provide some terrestrial linkage to core areas north and east of the property, although these areas are separated by Upper James Street and Twenty Road West. It is anticipated that these roadways may pose as a behaviour barrier to movement of some terrestrial wildlife species documented on the site.

As illustrated in Figure 4, the proposed development will be located within the thicket and meadow communities located on the eastern portion of the site. To maintain the potential for movement between the core area on the Subject Property and Core areas to the east, a portion of the cultural meadow on the property is proposed to be retained and enhanced. This meadow area to be retained measures approximately 50m in width, which when combined with the 20m wide hydro corridor, provides an approximately 70m wide Linkage feature. It is anticipated that a 70m wide Linkage is sufficient in size to maintain linkages for the wildlife species documented on the property.

In order to enhance this linkage connection, it is recommended that vegetation from the portion of the Gray Dogwood Cultural Thicket within the proposed development envelope be transplanted into the meadow area to be retained.

As no development is proposed on the western portion of the property, any potential linkage connections between the Core Area on this property and Core Areas north of Twenty Road are not likely to be impacted.

6.0 DEVELOPMENT PLAN

The proposed development plan for the Subject Property consists of a church and associated parking areas, however a stormwater management pond and landscaped area are also included in this plan. All development on this property is proposed to occur in the southeast corner of the site, in the areas identified as cultural thicket and cultural meadow. The extent of the proposed development is illustrated in Figure 4 and Appendix A, and includes all anticipated amenity areas.

7.0 POTENTIAL ECOLOGICAL IMPACTS

7.1 Direct Impacts

As illustrated in Figure 4, the development envelope on the property has been located within a portion of a Gray Dogwood Cultural thicket and cultural meadow on the property. Our inventories indicate that these vegetation communities provide habitat for a variety of avian wildlife species, most of which are considered common in the City of Hamilton. The cultural thicket portions of the property supported 21 species of birds, with 4 of these 21 species also observed utilizing the meadow portion of the property. None of the species documented on the property are considered to be area sensitive. Seven species of wildlife were also documented within these vegetation communities on the property.

Construction of the proposed development will require the removal of vegetation and site grading within the footprint of the development area. This removal of vegetation and grading has the potential to impact habitat of wildlife species using the property, disrupt wildlife movement across the property and affect drainage patterns to the adjacent wetland area.

From our assessment of the proposed site plan, the proposed development is anticipated to impact approximately 2.3ha of the 13.7ha of land available on the site. Although the proposed development will pose a minor impact to the area of cultural thicket and meadow habitats on the property, these habitat types are not limited on the site or in the vicinity of the property. It is anticipated that wildlife species observed utilizing the cultural meadow and thicket communities within the development footprint will continue to utilize habitats on the reminder of the property, thus not posing a significant impact to these species. To help mitigate any impacts to wildlife species using this portion of the property, a series of mitigation measures are proposed in Section 8.0 below.

As illustrated in Figure 4, the proposed development is situated in the southeast corner of the property, in an area identified as Linkage in the UHOP. It is our understanding that the proposed development has been designed to avoid being situated on fill material, the majority of which is located in the area identified as cultural meadow. Although it is possible that the proposed location of the development may impact wildlife species movement between the Subject Property and habitat areas east of Upper James Street, it is anticipated that a naturally vegetated area measuring approximately 70m in width will remain in the area north of the proposed development and will provide sufficient opportunities for wildlife movement between the Subject Property and lands east of Upper James Street.

In order to enhance and diversify habitat within the Linkage area to be maintained on the property, it is recommended that suitable tree and shrub species located within the proposed development footprint be relocated to this area as part of the landscaping of this property. The location of potential donor material and the enhancement area is illustrated in Figure 4.

As illustrated and described in the Stormwater Management Report (included as Appendix G), drainage from the majority of the proposed development envelope flows west and northwest to the wetland feature, with a small portion of the development envelope draining towards roadside ditches associated with Upper James Street. From our review of the proposed Stormwater Management Plan, it is our understanding that drainage patters across the site will generally be maintained, ultimately mitigating hydrological impacts to the wetland.

7.2 Indirect Impacts

In addition to the direct impacts discussed above, it is anticipated that the proposed development may result in several indirect impacts which may affect the wetland, watercourse and buffer areas. Indirect impacts anticipated as part of this project include increases in ambient light and noise, changes to the hydrology of the wetland and changes in flow patterns in the watercourse.

From our review of the proposed site plan, it is anticipated that security lighting will be installed on the building and in parking areas, which could increase the existing ambient lighting on adjacent lands. During our observations of the property it was noted that street lighting from Upper James Street and security lighting from adjacent residences and buildings currently provides ambient lighting on the property. As most of the species observed on the property are common in urbanized environments, it is not anticipated that any increase in ambient lighting will pose an impact to these species. To minimize any increases in ambient light to lands adjacent

to the development, it is recommended that security lighting be directed away from the wetland and buffer areas, and buffer areas be enhanced by planting native tree species to provide shade opportunities.

Impacts of anthropogenic noise on wildlife can include masking mating calls, increases in stress and habitat avoidance behaviours, however the level of impact is generally depended on sound frequency and species sensitivity. During our observations of the property, it was noted that noise from adjacent roads and the airport is currently very noticeable on the site. From our review of the site plan, any potential increases in noise on the site resulting from operation of the church will likely be related to vehicles using parking areas, which is not anticipated to contribute significantly to the existing ambient noise on the property.

Although it is not anticipated that noise levels on the property will increase during the operation of the church, it is anticipated that an increase in noise may result for a short period of time during construction activities on the property. This increase in noise has the potential to temporarily disrupt wildlife in close proximity to the development, however as the majority of wildlife species documented on the property are common in urbanized areas and can adapt to land use changes, this increase in noise is not anticipated to have a significant impact on wildlife use of the property. To help minimize impacts to wildlife species on the property, it is recommended that works in close proximity to the VPZ be limited when nesting birds be present adjacent to the work area.

The Stormwater Management Plan prepared for this property indicates that existing drainage patters across the property will generally be maintained as part of this development and that quantity controls have been proposed to maintain pre-development flows. Additionally, runoff from the impervious areas of the property will be treated to a normal standard (70% removal of Total Suspended Solids) using enhanced flat-bottom swales and runoff from the majority of parking areas will also be directed to an oil/grit separator prior to discharge to the wetland, providing an added level of water quality protection. From our review of the proposed Stormwater Management Plan, it is anticipated that the proposed stormwater management measures are sufficient to mitigate any potential impacts to water quality or quantity in the wetland and watercourse.

From our observations of the property and review of the proposed site plan, it is our conclusion that the proposed VPZ is sufficient to protect the ecological functions of the wetland and watercourse on the property. It is also our conclusion that the proposed development will maintain and enhance connectivity between the Core natural heritage features on this property and Core areas adjacent to the property. Based on our assessment, the proposed development on the property is not anticipated to impact any of the ecological functions provided by natural heritage features on the site and therefore it is our conclusion that the proposed development is consistent with applicable policies of the UHOP and NPCA Land Use Policies.

8.0 MITIGATION MEASURES

As discussed above, it is our expectation that the proposed development will have minimal impact on the ecological functions provided by cultural thicket and meadow habitats on the property and have no impact on the functions of the wetland and watercourse. To assist in minimizing any impacts associated with the proposed development, it is recommended that the following mitigation measure be implemented during final design and construction of the proposed development.

- A light duty silt fence should be installed prior to any site alteration to prevent off-site movement of soil material during excavation and grading. This fence should be installed at the limit of the wetland buffer/VPZ and remain in place until all disturbed areas have been vegetated or stabilized.
- The silt fence should be properly embedded into the ground to help minimize the potential for snakes and other wildlife entering the work area.
- Any stockpiled materials should be stored and stabilized away from the wetland buffer/VPZ.
- Vehicle and equipment re-fuelling and maintenance should be conducted in a manner to prevent petroleum based fluids from entering the wetland, watercourse or wetland buffer.
- Any required vegetation removal should be conducted in a manner to avoid impacts to nesting birds that may be utilizing habitats on the property. The breeding bird period for this area is generally March 15 to August 31. A survey for active bird nests should be conducted prior to any vegetation removal or site alteration planned to occur during this window.
- Construction works in close proximity to the VPZ should be limited during the breeding bird season. A survey for active bird nests in the VPZ should be conducted prior to any site alteration or construction works planned to occur during this time.
- Any lands not included within the development envelope or included as part of landscaped areas should be allowed to re-vegetate naturally in order to maintain the natural character of the property. It is recommended that plantings of suitable native trees species be incorporated into the buffer area adjacent to the development envelope.
- Any future trails or amenity areas should be located outside of the VPZ and wetland area.
- Any swales constructed as part of the SWM Plan should be seeded with deep-rooted grasses and maintained in an un-manicured state.
- Any plantings to be implemented as part of the Landscape or SWM Plans should incorporate only native or non-invasive species.
- Any security lighting to be installed on the building or within the parking areas should be directed away from the wetland and vegetation protection zone to minimize ambient light exposure to the wetland area.
- Permanent markers should be installed at the limit of the VPZ/wetland buffer to help minimize maintenance or accessory use encroachment into the buffer area.
- It is recommended that the Virginia Mountain-mint plants located within the development footprint be relocated to suitable areas within the vegetation protection zone.
- To protect trees on and adjacent to the development envelope, recommendations provided in the Vegetation Management Plan (see Appendix H) should be incorporated prior to and during construction.

9.0 RECOMMENDATIONS

As indicated above, four or five stems of Virginia Mountain-mint plants were observed in unit CUT1-4 within the proposed development area, representing one or two individual plants. These plants are at the edge of a trail through a dense thicket of Gray Dogwood that has formed on piles of fill. Virginia Mountain-mint has dry to mesic prairie affinities and it does not tolerate shade, and therefore the plants at the edge of the trail are being shaded out.

It is recommended that a mitigation plan be implemented for Virginia Mountain-mint on the subject property, either prior to or during development on the site. It is recommended that a new location to be used as a planting area within the wetland buffer be selected based on the following characteristics:

- site must be open, with sparse/low groundcover vegetation;
- moisture regime should be fresh to moist;
- ideally should be south and/or west facing; and,
- surrounding shrubs (Gray Dogwood) should be cut back to further reduce shading.

The existing plant(s) should be transplanted during the dormant period in late fall or early spring if possible. They can be dug out as large plugs and transplanted to the new site. Any seeds on the plants at the time of transplanting should also be planted. Some existing herbaceous vegetation should also be removed to create a seed bed and the seeds should be raked into the soil. Plants should be watered periodically as required during dry periods that may occur in the first two months of the growing season following transplant. Any competing woody and/or herbaceous vegetation should be controlled after transplanting (this could occur during watering events). Monitoring of the plants can occur during the visits for watering and site maintenance; a visit should also be made during the fall of the first two growing seasons to monitor the population and assess/correct any site issues (e.g. competition from woody and/or herbaceous plants). This Virginia Mountain-mint Transplant/Salvage Plan could be included as a condition of Site Plan Approval.

In addition to the relocation of the Virginia Mountain-mint plants, it is recommended that a Landscape Plan be prepared for this property, which should incorporate the inclusion of trees within and adjacent to the proposed VPZ to enhance the function of the buffer. It is recommended that the landscape plan be prepared to incorporate native plant species and be included as a condition of Site Plan Approval.

Our observations of the property indicate that scattered trees are located within and adjacent to the proposed development envelope. It is recommended that a Tree Protection Plan (TPP) be prepared for this property to address specific impacts to these trees and identify any appropriate mitigation measures. It is recommended that the preparation of a TPP be included as a condition of Site Plan Approval.

Respectfully submitted by:

Ian Barrett, M.Sc.
Colville Consulting Inc.

10.0 LITERATURE CITED

Beauchamp, J., A.L. Boyko, S. Dunn, D. Hardy, P.L. Jarvis, and S.K. Staton. 2012. Management plan for the Grass Pickerel (Esox americanus vermiculatus) in Canada. Species at Risk Act Management Plan Series. Fisheries and Oceans Canada, Ottawa. vii + 47 pp.

Cadman, M. D., D. A. Sutherland, G. G. Beck, D. Lepage and A. R. Couturier (eds.). 2007. Atlas of the Breeding Birds of Ontario, 2001-2005. Bird Studies Canada, Environment Canada, Ontario Field Ornithologists, Ontario Ministry of Natural Resources, and Ontario Nature, Toronto, xxii + 706 pp.

City of Hamilton. 2014. Urban Hamilton Official Plan. City of Hamilton. .

Dwyer, J.K. 2003. Nature Counts Project Hamilton Natural Areas Inventory. Site Summaries. Hamilton Naturalist Club. 508 pp.

Eagles, P. F. J. 2007. Yellow-breasted Chat, Icteria virens. Pp 530-531 in M.D. Cadman, D.A. Sutherland, G.G. Beck, D. Lepage, A.R. Couturier (eds.), Atlas of the Breeding Birds of Ontario, 2001-2005. Bird Studies Canada, Environment Canada, Ontario Field Ornithologists, Ontario Ministry of Natural Resources and Ontario Nature, xxii + 706 pp.

Environment Canada. 2011. Management Plan for the Yellow-breasted Chat virens subspecies (Icteria virens virens) in Canada. Species at Risk Act Management Plan Series. Environment Canada, Ottawa. iii + 18 pp.

Fischer, L. 2002. COSEWIC status report on the milksnake Lampropeltis triangulum in Canada. Ottawa, ON: Committee on the Status of Endangered Wildlife in Canada. 29 pp.

Goodban, A.G. 2003. The Vascular Plants of Hamilton, Ontario. pp. 1-1 to 1-99, In: Dwyer, J.K., Nature Counts Project, Hamilton Natural Areas Inventory 2003, Volume 1 – Species Checklists. Hamilton Naturalists' Club, Hamilton, Ontario.

Hamilton Conservation Authority. 2013a. What's Alive in Hamilton – Bird Checklist 2013. (data source Hamilton Natural Areas Database, 2013).

Hamilton Conservation Authority. 2013b. What's Alive in Hamilton – Reptile and Amphibian Checklist 2013. (data source Hamilton Natural Areas Database, 2013).

Lee, H.T., W.D. Bakowsky, J.L. Riley, J. Bowles, M. Puddister, P. Uhlig and S. McMurray. 1998. Ecological Community Classification for Southern Ontario: First Approximation and Its Application. Ontario Ministry of Natural Resources, Southcentral Science Section, Science Development and Transfer Branch. SCSS Field Guide FG-02.

Niagara Peninsula Conservation Authority. 2006. Twenty Mile Creek Watershed Plan. Niagara Peninsula Conservation Authority 51pp.

Niagara Peninsula Conservation Authority. 2011. Policies, Procedures and Guidelines for the Administration of Ontario Regulation 155/06 and Land Use Planning Policy Document (October 19, 2011 Housekeeping Amendments).

Oldham, M.J. and S.R. Brinker. 2009. Rare Vascular Plants of Ontario, Fourth Edition. Ontario Ministry of Natural Resources, Peterborough, Ontario. 188 pp.

Ontario Ministry of Natural Resources. 2005. Upper Twenty Mile Creek Wetland Evaluation. Ontario Ministry of Natural Resources, Vineland Area Office.

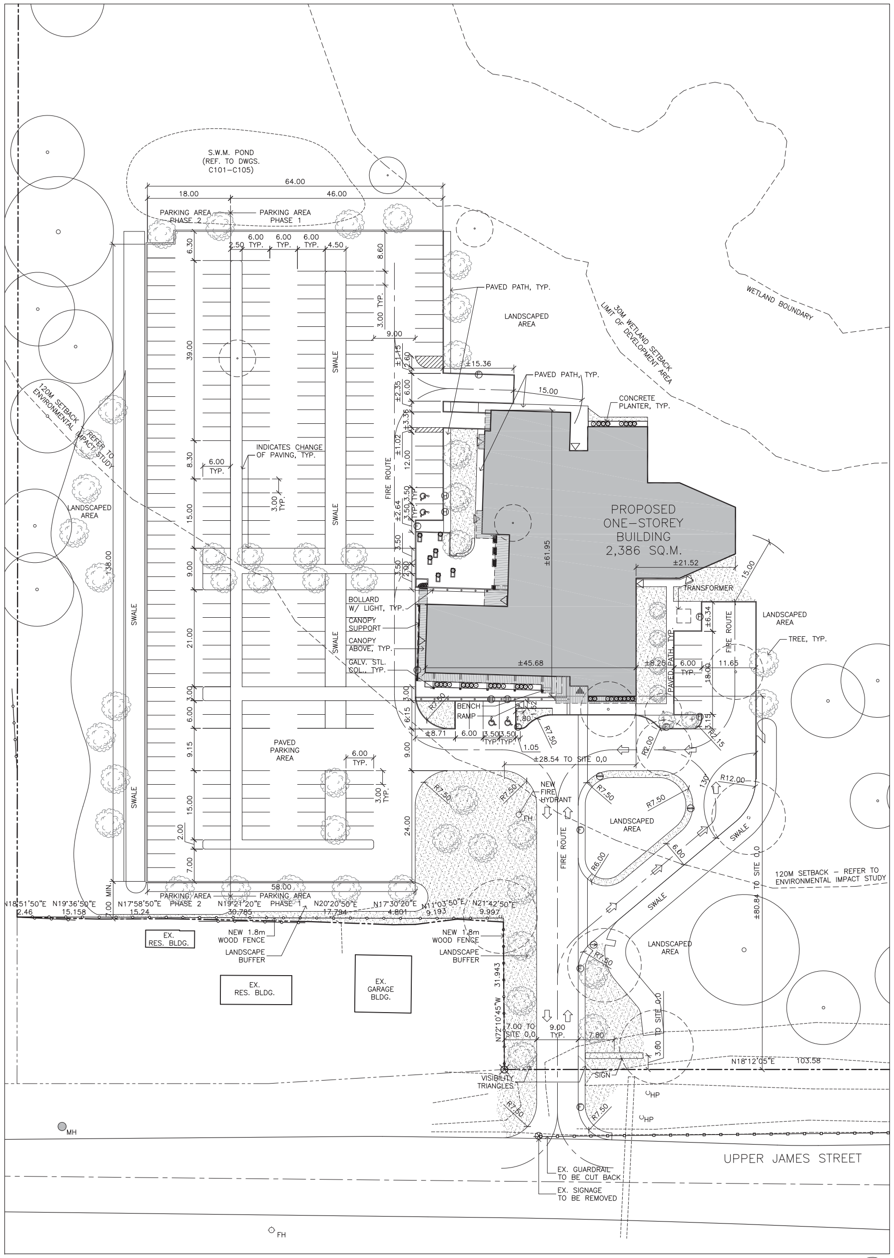
Ontario Ministry of Natural Resources. 2010. Natural Heritage Reference Manual for natural heritage policies of the Provincial Policy Statement, 2005. Second Edition. Toronto, ON: Queen's Printer for Ontario. 248 pp.

Ontario Ministry of Natural Resources. 2014. Hamilton SAR. Guelph, ON: Ontario Ministry of Natural Resources, Guelph District. 4 pp.

Peck, G. K. and R. D. James. 1987. Breeding Birds of Ontario: Nidiology and Distribution. Volume 2: Passerines. Royal Ontario Museum, 387 pp.

Appendix A

Site Plan



SITE PLAN - PARTIAL (5)
1:500

DETAILS OF DEVELOPMENT

LOT AREA: 137,201 m2
GROSS FLOOR AREA: 2,386 m2
BUILDING COVERAGE: 2,386 m2 (2%)
BUILDING HEIGHT
PROPOSED: 7.5 m, 1 STOREY
PERMITTED: 10.7 m, MAX
NO. OF PARKING SPACES
PROPOSED: 203 (125 – PHASE 1, 78 – PHASE 2)
REQUIRED: 199 MIN.
NO. OF LOADING SPACES
PROPOSED: 0
REQUIRED: 0
LANDSCAPED AREA: 126,723 m2

NOTES

1. ALL WORK INVOLVED IN THE CONSTRUCTION, RELOCATION, REPAIR OF MUNICIPAL SERVICES FOR THE PROJECT SHALL BE TO THE SATISFACTION OF THE DIRECTOR OF PLANNING, PLANNING AND ECONOMIC DEVELOPMENT DEPARTMENT.
2. FIRE ROUTE SIGNS AND 3–WAY FIRE HYDRANTS SHALL BE ESTABLISHED TO THE SATISFACTION OF THE CITY FIRE DEPARTMENT AND AT THE EXPENSE OF THE OWNER (WITHIN CONTRACTOR'S FEE).
3. MAIN DRIVEWAY DIMENSIONS AT THE PROPERTY LINE BOUNDARIES ARE PLUS OR MINUS 7.5 m UNLESS OTHERWISE STATED.
4. ALL DRIVEWAYS FROM PROPERTY LINES FOR THE FIRST 7.5 m SHALL BE WITHIN 5% MAXIMUM GRADE, THEREAFTER, ALL DRIVEWAYS SHALL BE WITHIN 10% MAXIMUM GRADES.
5. THE APPROVAL OF THIS PLAN DOES NOT EXEMPT THE OWNER'S BONDED CONTRACTOR FROM THE REQUIREMENTS TO OBTAIN THE VARIOUS PERMITS/APPROVALS NORMALLY REQUIRED TO COMPLETE A CONSTRUCTION PROJECT, SUCH AS, BUT NOT LIMITED TO THE FOLLOWING
   - BUILDING PERMIT
   - SEWER AND WATER PERMITS
   - ROAD CUT PERMITS
   - RELOCATION OF SERVICES
   - APPROACH APPROVAL PERMITS
   - ENCROACHMENT AGREEMENTS (IF REQUIRED)
   - COMMITTEE OF ADJUSTMENT
6. ABANDONED ACCESSES MUST BE REMOVED AND THE CURB AND BOULEVARD RESTORED WITH SOD AT THE OWNER'S EXPENSE (WITHIN CONTRACTOR'S FEE) TO THE SATISFACTION OF THE TRAFFIC ENGINEERING SECTION, PUBLIC WORKS DEPARTMENT.
7. VISIBILITY TRIANGLES SHOWN ARE 3m BY 3m AREAS OF LAND IN WHICH NO OBSTRUCTION, WHETHER PERMANENT OR TEMPORARY, THAT BLOCKS VISION BETWEEN A HEIGHT OF 0.75m & 2.4m ABOVE THE EXISTING PERPENDICULAR CENTRELINE ELEVATION OF THE ADJACENT STREET IS PERMITTED.
8. LANDSCAPE SHOWN FOR INFORMATION ONLY; TO BE FINALIZED IN FUTURE LANDSCAPE PLAN.
9. ACKNOWLEDGEMENT: THE SUBJECT PROPERTY HAS BEEN DETERMINED TO BE AN AREA OF ARCHAEOLOGICAL POTENTIAL. IT IS REASONABLE TO EXPECT THAT ARCHAEOLOGICAL RESOURCES MAY BE ENCOUNTERED DURING ANY DEMOLITION, GRADING, CONSTRUCTION ACTIVITIES, LANDSCAPING, STAGING, STOCKPILING OR OTHER SOIL DISTURBANCES AND THE PROPONENT IS ADVISED TO CONDUCT AN ARCHAEOLOGICAL ASSESSMENT PRIOR TO SUCH IMPACTS IN ORDER TO ADDRESS THESE CONCERNS AND MITIGATE, THROUGH PRESERVATION OR RESOURCE REMOVAL AND DOCUMENTATION, ADVERSE IMPACTS TO ANY SIGNIFICANT ARCHAEOLOGICAL RESOURCES FOUND. MITIGATION, BY AN ONTARIO–LICENSED ARCHAEOLOGIST, MAY INCLUDE THE MONITORING OF ANY MECHANICAL EXCAVATION ARISING FROM THIS PROJECT. IF ARCHAEOLOGICAL RESOURCES ARE IDENTIFIED ON–SITE, FURTHER STAGE 3 SITE–SPECIFIC ASSESSMENT AND STAGE 4 MITIGATION OF DEVELOPMENT IMPACTS MAY BE REQUIRED AS DETERMINED BY THE ONTARIO MINISTRY OF TOURISM, CULTURE AND SPORT. ALL ARCHAEOLOGICAL REPORTS SHALL BE SUBMITTED TO THE CITY OF HAMILTON FOR APPROVAL CONCURRENT WITH THEIR SUBMISSION TO THE MINISTRY OF TOURISM, CULTURE AND SPORT.
   SHOULD DEEPLY BURIED ARCHAEOLOGICAL MATERIALS BE FOUND ON THE PROPERTY DURING ANY OF THE ABOVE DEVELOPMENT ACTIVITIES THE ONTARIO MINISTRY OF TOURISM, CULTURE AND SPORT (MTCS) SHOULD BE NOTIFIED IMMEDIATELY (416.314.7143). IN THE EVENT THAT HUMAN REMAINS ARE ENCOUNTERED DURING CONSTRUCTION, THE PROPONENT SHOULD IMMEDIATELY CONTACT BOTH MTCS AND THE REGISTRAR OR DEPUTY REGISTRAR OF THE CEMETERIES REGULATION UNIT OF THE MINISTRY OF SMALL BUSINESS AND CONSUMER SERVICES (416.326.8392).

DETAILS OF DEVELOPMENT & NOTES (4)

FILE No.

UNDERTAKING

RE:

I, (We) ________________________________, the owner(s) of the land, hereby undertake and agree without reservation,

(a) to comply with all the content of this plan and drawing and not to vary therefrom;

(b) to perform the facilities, works or matters mentioned in Section 41(7)(a) of the Planning Act shown on this plan and drawing(s) in accordance with the conditions of approval as set out in the Letter of Approval dated ________________;

(c) to maintain to the satisfaction of the City and at my (our) sole risk and expense, all of the facilities, works or matters mentioned in Section 41(7)(b) of the said Act, shown in this plan and drawing, including removal of snow from access ramps and driveways, parking and loading areas and walkways; and,

(d) in the event that the Owner does not comply with the plan dated ____________ ____________________, the owner agrees that the City may enter the land and do the required works, and further the Owner authorizes the City to use the security filed to obtain compliance with this plan.

(e) Requirement for Specific Building Construction:
The building will require the provision of specific building components (windows, walls, roof etc.) as outlined within the noise study prepared by Valcoustics Canada Ltd. dated July 16, 2014, in order to satisfy MOE requirements.

(f) Requirement for Central Air Conditioning:
This building shall be supplied with a central air conditioning system which will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the Municipality's and the Ministry of Environment's noise criteria.

(g) Clause regarding inspection of building plans for compliance with Noise Study:
"Prior to the issuance of a building permit, the builder's plans shall be certified by a Professional Engineer qualified to provide acoustical engineering services in Ontatio as being in compliance with the recommendations of the Noise Study prepared by Valcoustics Canada Ltd., as approved. Prior to issuance of an occupancy permit, the building shall be certified by a Professional Engineer qualified to provide acoustical engineering services in Ontario as being in compliance with the recommendations of the Noise Study prepared by Valcoustics Canada Ltd., as approved."

Dated this ________________day of ____________________20____

______________________ ______________________ (seal)
Witness (signature) Owner(s) (signature)

______________________ ______________________
Witness (print) Owner (print)

____
Address of Witness

UNDERTAKING (2)

LEGEND

- PRIMARY ENTRANCE
- SECONDARY ENTRANCE/EXIT
- NO PARKING ZONE – PAINT LINES BY CONTRACTOR
- SODDED AREA
- HANDICAP PARKING SPACE – PAINT LINES BY CONTRACTOR
- DIRECTION OF TRAVEL – PAINT LINES BY CONTRACTOR
- FENCING (EX. TO REMAIN, UNLESS NOTED OTHERWISE)
- SITE 0,0 (CORNER OF PROPERTY LINES)

UTILITIES – EX. TO REMAIN, UNLESS NOTED OTHERWISE

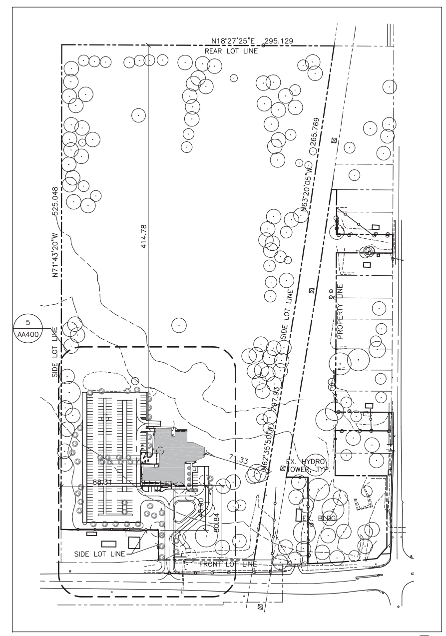
- HP HYDRO POLE
- MH MANHOLE
- CB CATCH–BASIN
- FH FIRE HYDRANT

SIGNAGE – APPROX. QUANTITY/LOCATIONS TO BE VETTED BY APPLICABLE AUTHORITY AND COORDINATED ON SITE

- EXISTING SIGN
- FIRE ROUTE SIGN
- HANDICAP PARKING SPACE SIGN
- DO NOT ENTER SIGN
- ONE–WAY SIGN

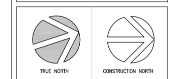
REFER TO "PAVEMENT MARKING & SIGNAGE PLAN" DRAWING FOR ADDITIONAL SIGNAGE REQUIREMENTS (AND REFER TO "GEOMETRY AND GENERAL LAYOUT" DRAWING FOR ROAD WIDENING).

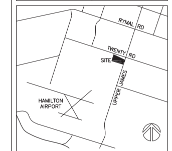
LEGEND (3)



SITE PLAN (1)
1:2500

PROJECT LOGO





KEY PLAN

ISSUE NO.	REV. NO.	DESCRIPTION	DATE
4		REISSUED FOR S.P.A.	15/01/29
3		ISSUED FOR COORDINATION	14/11/10
2		ISSUED FOR S.P.A.	14/09/26
1		ISSUED FOR CLIENT REVIEW	14/08/19

REVISIONS:

DISCREPANCIES MUST BE REPORTED IMMEDIATELY TO THE ARCHITECT BEFORE PROCEEDING.
ONLY FIGURED DIMENSIONS MUST BE USED.
THE CONTRACTOR MUST CHECK THE DIMENSIONS ON SITE.

ALL DIMENSIONS ARE SHOWN IN MILLIMETERS.

DO NOT SCALE THE DRAWINGS.

MSA Making Sustainable Architecture
McCallum Sather Architects Inc.

ONTARIO ASSOCIATION OF ARCHITECTS
HAUSER
LICENCE 5928
SEAL

CONSULTANTS:

PROJECT:
LIVING WORD CHRISTIAN FELLOWSHIP CENTRE
HAMILTON, ONTARIO

DRAWING TITLE:
SITE PLAN

DRAWN BY: AM, KVH	DATE: 14/07/15
CHECKED BY: MA	SCALE: AS NOTED

PROJECT NO. 14003

DRAWING NO. **AA400**

FILENAME: P:\2014\14003\WD\Sheet\AA400.dwg
PLOTDATE: Thursday, January 29, 2015 12:39:22 PM

D 610x914

Appendix B

Terms of Reference

COLVILLE CONSULTING INC.

MEMORANDUM

To: Melissa Kiddie
From: Ian Barrett
Date: January 26, 2015
Re: Terms of Reference for 2012 Upper James Street EIS

Hi Melissa,

Please except this revised Terms of Reference (ToR) for the EIS being prepared for 2012 Upper James Street. This ToR has been prepared to incorporate suggestions provided in your e-mail dated July 11, 2014.

The Subject Property is approximately 13.7 hectares (33.8 acres) in size and known by the municipal address of 2012 Upper James Street, in the City of Hamilton. The property is located south of Twenty Road West between Upper James Street and Glancaster Road. There are currently no buildings or structures located on the property, however the proposed development on this property includes the construction of a church, with associated parking area and stormwater management pond.

Based on my review of background mapping, a portion of the Subject Property has been included as part of the Upper Twenty Mile Creek Wetland Complex and a tributary to Twenty Mile Creek is located in the central portion of the property. The majority of the Subject Property has also been identified as Linkage in the Natural Heritage System mapping included within the Urban Hamilton Official Plan (UHOP).

In order to assess potential impacts the proposed development may have on natural heritage features, we are preparing an EIS. As part of the EIS, we intend to complete the following study components:

1) Three-season botanical inventory (spring, summer and fall), including an Ecological Land Classification description of the property;

2) Breeding bird survey of the property incorporating 2 surveys completed at least 10 days apart using the Ontario Breeding Bird Atlas protocol. The first survey will occur between May 24 and June 16 and the second survey between June 17 and July 10;

3) Breeding Amphibian Surveys with one survey conducted in each of the months of April, May and June using methods in the Marsh Monitoring Protocol. Surveys will occur when evening air temperatures are > 5.0C (first visit); >10.0C (second visit) and >17.0C (third visit);

4) Assess and describe aquatic habitat in the watercourse on site. Aquatic habitat description parameters will include channel width, depth, channel substrate, flow and thermal characteristics, descriptions of vegetation and habitat features and any other relevant site specific information. The above watercourse assessment parameters and method is consistent with NPCA and MNR methods used in the Twenty Mile Creek watershed;

5) Document any observations of wildlife on the property during site visits, including but not limited to mammals, Lepidoptera, reptiles and amphibians;

6) Conduct a wetland boundary delineation in consultation with the Ministry of Natural Resources and Niagara Peninsula Conservation Authority. Wetland boundary delineation will be completed during the spring/summer season;

7) Complete a species at risk screening for the property using information available from the MNRF, including the Species at Risk list generated for the City of Hamilton; and

8) Incorporate a Linkage Assessment into the EIS following UHOP Policies.

In addition to field inventories conducted as part of this EIS, an Environmental Constraints Report was prepared for the Subject Property in 2008 and it is our intention to incorporate information contained within this report into our assessment.

In regards to the EIS itself, the report will be prepared in a standard EIS format and follow City of Hamilton EIS guidelines. A sample Table of Contents is provided below as a general outline of the anticipated contents of the report, however modifications to order or layout may be made as necessary.

1.0 INTRODUCTION
- 1.1 Description of the Subject Property
- 1.2 Description of Proposed Development

2.0 ENVIRONMENTAL POLICY
- 2.1 Provincial Policy Statement
- 2.2 City of Hamilton - Urban Hamilton Official Plan
- 2.3 Niagara Peninsula Conservation Authority

3.0 STUDY APPROACH
- 3.1 Background Review
- 3.2 Field Inventories

4.0 STUDY FINDINGS
- 4.1 Botanical Inventories and ELC/Vegetation Mapping
  - 4.1.1 Botanical Inventory
  - 4.1.2 Vegetation Communities (ELC)
  - 4.1.3 Wetland Boundary Delineation
- 4.2 Wildlife and Wildlife Habitat
  - 4.2.1 Breeding Bird Surveys
  - 4.2.2 Amphibian Call Surveys
  - 4.2.3 Incidental observations
- 4.3 Aquatic Habitat Assessment
- 4.4 Species at Risk Screening

5.0 ASSESSMENT OF SIGNIFICANT NATURAL HERITAGE FEATURES
- 5.1 Species at Risk Habitat
  - 5.1.1 Significant Habitat of Endangered and Threatened Species
  - 5.1.2 Habitat of Other Potential Species of Conservation Concern
- 5.2 Seasonal Concentration Areas
- 5.3 Rare or Specialized Habitat
- 5.4 Migration Corridors
- 5.5 Significant Areas of Natural and Scientific Interest (ANSI)
- 5.6 Core Areas—Provincially Significant Wetland
- 5.7 Linkages

6.0 DEVELOPMENT PLAN

7.0 POTENTIAL ECOLOGICAL IMPACTS
- 7.1 Direct Impacts
- 7.2 Indirect Impacts

8.0 MITIGATION MEASURES
9.0 RECOMMENDATIONS
10.0 LITERATURE CITED

LIST OF FIGURES
LIST OF TABLES
LIST OF APPENDICES

Please let me know if you have any questions or comments.

Thank you.

Ian

Appendix C

Vascular Plant Checklist

VASCULAR PLANT CHECKLIST
2012 UPPER JAMES STREET, HAMILTON, ONTARIO

Field reconnaissance was undertaken by Goodban Ecological Consulting Inc. on May 31, July 3, August 9 and October 11, 2014. One hundred and eighty-three (184) vascular plant taxa were recorded to date in 2014, as listed below in the "GEC 2014" column. Seventy-six (76) taxa, or 41.3 % of the recorded flora, are considered non-native and introduced to the City of Hamilton and southern Ontario. Introduced taxa are denoted with the letter "I" in the Int (Introduced) column in the checklist below. No species considered rare in Ontario (Oldham and Brinker 2009) have been recorded to date. A few Virginia Mountain-mint (*Pycnanthemum virginianum*) plants were observed; this species is considered rare in the City of Hamilton (Goodban 2003).

Eighty-four (84) plant taxa were recorded by L. Campbell & Associates in 2008, as listed below in the "LCA 2008" column. Three taxa listed by L. Campbell & Associates, namely *Carex suberecta, Eleocharis elliptica* and *Hieracium scabrum* are considered misidentifications and excluded from list below. None of these species are known to occur in the City of Hamilton and similar, more common species noted during 2014 were not reported in the 2008 study. A further five (5) plant taxa recorded by Campbell in 2008 were not recorded in 2014 but are presumed valid records, bringing the total number of taxa recorded onsite to date up to 189 and the total number of introduced taxa to 76 (40.2% of the recorded flora).

Provincial ranks are provided in the "S-rank" column. Coefficients of conservatism (CC) and wetness (CW) are also provided (from Oldham et al. 1995).

Vascular Plant Checklist

Scientific Name	Common Name	Int.	S-Rank	CC	CW	LCA 2008	GEC 2014
Acer negundo	Manitoba Maple		S5	0	-2		X
Acer rubrum	Red Maple		S5	4	0	X	X
Acer saccharinum	Silver Maple		S5	5	-3	X	X
Acer saccharum ssp. *saccharum*	Sugar Maple		S5	4	3	X	X
Achillea millefolium	Yarrow	I	SE5	*	3	X	X
Agrostis gigantea	Redtop	I	SE5	*	0		X
Agrostis stolonifera	Creeping Bent Grass		S5	0	-3		X
Alisma plantago-aquatica	Water-plantain		S5	3	-5		X
Alliaria petiolata	Garlic Mustard	I	SE5	*	0	X	X
Ambrosia artemisiifolia	Common Ragweed		S5	0	3	X	X
Anemone canadensis	Canada Anemone		S5	3	-3		X
Arctium minus	Common Burdock	I	SE5	*	5	X	X
Arisaema triphyllum ssp. *triphyllum*	Jack-in-the-pulpit		S5	5	-2	X	X
Asclepias incarnata incarnata	Swamp Milkweed		S5	6	-5	X	X

Scientific Name	Common Name	Int.	S-Rank	CC	CW	LCA 2008	GEC 2014
Asclepias syriaca	Common Milkweed		S5	0	5	X	X
Asparagus officinalis	Garden Asparagus	I	SE5	*	3		X
Aster ericoides	Heath Aster		S5	4	4		X
Aster lanceolatus	Tall White Aster		S5	3	-3		X
Aster novae-angliae	New England Aster		S5	2	-3		X
Aster puniceus	Purple-stemmed Aster		S5	6	-5		X
Aster urophyllus	Arrow-leaved Aster		S4	6	5		X
Barbarea vulgaris	Yellow Rocket	I	SE5	*	0	X	X
Berberis thunbergii	Japanese Barberry	I	SE5	*	4		X
Berberis vulgaris	Common Barberry	I	SE5	*	3		X
Bidens cernua	Nodding Beggar-ticks		S5	2	-5		X
Bidens frondosa	Devil's Beggar-ticks		S5	3	-3		X
Bidens tripartita	Beggar-ticks		S5	4	-3		X
Bidens vulgata	Tall Beggar-ticks		S5	5	-3		X
Bromus inermis ssp. *inermis*	Smooth Brome Grass	I	SE5	*	5		X
Bromus tectorum	Downy Chess	I	SE5	*	5		X
Carex bebbii	Bebb's Sedge		S5	3	-5		X
Carex cristatella	Crested Sedge		S5	3	-4		X
Carex granularis	Granular Sedge		S5	3	-4		X
Carex hystericina	Porcupine Sedge		S5	5	-5		X
Carex molesta	Troublesome Sedge		S4	5	2		X
Carex retrorsa	Retrorse Sedge		S5	5	-5		X
Carex spicata	Spiked Sedge	I	SE5	*	5		X
Carex stipata	Awl-fruited Sedge		S5	3	-5	X	X
Carex vulpinoidea	Fox Sedge		S5	3	-5	X	X
Carpinus caroliniana	Blue-beech		S5	6	0	X	X
Carya cordiformis	Bitternut Hickory		S5	6	0	X	X
Carya ovata	Shagbark Hickory		S5	6	3	X	X

Scientific Name	Common Name	Int.	S-Rank	CC	CW	LCA 2008	GEC 2014
Centaurea jacea	Brown Knapweed	I	SE5	*	5		X
Centaurea maculosa	Spotted Knapweed	I	SE5	*	5		X
Chrysanthemum leucanthemum	Ox-eye Daisy	I	SE5	*	5	X	X
Cichorium intybus	Chicory	I	SE5	*	5		X
Circaea lutetiana ssp. *canadensis*	Enchanter's Nightshade		S5	3	3		X
Cirsium arvense	Canada Thistle	I	SE5	*	3		X
Cirsium vulgare	Bull Thistle	I	SE5	*	4		X
Clematis virginiana	Virgin’s-bower		S5	3	0		X
Convolvulus arvensis	Field Bindweed	I	SE5	*	5	X	X
Conyza canadensis	Horseweed		S5	0	1		X
Cornus alternifolia	Alternate-leaved Dogwood		S5	6	5	X	X
Cornus amomum ssp. *obliqua*	Silky Dogwood		S5	5	-4	X	X
Cornus foemina ssp. *racemosa*	Grey Dogwood		S5	2	-2	X	X
Cornus stolonifera	Red-osier Dogwood		S5	2	-3	X	X
Coronilla varia	Crown-vetch	I	SE5	*	5		X
Crataegus macracantha	Hawthorn		S5	4	5	X	X
Crataegus monogyna	English Hawthorn	I	SE5	*	5		X
Crataegus punctata	Dotted Hawthorn		S5	4	5		X
Cyperus esculentus	Yellow Nut Grass		S5	1	-3		X
Dactylis glomerata	Orchard Grass	I	SE5	*	3		X
Daucus carota	Queen Anne's Lace	I	SE5	*	5	X	X
Dipsacus fullonum ssp. *sylvestris*	Teasel	I	SE5	*	5		X
Echinochloa crusgalli	Barnyard Grass	I	SE5	*	-3		X
Eleocharis erythropoda	Red-based Spike-rush		S5	4	-5		X
Eleocharis obtusa	Blunt Spike-rush		S5	5	-5		X
Elymus repens	Quack Grass	I	SE5	*	3		X
Epilobium hirsutum	Great Hairy Willow-herb	I	SE5	*	-4		X
Epilobium parviflorum	Small-flowered Willow-herb	I	SE4	*	3		X

Scientific Name	Common Name	Int.	S-Rank	CC	CW	LCA 2008	GEC 2014
Epipactis helleborine	Helleborine	I	SE5	*	5		X
Equisetum arvense	Field Horsetail		S5	0	0	X	X
Erigeron annuus	Annual Fleabane		S5	0	1	X	X
Erigeron philadelphicus ssp. *philadelphicus*	Philadelphia Fleabane		S5	1	-3		X
Erigeron strigosus	Rough Fleabane		S5	0	1		X
Erythronium americanum ssp. *americanum*	Yellow Trout-lily		S5	5	5	X	X
Eupatorium maculatum	Spotted Joe-Pye-weed		S5	3	-5		X
Eupatorium perfoliatum	Boneset		S5	2	-4		X
Euthamia graminifolia	Grass-leaved Goldenrod		S5	2	-2	X	X
Fagus grandifolia	American Beech		S5	6	3	X	X
Festuca arundinacea	Tall Fescue	I	SE5	*	2		X
Festuca pratensis	Meadow Fescue	I	SE5	*	4		X
Festuca rubra	Red Fescue	I	SE5	*	1	X	X
Fragaria vesca ssp. *americana*	Woodland Strawberry		S5	4	4		X
Fragaria virginiana	Field Strawberry		S5	2	1		X
Fraxinus americana	White Ash		S5	4	3	X	X
Fraxinus pennsylvanica	Red Ash, Green Ash		S5	3	-3		X
Galium mollugo	Wild Madder	I	SE5	*	5		X
Galium verum	Yellow Bedstraw	I	SE5	*	5		X
Geum canadense	White Avens		S5	3	0	X	X
Glyceria striata	Fowl Manna Grass		S5	3	-5		X
Helianthus tuberosus	Jerusalem Artichoke	I	SE5	*	0		X
Hemerocallis fulva	Orange Day-lily	I	SE5	*	5		X
Hesperis matronalis	Dame's Rocket	I	SE5	*	5	X	X
Hieracium aurantiacum	Orange Hawkweed	I	SE5	*	5		X
Hieracium caespitosum ssp. *caespitosum*	Yellow Hawkweed	I	SE5	*	5		X

Scientific Name	Common Name	Int.	S-Rank	CC	CW	LCA 2008	GEC 2014
Hydrophyllum virginianum	Virginia Waterleaf		S5	6	-2	X	X
Hypericum perforatum	Common St. John's-wort	I	SE5	*	5	X	X
Impatiens capensis	Spotted Touch-me-not		S5	4	-3	X	X
Inula helenium	Elecampane	I	SE5	*	5		X
Juglans nigra	Black Walnut		S4	5	3	X	X
Juncus dudleyi	Dudley's Rush		S5	1	0		X
Juncus effusus ssp. *solutus*	Common Rush		S5	4	-5		X
Juncus tenuis	Path Rush		S5	0	0	X	X
Lactuca serriola	Prickly Lettuce	I	SE5	*	0		X
Lapsana communis	Nipplewort	I	SE5	*	5		X
Leersia oryzoides	Rice Cut Grass		S5	3	-5		X
Lemna minor	Common Duckweed		S5	2	-5		X
Lolium perenne	Perennial Rye Grass	I	SE4	*	3		X
Lonicera tatarica	Tartarian Honeysuckle	I	SE5	*	3	X	X
Lotus corniculatus	Bird’s-foot Trefoil	I	SE5	*	1	X	X
Lythrum salicaria	Purple Loosestrife	I	SE5	*	-5		X
Maianthemum stellatum	Starry False Solomon's-seal		S5	6	1	X	X
Malus pumila	Apple	I	SE5	*	5	X	X
Medicago lupulina	Black Medick	I	SE5	*	1	X	X
Melilotus alba	White Sweet-clover	I	SE5	*	3		X
Melilotus officinalis	Yellow Sweet-clover	I	SE5	*	3		X
Monarda fistulosa	Wild Bergamot		S5	6	3		X
Muhlenbergia mexicana var. *mexicana*	Muhly Grass		S5	1	-3		X
Myosotis laxa	Smaller Forget-me-not		S5	6	-5		X
Myosotis scorpioides	True Forget-me-not	I	SE5	*	-5	X	
Onoclea sensibilis	Sensitive Fern		S5	4	-3	X	X
Ostrya virginiana	Ironwood		S5	4	4	X	X

Scientific Name	Common Name	Int.	S-Rank	CC	CW	LCA 2008	GEC 2014
Panicum implicatum (*P. acuminatum; P. lanuginosum* var. *implicatum*)	Hairy Panic Grass		S5	2	0		X
Parthenocissus inserta	Virginia Creeper		S5	3	3	X	X
Phalaris arundinacea	Reed Canary Grass		S5	0	-4	X	X
Phleum pratense	Timothy Grass	I	SE5	*	3	X	X
Phragmites australis	Common Reed		S5	0	-4		X
Pinus strobus	White Pine		S5	4	3	X	X
Plantago lanceolata	English Plantain	I	SE5	*	0		X
Plantago major	Broad-leaved Plantain	I	SE5	*	-1	X	X
Poa compressa	Canada Blue Grass		S5	0	2		X
Poa palustris	Fowl Meadow Grass		S5	5	-4	X	X
Poa pratensis	Kentucky Blue Grass		S5	0	1		X
Podophyllum peltatum	May-apple		S5	5	3	X	X
Polygonum aviculare	Prostrate Knotweed		SE5	*	1	X	
Populus alba	White Poplar	I	SE5	*	5		X
Populus tremuloides	Trembling Aspen		S5	2	0	X	X
Potentilla norvegica	Rough Cinquefoil		S5	0	0		X
Potentilla recta	Rough-fruited Cinquefoil	I	SE5	*	5		X
Potentilla simplex	Common Cinquefoil		S5	3	4	X	
Prunella vulgaris ssp. *lanceolata*	Heal-all		S5	5	5	X	X
Prunus avium	Sweet Cherry	I	SE4	*	5	X	X
Prunus serotina	Wild Black Cherry		S5	3	3	X	X
Prunus virginiana ssp. *virginiana*	Chokecherry		S5	2	1	X	X
Pycnanthemum virginianum	Virginia Mountain-mint		S4	8	-4		X
Pyrus communis	Pear	I	SE4	*	5	X	X
Quercus macrocarpa	Bur Oak		S5	5	1	X	X
Quercus rubra	Red Oak		S5	6	3	X	X

Scientific Name	Common Name	Int.	S-Rank	CC	CW	LCA 2008	GEC 2014
Ranunculus abortivus	Small-flowered Buttercup		S5	2	-2		X
Ranunculus acris	Tall Buttercup	I	SE5	*	-2		X
Rhamnus cathartica	Common Buckthorn	I	SE5	*	3		X
Rhus radicans ssp. *rydbergii*	Rydberg's Poison-ivy		S5	0	0	X	X
Rhus typhina	Staghorn Sumac		S5	1	5	X	X
Ribes americanum	Wild Black Currant		S5	4	-3	X	X
Ribes cynosbati	Prickly Gooseberry		S5	4	5	X	X
Robinia pseudo-acacia	Black Locust	I	SE5	*	4		X
Rosa blanda	Smooth Wild Rose		S5	3	3		X
Rosa multiflora	Multiflora Rose	I	SE4	*	3		X
Rubus allegheniensis	Common Blackberry		S5	2	2	X	X
Rubus idaeus ssp. *melanolasius*	Wild Red Raspberry		S5	0	-2	X	X
Rubus occidentalis	Black Raspberry		S5	2	5		X
Rudbeckia hirta	Black-eyed Susan		S5	0	3		X
Rumex crispus	Curly Dock	I	SE5	*	-1		X
Salix amygdaloides	Peach-leaved Willow		S5	6	-3	X	X
Salix bebbiana	Bebb's Willow		S5	4	-4	X	X
Salix x rubens	Crack Willow	I	SE4	*	-4		X
Scirpus atrovirens	Black Bulrush		S5	3	-5		X
Setaria pumila	Yellow Foxtail	I	SE5	*	0		X
Setaria viridis	Green Foxtail	I	SE5	*	5		X
Sium suave	Water-parsnip		S5	4	-5	X	X
Solidago altissima	Tall Goldenrod		S5	1	3	X	X
Solidago canadensis	Canada Goldenrod		S5	1	3	X	X
Solidago rugosa ssp. *rugosa*	Rough Goldenrod		S5	4	-1		X
Sonchus arvensis	Perennial Sow-thistle		SE5	*	1		X
Spiraea alba	Meadowsweet		S5	3	-4		X
Taraxacum officinale	Common Dandelion	I	SE5	*	3		X

Scientific Name	Common Name	Int.	S-Rank	CC	CW	LCA 2008	GEC 2014
Tilia americana	American Basswood		S5	4	3	X	X
Tragopogon pratensis ssp. *pratensis*	Meadow Goat's-beard	I	SE5	*	5		X
Trifolium hybridum ssp. *elegans*	Alsike Clover	I	SE5	*	1		X
Trifolium pratense	Red Clover	I	SE5	*	2		X
Trifolium repens	White Clover	I	SE5	*	2		X
Tussilago farfara	Coltsfoot	I	SE5	*	3		X
Typha angustifolia	Narrow-leaved Cattail		S5	3	-5		X
Typha latifolia	Common Cattail		S5	3	-5		X
Ulmus americana	White Elm		S5	3	-2	X	X
Verbascum thapsus	Common Mullein	I	SE5	*	5		X
Verbena hastata	Blue Vervain		S5	4	-4	X	X
Verbena urticifolia	White Vervain		S5	4	-1		X
Viburnum acerifolium	Maple-leaved Viburnum		S5	6	5	X	
Viburnum lentago	Nannyberry		S5	4	-1		X
Viburnum opulus	Guelder-rose	I	SE4	*	0		X
Vicia cracca	Bird Vetch	I	SE5	*	5		X
Viola arvensis	Field Pansy	I	SE4	*	5	X	
Viola cucullata	Marsh Violet		S5	5	-5		X
Viola sororia	Common Blue Violet		S5	4	1		X
Vitis riparia	Riverbank Grape		S5	0	-2	X	X
Xanthium strumarium	Cocklebur		S5	2	0		X

Appendix D

Site Photos

Photo 1. Example of vegetation in cultural meadow on east side of property.

Photo 2. Example of vegetation in cultural meadow on east side of property.

Photo 3. Example of vegetation in cultural meadow and thicket on property.

Photo 4. Example of vegetation in cultural meadow and thicket on property.

Photo 5. Example of vegetation in cultural meadow and thicket on property.

Photo 6. Example of vegetation thicket on property.

Photo 7. Example of vegetation in cultural meadow and thicket on property. Photo facing wetland.

Photo 8. Example of vegetation in red canary grass marsh on property.

Appendix E

Upper Twenty Mile Creek Wetland Evaluation

Upper 20 Mile Creek Wetland Complex

Wetland Evaluation Edition	3rd

May 13, 2005

Comments

The following evaluation was completed using polygon information derived from a "Geographic Information Layer" provided by the Guelph Ministry of Natural Resources. The wetland polygon's were identified from 2002 Color G.T.A. Ortho aerial photography.

Additional Information

Include relevant information that can not be entered in the wetland data record(Ex. Sections that have not been completed.)

Catchment Area: 5889.56 ha

Official Name:	Upper 20 Mile Creek Wetland Complex				
Evaluation Edition:	3rd	Class:		Wetland ID.:	
Wetland Significance	Year/Month Last Evaluated			May 13, 2005	
Provincial (PSW)	Year/Month Last Updated				

Special Planning Considerations:		Scores	
		Biological:	146
		Social:	140
	13-May-05	Hydrological:	208
		Special Features:	250
Information Source	Field Observation Drabick/Yagi: 2002	Overall:	744
Submitted by:	Ron Drabick		
Date:			

WETLAND DATA AND SCORING RECORD

i) **WETLAND NAME:** **Upper 20 Mile Creek Wetland Complex**

ii) **MNR ADMINISTRATIVE REGION:** **Central** **DISTRICT:** **Guelph**

AREA OFFICE (if different from District): **Vineland**

iii) **CONSERVATION AUTHORITY JURISDICTION:** **Niagara Penisula C.A.**

(If not within a designated CA, check here: _____

iv) **COUNTY OR REGIONAL MUNICIPALITY:** **R.M. of Niagara**

v) **TOWNSHIP:** **Binbrook, Glanford, Ancaster**

vi) **LOTS & CONCESSIONS:** **Binbrook: Lot Block 4,Conc.2, Lot Block 5 Conc.2 Lot 7,Conc. 3**
Glanford: Lot 13,Conc.5 Lot8,9,11-16,Conc.4 Lots 2,3,8-16,Conc.3 Lots2-12,Conc.2 Lots1-5 Conc.1
Ancaster: Lot51, Conc.4

vii) **MAP AND AIR PHOTO REFERENCES**

a) Latitude: **431003** Longitude: **795217**

b) UTM grid reference: Zone: **17T** Block: **NH**
Grid:E **917** Grid:N **801**

c) National Topographic Series:

map name(s) _____

map number(s) **030M04** edition **N/A**

scale **1:50,000**

d) Aerial photographs: Date photo taken: **2002** Scale: **Digital**

Flight & plate numbers: **2002 G.T.A. Colour Ortho-Aerial Photography**
Grid#: O43, N40-43, M39-M43, I38-40

(attach separate sheet if necessary)

e) Ontario Base Map numbers & scale **1: 10,000**

10-17-5850-47800, 10-17-5900-47800, 10-17-5900-47750, 10-17-5950-47750
(attach separate sheets if necessary)

Field Comm	Comm Code		Site Type							Soil Type							Dominate Vegetation														Vegetation Forms	No. of Forms	Wetland Type				% OPEN WATER			Fish Hab Data ?
	A	N	I	P	R	L	RRM	LEB	LEL	C/L	S/M	Lim	S	H/M	F	G	H	C	DH	DC	TS	LS	DS	GC	M	NE	BE	RE	FF	F	SU	U			Sw	Ma	Fe	Bo	LOW	HIGH	AVG	
1	S	3		0.96						0.96																		0.96					re,h,ts	3	0.96							
Total			0.00	0.96	0.00	0.00	0.00	0.00	0.00																															
2	M	9		0.91						0.91																0.91							ne,re,ts,	3		0.91						
Total			0.00	0.91	0.00	0.00	0.00	0.00	0.00																															
3	S	10			3.85					3.85														3.85									gc,h,re,	3	3.85							
	M	4		3.58						3.58																		3.58					re,ne,gc	3		3.58						
	M	11		1.81						1.81																		1.81					re,ne,h	3		1.81						
Total			0.00	5.39	3.85	0.00	0.00	0.00	0.00																															
4	M	10		0.64						0.64																		0.64					re,ne,gc	3		0.64						
Total			0.00	0.64	0.00	0.00	0.00	0.00	0.00																															
5	M	12		0.27						0.27																		0.27					re,ne,ls	3		0.27						
	M	14		2.19						2.19																		2.19					re,ne,gc,ts	4		2.19						
Total			0.00	2.46	0.00	0.00	0.00	0.00	0.00																															
6	M	3		0.33						0.33																		0.33					re,ne	2		0.33						
	M	14		1.59						1.59																		1.59					re,ne,gc,ts	4		1.59						
Total			0.00	1.92	0.00	0.00	0.00	0.00	0.00																															
7	M	5		1.44						1.44																		1.44					re,ls	2		1.44						
Total			0.00	1.44	0.00	0.00	0.00	0.00	0.00																															
8	S	5			10.28					10.28							10.28																	h,gc,ts,re	4	10.28							
	S	7		1.23						1.23																		1.23					re,ne,h	3	1.23							
Total			0.00	1.23	10.28	0.00	0.00	0.00	0.00																															
9	S	2		1.95						1.95							1.95																	h,ts	2	1.95							
	S	9			9.52					9.52											9.52													ts,re,ne,gc	4	9.52							
	S	6			36.30					36.30											36.30													ts,h,gc,re	4	36.30							
	S	8		5.27						5.27																		5.27					re,ne,ls,h	4	5.27							
	M	7		3.26						3.26																3.26							ne,re	2		3.26						
	M	8			3.19					3.19																3.19							ne,gc,re	3		3.19						
Total			0.00	10.48	49.01	0.00	0.00	0.00	0.00																															
10	S	7		7.21						7.21																		7.21					re,ne,h,ts	4	7.21							
Total			0.00	7.21	0.00	0.00	0.00	0.00	0.00																															
11	M	3		0.59						0.59																		0.59					re,ne	2		0.59						
	M	1		0.30						0.30																		0.30					re	1		0.30						
Total			0.00	0.89	0.00	0.00	0.00	0.00	0.00																															
12	M	1		0.97						0.97																		0.97					re	1		0.97						
Total			0.00	0.97	0.00	0.00	0.00	0.00	0.00																															
13	M	3		2.89						2.89																		2.89					re,ne	2		2.89						
Total			0.00	2.89	0.00	0.00	0.00	0.00	0.00																															
14	S	12		3.90						3.90														3.90									gc,ts,h,re	4	3.90							
	S	14		11.80						11.80																11.80							ne,re,gc,ls,ts	5	11.80							
	S	15		12.51						12.51							12.51																	h,ts,re,ne,c,be	6	12.51							
	M	7		4.89						4.89																		4.89					re,ne	2		4.89						
	M	3		0.87						0.87																		0.87					re,ne,h	3		0.87						
	M	11		13.16						13.16																		13.16					re,ne,gc,h,ts	5		13.16						
Total			0.00	47.13	0.00	0.00	0.00	0.00	0.00																															
15	M	3		2.76						2.76																		2.76					re,ne	2		2.76						
Total			0.00	2.76	0.00	0.00	0.00	0.00	0.00																															
16	M	6		0.69						0.69																0.69							ne,re	2		0.69						
Total			0.00	0.69	0.00	0.00	0.00	0.00	0.00																															
17	S	6		6.58						6.58							6.58																	h,ts,gc	3	6.58							
Total			0.00	6.58	0.00	0.00	0.00	0.00	0.00																															
18	S	10		3.14						3.14																		3.14					re,ne,gc,ts,h	5	3.14							
	S	13		2.57						2.57																2.57							ne,re,gc,h	4	2.57							
	S	1		2.46						2.46							2.46																	h,ts,gc	3	2.46							
	M	6		0.21						0.21																		0.21					re	1		0.21						
	M	16		36.65						36.65																		36.65					re,ne,gc,ls,ts	5		36.65						
Total			0.00	45.03	0.00	0.00	0.00	0.00	0.00																															
19	M	3		2.79						2.79																		2.79					re,ne	2		2.79						
	M	3		0.46						0.46																		0.46					re,ne	2		0.46						

Total			0.00	3.25	0.00	0.00	0.00	0.00	0.00																																	
20	M	1		0.74						0.74																		0.74					re	1		0.74						
Total			0.00	0.74	0.00	0.00	0.00	0.00	0.00																																	
21	M	13		14.17						14.17																		14.17					re,ne,ts	3		14.17						
Total			0.00	14.17	0.00	0.00	0.00	0.00	0.00																																	
22	M	2		1.98						1.98																1.98							ne,re	2		1.98						
	M	6		3.82						3.82																3.82							ne	1		3.82						
	M	6		4.99						4.99																4.99							ne,re	2		4.99						
Total			0.00	10.79	0.00	0.00	0.00	0.00	0.00																																	
23	M	1		0.81						0.81																		0.81					re	1		0.81						
Total			0.00	0.81	0.00	0.00	0.00	0.00	0.00																																	
24	M	3		1.70						1.70																		1.70					re,ne	2		1.70						
Total			0.00	1.70	0.00	0.00	0.00	0.00	0.00																																	
30																																										
Total			0.00	0.00	0.00	0.00	0.00	0.00	0.00																																	
Total										234.18	0.00	0.00	0.00	0.00	0.00	0.00	33.78	0.00	0.00	0.00	45.82	0.00	0.00	7.75	0.00	33.21	0.00	113.62	0.00	0.00	0.00	0.00			119.53	114.65	0.00	0.00				

viii) WETLAND SIZE AND BOUNDARIES

a) Single contiguous wetland area: _____ hectares

b) Wetland complex comprised of 24 individual wetlands:

Wetland Unit Number (for reference)		Size of each wetland unit							
		Isolated	Palustrine	Riverine	Lacustrine	Riv. R.M.	Lac.E.B.	Lac.E.L.	
Wetland Unit No.	1	0.00	0.96	0.00	0.00	0.00	0.00	0.00	ha
Wetland Unit No.	2	0.00	0.91	0.00	0.00	0.00	0.00	0.00	ha
Wetland Unit No.	3	0.00	5.39	3.85	0.00	0.00	0.00	0.00	ha
Wetland Unit No.	4	0.00	0.64	0.00	0.00	0.00	0.00	0.00	ha
Wetland Unit No.	5	0.00	2.46	0.00	0.00	0.00	0.00	0.00	ha
Wetland Unit No.	6	0.00	1.92	0.00	0.00	0.00	0.00	0.00	ha
Wetland Unit No.	7	0.00	1.44	0.00	0.00	0.00	0.00	0.00	ha
Wetland Unit No.	8	0.00	1.23	10.28	0.00	0.00	0.00	0.00	ha
Wetland Unit No.	9	0.00	10.48	49.01	0.00	0.00	0.00	0.00	ha
Wetland Unit No.	10	0.00	7.21	0.00	0.00	0.00	0.00	0.00	ha
Wetland Unit No.	11	0.00	0.89	0.00	0.00	0.00	0.00	0.00	ha
Wetland Unit No.	12	0.00	0.97	0.00	0.00	0.00	0.00	0.00	ha
Wetland Unit No.	13	0.00	2.89	0.00	0.00	0.00	0.00	0.00	ha
Wetland Unit No.	14	0.00	47.13	0.00	0.00	0.00	0.00	0.00	ha
Wetland Unit No.	15	0.00	2.76	0.00	0.00	0.00	0.00	0.00	ha
Wetland Unit No.	16	0.00	0.69	0.00	0.00	0.00	0.00	0.00	ha
Wetland Unit No.	17	0.00	6.58	0.00	0.00	0.00	0.00	0.00	ha
Wetland Unit No.	18	0.00	45.03	0.00	0.00	0.00	0.00	0.00	ha
Wetland Unit No.	19	0.00	3.25	0.00	0.00	0.00	0.00	0.00	ha
Wetland Unit No.	20	0.00	0.74	0.00	0.00	0.00	0.00	0.00	ha
Wetland Unit No.	21	0.00	14.17	0.00	0.00	0.00	0.00	0.00	ha
Wetland Unit No.	22	0.00	10.79	0.00	0.00	0.00	0.00	0.00	ha
Wetland Unit No.	23	0.00	0.81	0.00	0.00	0.00	0.00	0.00	ha
Wetland Unit No.	24	0.00	1.70	0.00	0.00	0.00	0.00	0.00	ha
Wetland Unit Totals:		0.00	171.04	63.14	0.00	0.00	0.00	0.00	

(Attach additional sheets if necessary)

TOTAL WETLAND SIZE 234.18 ha

c) Brief documentation of reasons for including any areas less than 0.5 ha in size:

(Attach separate sheets if necessary .)

1.0 BIOLOGICAL COMPONENT

1.1 PRODUCTIVITY

1.1.1 GROWING DEGREE-DAYS/SOILS

GROWING DEGREE DAYS (check one)		
1)		<2800
2)		2800 -3200
3)		3200 -3600
4)	X	3600 -4000
5)		>4000

SOILS Estimated Fractional Area	
1.00	clay/loam
0.00	silt/marl
0.00	limestone
0.00	sand
0.00	humic/mesic
0.00	fibric
0.00	granite

Determine the soil type from the appropriate OMAF soils maps

SCORING:

Growing Degree-Days	Clay-Loam	Silt-Marl	Lime-stone	Sand	Humic-Mesic	Fibric	Granite
<2800	15	13	11	9	8	7	5
2800-3200	18	15	13	11	9	8	7
3200-3600	22	18	15	13	11	9	7
3600-4000	**26**	21	18	15	13	10	8
>4000	30	25	20	18	15	12	8

(maximum score 30; if wetland contains more than one soil type, evaluate based on the fractional area)

Steps required for evaluation: (maximum score 30 points)

1. Select GDD line in evaluation table applicable to your wetland;
2. Determine fractional area of the wetland for each soil type;
3. Multiply fractional area of each soil type by score;
4. Sum individual soil type scores (round to nearest whole number).

In wetland complexes the evaluator should aim at determining the percentage of area occupied by the categories for the complex as a whole.

Score		
26	clay/loam	26.00
	silt/marl	0.00
	limestone	0.00
	sand	0.00
	humic/mesic	0.00
	fibric	0.00
	granite	0.00

Final Score Growing Degree-Days/Soils (maximum 30 points) 26

1.1.2 WETLAND TYPE (Fractional Area = area of wetland type/total wetland area)

Estimate the Wetland Type from air photos or default to "swamp" (8)

	Fractional Area		Score
Bog		x 3	0.0
Fen		x 6	0.0
Swamp	0.51	x 8	4.1
Marsh	0.49	x 15	7.3
		Subtotal:	11.4

Wetland type score (maximum 15 points) 11

1.1.3 SITE TYPE (Fractional Area = area of site type/total wetland area)

Estimate from air photos

	Fractional Area		Score
Isolated	0.00	x 1 =	0.00
Palustrine (permanent or intermittent flow)	0.73	x 2 =	1.46
Riverine	0.27	x 4 =	1.08
Riverine (at rivermouth)	0.00	x 5 =	0.00
Lacustrine (at rivermouth	0.00	x 5 =	0.00
Lacustrine (on enclosed bay, with barrier beach)	0.00	x 3 =	0.00
Lacustrine (exposed to lake)	0.00	x 2 =	0.00
		Sub Total:	2.54

Site Type Score (maximum 5 points) 3

1.2 BIODIVERSITY

1.2.1 NUMBER OF WETLAND TYPES

(Check only one)		Score
1)	one	9 points
2) 13	two	13
3)	three	20
4)	four	30

Number of Wetland Types Score (maximum 30 points) 13

1.2.2 VEGETATION COMMUNITIES

Attach a separate sheet listing community (map) codes,vegetation forms and dominant species.
Use the form on the following page to record percent area by dominant vegetation form. This information will be used in other parts of the evaluation.

Communities should be grouped by number of forms. For example, 2 form communities might appear as follows:

2 forms

Code	Forms		Dominant Species				
M6	re,	ff	re,	*Typha latifolia;*	ff,	*Lemna minor,*	*Wolffia*
S1	ts,	gc	ts,	*Salix discolor;*	gc,	*lmpatiens capensis,*	*Thelypteris palustris*

Note that the dominant species for each form are separated by a semicolon. The dominant species (maximum of 2) within a form are separated by commas.

Scoring:

Total # of communities with 1-3 forms	Total # of communities with 4 -5 forms	Total # of communities with 6 or more forms
1 = 1.5 points	1 = 2 points	1 = 3 points
2 = 2.5	2 = 3.5	2 = 5
3 = 3.5	3 = 5	3 = 7
4 = 4.5	4 = 6.5	4 = 9
5 = 5	5 = 7.5	5 = 10.5
6 = 5.5	6 = 8.5	6 = 12
7 = 6	7 = 9.5	7 = 13.5
8 = 6.5	8 = 10.5	8 = 15
9 = 7	9 = 11.5	9 = 16.5
10 = 7.5	10 = 12.5	10 = 18
11 = 8	11 = 13	11 = 19
+.5 each additional community = 8.5	+.5 each additional community = 9.5	+ 1 each additional community = 3.0

e.g., a wetland with 3 one form communities 4 two form communities 12 four form communities and 8 six form communities would score:

6 + 13.5 + 15 = 34.5 = 35 points

Vegetation Communities Score (maximum 45 points) 21

Wetland Name: Upper 20 Mile Creek Wetland Complex

Wetland Size (ha): 234.18

Vegetation Form	% area in which form is dominant
h	14.42
c	0.00
dh	0.00
dc	0.00
ts	19.57
ls	0.00
ds	0.00
gc	3.31
m	0.00
ne	14.18
be	0.00
re	48.52
ff	0.00
f	0.00
su	0.00
u (unvegetated)	0.00
Total = 100%	100.00

1.2.3 DIVERSITY OF SURROUNDING HABITAT

(Check all appropriate items(1))

Determine from air photos

1	row crop
1	pasture
1	abandoned agricultural land
1	deciduous forest
	coniferous forest
1	mixed forest (at least 25% conifer and 75% deciduous or vice versa)
	abandoned pits and quarries
	open lake or deep river
1	fence rows with cover, or shelterbelts
	terrain appreciably undulating,hilly,or with ravines
1	creek flood plain
7	Subtotal

Diversity of Surrounding Habitat Score (1 for each, maximum 7 points) 7

1.2.4 PROXIMITY TO OTHER WETLANDS

(Check first appropriate category only) Scoring

Determine from air photos and other wetlands evaluations in the vicinity

1)	Hydrologically connected by surface water to other wetlands (different dominant wetlaI1d type) or to open lake or deep river within 1.5 km	8 points
2)	Hydrologically connected by surface water to other wetlands (same dominant wetland type) within 0.5 km	8
3)	Hydrologica11y connected by surface water to other wetlands (different dominant wetland type),or to open lake or deep river from 1.5 to 4 km away	5
4) 5	Hydrologically connected by surface water to other wetlands (same dominant wetland type) from 0.5 to 1.5 km away	5
5)	Within 0.75 km of other wetlands (different dominant wetland type) or open water body, but not hydrologically connected by surface water	5
6)	Within 1 km of other wetlands,but not hydrologically connected by surface water	2
7)	No wetland within 1 km	0

Proximity to other Wetlands Score (Choose one only, maximum 8 points) 5

1.2.5 INTERSPERSION

Optional: Complete as time permits or as scoring dictates.

	Number of Intersections (Check one)		Score
1)	26 or less		3
2)	27 to 40		6
3)	41 to 60		9
4)	61 to 80		12
5)	81 to l00		15
6)	101 to 125		18
7)	126 to 150	21	21
8)	151 to 175		24
9)	176 to 200		27
10)	>200		30

Interspersion Score (Choose one only maximum 30 points) 21

1.2.6 OPEN WATER TYPES

Determine from aerial photos.

	Permanently flooded: (Check one)		Score
1)		type 1	8
2)	8	type 2	8
3)		type 3	14
4)		type 4	20
5)		type 5	30
6)		type 6	8
7)		type 7	14
8)		type 8	3
9)		no open water	0

Open Water Type Score (Choose one only maximum 30 points) 8

1.3 SIZE

Score may be lower than actual if "Vegetation Community and Interspersion" have not been calculated.

234.2 hectares 75 Subtotal for Biodiversity

Size Score (Biological Component) (maximum 5O points) 31

Evaluation Table Size Score (Biological component)

Wetland size (ha)	Total Score for Biodiversity Subcomponent									
	<37	37-48	49-60	61-72	**73-84**	85-96	97-108	109-120	121-132	>132
<21 ha	1	5	7	8	9	17	25	34	43	50
21-40	5	7	8	9	10	19	28	37	46	50
41-60	6	8	9	10	11	21	31	40	49	50
61-80	7	9	10	11	13	23	34	43	50	50
81-100	8	10	11	13	15	25	37	46	50	50
101-120	9	11	13	15	18	28	40	49	50	50
121-140	10	13	15	17	21	31	43	50	50	50
141-160	11	15	17	19	23	34	46	50	50	50
161-180	13	17	19	21	25	37	49	50	50	50
181-200	15	19	21	23	28	40	50	50	50	50
201-400	17	21	23	25	**31**	43	50	50	50	50
401-600	19	23	25	28	34	46	50	50	50	50
601-800	21	25	28	31	37	49	50	50	50	50
801-1000	23	28	31	34	40	50	50	50	50	50
1001-1200	25	31	34	37	43	50	50	50	50	50
1201-1400	28	34	37	40	46	50	50	50	50	50
1401-1600	31	37	40	43	49	50	50	50	50	50
1601-1800	34	40	43	46	50	50	50	50	50	50
1801-2000	37	43	47	49	50	50	50	50	50	50
>2000	40	46	50	50	50	50	50	50	50	50

2.0 SOCIAL COMPONENT

2.1 ECONOMICALLY VALUABLE PRODUCTS

2.1.1 WOOD PRODUCTS

Determine the percentage of the wetland area dominated by "h" or "c" by using aerial photograph.

Area of wetland forested (ha), i.e. dominant form is h or c. Note that this is not wetland size. (Check one only)

h:	33.78		c:	0.00

			Score
1)		<5 ha	0
2)		5 -25 ha	3
3)	6	26 -50 ha	6
4)		51- l00 ha	9
5)		101 -200 ha	12
6)		>200 ha	18

Source of information: Field Observation Drabick/Yagi: 2002

Wood Products Score (Score one only, maximum 18 points) 6

2.1.2 WILD RICE

(Check one)			Score (Choose one)
Present (minimum size 0.5 ha)	1)		6 points
Absent	2)	0	0

Source of information: Field Observation Drabick/Yagi: 2002

Wild Rice Score (maximum 6 points) 0

2.1.3 COMMERCIAL FISH (BAIT FISH AND/OR COARSE FISH

(Check one)			Score (Choose one)
Present	1)	12	12 points
Habitat not suitable for fish	2)		0

Source of infolmation:

If any part of the wetland is riverine or the District fisheries files indicate presence of fish score "present"

Commercial Fish Score (maximum 12 points) 12

2.1.4 BULLFROGS

(Check one)			Score (Choose one)
Present	1)		1 points
Absent	2)	0	0

Source of information: Field Observation Drabick/Yagi: 2002

Bullfrog Score (maximum 1 point) 0

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2.1.5 SNAPPING TURTLES

(Check one)			Score (Choose one)
Present	1)	1	1 point
Absent	2)	0	0

Source of information: Field Observation Drabick/Yagi: 2002

Snapping Turtle Score (maximum 1 point) 1

2.1.6 FURBEARERS

(Consult Appendix 9)

	Name of furbearer		Source of information
1)	Coyote	3	0
2)	Skunk	3	0
3)	Raccoon	3	0
4)	Muskrat	3	0
5)			0
	SubTotal	12	

Scoring: 3 points for each species. maximum 12

Furbearer Score (maximum 12 points) 12

2.2 RECREATIONAL ACTIVITIES

Type of Wetland-Associated Use							
Intensity of Use	Hunting		Nature Enjoyment/ Ecosystem Study		Fishing		
High	40 points		40 points		40 points		
Moderate	20	20	20		20		
Low	8		8	8	8	8	
Not possible/NotKnown	0		0		0		
Totals		20		8		8	36

(score one level for each of the three wetland uses; scores are cumulative; maximum score 80 points)

Sources of information:

Hunting: Field Observation Drabick/Yagi: 2002

Nature: Field Observation Drabick/Yagi: 2002

Fishing: Field Observation Drabick/Yagi: 2002

Recreational Activities Score (maximum 80 points) 36

2.3 LANDSCAPE AESTHETICS

Score using ortho-aerial photography

2.3.1 DISTINCTNESS

(Check one)			Score (Choose one)
Clearly distinct	1)	3	3 points
Indistinct	2)		0

Landscape Distinctness Score (maximum 3 points) 3

2.3.2 ABSENCE OF HUMAN DISTURBANCE

(Check one)			Score (Choose one)
Human disturbances absent or nearly so	1)		7 points
One or several localized disturbances	2)		4
Moderate disturbance; localized water pollution	3)		2
Wetland intact but impairment of ecosystem quality intense in some areas	4)	1	1
Extreme ecological degradation, or water pollution severe and widespread	5)		0

Source of information: Field Observation Drabick/Yagi: 2002
Roads, Housing development, Farm runoff, localized dumps

Absence of Human Disturbance Score (maximum 7 points) 1

2.4 EDUCATION AND PUBLIC AWARENESS

Optional: complete as time and scoring dictates.

2.4.1 EDUCATIONAL USES

(Check one)			Score (Choose one)
Frequent	1)		20 points
Infrequent	2)		12
No visits	3)	0	0

Source of information: Field Observation Drabick/Yagi 2005

Requires contact with Local Boards of Education.

Educational Uses Score (maximum 20 points) 0

2.4.2 FACILITIES AND PROGRAMS

(check one)			Score (Choose one)
Staffed interpretation centre	1)		8 points
No interpretation centre or staff but a system of self-guiding trails or brochures available	2)		4
Facilities such as maintained paths (e.g., woodchips) boardwalks, boat launches or observation towers but no brochures or other interpretation	3)		2
No facilities or programs	4)	0	0

Source of information: Field Observation Drabick/Yagi 2005

Facilities and Programs Score (maximum 8 points) 0

2.4.3 RESEARCH AND STUDIES

(check appropriate spaces)		Score
Long term research has been done		12 points
Research papers published in refereed scientific journal or as a thesis		10
One or more (non-research) reports have been written on some aspect of the wetland ' s flora fauna hydrology etc.	5	5
No research or reports		0
Subtotal:	5	

Attach list of known reports by above categories

Refer to ESPA, EPA and ANSI reports.

Research and Studies Score (Score is cumulative, maximum 12 points) 5

2.5 PROXIMITY TO AREAS OF HUMAN SETTLEMENT

Circle the highest applicable score

Distance of wetland from settlement	1) population> 10,000		2) population 2,500 -10,000		3) population <2,500 or cottage community	
1) Within or adjoining settlement	40 points	40	26		16	
2) 0.5 to 10 km from settlement	26		16		10	
3) 10 to 60 km from settlement	12		8		4	
4) >60 km from settlement	5		2		0	
		40		0		0

Name of settlement: City of Hamilton

Proximity to Human Settlement Score (maximum 40 points) 40

2.6 OWNERSHIP (FA= fraction Area)

Select a default value of "4" if no other information exists.

					Score
FA of wetland in public or private ownership held under contract or in trust for wetland protection		x	10	=	0.00
FA of wetland area in public ownership,not as above		x	8	=	0.00
FA of wetland area in private ownership,not as above	1.00	x	4	=	4.00

Source of information: OMNR Teranet GIS Layer 2005

Ownership Score (maximum 10 points) 4

Additional Reports
Twenty Mile Creek Meander B : Life Science ANSI : Regional : NHIC # N-20-02
R.M. of Hamilton: ESA #GLAN-58 : Regional Life Science : Hannon Floodplain Forests
R.M. of Hamilton: ESA #GLAN-54 : Regional Life Science : Nebo Road West Floodplain
Hamilton-Wentworth Natural Areas Inventory Vol I , II, III: 1995, Heagy A.E (Editor) Hamilton Naturalist Club
Ontario Herpetofaunal Summary : 1986, Oldham and Weller
OMNR NHIC Database

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2.7 SIZE

The score may be lower than actual since economic and recreational values have not been completed.

234.2 hectares 107 Subtotal for Social

Evaluation Table for Size Score (Social Component)

Wetland Size (ha)	Total for Size Dependent Score									
	<31	31-45	46-60	61-75	**76-90**	91-105	**106-120**	121-135	136-150	>150
<2 ha	1	2	4	8	10	12	14	14	14	15
2 - 4ha	1	2	4	8	12	13	14	14	15	16
5 - 8ha	2	2	5	9	13	14	15	15	16	16
9 - 12ha	3	3	6	10	14	15	15	16	17	17
13-17	3	4	7	10	14	15	16	16	17	17
18-28	4	5	8	11	15	16	16	17	17	18
29-37	5	7	10	13	16	17	18	18	19	19
38-49	5	7	10	13	16	17	18	18	19	20
50-62	5	8	11	14	17	17	18	19	20	20
63-81	5	8	11	15	17	18	19	20	20	20
82-105	6	9	11	15	18	18	19	20	20	20
106-137	6	9	12	16	18	19	20	20	20	20
138-178	6	9	13	16	18	19	20	20	20	20
179-233	6	9	13	16	18	20	20	20	20	20
234-302	7	9	13	16	**18**	20	**20**	20	20	20
303-393	7	9	14	17	18	20	20	20	20	20
394-511	7	10	14	17	18	20	20	20	20	20
512-665	7	10	14	17	18	20	20	20	20	20
666-863	7	10	14	17	19	20	20	20	20	20
864-1123	8	12	15	17	19	20	20	20	20	20
1124-1460	8	12	15	17	19	20	20	20	20	20
1461-1898	8	13	15	18	19	20	20	20	20	20
1899-2467	8	14	16	18	20	20	20	20	20	20
>2467	8	14	16	18	20	20	20	20	20	20

Total Size Score (Social Component) 20.0

2.8 ABORIGINAL AND CULTURAL HERITAGE VALUES

Either or both Aboriginal or Cultural Values may be scored. However, the maximum score permitted for 2.8 is 30 points. Attach documentation.

2.8.1 ABORIGINAL VALUES

Full documentation of sources must be attached to the data record.

1)	Significant		=	30 points
2)	Not Significant		=	0
3)	Unknown		=	0
	Total:	0		

2.8.2 CULTURAL HERITAGE

1)	Significant		=	30 points
2)	Not Significant		=	0
3)	Unknown		=	0
	Total:	0		

Aboriginal Values/Cultural Heritage Score (maximum 30 points) 0.0

3.0 HYDROLOGICAL COMPONENT

3.1 FLOOD ATTENUATION

Estimated&Calculated values can be obtained from G.I.S. data layers.

If the wetland is a complex including isolated wetlands, apportion the l00 points according to area. For example if 10 ha of a l00 ha complex is isolated, the isolated portion receives the maximum proportional score of 10. The remainder of the wetland is then evaluated out of 90.

Step 1: Detennination of Maximum Score

_____	Wetland is located on one of the defined 5 large lakes or 5 major rivers (Go to Step 4)
_____	Wetland is entirely isolated (i.e. not part of a complex) (Go to Step 4)
X	All other wetland types (Go through Steps 2,3 and 4B)

Step 2: Determination of Upstream Detention Factor (DF)

(a)	Wetland area (ha)		234.18	
(b)	Total area (ha) of upstream detention areas (include the wetland itself)		234.18	***estimate***
(c)	Ratio of (a):(b)		1.00	
(d)	Upstream detention factor: (c) x 2 = (maximum allowable factor = 1)	2.0	1.00	

Step 3: Determination of Wetland Attenuation Factor (AF)

(a)	Wetland area (ha)		234.18	
(b)	Size of catchment basin (ha) upstream of wetland (include wetland itself in catchment area)		5889.56	***calculate***
(c)	Ratio of (a):(b)		0.04	
(d)	Wetland attenuation factor: (c) x 10 = (maximum allowable factor = 1)	0.4	0.40	

Step 4: Calculation of final score

(a)	Wetlands on large lakes or major rivers		0
(b)	Wetland entirely isolated		l00
(b)	All other wetlands --calculate as follows:		
(c	* Complex Formula - Isolated portion	100.00	
	Initial Score		100 *
	Upstream detention factor (DF) (Step 2)		1.00
	Wetland attenuation factor (AF) (Step 3)		0.40
	Final score: [(DF + AF)/2] x Initial score =		69.88
(c	* Final score:=	70	

*Unless wetland is a complex with isolated portions (see above).

Flood Attenuation Score (maximum l00 points) 75.0

3.2 WATER QUALITY IMPROVEMENT

3.2.1 SHORT TERM WATER QUALITY IMPROVEMENT

Step 1: **Determination of maximum initial score**

	Wetland on one of the 5 defined large lakes or 5 major rivers (Go to Step 5a)
X	All other wetlands (Go through Steps 2, 3, 4, and 5b)

Step 2: **Determination of watershed improvement factor (WIF)**

Calculation of WIF is based on the fractional area (FA) of each site type that makes up the total area of the wetland.

(FA= area of site type/total area of wetland)	Fractional Area				
FA of isolated wetland	0.00	x	0.5	=	0.00
FA of riverine wetland	0.27	x	1	=	0.27
FA of palustrine wetland with no inflow		x	0.7	=	0.00
FA of palustrine wetland with inflows	0.73	x	1	=	0.73
FA of lacustrine on lake shoreline	0.00	x	0.2	=	0.00
FA of lacustrine at lake inflow or outflow		x	1	=	0.00
			Sub Total:		1.00
			Sum (WIF cannot exceed 1.0)		1.00

Step 3: Determination of catchment land use factor (LUF)
(Choose the first category that fits upstream landuse in the catchment.)

1)	1.0	Over 50% agricultural and/or urban	1.0
2)		Between 30 and 50% agricultural and/or urban	0.8
3)		Over 50% forested or other natural vegetation	0.6

LUF (maximum 1.0) 1.00

Step 4: Determination of pollutant uptake factor (PUT)

Calculation of PUT is based on the fractional area (FA) of each vegetation type that makes up the total area of the wetland. Base assessment on the dominant vegetation form for each community except where dead trees or shrubs dominate. In that case base assessment on the domininant live vegetation. (FA = area of vegetation type/total area of wetland)

	Fractional Area				
FA of wetland with live trees, shrubs, herbs or mosses (c,h,ts,ls,gc,m)	0.73	x	0.75	=	0.55
FA of wetland with emergent, submergent or floating vegetation (re,be,ne,su,f,ff)	1.23	x	1	=	1.23
FA of wetland with little or no vegetation (u)	0.00	x	0.5	=	0.00
			Subtotal:		1.78

Estimate FA from air photos or use default factor of "0.75" **Sum (PUT cannot exceed 1.0)** 1.00

Step 5: **Calculation of final score**

(a)	Wetland on large lakes or major rivers	0
(b)	All other wetlands -calculate as follows	
	Initial score	60
	Water quality improvement factor (WQF)	1.00
	Land use factor (LUF)	1.00
	Pollutant uptake factor (PUT)	1.00
	Final score: 60 x WQF x LUF x PUT =	60.00

Short Term Water Quality Improvement Score (maximum 60 points) 60

3.2.2 LONG TERM NUTRIENT TRAP

Determine wetland type from aerial photos and soil type from OMAF soils maps.

Step 1:

	Wetland on large lakes or 5 major rivers	0 points
X	All other wetlands (proceed to Step 2)	

Step 2: Choose only one of the following settings that best describes the wetland being evaluated

1)		Wetland located in a river mouth	10 points
2)		Wetland is a bog, fen or swamp with more than 50% of the wetland being covered with organic soil	10
3)	3	Wetland is a bog, fen or swamp with less than 50% of the wetland being covered with organic soil	3
4)		Wetland is a marsh with more than 50% of the wetland covered with organic soil	3
5)		None of the above	0

Long Term Nutrient Trap Score (maximum 10 points) 3

3.2.3 GROUNDWATER DISCHARGE

The final score will be underestimated since some of the wetland characteristics cannot be scored

(Circle the characteristics that best describe the wetland being evaluated and then sum the scores. If the sum exceeds 30 points assign the maximum score of 30.)

Wetland Characteristics	Potential for Discharge					
	None to Little		Some		High	
Wetland type	1) Bog = 0		2) Swamp/Marsh = 2	2	3) Fen = 5	
Topography	1) Flat/rolling = 0	0	2) Hilly = 2		3) Steep = 5	
Wetland Area: Upslope Catchment Area	Large (>50%) = 0		Moderate (5-50%) = 2	2	Small <(5%) = 5	
Lagg Development	1) None found = 0	0	2) Minor = 2		3) Extensive = 5	
Seeps	1) None = 0		2) = or < 3 seeps = 2		3) > 3 seeps = 5	
Surface marl deposits	1) None = 0	0	2) = or < 3 sites = 2		3) > 3 sites = 5	
Iron precipitates	1) None = 0		2) = or < 3 sites = 2		3) > 3 sites = 5	
Located within 1 km of a major aquifer	N/A = 0		N/A = 0		Yes = 10	
Totals		0		4		0

(Scores are cumulative maximum score 30 points)

Groundwater Discharge Score (maximum 30 points) 4

Note: Potential for Karst Areas in this watershed (A. Yagi, 2005)

3.3 CARBON SINK

Choose only one of the following

1)	Bog, fen or swamp with more than 50% coverage by organic soil		5 points
2)	Bog, fen or swamp with between 10 to 49% coverage by organic soil	2	2
3)	Marsh with more than 50% coverage by organic soil		3
4)	Wetlands not in one of the above categories		0

Carbon Sink Score (maximum 5 points) 2

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3.4 SHORELINE EROSION CONTROL

Step 1: ***Determine from ortho-aerial photography*** Score

	Wetland entirely isolated or palustrine	0
X	Any part of the Wetland riverine or lacustrine (proceed to Step 2)	

Step 2:

Choose the **one** characteristic that best describes the shoreline vegetation (see text for a definition of shoreline)

			Score
1)	15	Trees and shrubs	15
2)		Emergent vegetation	8
3)		Submergent vegetation	6
4)		Other shoreline vegetation	3
5)		No vegetation	0

Shoreline Erosion Control Score (maximum 15 points) 15

3.5 GROUND WATER RECHARGE

3.5.1 WETLAND SITE TYPE

Score

(a) Wetland > 50% lacustrine (by area) or located on one of the five major rivers — 0

(b) Wetland not as above. Calculate final score as follows:
(FA= area of site type/total area of wetland)

	Fractional Area				
FA of isolated or palustrine wetland	0.73	x	50	=	36.5
FA of riverine wetland	0.27	x	20	=	5.4
FA of lacustrine wetland (wetland <50% lacustrine)	0.00	x	0	=	0.0
			Subtotal:		41.9

Ground Water Recharge Wetland Site Type Component Score (maximum 50 points) 42

3.5.2 WETLAND SOIL RECHARGE POTENTIAL

Determine from OMAF soils maps.

(Circle only **one** choice that best describes the hydrologic soil class of the area surrounding the wetland being evaluated.)

Dominant Wetland Type	1) Sand, loam, gravel, till		2) Clay or bedrock	
1) Lacustrine or on a major river	0		0	
2) Isolated	10		5	
3) Palustrine	7	7	4	
4) Riverine (not a major river)	5		2	
Totals		7		0

Ground Water Recharge Wetland Soil Recharge Potential Score (maximum 10 points) 7

4.0 SPECIAL FEATURES COMPONENT

4.1 RARITY

4.1.1 WETLANDS

Site District 7-5
Presence of wetland type (check one or more)

	Bog
	Fen
X	Swamp
X	Marsh

Score for rarity within the landscape and rarity of the wetland type. Score for rarity of wetland type is cumulative (maximum 80 points) based on presence or absence.

Slte District	Score for Rarity within the Landscape	Score for Rarity of Wetland Type			
		Marsh	Swamp	Fen	Bog
6-1	60	40	0	80	80
6-2	60	40	0	80	80
6-3	40	10	0	40	80
6-4	60	40	0	80	80
6-5	20	40	0	80	80
6-6	40	20	0	80	80
6-7	60	10	0	80	80
6-8	20	20	0	80	80
6-9	0	20	0	80	80
6-10	20	0	20	80	80
6-11	0	30	0	80	80
6-12	0	30	0	60	80
6-13	60	10	0	80	80
6-14	40	20	0	40	80
6-15	40	0	0	80	80
7-1	60	0	60	80	80
7-2	60	0	0	80	80
7-3	60	0	0	80	80
7-4	80	0	0	80	80
7-5	**60**	**20**	**0**	80	80
7-6	80	30	0	80	80

Rarity within the Landscape Score (maximum 80 points) 60
Rarity of Wetland Type Score (maximum 80 points) 20

The updated scores for rarity in Site Region 7-5 are in the stages of review and still require official confirmation.(June 8, 2004)

4.1.2 SPECIES

4.1.2.1 BREEDING HABITAT FOR AN ENDANGERED OR THREATENED SPECIES

	Name of species		Source of information
1)			
2)			
3)			
4)			
5)			
	Total:	0	

Attach documentation.

Scoring:

For each species 250 points

(score is cumulative, no maximum score)

Breeding Habitat for Endangered or Threatened Species Score (no maximum) 0

4.1.2.2 TRADITIONAL MIGRATION OR FEEDING HABITAT FOR AN ENDANGERED OR THREATENED SPECIES

	Name of species		Source of information
1)			
2)			
3)			
4)			
5)			
	Total:	0	

Attach documentation.
Scoring:

For one species 150 points
For each additional species 75

(score is cumulative, no maximum score)

Traditional Habitat for Endangered Species Score (no maximum) 0

4.1.2.3 PROVINCIALLY SIGNIFICANT ANIMAL SPECIES

	Name of species	Source of information
1)	Milksnake (Lampropeltis triangulum)	2005 NHIC datarecords
2)		
3)		
4)		
5)		
6)		
7)		
8)		
9)		
10)		
11)		
12)		
13)		
14)		
15)		

Attach separate list if necessary; Attach documentation

Scoring:

Number of provincially significant animal species in the wetland:

1 species	=	50 points	14 species	=	154
2 species	=	80	15 species	=	156
3 species	=	95	16 species	=	158
4 species	=	105	17 species	=	160
5 species	=	115	18 species	=	162
6 species	=	125	19 species	=	164
7 species	=	130	20 species	=	166
8 species	=	135	21 species	=	168
9 species	=	140	22 species	=	170
10 species	=	143	23 species	=	172
11 species	=	146	24 species	=	174
12 species	=	149	25 species	=	176
13 species	=	152			

Add one point for every species past 25 (for example, 26 species = 177 points, 27 species = 178 points etc.)

(no maximum score)

Provincially Significant Animal Species Score (no maximum) 50

4.1.2.4 PROVINCIALLY SIGNIFICANT PLANT SPECIES

(Scientific names must be recorded)

	Common Name	Scientific Name	Source of information
1)	Green Dragon	Arisaema dracontium	NHIC 2003, HNAI 2003
2)	Yellow Pond-lily	Nuphar advena	NHIC 2003, HNAI 2004
3)	Lizard's Tail	Saururus cernuus	NHIC 2003, HNAI 2005
4)			
5)			
6)			
7)			
8)			
9)			
10)			
11)			
12)			
13)			
14)			
15)			

Attach separate list if necessary; Attach documentation

Scoring:

Number of provincially significant plant species in the wetland:

1 species	=	50 points	14 species	=	154
2 species	=	80	15 species	=	156
3 species	=	95	16 species	=	158
4 species	=	105	17 species	=	160
5 species	=	115	18 species	=	162
6 species	=	125	19 species	=	164
7 species	=	130	20 species	=	166
8 species	=	135	21 species	=	168
9 species	=	140	22 species	=	170
10 species	=	143	23 species	=	172
11 species	=	146	24 species	=	174
12 species	=	149	25 species	=	176
13 species	=	152			

Add one point for every species past 25 (for example, 26 species = 177 points, 27 species = 178 points etc.)

Provincially Significant Plant Species Score (no maximum) 95

HNAI: Hamilton Natural Area Inventory : 2003

4.1.2.5 REGIONALLY SIGNIFICANT SPECIES (SITE REGION)

Scientific names must be recorded for plant species. **Lists of significant species must be approved by MNR.**

SIGNIFICANT IN SITE REGION:

.

	Common Name	Scientific Name	Source of information
1)			
2)			
3)			
4)			
5)			
6)			
7)			
8)			
9)			
10)			
11)			
12)			
13)			
14)			
15)			

Attach separate list if necessary .Attach documentation.

Scoring:

No. of species significant in Site Region

1 species	=	20	6 species	=	55
2 species	=	30	7 species	=	58
3 species	=	40	8 species	=	61
4 species	=	45	9 species	=	64
5 species	=	50	10 species	=	67

Add one point for every species past 10. (no maximum score)

Regionally Significant Species Score (Site Region)(no maximum) _____

Additional Species							
Common Name	Scienctific Name	S Rank	G Rank	Wet CoE	Tracked	Poly. Loc	Comments
Plants							
Sweet Joe-pye-weed	Eupatorium purpureum	S3					1991
Yellow Pond-lily	Nuphar advena	S3					
Lizard's Tail	Saururus cernuus	S3					
Swamp Beggar-ticks	Bidens discoidea	S4					
Valerand'sbrookweed	Samolus valerandi	S4					
Springs Clearweed	Pilea fontana	S4					
Fourleaf Wild-yam	Dioscorea quaternata	S4					
Wirestem Muhly	Muhlenbergia frondosa	S4					
Yellow Water-crowfoot	Ranunculus flabellaris	S4?					
Wapatum Arrowhead	Sagittaria cuneata	S4?					
Vernal Water Starwort	Callitriche palustris	S5					
Green Dragon	Arisaema dracontium	S3	S5				HNAI 2003 Rare City of Hamilton
Tuffed Love Grass	Eragrostis pectinacea	S4					Hamilton Natural Areas Inventory -2003
American Burnweed	Erechtites hieracifolia						HNAI 2003 Rare City of Hamilton
Wood Millet	Milium effusum	S4/5					HNAI 2003 Rare City of Hamilton
Long Styled Canadian Sanicle	Sanicula canadensis var. grandis	S2		2			HNAI 2003 Uncommon (Snakeroot)
Bur Cucumber	Sicyos angulatus	S5					HNAI 2003 Rare City of Hamilton
Toad Mustard	Arabis glabra	S5					HNAI 2003 Rare City of Hamilton
Peck's Sedge	Carex peckii	S5					HNAI 2003 Rare City of Hamilton
Flat Stemmed Pondweed	Potamogeton zosteriformis	S5					HNAI 2003 Rare City of Hamilton
Spatterdock	Nuphar advenum						HNAI 2003 Rare City of Hamilton
Amphibians							
Mammals							
Birds							
Orchard Oriole	Icterus spurius	SZB,SZN					
Carolina Wren	Thryothorus ludovicianus	S4					HNAI 2003 Rare City of Hamilton
Reptiles							
Milksnake	Lampropeltis triangulum	S3					Special Concern
Fish							
Black Bullhead	Ameiurus melas	S4	G5				1998
Banded Killifish	Fundulus diaphanus	S5					
Butterflies							HNAI 2003 Rare City of Hamilton
Hickory Hairstreak	Satyrium caryaevorum	S3					HNAI 2003 Uncommon City of Hamilton
Monarch	Damaus plexippus	S5					SC, NIAC (HNAI 2003)

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4.2.1.6 LOCALLY SIGNIFICANT SPECIES (SITE DISTRICT)

Scientific names must be recorded for plant species. **Lists of significant species must be approved by MNR.**

	Common Name	Scientific Name	Source of information
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			
33			
34			
35			
36			
37			
38			
39			
40			
41			
42			
43			
44			
45			
46			
47			
48			
49			
50			

Attach separate list if necessary .Attach documentation.

Scoring:

No. of species significant in Site District

1 species	=	10	6 species	=	41
2 species	=	17	7 species	=	43
3 species	=	24	8 species	=	45
4 species	=	31	9 species	=	47
5 species	=	38	10 species	=	49

For each significant species over 10 in the wetland, add 1 point.

Locally Significant Species Score (Site District) (no maximum)

4.2 SIGNIFICANT FEATURES AND/OR FISH & WILDLIFE HABITAT

4.2.1 NESTING OF COLONIAL WATERBIRDS

Status	Name of species	Source of Information	Score	
1) Currently nesting			50	
2) Known to have nested within past 5 years			25	
3) Active feeding area (Do not include feeding by great blue herons)			15	
4) None known			0	

Consult the Ontario Heronry database at Bird Studies Canada. Subtotal: 0

Attach documentation (nest locations etc., if known)

Score highest applicable category only; maximum score 50 points.

Score for Nesting Colonial Waterbirds (maximum 50 points) 0

4.2.2. WINTER COVER FOR WILDLIFE

Score "locally significant" if trees & shrubs are present, also consult District deer yard data.

(Check only highest level of significance) **(one only)**		Score
1)	Provincially significant	l00
2)	Significant in Site Region	50
3)	Significant in Site District	25
3) 10	Locally significant	10
4)	Little or poor winter cover present	0

Source of information: OMNR GIS Layer: 2005

Winter Cover for Wildlife Score (maximum l00 points) 10

4.2.3 WATERFOWL STAGING AND/OR MOULTING

(Check only highest level of significance for both staging and moulting; score is cumulative across columns, maximum score 15

		Staging	Score (one only)	Moulting	Score (one only)
1)	Nationally significant		150		150
2)	Provincially significant		100		l00
3)	Regionally significant		50		50
4)	Known to occur	10	10	10	10
5)	Not possible		0		0
6)	Unknown		0		0
	Total:	10		10	
	Subtotal:		20		

Source of information: Field Observation Drabick/Yagi: 2005

Waterfowl Moulting and Staging Score (maximum 150 points) 20

4.2.4 WATERFOWL BREEDING

		(Check only highest level of significance)	Score
1)		Provincially significant	l00
2)		Regionally significant	50
3)	10	Habitat suitable	10
4)		Habitat not suitable	0

Source of information: Field Observation Drabick/Yagi: 2005

Waterfowl Breeding Score (maximum lOO points) 10

4.2.5 MIGRATOR PASSERINE, SHOREBIRD OR RAPTOR STOPOVER AREA

(check highest applicable category)

1)		Provincially significant	l00
2)		Significant in Site Region	50
3)		Significant in Site District	10
4)	0	Not significant	0

Source of information: Field Observation Drabick/Yagi: 2005

Passerine, Shorebird or Raptor Stopover Score (maximum 100 points) 0

4.2.6 FISH HABITAT

Consult District Fisheries files. If fish are present in the wetland, score 15 or 25 points depending on the size of the fish habitat present.

4.2.6. Spawning and Nursery Habitat

Table 5. Area Factors for Low Marsh, High Marsh, and Swamp Communities.

No. of ha of Fish Habitat	Area Factor
< 0.5 ha	0.1
0.5- 4.9	0.2
5.0- 9.9	0.4
10.0- 14.9	0.6
15.0 -19.9	0.8
20.0+ ha	1.0

Step 1:

_____ Fish habitat is not present within the wetland (Score = 0)

X Fish habitat is present within the wetland (Go to Step 2)

Step 2: Choose only one option

1) X Significance of the spawning and nursery habitat within the wetland is known (Go to Step 3)

2) _____ Significance of the spawning and nursery habitat within the wetland is not known (Go through Steps 4, 5, 6 and 7)

Step 3: Select the highest appropriate category below attach documentation:

1)		Significant in Site Region	l00 points
2)		Significant in Site District	50
3)		Locally Significant Habitat (5.0+ ha)	25
4)	15	Locally Significant Habitat (<5.0 ha)	15

Score for Spawning and Nursery Habitat (maximum score 100 points) 15

Step 4: **Proceed to Steps 4 to 7 only if Step 3 was not answered.**

(**Low Marsh**: marsh area from the existing water line out to the outer boundary of the wetland)

_____ Low marsh not present (Continue to Step 5)
_____ Low marsh present (Score as follows)

Scoring for Presence of Key Vegetation Groups

Scoring is based on the one most clearly dominant plant species of the dominant form in each Low Marsh vegetation community. Check the appropriate Vegetation Group (see Appendix 16 Table 16-2) for each Low Marsh community. Sum the areas of the communities assigned to each Vegetation Group and multiply by the appropriate size factor from Table 5.

Vegetation Group Number	Vegetation Group Name	Present as a Dominant Form (check)	Total Area (ha)	Area Factor (see Table 5)	Score	Final Score (area factor x score)
1	Tallgrass				6 pts	0.0
2	Shortgrass-Sedge				11	0.0
3	Cattail-Bulrush-Burreed				5	0.0
4	Arrowhead-Pickerelweed				5	0.0
5	Duckweed				2	0.0
6	Smartweed-Waterwillow				6	0.0
7	Waterlily-Lotus				11	0.0
8	Waterweed-Watercress				9	0.0
9	Ribbongrass				10	0.0
10	Coontail-Naiad-Watermilfoil				13	0.0
11	Narrowleaf Pondweed				5	0.0
12	Broadleaf Pondweed				8	0.0
Sub Total Score (maximum 75 points)						0.0
Total Score (maximum 75 points)						0.0

Step 5: (**High Marsh**: area from the water line to the inland boundary of marsh wetland type. This is essentially what is commonly referred to as a wet meadow, in that there is insufficient standing water to provide fisheries habitat except during flood or high water conditions.)

_____ High marsh not present (Continue to Step 6)
_____ High marsh present (Score as follows)

Scoring for Presence of Key Vegetation Groups

Scoring is based on the one most clearly dominant plant species of the dominant form in each High 1Marsh vegetation community. Check the appropriate Vegetation Group (see Appendix 16 Table 16-2) for each High Marsh community. Sum the areas of the communities assigned to each Vegetation Group and multiply by the appropriate size factor from Table 5.

Vegetation Group Number	Vegetation Group Name	Present as a Dominant Form (check)	Total Area (ha)	Area Factor (see Table 5)	Score	Final Score (area factor x score)
1	Tallgrass				6 pts	0.0
2	Shortgrass-Sedge				11	0.0
3	Cattail-Bulrush-Burreed				5	0.0
4	Arrowhead-Pickerelweed				5	0.0
Sub Total Score (maximum 25 points)						0.0
Total Score (maximum 25 points)						0.0

Step 6: (**Swamp**: Swamp communities containing fish habitat,either seasonally or permanently. Determine the total area of seasonally flooded swamps and permanently flooded swamps containing fish habitat.)

_____ Swamp containing fish habitat not present (Continue to Step 7)
_____ Swamp containing fish habitat present (Score as follows)

Swamp containing fish Habitat	Present (check)	Total area (ha)	Area Factor (see Table 5)	Score	TOTAL SCORE (factor x score)
Seasonally flooded				10	0.0
Permanently flooded				10	0.0
Sub SCORE (maximum 20 points)					0.0
SCORE (maximum 20 points)					0.0

Step 7: Calculation of final score

Score for Spawning and Nursery Habitat (Low Marsh) (maximum 75) = 0.0

Score for Spawning and Nursery Habitat (High Marsh) (maximum 25) = 0.0

Score for Swamp Containing Fish Habitat (maximum 20) = 0.0

Subtotal: 0.0

Sum (maximum score 100 points) = 0.0

4.2.6.2 Migration and Staging Habitat

Score only if information on fish migration and staging exists, e.g. migration of northern pike through a wetland to access spawning areas.

Step 1:

1) _____ Staging or Migration Habitat is not present in the wetland (Score = 0)

2) _____ Staging or Migration Habitat is present in the wetland significance of the habitat is known (Go to Step 2)

3) _____ Staging or Migration Habitat is present in the wetland significance of the habitat is not known (Go to Step 3)

NOTE: Only one of Step 2 or Step 3 is to be scored.

Step 2: Select the highest appropriate category below, attach documentation:

		Score
1)	Significant in Site Region	25 points
2)	Significant in Site District	15
3)	Locally Significant	10
4)	Fish staging and/or migration habitat present,but not as above	5

Score for Fish Migration and Staging Habitat (maximum score 25 points) 0

Step 3: Select the highest appropriate category below based on presence of the designated site type (does not have to be dominant). See Section 1.1.3. Note name of river for 2) and 3).

		Score
1)	Wetland is riverine at rivermouth or lacustrine at rivermouth	25 points
2)	Wetland is riverine,within 0.75 km of rivermouth	15
3)	Wetland is lacustrine,within 0.75 km of rivermouth	10
4)	Fish staging and/or migration habitat present, but not as above	5

Score for Staging and Migration Habitat (maximum score 25 points) 0

4.3 ECOSYSTEM AGE

(Fractional Area = area of wetland/total wetland area)

	Fractional Area			Scoring
Bog	0.00	x	25 =	0.0
Fen, treed to open on deep soils floating mats or marl		x	20 =	0.0
Fen, on limestone rock		x	5 =	0.0
Swamp	0.51	x	3 =	1.5
Marsh	0.49	x	0 =	0.0
		Sub Total:		1.5

Ecosystem Age Score (maximum 25 points) 1.5

4.4 GREAT LAKES COASTAL WETLANDS

Score for coastal (see text for definition) wetlands only

Choose one only

	wetland < 10 ha	= 0 points
	wetland 10- 50 ha	= 25
	wetland 51 -lOO ha	= 50
	wetland > 100 ha	= 75

Great Lakes Coastal Wetlands Score (maximum 75 points) 0

5.0 EXTRA INFORMATION

5.1 PURPLE LOOSESTRIFE

____ Absent/Not seen

X Present

(a) One location in wetland ____
Two to many locations X

Abundance code
(b) (1 < 20 stems ____
(2 20-99 stems ____
(3 100-999 stems ____
(4 >1000 stems ____

5.2 SEASONALLY FLOODED AREAS

Check one or more

Ephemeral	(less than 2 weeks)	X
Temporal	(2 weeks to 1 month)	X
Seasonal	(1 to 3 months)	X
Semi-permanent	(>3 months)	X
No seasonal flooding		____

5.3 SPECIES OF SPECIAL SIGNIFICANCE

5.3.1 Osprey

Present and nesting	____
Known to have nested in last 5 yr	____
Feeding area for osprey	____
Not as above	X

5.3.2 Common Loon

Nesting in wetland	____
Feeding at edge of wetland	____
Observed or heard on lake or river adjoining the wetland	____
Not as above	X

INVESTIGATORS	AFFILIATION
Ron Drabick / Anne Yagi	OMNR 2005

DATES WETLAND VISITED

May 6,9 2005

DATE THIS EVALUATION COMPLETED: **May 13, 2005**

ESTIMATED TIME DEVOTED TO COMPLETING THE FIELD SURVEY IN "PERSON HOURS"

6 person hr

WEATHER CONDITIONS

May 6,9 2005: sunny intermittent cloud, 14 degrees Celsius

i) at time of field work

(Continue in the space below if necessary)

ii) summer conditions in general

OTHER POTENTIALLY USEFUL INFORMATION:

CHECKLIST OF PLANT AND ANIMAL SPECIES RECORDED IN THE WETLAND:

Attach a list of all flora and fauna observed in the wetland.

*Indicate if voucher specimens or photos have been obtained, where located, etc.

WETLAND EVALUATION SCORING RECORD

WETLAND NAME AND/OR NUMBER: Upper 20 Mile Creek Wetland Complex

1.0 BIOLOGICAL COMPONENT

1.1 PRODUCTIVITY

1.1.1	Growing Degree-Days/Soils	26.0	
1.1.2	Wetland Type	11.4	
1.1.3	Site Type	2.5	
	Total for Productivity		40

1.2 BIODIVERSITY

1.2.1	Number of Wetland Types	13.0	
1.2.2	Vegetation Communities (maxixmum 45)	21.0	
1.2.3	Diversity of Surrounding Habitat (maximum 7)	7.0	
1.2.4	Proximinty to Other Wetlands	5.0	
1.2.5	Interspersion	21.0	
1.2.6	Open Water Type	8.0	
	Total for Biodiversity		75

Sub Total for Biodiversity: 75

1.3 SIZE (Biological Component): 31

Sub Total: 146

TOTAL FOR BIOLOGICAL COMPONENT (not to exceed 250): 146

2.0 SOCIAL COMPONENT

2.1 ECONOMICALLY VALUABLE PRODUCTS

2.1.1	Wood Products	6
2.1.2	Wild Rice	0
2.1.3	Commercial Fish	12
2.1.4	Bullfrogs	0
2.1.5	Snapping Turtles	1
2.1.6	Furbearers	12

Total for Economically Valuable Products: 31

2.2 RECREATIONAl ACTIVITIES (maximum 80): 36

2.3 LANDSCAPE AESTHETICS

2.3.1	Distinctness	3
2.3.2	Absence of Human Disturbance	1

Total for Landscape Aesthetics: 4

2.4 EDUCATION AND PUBLIC AWARENESS

2.4.1	Educational Uses	0
2.4.2	Facilities and Programs	0
2.4.3	Research and Studies	5

Total for Education and Public Awareness: 5

2.5 PROXIMITY TO AREAS OF HUMAN SETTLEMENT: 40

2.6 OWNERSH1P: 4

Subtotal for Social Component: 107.0

2.7 SIZE (Social Component): 20

2.8 ABORIGINAL AND CULTURAL VALUES: 0

Sub Total: 140

TOTAL FOR SOCIAL COMPONENT (not to exceed 250): 140

3.0 HYDROLOGICAL COMPONENT

3.1 FLOOD ATTENUATION		75
3.2 WATER QUALITY IMPROVEMENT		
3.2.1 Short Term Improvement	60.0	
3.2.2 Long Term Improvement	3.0	
3.2.3 Groundwater Discharge (maximum 30)	4.0	
Total for Water Quality Improvement		67
3.3 CARBON SINK		2
3.4 SHORELINE EROSION CONTROL		15
3.5 GROUNDWATER RECHARGE		
3.5.1 Site Type	41.91	
3.5.2 Soils	7.0	
Total for Groundwater Recharge		49
Sub Total:		208
TOTAL FOR HYDROLOGICAL COMPONENT (not to exceed 250)		208

4.0 SPECIAL FEATURES

4.1 RARITY

4.1.1 Wetlands		
4.1.1.1 Rarity within the Landscape	60.0	
4.1.1.2 Rarirty of Wetland Type (maximum 80)	20.0	
Total for Wetland Rarity		80
4.1.2 Species		
4.1.2.1 Endangered or Threatened Species Breeding	0.0	
4.1.2.2 Traditional Use by Endangered or Threatened Species	0.0	
4.1.2.3 Provincially Significant Animals	50.0	
4.1.2.4 Provincially Significant Plants	95.0	
4.1.2.5 Regionally Significant Species	0.0	
4.1.2.6 Locally Significant Species	0.0	
Total for Species Rarity		145

4.2 SIGNIFICANT FEATURES OR HABITAT

4.2.1 Colonial Waterbirds	0.0	
4.2.2 Winter Cover for Wildlife	10.0	
4.2.3 Waterfowl Staging and Moulting	20.0	
4.2.4 Waterfowl Breeding	10.0	
4.2.5 Migratory Passerine, Shorebird or Raptor Stopover	0.0	
4.2.6 Fish Habitat	15.0	
Total for Significant Features and Habitat		55

4.3 ECOSYSTEM AGE 2

4.4 GREAT LAKES COASTAL WETLANDS 0

Sub Total: 282

TOTAL FOR SPECIAL FEATURES (maximum 250) 250

Southern Ontario Wetland Evaluation, Score Summary — March 1993

Wetlands Manual

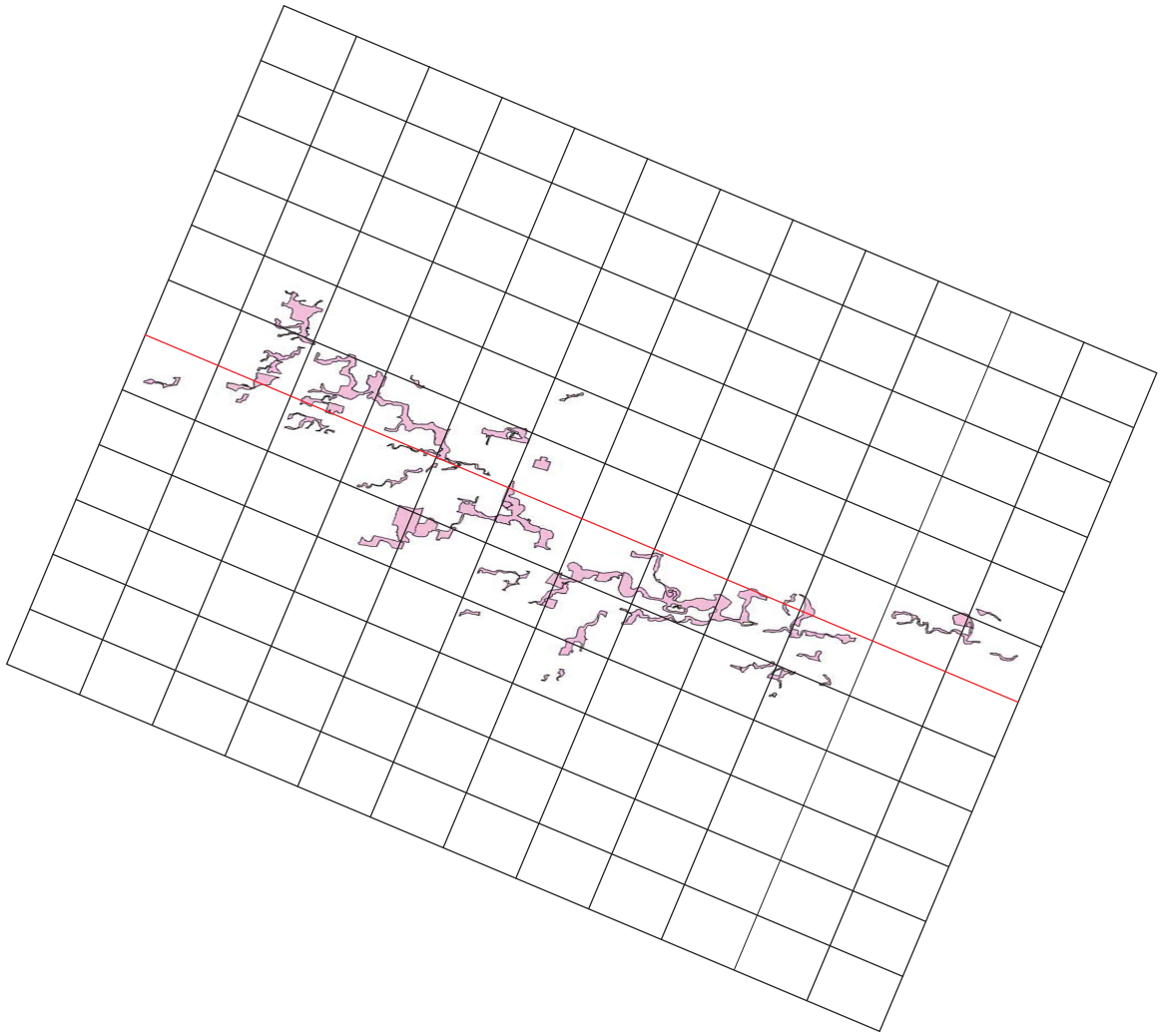
SUMMARY OF EVALUATION RESULT

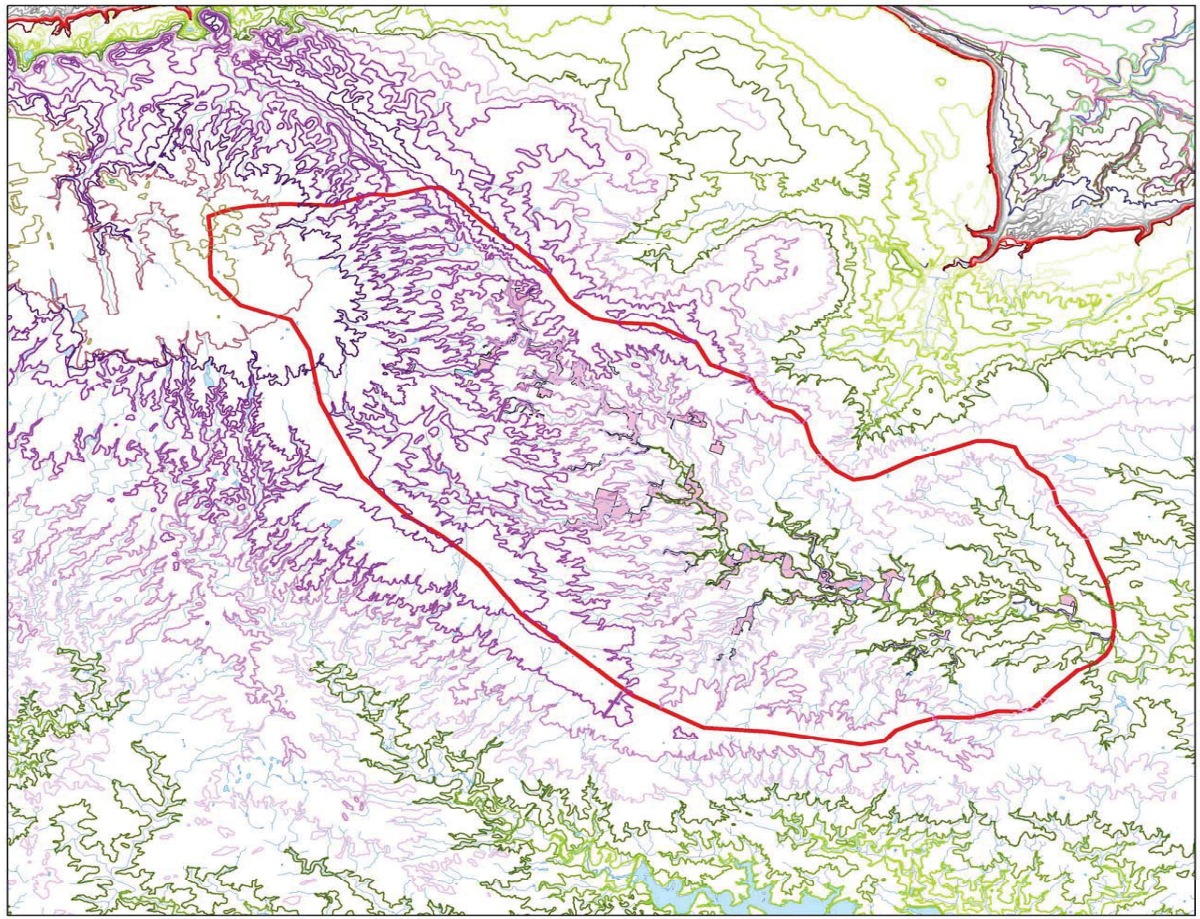
Wetland	Upper 20 Mile Creek Wetland Complex
TOTAL FOR 1.0 BIOLOGICAL COMPONENT	146
TOTAL FOR 2.0 SOCIAL COMPONENT	140
TOTAL FOR 3.0 HYDROLOGICAL COMPONENT	208
TOTAL FOR 4.0 SPECIAL FEATURES COMPONENT	250
WETLAND TOTAL	744

INVESTIGATORS	AFFILIATION
Ron Drabick / Anne Yagi	OMNR 2005
0	0
0	0
0	0
0	0

DATE: May 13, 2005

	Horiz	Vertical	
	7	1	
	14	2	
	27	10	
	20	2	
	7	8	
		6	
		3	
		4	
		4	
		10	
		1	
		4	
		1	
Total	75	56	131





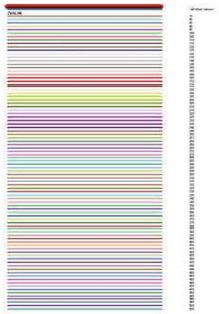
Ontario

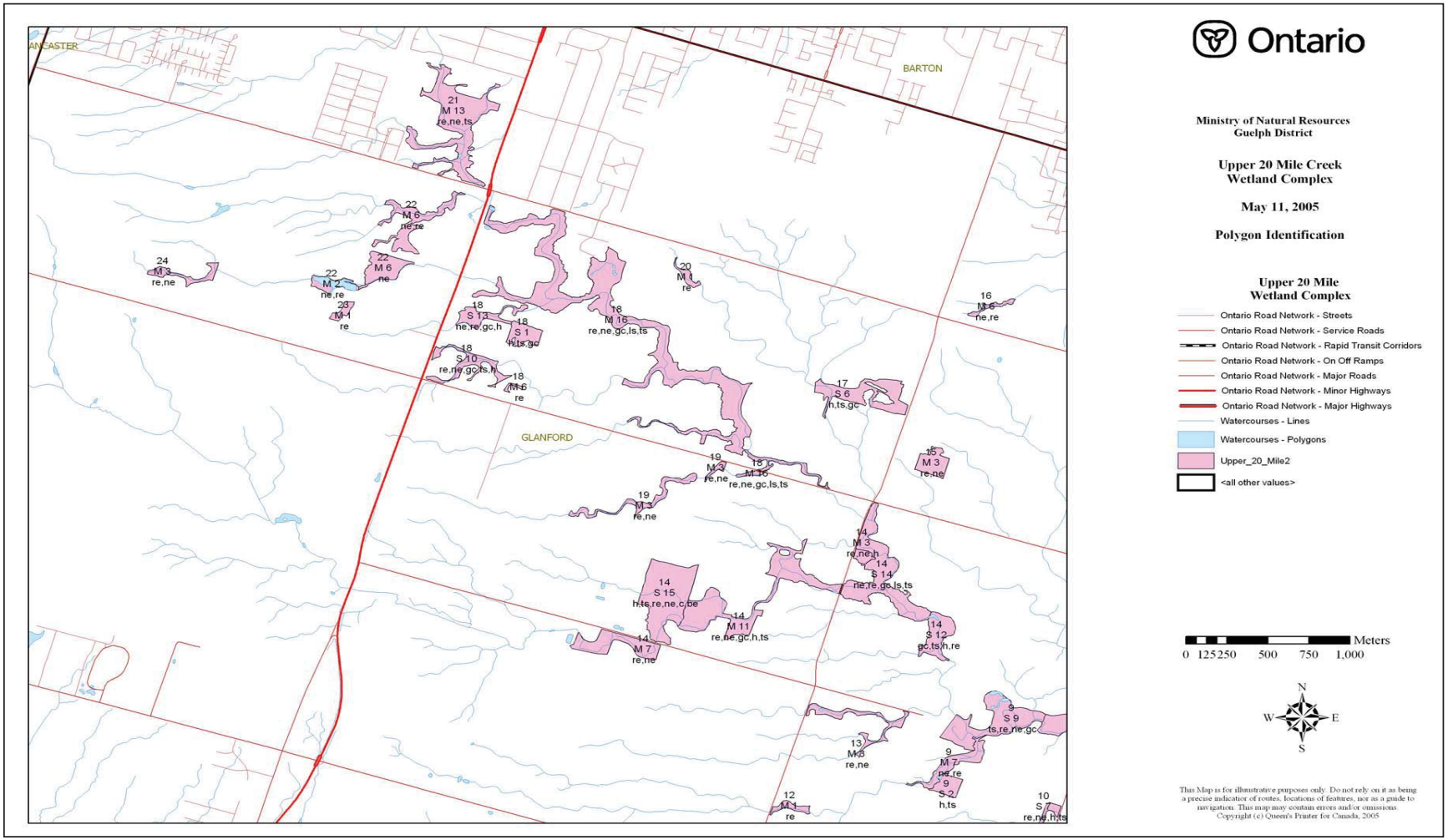
Ministry of Natural Resources
Guelph District

**Upper 20 Mile Creek
Wetland Complex**

May 11, 2005

**Catchment
Catchment Area: 5889.56 ha**

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Ontario
Ministry of Natural Resources
Guelph District
Upper 20 Mile Creek
Wetland Complex
May 11, 2005
Polygon Identification
Upper 20 Mile
Wetland Complex
Ontario Road Network - Streets
Ontario Road Network - Service Roads
Ontario Road Network - Rapid Transit Corridors
Ontario Road Network - On Off Ramps
Ontario Road Network - Major Roads
Ontario Road Network - Minor Highways
Ontario Road Network - Major Highways
Watercourses - Lines
Watercourses - Polygons
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This Map is for illustrative purposes only. Do not rely on it as being a precise indicator of routes, locations of features, nor as a guide to navigation. This map may contain errors and/or omissions.
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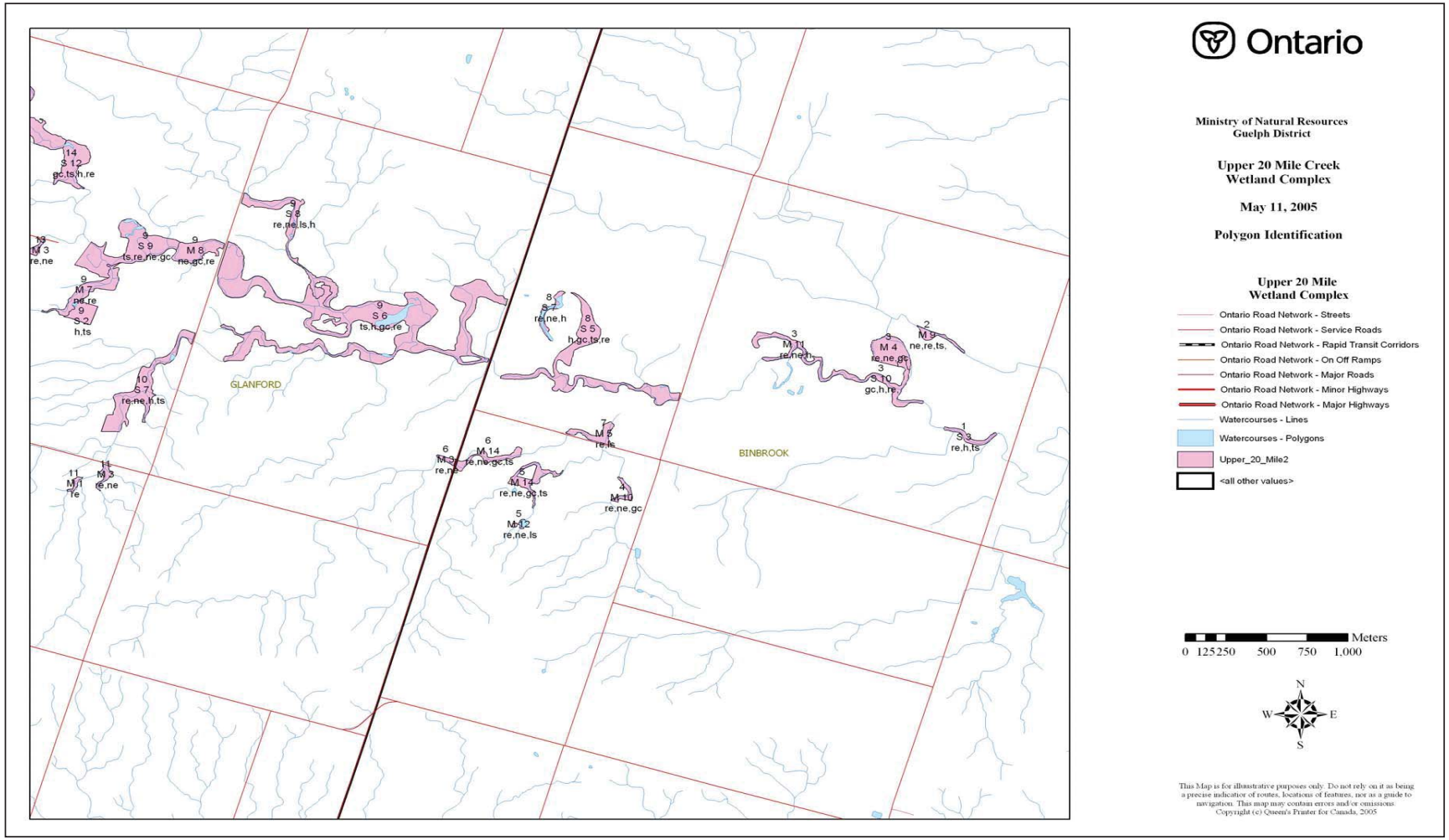

Ontario

Ministry of Natural Resources
Guelph District

Upper 20 Mile Creek Wetland Complex

May 11, 2005

Polygon Identification

Upper 20 Mile Wetland Complex

- Ontario Road Network - Streets
- Ontario Road Network - Service Roads
- Ontario Road Network - Rapid Transit Corridors
- Ontario Road Network - On Off Ramps
- Ontario Road Network - Major Roads
- Ontario Road Network - Minor Highways
- Ontario Road Network - Major Highways
- Watercourses - Lines
- Watercourses - Polygons
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- <all other values>

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Vegetation Communities						
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3	M	4	re,ne,gc	3		
3	M	11	re,ne,h	3		
4	M	10	re,ne,gc	3		
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9	S	2	h,ts	2		
9	M	7	ne,re	2		
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Appendix F

Species at Risk Screening

SAR known to occur in the City of Hamilton

Species At Risk Designations	
ENDANGERED	
THREATENED	
SPECIAL CONCERN	
EXTIRPATED	

AMPHIBIANS		ESA Protection	Key Habitats Used By Species	Notes Specific to Subject Property
Jefferson Salamander (*Ambystoma jeffersonianum*)	Known to Occur	*Species Protection and* ***Habitat Regulation***	inhabit deciduous and mixed deciduous forests with suitable breeding areas which generally consist of ephemeral (temporary) bodies of water that are fed by spring runoff, groundwater, or springs.	No suitable habtiat present on property. No known breeding ponds within 1000m of property.

BIRDS		ESA Protection	Key Habitats Used By Species	Notes Specific to Subject Property
Acadian Flycatcher (*Empidonax virescens*)	Known to Occur	*Species and General Habitat Protection*	generally requires large areas of mature, undisturbed forest; avoids the forest edge; often found in well wooded swamps and ravines	Typical habitat not present on property. Not observed on property.
Bald Eagle (*Haliaeetus leucocephalus*)	Known to Occur	*N/A*	prefers deciduous and mixed-deciduous forest; and habitat close to water bodies such as lakes and rivers; They roost in super canopy trees such as Pine	Typical habitat not present on property. Not observed on property.
Bank Swallow (Riparia riparia)	Known to Occur	*Species and General Habitat Protection June 27, 2014*	It nests in a wide variety of naturally and anthropogenically created vertical banks, which often erode and change over time including aggregate pits and the shores of large lakes and rivers	Typical habitat not present on property. Not observed on property.
Barn Owl (*Tyto alba*)	Known to Occur	*Species Protection and* ***Habitat Regulation***	generally prefer low-elevation, open country; often associated with agricultural lands, especially pasture. Nests are located in buildings, hollow trees and cavities in cliffs.	Typical habitat not present on property. Not observed on property.
Barn Swallow (Hirundo rustica)	Known to Occur	*Species and General Habitat Protection*	prefers farmland; lake/river shorelines; wooded clearings; urban populated areas; rocky cliffs; and wetlands. They nest inside or outside buildings; under bridges and in road culverts; on rock faces and in caves etc.	Typical nesting habitat not present on property. Observed foraging over property. No confirmed nests or nesting structures within 200m of property.
Black Tern (*Childonias niger*)	Known to Occur	*N/A*	generally prefer freshwater marshes and wetlands; nest either on floating material in a marsh or on the ground very close to water	Not observed on property. Typical habitat not present on property.
Bobolink (*Dolichonyx oryzivorus*)	Known to Occur	*Species and General Habitat Protection*	generally prefers open grasslands and hay fields. In migration and in winter uses freshwater marshes and grasslands	Typical habitat not present on property. Observed adjacnet to property only. Possible breeder on adjacent lands.
Canada Warbler (*Cardellina canadensis*; formerly *Wilsonia canadensis*)	Known to Occur	*N/A*	Generally prefers wet coniferous, deceduous and mixed forest types, with a dense shrub layer. Nests on the ground, on logs or hummocks, and uses dense shrub layer to conceal the nest.	Typical habitat not present on property. Not observed on property.
Cerulean Warbler (*Setophaga cerulea;* formerly *Dendoica cerulea*)	Known to Occur	*Species and General Habitat Protection*	generally found in mature deciduous forests with an open understorey; also nests in older, second-growth deciduous forests.	Typical habitat not present on property. Not observed on property.
Chimney Swift (*Chaetura pelagica*)	Known to Occur	*Species and General Habitat Protection*	historically found in deciduous and coniferous, usually wet forest types, all with a welldeveloped, dense shrub layer; now most are found in urban areas in large uncapped chimneys	Typical habitat not present on property. Not observed on property.
Common Nighthawk (*Chordeiles minor*)	Known to Occur	*N/A*	generally prefer open, vegetation-free habitats, including dunes, beaches, recently harvested forests, burnt-over areas, logged areas, rocky outcrops, rocky barrens, grasslands, pastures, peat bogs, marshes, lakeshores, and river banks. This species also inhabits mixed and coniferous forests. Can also be found in urban areas (nest on flat roof-tops)	Typical habitat not present on property. Not observed on property.
Eastern Meadowlark (*Sturnella Magna*)	Known to Occur	*Species and General Habitat Protection*	generally prefers grassy pastures, meadows and hay fields. Nests are always on the ground and usually hidden in or under grass clumps.	Typical habitat not present on property. Observed adjacnet to property only. Possible breeder on adjacent lands.
Eastern Wood-Pewee (*Contopus virens*)	Known to Occur	*N/A*	asscoiated with deciduous and mixed forests. Witin mature and intermediate age stands it prefers areas with little understory vegetation as well as forest clearings and edges.	Typical habitat not present on property. Not observed on property.
Eastern Whip-poor-will (*Caprimlugus vociferus*)	Known to Occur	*Species and General Habitat Protection*	generally prefer semi-open deciduous forests or patchy forests with clearings; areas with little ground cover are also preferred; In winter they occupy primarily mixed woods near open areas.	Typical habitat not present on property. Not observed on property.
Golden-winged Warbler (Vermivora chrysoptera)	Known to Occur	*N/A*	generally prefer areas of early successional vegetation, found primarily on field edges, hydro or utility right-of-ways, or recently logged areas, adjacnet to mature forests.	Typical habitat not present on property. Not observed on property.
Henslow's Sparrow (*Ammodramus henslowii*)	Historically Known to Occur	*Species and General Habitat Protection*	generally found in old fields, pastures and wet meadows. They prefer areas with dense, tall grasses, and thatch, or decaying plant material	Typical habitat not present on property. Not observed on property.
King Rail (*Rallus elegans*)	Known to Occur	*Species and General Habitat Protection*	generally this species requires large marshes with open shallow water that merges with shrubby areas	Typical habitat not present on property. Not observed on property.
Least Bittern (*Ixobrychus exilis*)	Known to Occur	*Species and General Habitat Protection*	generally located near pools of open water in relatively large marshes and swamps that are dominated by cattail and other robust emergent plants	Typical habitat not present on property. Not observed on property.
Louisiana Waterthrush (*Seiurus motacilla*)	Known to Occur	*N/A*	generally inhabits mature forests along steeply sloped ravines adjacent to running water. It prefers clear, cold streams and densely wooded swamps	Typical habitat not present on property. Not observed on property.
Peregrine Falcon (*Falco peregrinus*)	Known to Occur	*N/A*	generally nest on tall, steep cliff ledges adjacent to large waterbodies; some birds adapt to urban environments and nest on ledges of tall buildings, even in densely populated downtown areas.	Typical habitat not present on property. Not observed on property.
Prothonotary Warbler (*Protonotaria citrea*)	Known to Occur	*Species and General Habitat Protection*	generally found in the dead trees of flooded woodlands or deciduous swamp forests; Carolinian zone	Typical habitat not present on property. Not observed on property.
Red-Headed Woodpecker (*Melanerpes erythrocephalus*)	Known to Occur	*N/A*	generally prefer open oak and beech forests, grasslands, forest edges, orchards, pastures, riparian forests, roadsides, urban parks, golf courses, cemeteries, as well as along beaver ponds and brooks	Typical habitat not present on property. Not observed on property.
Short-eared Owl (*Asio flammeus*)	Suspected to Occur	*N/A*	generally prefers a wide variety of open habitats, including grasslands, peat bogs, marshes, sand-sage concentrations, old pastures and agricultural fields	Typical habitat not present on property. Not observed on property.
Wood Thrush (Hylocichla mustelina)	Known to Occur	*N/A*	Nests mainly in second-growth and mature deciduous and mixed forests, with saplings and well-developed understory layers. Prefers large forest mosaics, but may also nest in small forest fragments.	Typical habitat not present on property. Not observed on property.
Yellow-breasted Chat (*Icteria virens*)	Known to Occur	*Species and General Habitat Protection*	generally prefer dense thickets around wood edges, riparian areas, and in overgrown clearings	Potential Habitat Present. Not observed on property.

FISH		ESA Protection	Key Habitats Used By Species	Notes Specific to Subject Property
American Eel (*Anguilla rostrata*)	Known to Occur	*Species and General Habitat Protection*	all fresh water, estuaries and coastal marine waters that are accessible to the Atlantic Ocean; 12-mile creek watershed and Lake Ontario	Not present in watershed.
Grass Pickerel (*Esox americanus vermiculatus*)	Known to Occur	*N/A*	generally occur in wetlands with warm, shallow water and an abundance of aquatic plants; occur in the St. Lawrence River, Lake Ontario, Lake Erie, and Lake Huron	Not known to occur in the area of the property, however suitable habitat present in watercourse and wetland.
Redside Dace (*Clinostomus elongatus*)	Known to Occur	*Species Protection and* ***Habitat Regulation***	generally found in pools and slow-moving areas of small headwater streams with a moderate to high gradien	Not present in watershed.
Silver Shiner (*Notropis photogenis*)	Known to Occur	*Species and General Habitat Protection*	generally prefer moderate to large, deep, relatively clear streams with swift currents, and moderate to high gradients	Not present in watershed.

INSECTS	ESA Protection	Key Habitats Used By Species	Notes Specific to Subject Property

Monarch Butterfly *(Danaus plexippus)*	**Known to Occur**	*N/A*	exist primarily wherever milkweed and wildflowers exist; abandoned farmland, along roadsides, and other open spaces	Not observed on property.
Mottled Duskywing (Erynnis martialis)	**Known to Occur**	*Species and General Habitat Protection June 27, 2014*	generally inhabits a range of grassland, shrubland, and savanna habitats that contain well drained soils and the presence of its host plants Prairie Redroot (Ceanothus herbaceus) or New Jersey Tea (Ceanothus americanus).	Not observed on property.
West Virginia White (Pieris virginiensis)	**Known to Occur**	*N/A*	generally prefer moist, deciduous woodlands. The larvae feed only on the leaves of the two-leaved toothwort (Cardamine diphylla), which is a small, spring-blooming plant of the forest floor.	Not observed on property.
MAMMALS		**ESA Protection**	**Key Habitats Used By Species**	**Notes Specific to Subject Property**
American Badger *(Taxidea taxus jacksoni)*	**Known to Occur**	*Species Protection and* ***Habitat Regulation***	generally prefer open habitats, whether natural (grasslands) or man-made (agricultural fields, road right-of-ways, golf courses)	Not observed on property. No woodchuck burrows observed on property.
Eastern Small-footed Myotis (Myotis leibii)	**Suspected to Occur**	*Species and General Habitat Protection as of June 27, 2014*	Overwintering habitat: Caves and mines that remain above 0 Maternal Roosts: primarily under loose rocks on exposed rock outcrops, crevices and cliffs, and occasionally in buildings, under bridges and highway overpasses and under tree bark.	No overwintering habitat or potential maternal roosts present on property.
Little Brown Myotis (Myotis lucifugus)	**Suspected to Occur**	*Species and General Habitat Protection*	Overwintering habitat: Caves and mines that remain above 0 Maternal Roosts: Often associated with buildings (attics, barns etc.). Occasionally found in trees (25-44 cm dbh).	No overwintering habitat or potential maternal roosts present on property.
Northern Myotis (Myotis septentrionalis)	**Suspected to Occur**	*Species and General Habitat Protection*	Overwintering habitat: Caves and mines that remain above 0 Maternal Roosts: Often asssociated with cavities of large diameter trees (25-44 cm dbh). Occasionally found in structures (attics, barns etc.)	No overwintering habitat or potential maternal roosts present on property.
Woodland Vole *(Microtus pinetorum)*	**Known to Occur**	*N/A*	generally associated with deciduous forests in areas of soft, friable, often sandy soil beneath deep humus, where it can burrow easily.	No suitable habtiat present on property.
MOLLUSCS		ESA Protection	**Key Habitats Used By Species**	**Notes Specific to Subject Property**
Eastern Pondmussel *(Ligumia nasuta)*	**Known to Occur**	*Species and General Habitat Protection*	generally inhabit sheltered areas of lakes or slow streams in substrates of fine sand and mud	Not present in watershed. No mussels observed in watercourse.
Lilliput (Taxolasma parvum)	**Known to Occur**	*Species and General Habitat Protection June 27, 2014*	Found in a variety of habitats including small to large rivers, wetlands, shallows of lakes, ponds and reservoirs. They are common in soft substrates with over 50% of the substrate type comprised of sand and a mud/muck/silt combination. Typically occur with or near Green Sunfish, Bluegill, White Crappie, and Johnny Darter	Not present in watershed. No mussels observed in watercourse.
Rainbow Mussel *(Villosa iris)*	**Known to Occur**	*Species and General Habitat Protection*	most abundant in shallow, well- oxygenated reaches of small- to medium-sized rivers and sometimes lakes, on substrates of cobble, gravel, sand and occasionally mud	Not present in watershed. No mussels observed in watercourse.
MOSSES		ESA Protection	**Key Habitats Used By Species**	**Notes Specific to Subject Property**
PLANTS		ESA Protection	**Key Habitats Used By Species**	**Notes Specific to Subject Property**
American Chestnut *(Castanea dentata)*	**Known to Occur**	*Species and General Habitat Protection*	found in deciduous forest communities; this tree prefers arid forests with acid and sandy soils.	Not observed on property.
American Columbo *(Frasera caroliniensis)*	**Known to Occur**	*Species and General Habitat Protection*	most commonly associated with open deciduous forested slopes, thickets and clearings; grows in a variety of relatively stable habitats as well as on a wide variety of soils	Not observed on property.
American Ginseng *(Panax quinquefolius)*	**Known to Occur**	*Species and General Habitat Protection*	grows in rich, moist, undisturbed and relatively mature deciduous woods in areas of neutral soil (such as over limestone or marble bedrock).	Not observed on property.
Broad Beech Fern *(Phegopteris hexagonoptera)*	**Known to Occur**	*N/A*	generally inhabits shady areas of beech and maple forests where the soil is moist or wet	Not observed on property.
Butternut *(Juglans cinerea)*	**Known to Occur**	*Species and General Habitat Protection*	generally grows in rich, moist, and well-drained soils often found along streams. It may also be found on well-drained gravel sites, especially those made up of limestone. It is also found, though seldomly, on dry, rocky and sterile soils. In Ontario, the Butternut generally grows alone or in small groups in deciduous forests as well as in hedgerows	Not observed on property.
Eastern Flowering Dogwood *(Cornus florida)*	**Known to Occur**	*Species Protection and* ***Habitat Regulation***	generally grows in deciduous and mixed forests, in the drier areas of its habitat, although it is occasionally found in slightly moist environments; Also grows around edges and hedgerows	Not observed on property.
Few-flowered Club-rush *(Trichophorum planifolium)*	**Known to Occur**	*Species Protection and* ***Habitat Regulation***	generally found in Dry Fresh Oak deciduous forests and Dry Fresh Oak-Maple-Hickory deciduous forests (only found on RBG property)	Not observed on property.
Green Dragon *(Arisaema dracontium)*	**Known to Occur**	*N/A*	generally grows in damp deciduous forests and along streams.	Not observed on property.
Hoary Mountain Mint (*Pycnanthemum incanum*)	**Known to Occur**	*Species and General Habitat Protection*	Oak savannas and prairies	Not observed on property.
Red Mulberry *(Morus rubra)*	**Known to Occur**	*Species and General Habitat Protection*	generally grows in moist forest habitats. In Ontario, these include slopes and ravines of the Niagara Escarpment, and sand spits and bottom lands; Can grow in open areas such as hydro corridors	Not observed on property.
Spotted Wintergreen *(Chimaphila maculata)*	**Historically Known to Occur**	*Species and General Habitat Protection*	generally grow in sandy habitats in dry-mesic oak-pine woods. In Canada, they grow very close to the Great Lakes	Not observed on property.
White Wood Aster *(Eurybia divaricata)*	**Known to Occur**	*Species and General Habitat Protection*	generally grows in open, dry, deciduous forests. It has been suggested that it may benefit from some disturbance, as it often grows along trails.	Not observed on property.
REPTILES		ESA Protection	**Key Habitats Used By Species**	**Notes Specific to Subject Property**
Blanding's Turtle *(Emydonidea blandingii)*	**Known to Occur**	*Species and General Habitat Protection*	generally occur in freshwater lakes, permanent or temporary pools, slow-flowing streams, marshes and swamps. They prefer shallow water that is rich in nutrients, organic soil and dense vegetation. Adults are generally found in open or partially vegetated sites, and juveniles prefer areas that contain thick aquatic vegetation including sphagnum, water lilies and algae. They dig their nest in a variety of loose substrates, including sand, organic soil, gravel and cobblestone. Overwintering occurs in permanent pools that average about one metre in depth, or in slow-flowing streams.	Suitable habitat not present on property. Not observed on property.
Eastern Hog-nosed Snake *(Heterodon platirhinos)*	**Historically Known to Occur and May Still Occur**	*Species and General Habitat Protection*	generally prefer habitats with sandy, well-drained soil and open vegetative cover, such as open woods, brushland, fields, forest edges and disturbed sites. The species is often found near water.	Suitable habitat not present on property. Not observed on property.
Eastern Ribbonsnake *(Thamnophis sauritus)*	**Known to Occur**	*N/A*	generally occur along the edges of shallow ponds, streams, marshes, swamps, or bogs bordered by dense vegetation that provides cover. Abundant exposure to sunlight is also required, and adjacent upland areas may be used for nesting.	Suitable habitat not present on property. Not observed on property.
Milksnake *(Lampropeltis triangulum)*	**Known to Occur**	*N/A*	generally occur in rural areas, where it is most frequently reported in and around buildings, especially old structures. It is also found in a wide variety of habitats, from prairies, pastures, and hayfields, to rocky hillsides and a wide variety of forest types. They must also be in proximity of water, and suitable locations for basking and egg-laying.	Suitable habitat present on property. Not observed on property.

Northern Map Turtle *(Graptemys geographica)*	**Known to Occur**	*N/A*	generally inhabits both lakes and rivers, showing a preference for slow moving currents, muddy bottoms, and abundant aquatic vegetation. These turtles need suitable basking sites (such as rocks and logs) and exposure to the sun for at least part of the day.	Suitable habitat not present on property. Not observed on property.
Snapping Turtle *(Chelydra serpentina)*	**Known to Occur**	*N/A*	generally inhabit shallow waters where they can hide under the soft mud and leaf litter. Nesting sites usually occur on gravely or sandy areas along streams. Snapping Turtles often take advantage of man-made structures for nest sites, including roads (especially gravel shoulders), dams and aggregate pits.	Suitable habitat not present on property. Not observed on property.
Spiny Softshell *(Apalone spinifera)*	**Known to Occur**	*Species and General Habitat Protection*	generally prefer marshy creeks, swift-flowing rivers, lakes, impoundments, bays, marshy lagoons, ditches and ponds near rivers	Suitable habitat not present on property. Not observed on property.
Table mofified from MNRF 2014.				

Appendix G

Stormwater Management Plan prepared by S. Llewellyn & Associates Limited

S. LLEWELLYN & ASSOCIATES LIMITED
CONSULTING ENGINEERS

Stormwater Management Report

LIVING WORD CHRISTIAN FELLOWSHIP

2060 UPPER JAMES STREET

CITY OF HAMILTON

McCALLUM SATHER ARCHITECTS INC.

Revised January 2015
September 2014

SLA File # 14008

3228 South Service Road, Suite 105, East Wing Burlington, Ontario L7N 3H8
Tel. (905) 631-6978 Fax (905) 631-8927

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APPENDICES

1.0 INTRODUCTION AND BACKGROUND

1.1 Overview

S. Llewellyn & Associates Limited has been retained by McCallum Sather Architects Inc. to provide consulting engineering services for the proposed Community Centre development at 2060 Upper James Street, in the City of Hamilton (see Figure 1.0 for location plan). This report will outline a stormwater management strategy for the proposed development.

The proposed development consists of constructing a 2386m^2 community centre with associated asphalt driveway/parking lots, concrete curb/sidewalk, and landscaped areas.

This Stormwater Management Report will provide detailed information of the proposed SWM servicing scheme for the development. Please refer to the site engineering plans prepared by S. Llewellyn and Associates Limited and the site plan prepared by McCallum Sather Architects Inc. for additional information.

1.2 Background Information

The following documents were referenced in the preparation of this report:

Ref. 1: MOE Stormwater Management Practices Planning and Design Manual (Ministry of Environment, March 2003)

Ref. 2: Engineering Guidelines for Land Under Development Applications (City of Hamilton, December 2012)

Ref. 3: City of Hamilton Criteria and Guidelines for Stormwater Management Infrastructure (September 2007)

Ref. 4: City of Hamilton Storm Drainage Policy (2004)

Ref. 5: Twenty Mile Creek Watershed Plan (Niagara Peninsula Conservation Authority, 2006)

Ref. 6: City of Hamilton Airport Employment Growth District Subwatershed Study and Stormwater Master Plan (Dillon Consulting Ltd / Aquafor Beech Ltd., June 2011)

Ref. 7: Low Impact Development Stormwater Management Planning and Design Guide (Credit Valley Conservation Authority / Toronto and Region Conservation Authority, 2010)

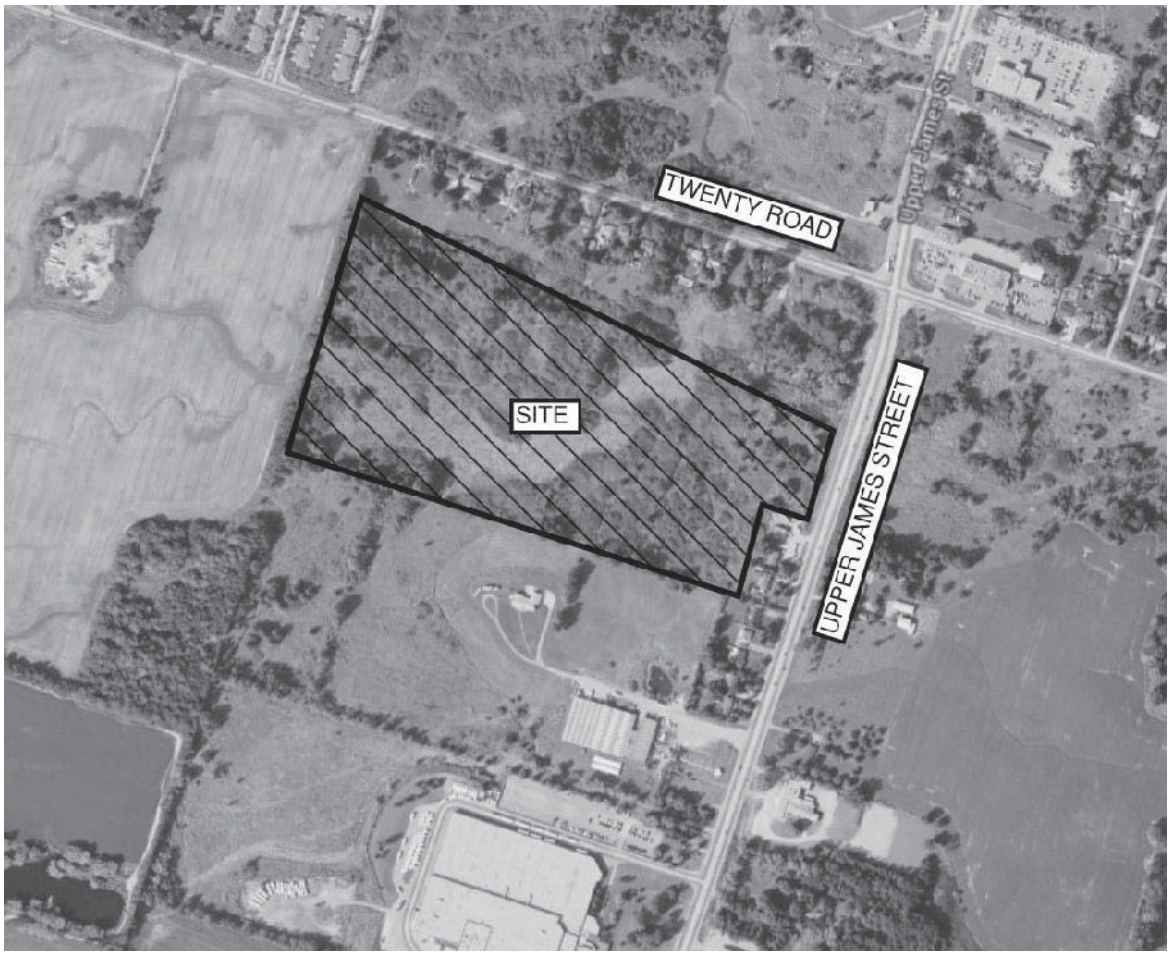


Figure 1.0 – Location Plan

2.0 STORMWATER MANAGEMENT CRITERIA

Based on criteria from the City of Hamilton and the Niagara Peninsula Conservation Authority, the following stormwater management (SWM) criteria will be applied to the site:

Quantity Control
The peak runoff of stormwater from the proposed condition site will be controlled to the respective existing condition peak runoff or less for all storm events up to and including the 100-year storm.

Quality Control
The stormwater runoff from the proposed condition site must meet Level 2 (Normal) stormwater quality control (70% TSS removal).

Low-Impact Development
As part of the Airport Employment Growth District, the subject site is required to implement low-impact development measures as per the City of Hamilton AEGD Stormwater Master Plan (Ref 6).

Erosion Control
Erosion and sediment control measures will be implemented in accordance with the standards of the City of Hamilton.

3.0 EXISTING CONDITIONS

The subject site is 13.7 hectares in area, but the proposed development is confined to a 2.30 hectare development area. For the purposes of this report, only the 2.30 hectare development area will be considered, as no changes will be made outside of this area.

In the existing condition, the 2.30 hectare development area is completely vegetated. The area is bounded by Upper James Street to the east, a hydro easement to the north, residential and commercial lands to the south, and provincially significant wetlands to the west. The development area generally slopes northwest to the provincially significant wetland, which traverses the property. This wetland is part of the Twenty Mile Creek watershed and is regulated by the Niagara Peninsula Conservation Authority.

One catchment area, Catchment 101, has been identified in the existing condition. Catchment 101 represents the existing condition discharge for the 2.30 hectare development area. See Table 3.1 below and the Existing Condition Drainage Area Plan in Appendix A for details.

Table 3.1 – Existing Conditions Catchment Areas

Catchment ID	Description	Area (ha)	Percent Impervious
101	Development Area	2.30	0%

An analysis was performed on Catchment 101 using the SWMHYMO hydrologic modeling program developed by J.F. Sabourin & Associates for the 2-year to 100-year City of Hamilton Mount Hope design storms. A summary of the results can be found in the Table 3.2 and detailed SWMHYMO input/output information can be found in Appendix B.

Table 3.2 – Existing Condition Site Discharge

Storm Event	Catchment 101 Discharge (m^3/s)
2-Yr Event	0.058
5-Yr Event	0.145
10-Yr Event	0.190
25-Yr Event	0.274
50-Yr Event	0.339
100-Yr Event	0.411

This analysis determined the following:

- These existing condition discharge rates cannot be exceeded in the proposed condition for all storms up to and including the 100-year storm..

4.0 PROPOSED CONDITIONS

It is proposed to develop the site by constructing a 2386m^2 community centre with associated asphalt driveway/parking lots, concrete curb/sidewalk, and landscaped areas. It is proposed to service the site with a series of enhanced flat-bottom swales and storm sewers, designed and constructed in accordance with City of Hamilton standards.

Two catchment areas, Catchment 201 and 202 have been identified in the proposed condition. Catchment 201 represents the northeast portion of the development area. Drainage from Catchment 201 will be collected by an enhanced flat-bottom swale and discharged to the existing roadside ditch adjacent to Upper James Street, which ultimately discharges to the Twenty Mile Creek watershed.

Catchment 202 represents the majority of the development area. Drainage from Catchment 202 will be captured by enhanced flat-bottom swales and be routed through the stormwater management controls before being discharged to the existing Provincially

Significant Wetland to the northwest of the development area. See Table 4.1 below and the Proposed Condition Drainage Area Plan in Appendix A for details.

Table 4.1 – Proposed Condition Catchment Areas

Catchment ID	Description	Area (ha)	% Imp.
201	Drainage to roadside ditch	0.47	54
202	Drainage to wetlands	1.83	64
	Total	2.30	62

4.1 Water Quantity Control

It is proposed to apply quantity control measures to the runoff from Catchment 202. To achieve the required control while reducing the amount of stormwater storage required, a two-stage control system has been proposed for this development.

Discharge from Catchment 202 will outlet to the proposed Dry Pond located to the west of the proposed parking lot. Two outlets complete with orifice plates will be constructed at specific elevations in the Dry Pond to allow controlled discharge from the pond to the wetland. See Site Servicing Plan for details.

With the installation of the quantity control measures for Catchment 202, it will be required to provide stormwater storage during storm events. Stormwater storage will be provided entirely within the proposed Dry Pond to avoid nuisance ponding in the swales and parking lot. Table 4.2 below shows the stage-storage-discharge characteristics for the site. See the Stage-Storage-Discharge Calculations in Appendix A for details.

Table 4.2 – Proposed Condition Stage-Storage-Discharge

Elevation (m)	Storage (m^3)	Discharge (m^3/s)
219.03 (Orifice Plate)	0	0
219.10 (Bottom of Pond)	0	0.0021
219.35 (0.25m Deep)	19	0.0062
219.60 (0.5m Deep)	105	0.0086
219.85 (0.75m Deep)	207	0.0104
220.10 (1.0m Deep)	328	0.0119
220.35 (1.25m Deep)	469	0.1032
220.60 (1.5m Deep)	632	0.1137
220.85 (Emergency Spill Level)	817	0.1232
221.10 (Top of Pond)	1026	0.1321

An analysis was performed on the Proposed Condition site using the SWMHYMO hydrologic modeling program for the 2-year to 100-year City of Hamilton Mount Hope design storms. A summary of the results can be found in the Table 4.3 and detailed SWMHYMO input/output information can be found in Appendix B.

Table 4.3 – Proposed Condition Site Discharge

Event	Uncontrolled Discharge (Catchment 201) (m^3/s)	Controlled Discharge (Catchment 202) (m^3/s)	Total Discharge (m^3/s)	Allowable Discharge (Catchment 101) (m^3/s)	Percent Differential (%)	Required Storage (m^3)
2-Yr Event	0.054	0.012	0.063	0.058	+ 9%	315
5-Yr Event	0.088	0.059	0.100	0.145	- 31%	401
10-Yr Event	0.100	0.092	0.124	0.190	- 35%	452
25-Yr Event	0.125	0.108	0.179	0.274	- 35%	549
50-Yr Event	0.146	0.114	0.237	0.339	- 30%	633
100-Yr Event	0.166	0.119	0.271	0.411	- 34%	735

This analysis determined the following:

- The proposed condition discharge rates will not exceed the allowable discharge rates for the 5-year to 100-year design storms. The proposed condition provides a minimum 30% reduction in flow rate from site during these storm events.

- The proposed condition discharge rate during the 2-year design storm will be 9% greater than the existing condition. We consider this minimal increase negligible and propose the City and Conservation Authority allow this slight increase in discharge rate during this storm event, as this increase in discharge poses no significant flooding threat to the receiving wetland and the larger storm events are controlled significantly lower than required. Also, due to the extensive network of proposed swales, infiltration will further reduce the 2-year flow rate.

- The installation of the two-stage quantity control measures at the outlet from the proposed Dry Pond will provide effective quantity control for the site.

- Sufficient stormwater storage is provided on site. $735m^3$ of storage is required during the 100-year storm event, while $817m^3$ is provided via Dry Pond storage. The 100-year ponding elevation within the Dry Pond is 220.74.

4.2 Water Quality Control

The proposed development is required to achieve a "Normal" (70% TSS removal) level of water quality protection, as per Niagara Peninsula Conservation Authority requirements. To achieve this criteria, drainage from the impervious surfaces of the site will be directed to enhanced flat-bottom swales, used as storm conveyance systems throughout the site. These enhanced flat-bottom swales will provide the first stage of quality control, as the shallow slope and vegetation throughout the swales will slow down the water to promote sedimentation and infiltration. These enhanced flat-bottom swales have been incorporated into both Catchment 201 and 202 to provide quality control. Based on the Low-Impact Development Stormwater Management Planning and Design Guide (Ref 7), enhanced grass swales achieve median TSS removal rates of 76%.

In addition to the treatment via the enhanced flat-bottom swales, drainage from Catchment 202 will be subject to control via a Hydroguard oil/grit separator, before ultimately discharging to the wetland. The Hydroguard Hydroworks software was used to determine the required size of Hydroguard unit for the site. It was determined that a Hydroguard HG4 will provide 87% TSS removal and treat 99% of the average annual runoff from Catchment 202, which satisfies the "Enhanced" level for quality control, above and beyond the required "Normal" level. See Hydroguard unit sizing in Appendix C for details.

Hydroguard units require regular inspection and maintenance as per the manufacturer's specifications to ensure the unit operates properly. See Hydroguard Maintenance Manual in Appendix C for details.

5.0 Low-Impact Development (LID)

Based on the City of Hamilton Airport Employment Growth District Stormwater Master Plan (Ref. 6), low-impact development (LID) measures are required to be incorporated into the stormwater management scheme for the proposed development. As per "Chapter 3.0 – Recommended Stormwater Plan" of the AEGD SWP (Ref 6), it is encouraged to provide a stormwater management scheme which incorporates LID source controls, LID conveyance controls, and end-of-pipe dry pond facilities in a treatment train approach to providing stormwater management.

LID Source Controls

The following LID source controls have been incorporated into the proposed development to provide increased infiltration, reduce runoff and promote water balance:

Roof Downspout Disconnection

Disconnection of roof downspouts is a simple and cost-effective LID practice that promotes increased infiltration by directing roof discharge to pervious ground surfaces, rather than direct connection to storm sewers or discharge to impervious surfaces.

The flat roof of the proposed community centre drains internally via roof drains to a 300mmø storm sewer. To provide downspout disconnection, the 300mmø storm sewer is proposed to outlet to the enhanced flat-bottom swale adjacent to the building. Redirecting

the drainage to the enhanced swale rather than a direct connection method will increase the opportunity for infiltration on the site, which will ultimately improve water balance and water quality control characteristics of the stormwater management scheme.

Permeable Pavement

Permeable pavements offer the opportunity to incorporate an LID practice into an impervious area of a development. The pavements; either permeable interlocking pavers, plastic or concrete grid systems, pervious concrete, or porous asphalt, allow stormwater to drain through the pavement to an underlying stone reservoir and infiltrate into the soil.

Permeable interlocking concrete pavers have been proposed throughout the site as an alternative to typical impervious surfaces for approximately 1300m^2 of sidewalks, patios, and crosswalks. Providing these permeable paver sections will offer additional opportunities for infiltration of stormwater on the subject site, which will improved the water balance and water quality control characteristics of the stormwater management scheme.

LID Conveyance Controls

The following LID conveyance controls have been incorporated into the proposed development as an alternative to traditional stormwater conveyance, such as storm sewers or curb and gutter systems. These measures provide conveyance of stormwater, while also providing an opportunity for infiltration. These measures will reduce runoff, improve water quality control and promote water balance.

Enhanced Flat-Bottom Swales

Also referred to as “Enhanced Grass Swales” or “Enhanced Vegetated Swales”, this LID technique consists of providing a grassed or vegetated ditch, which has been designed with shallow longitudinal slope and modified geometry to provide and promote infiltration.

Three enhanced flat-bottom swales, with a combined length of approximately 320m, have been proposed throughout the site. These enhanced swales are proposed at a longitudinal slope between 1% and 2% and will be landscaped with un-manicured grasses to reduce flow rate through the swale. The site has been graded to provide sheet drainage from the entire parking lot to the enhanced grass swales. Draining the flows from the impervious surfaces of the site to the enhanced swales will improve the water quality of the runoff by providing sedimentation and infiltration.

End-of-Pipe Controls

The following are traditional SWM techniques incorporated at the stormwater outlet of Catchment 202 to address quantity and quality control requirements for the development.

Dry Pond

A dry pond facility is proposed at the west side of the proposed parking lot to provide stormwater storage for the proposed development during all storm events up to and including the 100-year event. The dry pond has been designed to have a capacity of 817m^3, while only 735m^3 of storage is required during the 100-year event. See Chapter 4.1 for details.

Oil/Grit Separator

To provide further quality control and ensure the discharge to the existing wetland is controlled to a minimum 70% TSS removal, a Hydroguard oil/grit separator has been proposed at the stormwater outlet. The Hydroguard Hydroworks software was used to determine the required size of Hydroguard unit for the site. It was determined that a Hydroguard HG4 will provide 87% TSS removal and treat 99% of the average annual runoff from Catchment 202, which satisfies the "Enhanced" level for quality control. See Chapter 4.2 for details.

Summary

The following is a summary of the proposed LID techniques proposed throughout the site:

Table 5.1 – Proposed Low-Impact Development Techniques

Control Type	LID Technique
LID Source Control	• Downspout Disconnection • Permeable Pavement
LID Conveyance Control	• Enhanced Flat-Bottom Swales
End-of-Pipe Control	• Dry Pond • Oil/Grit Separator

Based on the proposed LID source controls, LID conveyance controls, and end-of-pipe controls mentioned above, the proposed stormwater management scheme meets the requirements set out by the City of Hamilton AEGD Stormwater Master Plan (Ref. 6) to provide an LID treatment train approach to providing quantity control and quality control requirements for the development. See engineering plans for location of LID controls.

6.0 SEDIMENT AND EROSION CONTROL

In order to minimize erosion during the grading and site servicing period of construction, the following measures will be implemented:

- Install silt fencing along the outer boundary of the site to ensure that sediment does not migrate to the adjacent properties;
- Install sediment control (silt sacks) in the proposed catchbasins as well as the nearby existing catchbasins to ensure that no untreated runoff enters the existing conveyance system
- Stabilize all disturbed or landscaped areas with hydro seeding/sodding to minimize the opportunity for erosion.

To ensure and document the effectiveness of the erosion and sediment control structures, an appropriate inspection and maintenance program is necessary.

The program will include the following activities:

- Inspection of the erosion and sediment controls (e.g. silt fences, sediment traps, outlets, vegetation, etc.); and
- The developer and/or his contractor shall be responsible for any costs incurred during the remediation of problem areas.

For details on the proposed erosion and sediment control for the proposed site, see the Grading and Erosion Control Plan included in the engineering drawings.

7.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the information provided herein, it is concluded that the development of the proposed community centre can be constructed to meet the requirements of the City of Hamilton and Niagara Peninsula Conservation Authority. Therefore, it is recommended that:

- The development be graded and serviced in accordance with the Grading & Erosion Control Plan and the Site Servicing Plan by S. Llewellyn & Associates Limited;

- The two-stage orifice plate quantity control measures be installed as per this report and the Site Servicing Plan to provide the required stormwater quantity control;

- The proposed Dry Pond be graded as per the Grading & Erosion Control Plan to provide the required stormwater storage during storm events;

- Enhanced flat-bottom swales and a Hydroguard HG4 oil/grit separator be installed as per the Grading & Erosion Control Plan, Site Servicing Plan and this report to provide effective stormwater quality control;

- The proposed LID source controls, LID conveyance controls, and end-of-pipe controls be installed as per the engineering plans and this report to meet the requirements set out by the City of Hamilton AEGD Stormwater Master Plan (Ref. 6) to provide an LID treatment train approach to providing quantity control and quality control requirements for the development.

- Erosion and sediment controls be installed as described in this report and shown on the Grading & Erosion Control Plan prepared by S. Llewellyn & Associates Limited;

- The proposed stormwater management plan presented in this report and the drainage works shown on the site engineering plans be accepted in support of the site plan approval process.

We trust the information enclosed herein is satisfactory. Should you have any questions please do not hesitate to contact our office.

Prepared by:

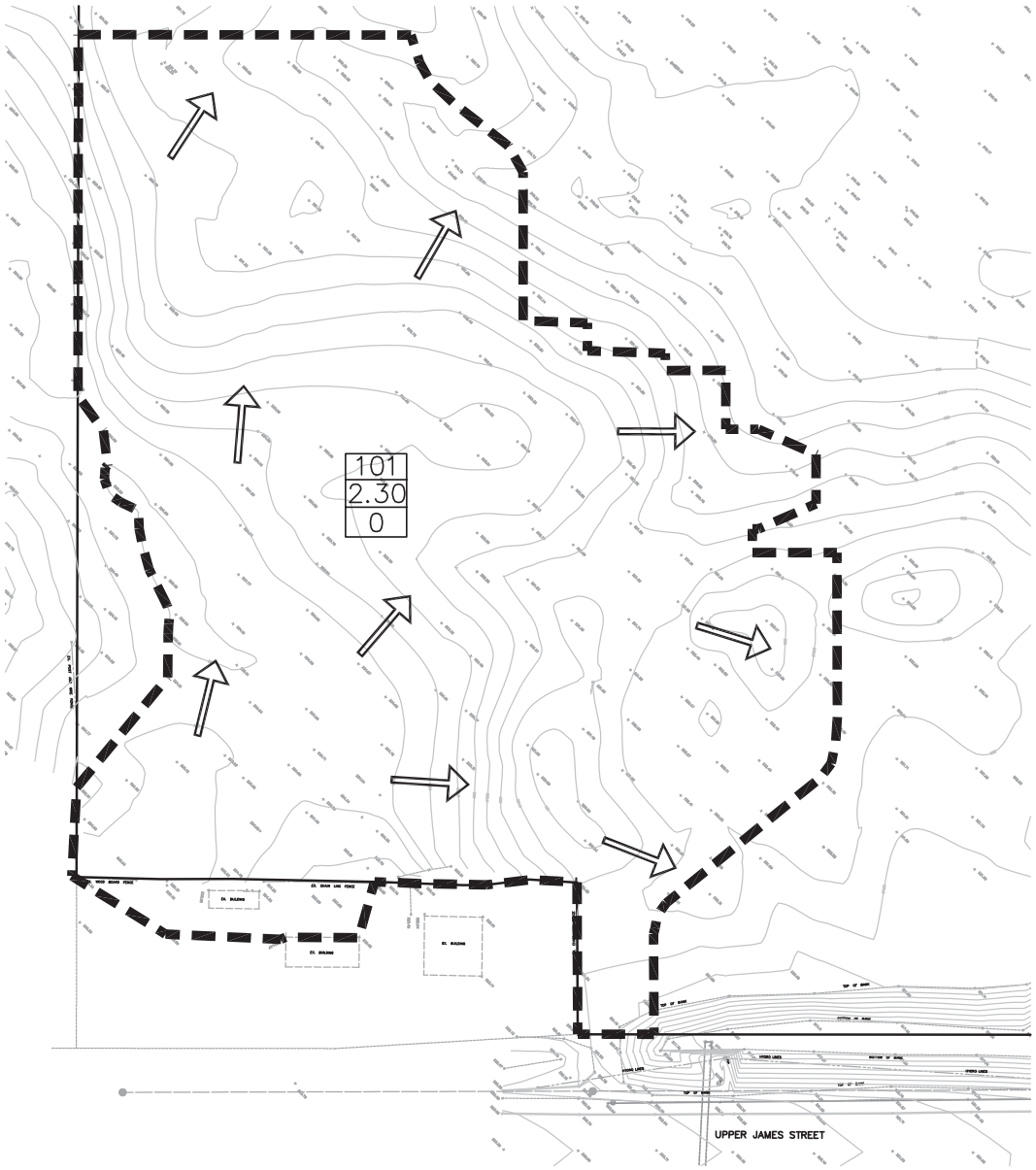
S. LLEWELLYN & ASSOCIATES LIMITED

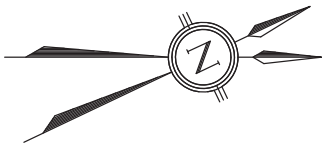
J. Clarke, Dipl.T.

S. Frankovich, P.Eng.

APPENDIX A

STORMWATER MANAGEMENT INFORMATION





LEGEND

102 1.21 90	CATCHMENT ID AREA (HA) % IMPERVIOUS
	CATCHMENT BOUNDARY
	EX. DIRECTION OF DRAINAGE

EXISTING CONDITION
DRAINAGE AREA PLAN

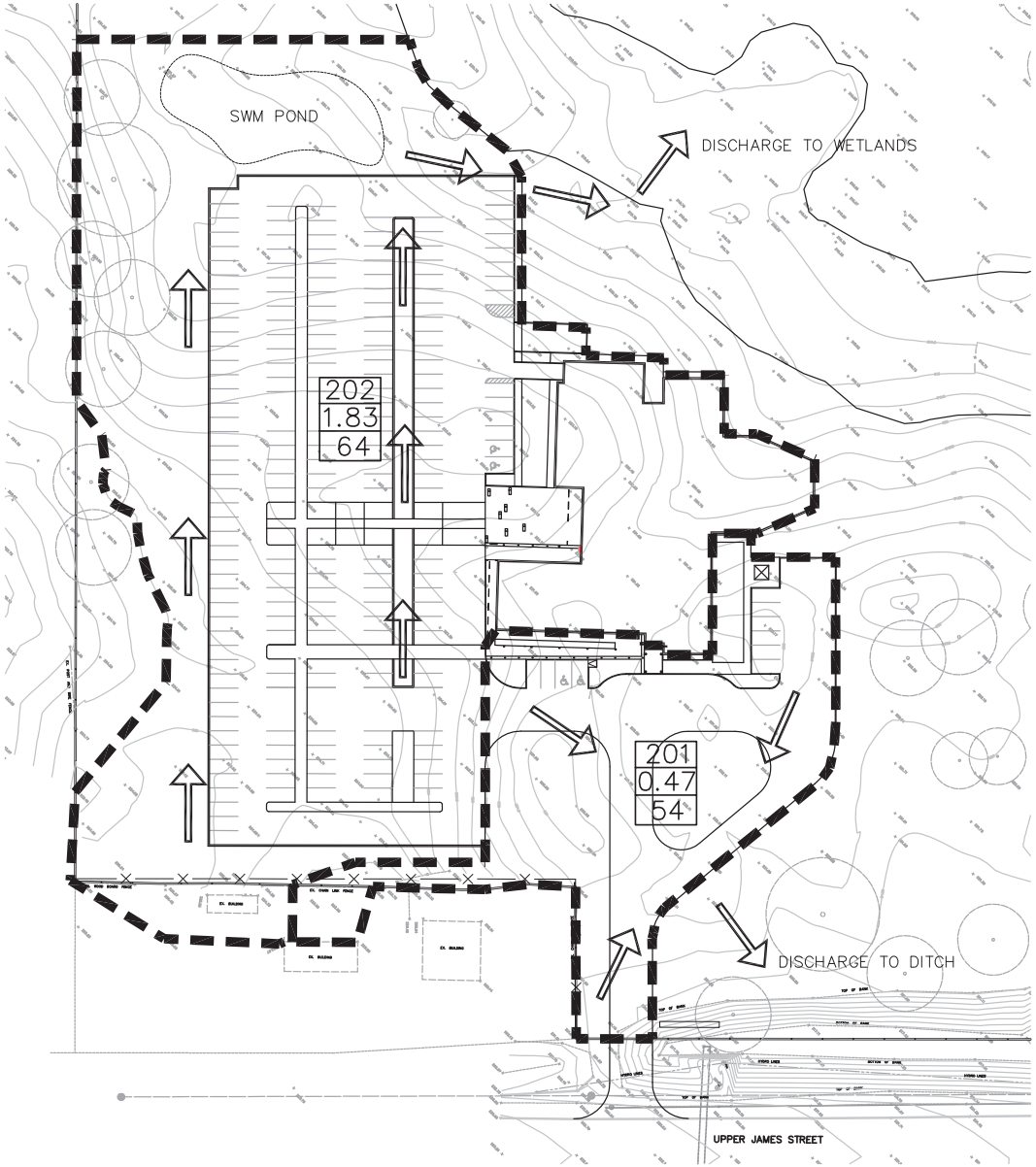
SCALE: 1:1000

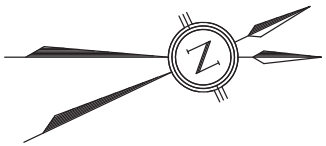
PROJECT: LIVING WORD CHRISTIAN FELLOWSHIP
PROJECT No.: 14008

S. LLEWELLYN & ASSOCIATES LIMITED
CONSULTING ENGINEERS

Tel. (905) 631-6978
Fax (905) 631-8927
email: info@sla.on.ca

3228 South Service Road, Suite #105 East Wing, Burlington, Ont., L7N 3H8





LEGEND

102	CATCHMENT ID
1.21	AREA (HA)
90	% IMPERVIOUS
	CATCHMENT BOUNDARY
	PROP. DIRECTION OF DRAINAGE

PROPOSED CONDITION
DRAINAGE AREA PLAN

SCALE: 1:1000

PROJECT: LIVING WORD CHRISTIAN FELLOWSHIP
PROJECT No.: 14008

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Living Word Christian Fellowship
City of Hamilton

S. LLEWELLYN & ASSOCIATES LIMITED
CONSULTING ENGINEERS

STAGE-STORAGE-DISCHARGE CALCULATIONS

Outlet Device No. 1 (Quantity)

Type:	Circular Orifice
Diameter (mm)	75
Area (m^2)	0.00442
Invert Elev. (m)	219.03
C/L Elev. (m)	219.07
Disch. Coeff. (C_d)	0.6
Discharge (Q) =	$C_d A (2 g H)^{0.5}$
Number of Orifices:	1

Outlet Device No. 2 (Quantity)

Type:	Circular Orifice
Diameter (mm)	200
Area (m^2)	0.03142
Invert Elev. (m)	219.09
C/L Elev. (m)	219.19
Disch. Coeff. (C_d)	0.6
Discharge (Q) =	$C_d A (2 g H)^{0.5}$
Number of Orifices:	1
Spill into structure at elev. (m)	

Outlet Device No. 3

Type:	N/A
Diameter (mm)	0
Area (m^2)	0.00000
Invert Elev. (m)	0.00
C/L Elev. (m)	0.00
Disch. Coeff. (C_d)	0
Discharge (Q) =	0
Number of Orifices:	0

Outlet No. 4 (Quantity)

Type:	N/A
Sill Elevation (m)	0.00
Length (m)	0.0
Discharge (Q) =	$1.67 L H^{1.5}$

		SWM Pond Volumes				Outlet No. 1		Outlet No. 2		Outlet No. 3		Outlet No. 4		
	Elevation m	Area m^2	Incremental Volume m^3	Cumulative Volume m^3	Active Storage Volume m^3	H m	Discharge m^3/s	H m	Discharge m^3/s	H m	Discharge m^3/s	H m	Discharge m^3/s	Total Discharge m^3/s
Orifice Invert	219.03	257	0	0	0	0.000	0.0000							0.0000
Bottom of Pond	219.10	320	0	0	0	0.032	0.0021							0.0021
0.25 deep	219.35	320	19	19	19	0.282	0.0062							0.0062
0.5 deep	219.60	369	86	105	105	0.532	0.0086							0.0086
0.75 deep	219.85	444	102	207	207	0.782	0.0104							0.0104
1 deep	220.10	524	121	328	328	1.033	0.0119							0.0119
1.25 deep	220.35	609	142	469	469	1.283	0.0133	1.16	0.0899					0.1032
1.5 deep	220.60	689	162	632	632	1.533	0.0145	1.41	0.0991					0.1137
1.75 deep	220.85	791	185	817	817	1.783	0.0157	1.66	0.1076					0.1232
Top of Pond	221.10	880	209	1026	1026	2.033	0.0167	1.91	0.1154					0.1321

APPENDIX B

SWMHYMO INPUT/OUTPUT INFORMATION

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00004> *#               HAMILTON, ONTARIO
00005> *#  JOB NUMBER  : 14008
00006> *#       Date   : AUGUST 2014
00007> *#    Revised   :
00008> *#    Company   : S. LLEWELLYN AND ASSOCIATES LTD.
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00031> *#
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00014>  *********     based on the principles of HYMO and its successors      *********
00015>  *********                  OTTHYMO-83 and OTTHYMO-89.                  *********
00016>  ********************************************************************************
00017>  ********* Distributed by:  J.F. Sabourin and Associates Inc.          *********
00018>  *********                  Ottawa,  Ontario: (613) 836-3884           *********
00019>  *********                  Gatineau, Quebec: (819) 243-6858           *********
00020>  *********                  E-Mail: swmhymo@jfsa.Com                   *********
00021>  ********************************************************************************
00022>
00023>  +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
00024>  +++++++++ Licensed user: S. Llewellyn & Associates Ltd                +++++++++
00025>  +++++++++                Burlington           SERIAL#:3902680        +++++++++
00026>  +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
00027>
00028>  ********************************************************************************
00029>  *********           ++++++ PROGRAM ARRAY DIMENSIONS ++++++             *********
00030>  *********           Maximum value for ID numbers  :     10             *********
00031>  *********           Max. number of rainfall points: 105408             *********
00032>  *********           Max. number of flow points    : 105408             *********
00033>  ********************************************************************************
00034>
00035>
00036>  **********************   D E T A I L E D   O U T P U T   **********************
00037>  ********************************************************************************
00038>  *         DATE: 2014-08-07     TIME: 13:34:45     RUN COUNTER: 000466         *
00039>  ********************************************************************************
00040>  * Input   filename: T:\projects\14008\SWMREP~1\01_AUG~1\SWMHYMO\14008_1.dat    *
00041>  * Output  filename: T:\projects\14008\SWMREP~1\01_AUG~1\SWMHYMO\14008_1.out    *
00042>  * Summary filename: T:\projects\14008\SWMREP~1\01_AUG~1\SWMHYMO\14008_1.sum    *
00043>  * User comments:                                                              *
00044>  * 1:_____________________________________________________________________________*
00045>  * 2:_____________________________________________________________________________*
00046>  * 3:_____________________________________________________________________________*
00047>  ********************************************************************************
00048>
00049> --------------------------------------------------------------------------------
00050> 001:0001-----------------------------------------------------------------------
00051> *#*****************************************************************************|
00052> *#  Project Name: LIVING WORD CHRISTIAN FELLOWSHIP
00053> *#               HAMILTON, ONTARIO
00054> *#  JOB NUMBER  : 14008
00055> *#       Date   : AUGUST 2014
00056> *#    Revised   :
00057> *#    Company   : S. LLEWELLYN AND ASSOCIATES LTD.
00058> *#       File   : 14008_1.DAT
00059> *#*****************************************************************************|
00060> *
00061>   ** END OF RUN :   1
00062>
00063> ********************************************************************************
00064>
00065>
```

```
00066>
00067>
00068>
00069> --------------------
00070> | START            |  Project  dir.: T:\projects\14008\SWMREP~1\01_AUG~1\SWMHYMO
00071> --------------------  Rainfall dir.: T:\projects\14008\SWMREP~1\01_AUG~1\SWMHYMO
00072>     TZERO =   .00 hrs on        0
00073>     METOUT=   2 (output = METRIC)
00074>     NRUN  = 002
00075>     NSTORM=   1
00076>            #  1=MTHP3002.stm
00077> ------------------------------------------------------------------------------
00078> 002:0002----------------------------------------------------------------------
00079> *#*****************************************************************************|
00080> *#  Project Name: LIVING WORD CHRISTIAN FELLOWSHIP
00081> *#                HAMILTON, ONTARIO
00082> *#  JOB NUMBER  : 14008
00083> *#       Date   : AUGUST 2014
00084> *#    Revised   :
00085> *#    Company   : S. LLEWELLYN AND ASSOCIATES LTD.
00086> *#       File   : 14008_1.DAT
00087> *#*****************************************************************************|
00088> *
00089> ------------------------------------------------------------------------------
00090> 002:0002----------------------------------------------------------------------
00091> --------------------
00092> | READ STORM       |    Filename: 2-YR 3hr Mount Hope Chicago Storm
00093> | Ptotal=  32.71 mm|    Comments: 2-YR 3hr Mount Hope Chicago Storm
00094> --------------------
00095>              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00096>               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
00097>               .17   3.193 |   1.00  74.099 |   1.83   5.648 |   2.67   3.087
00098>               .33   3.921 |   1.17  24.316 |   2.00   4.806 |   2.83   2.846
00099>               .50   5.164 |   1.33  12.980 |   2.17   4.199 |   3.00   2.644
00100>               .67   7.836 |   1.50   8.954 |   2.33   3.739 |
00101>               .83  18.525 |   1.67   6.898 |   2.50   3.378 |
00102>
00103> ------------------------------------------------------------------------------
00104> 002:0003----------------------------------------------------------------------
00105> *
00106> *#*****************************************************************************|
00107> *#
00108> *#        PRE-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
00109> *#        ============================================
00110> *#
00111> *#*****************************************************************************|
00112> *# CATCHMENT 101
00113> *
00114> ----------------------
00115> | CALIB NASHYD       |   Area    (ha)=    2.30   Curve Number   (CN)=76.00
00116> | 01:101    DT= 1.00 |   Ia      (mm)=   6.350   # of Linear Res.(N)= 3.00
00117> ----------------------   U.H. Tp(hrs)=    .100
00118>
00119>      Unit Hyd Qpeak  (cms)=     .878
00120>
00121>      PEAK FLOW       (cms)=     .058 (i)
00122>      TIME TO PEAK    (hrs)=    1.083
00123>      RUNOFF VOLUME    (mm)=    6.518
00124>      TOTAL RAINFALL   (mm)=   32.705
00125>      RUNOFF COEFFICIENT   =     .199
00126>
00127>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00128>
00129> ------------------------------------------------------------------------------
00130> 002:0004----------------------------------------------------------------------
```

```
00131> *#*************************************************************************|
00132> *#
00133> *#        POST-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
00134> *#        ==============================================
00135> *#
00136> *#*************************************************************************|
00137> *# CATCHMENT 201
00138> *
00139> ----------------------
00140> | CALIB STANDHYD     |   Area    (ha)=     .47
00141> | 02:201    DT= 1.00 |   Total Imp(%)=   54.00   Dir. Conn.(%)=   54.00
00142> ----------------------
00143>                              IMPERVIOUS    PERVIOUS (i)
00144>      Surface Area     (ha)=        .25          .22
00145>      Dep. Storage     (mm)=       1.00         6.35
00146>      Average Slope     (%)=       2.00         5.00
00147>      Length            (m)=      50.00        20.00
00148>      Mannings n             =       .015         .250
00149>
00150>      Max.eff.Inten.(mm/hr)=      74.10        10.89
00151>                 over (min)        2.00        10.00
00152>      Storage Coeff.  (min)=       1.68 (ii)   10.27 (ii)
00153>      Unit Hyd. Tpeak (min)=       2.00        10.00
00154>      Unit Hyd. peak  (cms)=        .62          .11
00155>                                                          *TOTALS*
00156>      PEAK FLOW       (cms)=        .05          .00          .054 (iii)
00157>      TIME TO PEAK    (hrs)=       1.00         1.15         1.000
00158>      RUNOFF VOLUME    (mm)=      31.71         6.52        20.119
00159>      TOTAL RAINFALL   (mm)=      32.71        32.71        32.705
00160>      RUNOFF COEFFICIENT   =        .97          .20          .615
00161>
00162>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00163>            CN* =  76.0    Ia = Dep. Storage  (Above)
00164>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00165>            THAN THE STORAGE COEFFICIENT.
00166>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00167>
00168> ---------------------------------------------------------------------------
00169> 002:0005------------------------------------------------------------------
00170> *#*************************************************************************|
00171> *# CATCHMENT 202
00172> *
00173> ----------------------
00174> | CALIB STANDHYD     |   Area    (ha)=    1.83
00175> | 03:202    DT= 1.00 |   Total Imp(%)=   64.00   Dir. Conn.(%)=   64.00
00176> ----------------------
00177>                              IMPERVIOUS    PERVIOUS (i)
00178>      Surface Area     (ha)=       1.17          .66
00179>      Dep. Storage     (mm)=       1.00         6.35
00180>      Average Slope     (%)=       2.00         5.00
00181>      Length            (m)=      50.00        20.00
00182>      Mannings n             =       .015         .250
00183>
00184>      Max.eff.Inten.(mm/hr)=      74.10        10.89
00185>                 over (min)        2.00        10.00
00186>      Storage Coeff.  (min)=       1.68 (ii)   10.27 (ii)
00187>      Unit Hyd. Tpeak (min)=       2.00        10.00
00188>      Unit Hyd. peak  (cms)=        .62          .11
00189>                                                          *TOTALS*
00190>      PEAK FLOW       (cms)=        .24          .01          .245 (iii)
00191>      TIME TO PEAK    (hrs)=       1.00         1.15         1.000
00192>      RUNOFF VOLUME    (mm)=      31.71         6.52        22.638
00193>      TOTAL RAINFALL   (mm)=      32.71        32.71        32.705
00194>      RUNOFF COEFFICIENT   =        .97          .20          .692
00195>
```

```
00196>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00197>            CN* =  76.0    Ia = Dep. Storage  (Above)
00198>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00199>            THAN THE STORAGE COEFFICIENT.
00200>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00201>
00202> ------------------------------------------------------------------------------
00203> 002:0006--------------------------------------------------------------------
00204> *#*************************************************************************|
00205> *#
00206> *# ROUTE CATCHMENT 202 THROUGH ORIFICE PLATE
00207> *# ========================================================
00208> *#
00209> *#*************************************************************************|
00210> *#
00211> *
00212> ----------------------
00213> | ROUTE RESERVOIR    |    Requested routing time step =  1.0 min.
00214> |  IN>03:(202   )    |
00215> | OUT<04:(SWM   )    |    =========  OUTLFOW STORAGE TABLE  =========
00216> ----------------------    OUTFLOW    STORAGE    |  OUTFLOW    STORAGE
00217>                             (cms)    (ha.m.)    |    (cms)    (ha.m.)
00218>                              .000  .0000E+00    |     .012  .3280E-01
00219>                              .002  .0000E+00    |     .103  .4690E-01
00220>                              .006  .1900E-02    |     .114  .6320E-01
00221>                              .009  .1050E-01    |     .123  .8170E-01
00222>                              .010  .2070E-01    |     .132  .1026E+00
00223>
00224>      ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
00225>      --------------------       (ha)     (cms)     (hrs)       (mm)
00226>      INFLOW >03: (202   )       1.83      .245     1.000     22.638
00227>      OUTFLOW<04: (SWM   )       1.83      .012     2.783     22.639
00228>     OVERFLOW<05: (OFL-SE)        .00      .000      .000       .000
00229>
00230>                     TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
00231>                     CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
00232>                     PERCENTAGE OF TIME OVERFLOWING    (%)=      .00
00233>
00234>
00235>                     PEAK   FLOW   REDUCTION [Qout/Qin](%)=    4.789
00236>                     TIME SHIFT OF PEAK FLOW         (min)=   107.00
00237>                     MAXIMUM  STORAGE   USED       (ha.m.)=.3152E-01
00238>
00239> ------------------------------------------------------------------------------
00240> 002:0007--------------------------------------------------------------------
00241> ------------------------
00242> | ADD HYD (TOTAL     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
00243> ------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
00244>                      ID1 02:201            .47     .054    1.00  20.12    .000
00245>                     +ID2 04:SWM           1.83     .012    2.78  22.64    .000
00246>                     +ID3 05:OFL-SE         .00     .000     .00    .00    .000
00247>                      ========================================================
00248>                      SUM 06:TOTAL         2.30     .063    1.00  22.12    .000
00249>
00250>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00251>
00252> ------------------------------------------------------------------------------
00253> 002:0008--------------------------------------------------------------------
00254> * RUN REMAINING DESIGN STORMS (MOUNT HOPE 5 TO 100-YR)
00255> *
00256>   ** END OF RUN :   4
00257>
00258> ******************************************************************************
00259>
00260>
```

```
00261>
00262>
00263>
00264> --------------------
00265> | START            |  Project  dir.: T:\projects\14008\SWMREP~1\01_AUG~1\SWMHYMO
00266> --------------------  Rainfall dir.: T:\projects\14008\SWMREP~1\01_AUG~1\SWMHYMO
00267>     TZERO =   .00 hrs on        0
00268>     METOUT=   2 (output = METRIC)
00269>     NRUN  = 005
00270>     NSTORM=   1
00271>            #  1=MTHP3005.stm
00272> ------------------------------------------------------------------------------
00273> 005:0002----------------------------------------------------------------------
00274> *#*************************************************************************|
00275> *#  Project Name: LIVING WORD CHRISTIAN FELLOWSHIP
00276> *#                HAMILTON, ONTARIO
00277> *#  JOB NUMBER  : 14008
00278> *#       Date   : AUGUST 2014
00279> *#    Revised   :
00280> *#    Company   : S. LLEWELLYN AND ASSOCIATES LTD.
00281> *#       File   : 14008_1.DAT
00282> *#*************************************************************************|
00283> *
00284> ------------------------------------------------------------------------------
00285> 005:0002----------------------------------------------------------------------
00286> --------------------
00287> | READ STORM       |    Filename: 5-YR 3hr Mount Hope Chicago Storm
00288> | Ptotal=  47.36 mm|    Comments: 5-YR 3hr Mount Hope Chicago Storm
00289> --------------------
00290>              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00291>               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
00292>               .17   4.253 |   1.00 113.259 |   1.83   7.710 |   2.67   4.105
00293>               .33   5.267 |   1.17  35.540 |   2.00   6.513 |   2.83   3.773
00294>               .50   7.022 |   1.33  18.424 |   2.17   5.656 |   3.00   3.495
00295>               .67  10.864 |   1.50  12.488 |   2.33   5.012 |
00296>               .83  26.797 |   1.67   9.503 |   2.50   4.509 |
00297>
00298> ------------------------------------------------------------------------------
00299> 005:0003----------------------------------------------------------------------
00300> *
00301> *#*************************************************************************|
00302> *#
00303> *#        PRE-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
00304> *#        ============================================
00305> *#
00306> *#*************************************************************************|
00307> *# CATCHMENT 101
00308> *
00309> ----------------------
00310> | CALIB NASHYD       |   Area    (ha)=    2.30   Curve Number   (CN)=76.00
00311> | 01:101    DT= 1.00 |   Ia      (mm)=   6.350   # of Linear Res.(N)= 3.00
00312> ----------------------   U.H. Tp(hrs)=    .100
00313>
00314>      Unit Hyd Qpeak  (cms)=     .878
00315>
00316>      PEAK FLOW       (cms)=     .145 (i)
00317>      TIME TO PEAK    (hrs)=    1.067
00318>      RUNOFF VOLUME    (mm)=   13.877
00319>      TOTAL RAINFALL   (mm)=   47.364
00320>      RUNOFF COEFFICIENT   =     .293
00321>
00322>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00323>
00324> ------------------------------------------------------------------------------
00325> 005:0004----------------------------------------------------------------------
```

```
00326> *#*************************************************************************|
00327> *#
00328> *#        POST-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
00329> *#        ==============================================
00330> *#
00331> *#*************************************************************************|
00332> *# CATCHMENT 201
00333> *
00334> ----------------------
00335> | CALIB STANDHYD     |   Area    (ha)=     .47
00336> | 02:201    DT= 1.00 |   Total Imp(%)=   54.00   Dir. Conn.(%)=   54.00
00337> ----------------------
00338>                              IMPERVIOUS    PERVIOUS (i)
00339>      Surface Area     (ha)=        .25          .22
00340>      Dep. Storage     (mm)=       1.00         6.35
00341>      Average Slope     (%)=       2.00         5.00
00342>      Length            (m)=      50.00        20.00
00343>      Mannings n             =       .015         .250
00344>
00345>      Max.eff.Inten.(mm/hr)=     113.26        32.41
00346>                 over (min)        1.00         7.00
00347>      Storage Coeff.  (min)=       1.42 (ii)    6.97 (ii)
00348>      Unit Hyd. Tpeak (min)=       1.00         7.00
00349>      Unit Hyd. peak  (cms)=        .86          .16
00350>                                                          *TOTALS*
00351>      PEAK FLOW       (cms)=        .08          .01          .088 (iii)
00352>      TIME TO PEAK    (hrs)=       1.00         1.08         1.000
00353>      RUNOFF VOLUME    (mm)=      46.36        13.88        31.420
00354>      TOTAL RAINFALL   (mm)=      47.36        47.36        47.364
00355>      RUNOFF COEFFICIENT   =        .98          .29          .663
00356>
00357>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00358>            CN* =  76.0    Ia = Dep. Storage  (Above)
00359>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00360>            THAN THE STORAGE COEFFICIENT.
00361>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00362>
00363> ---------------------------------------------------------------------------
00364> 005:0005------------------------------------------------------------------
00365> *#*************************************************************************|
00366> *# CATCHMENT 202
00367> *
00368> ----------------------
00369> | CALIB STANDHYD     |   Area    (ha)=    1.83
00370> | 03:202    DT= 1.00 |   Total Imp(%)=   64.00   Dir. Conn.(%)=   64.00
00371> ----------------------
00372>                              IMPERVIOUS    PERVIOUS (i)
00373>      Surface Area     (ha)=       1.17          .66
00374>      Dep. Storage     (mm)=       1.00         6.35
00375>      Average Slope     (%)=       2.00         5.00
00376>      Length            (m)=      50.00        20.00
00377>      Mannings n             =       .015         .250
00378>
00379>      Max.eff.Inten.(mm/hr)=     113.26        32.41
00380>                 over (min)        1.00         7.00
00381>      Storage Coeff.  (min)=       1.42 (ii)    6.97 (ii)
00382>      Unit Hyd. Tpeak (min)=       1.00         7.00
00383>      Unit Hyd. peak  (cms)=        .86          .16
00384>                                                          *TOTALS*
00385>      PEAK FLOW       (cms)=        .37          .04          .395 (iii)
00386>      TIME TO PEAK    (hrs)=       1.00         1.08         1.000
00387>      RUNOFF VOLUME    (mm)=      46.36        13.88        34.669
00388>      TOTAL RAINFALL   (mm)=      47.36        47.36        47.364
00389>      RUNOFF COEFFICIENT   =        .98          .29          .732
00390>
```

```
00391>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00392>            CN* =  76.0    Ia = Dep. Storage  (Above)
00393>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00394>            THAN THE STORAGE COEFFICIENT.
00395>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00396>
00397> ------------------------------------------------------------------------------
00398> 005:0006----------------------------------------------------------------------
00399> *#*************************************************************************|
00400> *#
00401> *# ROUTE CATCHMENT 202 THROUGH ORIFICE PLATE
00402> *# ======================================================
00403> *#
00404> *#*************************************************************************|
00405> *#
00406> *
00407> ---------------------
00408> | ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
00409> |  IN>03:(202   )   |
00410> | OUT<04:(SWM   )   |    =========  OUTLFOW STORAGE TABLE  =========
00411> ---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
00412>                            (cms)    (ha.m.)   |    (cms)    (ha.m.)
00413>                             .000  .0000E+00   |     .012  .3280E-01
00414>                             .002  .0000E+00   |     .103  .4690E-01
00415>                             .006  .1900E-02   |     .114  .6320E-01
00416>                             .009  .1050E-01   |     .123  .8170E-01
00417>                             .010  .2070E-01   |     .132  .1026E+00
00418>
00419>      ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
00420>      --------------------       (ha)     (cms)     (hrs)       (mm)
00421>      INFLOW >03: (202   )       1.83      .395     1.000     34.669
00422>      OUTFLOW<04: (SWM   )       1.83      .059     1.417     34.671
00423>     OVERFLOW<05: (OFL-SE)        .00      .000      .000       .000
00424>
00425>                     TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
00426>                     CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
00427>                     PERCENTAGE OF TIME OVERFLOWING    (%)=      .00
00428>
00429>
00430>                     PEAK   FLOW   REDUCTION [Qout/Qin](%)=   14.942
00431>                     TIME SHIFT OF PEAK FLOW         (min)=    25.00
00432>                     MAXIMUM  STORAGE   USED       (ha.m.)=.4007E-01
00433>
00434> ------------------------------------------------------------------------------
00435> 005:0007----------------------------------------------------------------------
00436> ------------------------
00437> | ADD HYD (TOTAL     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
00438> ------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
00439>                       ID1 02:201            .47     .088    1.00  31.42    .000
00440>                      +ID2 04:SWM           1.83     .059    1.42  34.67    .000
00441>                      +ID3 05:OFL-SE         .00     .000     .00    .00    .000
00442>                       ========================================================
00443>                       SUM 06:TOTAL          2.30     .100    1.00  34.01    .000
00444>
00445>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00446>
00447> ------------------------------------------------------------------------------
00448> 005:0008----------------------------------------------------------------------
00449> * RUN REMAINING DESIGN STORMS (MOUNT HOPE 5 TO 100-YR)
00450> *
00451> ------------------------------------------------------------------------------
00452> 005:0002----------------------------------------------------------------------
00453> *
00454>   ** END OF RUN :   9
00455>
```

```
00456> ********************************************************************************
00457>
00458>
00459>
00460>
00461>
00462> --------------------
00463> | START            |  Project  dir.: T:\projects\14008\SWMREP~1\01_AUG~1\SWMHYMO
00464> --------------------  Rainfall dir.: T:\projects\14008\SWMREP~1\01_AUG~1\SWMHYMO
00465>     TZERO =   .00 hrs on        0
00466>     METOUT=   2 (output = METRIC)
00467>     NRUN  = 010
00468>     NSTORM=   1
00469>            #  1=MTHP3010.stm
00470> --------------------------------------------------------------------------------
00471> 010:0002--------------------------------------------------------------------------
00472> *#*************************************************************************|
00473> *#  Project Name: LIVING WORD CHRISTIAN FELLOWSHIP
00474> *#                HAMILTON, ONTARIO
00475> *#  JOB NUMBER  : 14008
00476> *#       Date   : AUGUST 2014
00477> *#    Revised   :
00478> *#    Company   : S. LLEWELLYN AND ASSOCIATES LTD.
00479> *#       File   : 14008_1.DAT
00480> *#*************************************************************************|
00481> *
00482> --------------------------------------------------------------------------------
00483> 010:0002--------------------------------------------------------------------------
00484> --------------------
00485> | READ STORM       |    Filename: 10-YR 3hr Mount Hope Chicago Storm
00486> | Ptotal=  56.51 mm|    Comments: 10-YR 3hr Mount Hope Chicago Storm
00487> --------------------
00488>               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00489>                hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
00490>                .17   5.173 |   1.00 122.292 |   1.83   9.714 |   2.67   4.982
00491>                .33   6.489 |   1.17  45.465 |   2.00   8.126 |   2.83   4.557
00492>                .50   8.802 |   1.33  23.981 |   2.17   6.998 |   3.00   4.203
00493>                .67  13.931 |   1.50  16.104 |   2.33   6.156 |
00494>                .83  34.487 |   1.67  12.108 |   2.50   5.503 |
00495>
00496> --------------------------------------------------------------------------------
00497> 010:0003--------------------------------------------------------------------------
00498> *
00499> *#*************************************************************************|
00500> *#
00501> *#        PRE-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
00502> *#        ============================================
00503> *#
00504> *#*************************************************************************|
00505> *# CATCHMENT 101
00506> *
00507> ----------------------
00508> | CALIB NASHYD       |   Area    (ha)=    2.30   Curve Number   (CN)=76.00
00509> | 01:101    DT= 1.00 |   Ia      (mm)=   6.350   # of Linear Res.(N)= 3.00
00510> ----------------------   U.H. Tp(hrs)=    .100
00511>
00512>      Unit Hyd Qpeak  (cms)=     .878
00513>
00514>      PEAK FLOW       (cms)=     .190 (i)
00515>      TIME TO PEAK    (hrs)=    1.067
00516>      RUNOFF VOLUME    (mm)=   19.300
00517>      TOTAL RAINFALL   (mm)=   56.511
00518>      RUNOFF COEFFICIENT   =     .342
00519>
00520>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
00521>
00522> ------------------------------------------------------------------------------
00523> 010:0004--------------------------------------------------------------------
00524> *#*****************************************************************************|
00525> *#
00526> *#        POST-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
00527> *#        ==============================================
00528> *#
00529> *#*****************************************************************************|
00530> *# CATCHMENT 201
00531> *
00532> ----------------------
00533> | CALIB STANDHYD     |   Area    (ha)=     .47
00534> | 02:201    DT= 1.00 |   Total Imp(%)=   54.00   Dir. Conn.(%)=   54.00
00535> ----------------------
00536>                               IMPERVIOUS    PERVIOUS (i)
00537>      Surface Area     (ha)=        .25          .22
00538>      Dep. Storage     (mm)=       1.00         6.35
00539>      Average Slope     (%)=       2.00         5.00
00540>      Length            (m)=      50.00        20.00
00541>      Mannings n             =       .015         .250
00542>
00543>      Max.eff.Inten.(mm/hr)=     122.29        42.69
00544>                 over (min)        1.00         6.00
00545>      Storage Coeff.  (min)=       1.38 (ii)    6.35 (ii)
00546>      Unit Hyd. Tpeak (min)=       1.00         6.00
00547>      Unit Hyd. peak  (cms)=        .88          .18
00548>                                                          *TOTALS*
00549>      PEAK FLOW       (cms)=        .09          .02          .100 (iii)
00550>      TIME TO PEAK    (hrs)=       1.00         1.07         1.000
00551>      RUNOFF VOLUME    (mm)=      55.51        19.30        38.854
00552>      TOTAL RAINFALL   (mm)=      56.51        56.51        56.511
00553>      RUNOFF COEFFICIENT   =        .98          .34          .688
00554>
00555>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00556>            CN* =  76.0    Ia = Dep. Storage  (Above)
00557>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00558>            THAN THE STORAGE COEFFICIENT.
00559>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00560>
00561> ------------------------------------------------------------------------------
00562> 010:0005--------------------------------------------------------------------
00563> *#*****************************************************************************|
00564> *# CATCHMENT 202
00565> *
00566> ----------------------
00567> | CALIB STANDHYD     |   Area    (ha)=    1.83
00568> | 03:202    DT= 1.00 |   Total Imp(%)=   64.00   Dir. Conn.(%)=   64.00
00569> ----------------------
00570>                               IMPERVIOUS    PERVIOUS (i)
00571>      Surface Area     (ha)=       1.17          .66
00572>      Dep. Storage     (mm)=       1.00         6.35
00573>      Average Slope     (%)=       2.00         5.00
00574>      Length            (m)=      50.00        20.00
00575>      Mannings n             =       .015         .250
00576>
00577>      Max.eff.Inten.(mm/hr)=     122.29        42.69
00578>                 over (min)        1.00         6.00
00579>      Storage Coeff.  (min)=       1.38 (ii)    6.35 (ii)
00580>      Unit Hyd. Tpeak (min)=       1.00         6.00
00581>      Unit Hyd. peak  (cms)=        .88          .18
00582>                                                          *TOTALS*
00583>      PEAK FLOW       (cms)=        .40          .05          .439 (iii)
00584>      TIME TO PEAK    (hrs)=       1.00         1.07         1.000
00585>      RUNOFF VOLUME    (mm)=      55.51        19.30        42.475
```

```
00586>      TOTAL RAINFALL   (mm)=      56.51        56.51         56.511
00587>      RUNOFF COEFFICIENT   =        .98          .34           .752
00588>
00589>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00590>            CN* =  76.0    Ia = Dep. Storage  (Above)
00591>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00592>            THAN THE STORAGE COEFFICIENT.
00593>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00594>
00595> ----------------------------------------------------------------------------
00596> 010:0006------------------------------------------------------------------------
00597> *#*************************************************************************|
00598> *#
00599> *# ROUTE CATCHMENT 202 THROUGH ORIFICE PLATE
00600> *# ========================================================
00601> *#
00602> *#*************************************************************************|
00603> *#
00604> *
00605> ---------------------
00606> | ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
00607> |  IN>03:(202   )   |
00608> | OUT<04:(SWM   )   |    =========  OUTLFOW STORAGE TABLE  =========
00609> ---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
00610>                            (cms)    (ha.m.)   |    (cms)    (ha.m.)
00611>                             .000  .0000E+00   |     .012  .3280E-01
00612>                             .002  .0000E+00   |     .103  .4690E-01
00613>                             .006  .1900E-02   |     .114  .6320E-01
00614>                             .009  .1050E-01   |     .123  .8170E-01
00615>                             .010  .2070E-01   |     .132  .1026E+00
00616>
00617>      ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
00618>      --------------------       (ha)     (cms)     (hrs)       (mm)
00619>      INFLOW >03: (202   )       1.83      .439     1.000     42.475
00620>      OUTFLOW<04: (SWM   )       1.83      .092     1.350     42.478
00621>     OVERFLOW<05: (OFL-SE)        .00      .000      .000       .000
00622>
00623>                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =         0
00624>                    CUMULATIVE TIME OF OVERFLOWS  (hours)=       .00
00625>                    PERCENTAGE OF TIME OVERFLOWING    (%)=       .00
00626>
00627>
00628>                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=    21.028
00629>                    TIME SHIFT OF PEAK FLOW         (min)=     21.00
00630>                    MAXIMUM  STORAGE   USED       (ha.m.)=.4523E-01
00631>
00632> ----------------------------------------------------------------------------
00633> 010:0007------------------------------------------------------------------------
00634> ------------------------
00635> | ADD HYD (TOTAL     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
00636> ------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
00637>                       ID1 02:201           .47      .100    1.00  38.85    .000
00638>                      +ID2 04:SWM          1.83      .092    1.35  42.48    .000
00639>                      +ID3 05:OFL-SE        .00      .000     .00    .00    .000
00640>                       ========================================================
00641>                       SUM 06:TOTAL         2.30      .124    1.17  41.74    .000
00642>
00643>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00644>
00645> ----------------------------------------------------------------------------
00646> 010:0008------------------------------------------------------------------------
00647> * RUN REMAINING DESIGN STORMS (MOUNT HOPE 5 TO 100-YR)
00648> *
00649> ----------------------------------------------------------------------------
00650> 010:0002------------------------------------------------------------------------
```

```
00651> *
00652> --------------------------------------------------------------------------------
00653> 010:0002----------------------------------------------------------------------
00654> *
00655>   ** END OF RUN :  24
00656>
00657> ********************************************************************************
00658>
00659>
00660>
00661>
00662>
00663> --------------------
00664> | START            |  Project  dir.: T:\projects\14008\SWMREP~1\01_AUG~1\SWMHYMO
00665> --------------------  Rainfall dir.: T:\projects\14008\SWMREP~1\01_AUG~1\SWMHYMO
00666>     TZERO =   .00 hrs on        0
00667>     METOUT=   2 (output = METRIC)
00668>     NRUN  = 025
00669>     NSTORM=   1
00670>            #  1=MTHP3025.stm
00671> --------------------------------------------------------------------------------
00672> 025:0002----------------------------------------------------------------------
00673> *#*****************************************************************************|
00674> *#  Project Name: LIVING WORD CHRISTIAN FELLOWSHIP
00675> *#                HAMILTON, ONTARIO
00676> *#  JOB NUMBER  : 14008
00677> *#       Date   : AUGUST 2014
00678> *#    Revised   :
00679> *#    Company   : S. LLEWELLYN AND ASSOCIATES LTD.
00680> *#       File   : 14008_1.DAT
00681> *#*****************************************************************************|
00682> *
00683> --------------------------------------------------------------------------------
00684> 025:0002----------------------------------------------------------------------
00685> --------------------
00686> | READ STORM       |    Filename: 25-YR 3hr Mount Hope Chicago Storm
00687> | Ptotal=  68.68 mm|    Comments: 25-YR 3hr Mount Hope Chicago Storm
00688> --------------------
00689>               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00690>                hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
00691>                .17   6.198 |   1.00 146.101 |   1.83  11.847 |   2.67   5.963
00692>                .33   7.827 |   1.17  56.322 |   2.00   9.863 |   2.83   5.440
00693>                .50  10.708 |   1.33  29.752 |   2.17   8.458 |   3.00   5.006
00694>                .67  17.140 |   1.50  19.870 |   2.33   7.413 |
00695>                .83  42.745 |   1.67  14.849 |   2.50   6.605 |
00696>
00697> --------------------------------------------------------------------------------
00698> 025:0003----------------------------------------------------------------------
00699> *
00700> *#*****************************************************************************|
00701> *#
00702> *#        PRE-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
00703> *#        ==============================================
00704> *#
00705> *#*****************************************************************************|
00706> *# CATCHMENT 101
00707> *
00708> ----------------------
00709> | CALIB NASHYD       |   Area    (ha)=    2.30   Curve Number   (CN)=76.00
00710> | 01:101    DT= 1.00 |   Ia      (mm)=   6.350   # of Linear Res.(N)= 3.00
00711> ----------------------   U.H. Tp(hrs)=    .100
00712>
00713>      Unit Hyd Qpeak  (cms)=     .878
00714>
00715>      PEAK FLOW       (cms)=     .274 (i)
```

```
00716>      TIME TO PEAK    (hrs)=    1.067
00717>      RUNOFF VOLUME    (mm)=   27.259
00718>      TOTAL RAINFALL   (mm)=   68.685
00719>      RUNOFF COEFFICIENT   =     .397
00720>
00721>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00722>
00723> ---------------------------------------------------------------------------
00724> 025:0004-----------------------------------------------------------------------
00725> *#*****************************************************************************|
00726> *#
00727> *#        POST-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
00728> *#        ==============================================
00729> *#
00730> *#*****************************************************************************|
00731> *# CATCHMENT 201
00732> *
00733> ----------------------
00734> | CALIB STANDHYD     |   Area    (ha)=     .47
00735> | 02:201    DT= 1.00 |   Total Imp(%)=   54.00   Dir. Conn.(%)=   54.00
00736> ----------------------
00737>                              IMPERVIOUS    PERVIOUS (i)
00738>      Surface Area     (ha)=       .25          .22
00739>      Dep. Storage     (mm)=      1.00         6.35
00740>      Average Slope     (%)=      2.00         5.00
00741>      Length            (m)=     50.00        20.00
00742>      Mannings n           =      .015         .250
00743>
00744>      Max.eff.Inten.(mm/hr)=    146.10        60.44
00745>                over (min)       1.00         6.00
00746>      Storage Coeff.  (min)=      1.28 (ii)    5.61 (ii)
00747>      Unit Hyd. Tpeak (min)=      1.00         6.00
00748>      Unit Hyd. peak  (cms)=       .92          .20
00749>                                                        *TOTALS*
00750>      PEAK FLOW       (cms)=       .10          .03          .125 (iii)
00751>      TIME TO PEAK    (hrs)=      1.00         1.07         1.000
00752>      RUNOFF VOLUME    (mm)=     67.68        27.26        49.089
00753>      TOTAL RAINFALL   (mm)=     68.68        68.68        68.685
00754>      RUNOFF COEFFICIENT   =       .99          .40          .715
00755>
00756>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00757>            CN* =  76.0    Ia = Dep. Storage  (Above)
00758>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00759>            THAN THE STORAGE COEFFICIENT.
00760>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00761>
00762> ---------------------------------------------------------------------------
00763> 025:0005-----------------------------------------------------------------------
00764> *#*****************************************************************************|
00765> *# CATCHMENT 202
00766> *
00767> ----------------------
00768> | CALIB STANDHYD     |   Area    (ha)=    1.83
00769> | 03:202    DT= 1.00 |   Total Imp(%)=   64.00   Dir. Conn.(%)=   64.00
00770> ----------------------
00771>                              IMPERVIOUS    PERVIOUS (i)
00772>      Surface Area     (ha)=      1.17          .66
00773>      Dep. Storage     (mm)=      1.00         6.35
00774>      Average Slope     (%)=      2.00         5.00
00775>      Length            (m)=     50.00        20.00
00776>      Mannings n           =      .015         .250
00777>
00778>      Max.eff.Inten.(mm/hr)=    146.10        60.44
00779>                over (min)       1.00         6.00
00780>      Storage Coeff.  (min)=      1.28 (ii)    5.61 (ii)
```

```
00781>      Unit Hyd. Tpeak (min)=       1.00         6.00
00782>      Unit Hyd. peak  (cms)=        .92          .20
00783>                                                      *TOTALS*
00784>      PEAK FLOW       (cms)=        .48          .08          .541 (iii)
00785>      TIME TO PEAK    (hrs)=       1.00         1.07         1.000
00786>      RUNOFF VOLUME    (mm)=      67.68        27.26        53.131
00787>      TOTAL RAINFALL   (mm)=      68.68        68.68        68.685
00788>      RUNOFF COEFFICIENT   =        .99          .40          .774
00789>
00790>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00791>            CN* =  76.0    Ia = Dep. Storage  (Above)
00792>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00793>            THAN THE STORAGE COEFFICIENT.
00794>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00795>
00796> ---------------------------------------------------------------------------
00797> 025:0006-----------------------------------------------------------------------
00798> *#####################################################################|
00799> *#
00800> *# ROUTE CATCHMENT 202 THROUGH ORIFICE PLATE
00801> *# ========================================================
00802> *#
00803> *#####################################################################|
00804> *#
00805> *
00806> ---------------------
00807> | ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
00808> |  IN>03:(202   )   |
00809> | OUT<04:(SWM   )   |    =========  OUTLFOW STORAGE TABLE  =========
00810> ---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
00811>                            (cms)     (ha.m.)   |    (cms)    (ha.m.)
00812>                             .000  .0000E+00    |     .012  .3280E-01
00813>                             .002  .0000E+00    |     .103  .4690E-01
00814>                             .006  .1900E-02    |     .114  .6320E-01
00815>                             .009  .1050E-01    |     .123  .8170E-01
00816>                             .010  .2070E-01    |     .132  .1026E+00
00817>
00818>      ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
00819>      --------------------       (ha)     (cms)     (hrs)       (mm)
00820>      INFLOW >03: (202   )       1.83      .541     1.000     53.131
00821>      OUTFLOW<04: (SWM   )       1.83      .108     1.367     53.134
00822>     OVERFLOW<05: (OFL-SE)        .00      .000      .000       .000
00823>
00824>                     TOTAL NUMBER OF SIMULATED OVERFLOWS  =         0
00825>                     CUMULATIVE TIME OF OVERFLOWS  (hours)=       .00
00826>                     PERCENTAGE OF TIME OVERFLOWING    (%)=       .00
00827>
00828>
00829>                     PEAK   FLOW   REDUCTION [Qout/Qin](%)=    20.026
00830>                     TIME SHIFT OF PEAK FLOW          (min)=    22.00
00831>                     MAXIMUM  STORAGE   USED       (ha.m.)=.5485E-01
00832>
00833> ---------------------------------------------------------------------------
00834> 025:0007-----------------------------------------------------------------------
00835> ------------------------
00836> | ADD HYD (TOTAL     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
00837> ------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
00838>                       ID1 02:201            .47      .125    1.00  49.09    .000
00839>                      +ID2 04:SWM           1.83      .108    1.37  53.13    .000
00840>                      +ID3 05:OFL-SE         .00      .000     .00    .00    .000
00841>                       ========================================================
00842>                       SUM 06:TOTAL         2.30      .179    1.00  52.31    .000
00843>
00844>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00845>
```

```
00846> ------------------------------------------------------------------------------
00847> 025:0008--------------------------------------------------------------------
00848> * RUN REMAINING DESIGN STORMS (MOUNT HOPE 5 TO 100-YR)
00849> *
00850> ------------------------------------------------------------------------------
00851> 025:0002--------------------------------------------------------------------
00852> *
00853> ------------------------------------------------------------------------------
00854> 025:0002--------------------------------------------------------------------
00855> *
00856> ------------------------------------------------------------------------------
00857> 025:0002--------------------------------------------------------------------
00858> *
00859>   ** END OF RUN :  49
00860>
00861> ********************************************************************************
00862>
00863>
00864>
00865>
00866>
00867> --------------------
00868> | START            |  Project  dir.: T:\projects\14008\SWMREP~1\01_AUG~1\SWMHYMO
00869> --------------------  Rainfall dir.: T:\projects\14008\SWMREP~1\01_AUG~1\SWMHYMO
00870>     TZERO =   .00 hrs on        0
00871>     METOUT=   2 (output = METRIC)
00872>     NRUN  = 050
00873>     NSTORM=   1
00874>            #  1=MTHP3050.stm
00875> ------------------------------------------------------------------------------
00876> 050:0002--------------------------------------------------------------------
00877> *#*****************************************************************************|
00878> *#  Project Name: LIVING WORD CHRISTIAN FELLOWSHIP
00879> *#                HAMILTON, ONTARIO
00880> *#  JOB NUMBER  : 14008
00881> *#       Date   : AUGUST 2014
00882> *#    Revised   :
00883> *#    Company   : S. LLEWELLYN AND ASSOCIATES LTD.
00884> *#       File   : 14008_1.DAT
00885> *#*****************************************************************************|
00886> *
00887> ------------------------------------------------------------------------------
00888> 050:0002--------------------------------------------------------------------
00889> --------------------
00890> | READ STORM       |    Filename: 50-YR 3hr Mount Hope Chicago Storm
00891> | Ptotal=  76.86 mm|    Comments: 50-YR 3hr Mount Hope Chicago Storm
00892> --------------------
00893>               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00894>                hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
00895>                .17   6.856 |   1.00 164.608 |   1.83  13.160 |   2.67   6.594
00896>                .33   8.670 |   1.17  63.166 |   2.00  10.942 |   2.83   6.012
00897>                .50  11.887 |   1.33  33.244 |   2.17   9.374 |   3.00   5.529
00898>                .67  19.086 |   1.50  22.146 |   2.33   8.209 |
00899>                .83  47.876 |   1.67  16.518 |   2.50   7.309 |
00900>
00901> ------------------------------------------------------------------------------
00902> 050:0003--------------------------------------------------------------------
00903> *
00904> *#*****************************************************************************|
00905> *#
00906> *#        PRE-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
00907> *#        ============================================
00908> *#
00909> *#*****************************************************************************|
00910> *# CATCHMENT 101
```

```
00911> *
00912> ----------------------
00913> | CALIB NASHYD       |   Area    (ha)=    2.30   Curve Number   (CN)=76.00
00914> | 01:101    DT= 1.00 |   Ia      (mm)=   6.350   # of Linear Res.(N)= 3.00
00915> ----------------------   U.H. Tp(hrs)=    .100
00916>
00917>      Unit Hyd Qpeak  (cms)=     .878
00918>
00919>      PEAK FLOW       (cms)=     .339 (i)
00920>      TIME TO PEAK    (hrs)=    1.067
00921>      RUNOFF VOLUME    (mm)=   32.989
00922>      TOTAL RAINFALL   (mm)=   76.864
00923>      RUNOFF COEFFICIENT   =     .429
00924>
00925>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00926>
00927> ---------------------------------------------------------------------------
00928> 050:0004-----------------------------------------------------------------------
00929> *#*****************************************************************************|
00930> *#
00931> *#        POST-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
00932> *#        ==============================================
00933> *#
00934> *#*****************************************************************************|
00935> *# CATCHMENT 201
00936> *
00937> ----------------------
00938> | CALIB STANDHYD     |   Area    (ha)=     .47
00939> | 02:201    DT= 1.00 |   Total Imp(%)=   54.00   Dir. Conn.(%)=   54.00
00940> ----------------------
00941>                              IMPERVIOUS    PERVIOUS (i)
00942>      Surface Area     (ha)=        .25          .22
00943>      Dep. Storage     (mm)=       1.00         6.35
00944>      Average Slope     (%)=       2.00         5.00
00945>      Length            (m)=      50.00        20.00
00946>      Mannings n           =       .015         .250
00947>
00948>      Max.eff.Inten.(mm/hr)=     164.61        77.01
00949>                 over (min)        1.00         5.00
00950>      Storage Coeff.  (min)=       1.22 (ii)    5.15 (ii)
00951>      Unit Hyd. Tpeak (min)=       1.00         5.00
00952>      Unit Hyd. peak  (cms)=        .95          .22
00953>                                                          *TOTALS*
00954>      PEAK FLOW       (cms)=        .12          .03          .146 (iii)
00955>      TIME TO PEAK    (hrs)=       1.00         1.05         1.000
00956>      RUNOFF VOLUME    (mm)=      75.86        32.99        56.142
00957>      TOTAL RAINFALL   (mm)=      76.86        76.86        76.864
00958>      RUNOFF COEFFICIENT   =        .99          .43          .730
00959>
00960>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00961>            CN* =  76.0    Ia = Dep. Storage  (Above)
00962>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00963>            THAN THE STORAGE COEFFICIENT.
00964>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00965>
00966> ---------------------------------------------------------------------------
00967> 050:0005-----------------------------------------------------------------------
00968> *#*****************************************************************************|
00969> *# CATCHMENT 202
00970> *
00971> ----------------------
00972> | CALIB STANDHYD     |   Area    (ha)=    1.83
00973> | 03:202    DT= 1.00 |   Total Imp(%)=   64.00   Dir. Conn.(%)=   64.00
00974> ----------------------
00975>                              IMPERVIOUS    PERVIOUS (i)
```

```
00976>      Surface Area     (ha)=       1.17          .66
00977>      Dep. Storage     (mm)=       1.00         6.35
00978>      Average Slope     (%)=       2.00         5.00
00979>      Length            (m)=      50.00        20.00
00980>      Mannings n           =       .015         .250
00981>
00982>      Max.eff.Inten.(mm/hr)=     164.61        77.01
00983>                over (min)        1.00         5.00
00984>      Storage Coeff.  (min)=       1.22 (ii)    5.15 (ii)
00985>      Unit Hyd. Tpeak (min)=       1.00         5.00
00986>      Unit Hyd. peak  (cms)=        .95          .22
00987>                                                      *TOTALS*
00988>      PEAK FLOW       (cms)=        .54          .10          .627 (iii)
00989>      TIME TO PEAK    (hrs)=       1.00         1.05         1.000
00990>      RUNOFF VOLUME    (mm)=      75.86        32.99        60.429
00991>      TOTAL RAINFALL   (mm)=      76.86        76.86        76.864
00992>      RUNOFF COEFFICIENT   =        .99          .43          .786
00993>
00994>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00995>            CN* =  76.0    Ia = Dep. Storage  (Above)
00996>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00997>            THAN THE STORAGE COEFFICIENT.
00998>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00999>
01000> ---------------------------------------------------------------------------
01001> 050:0006-----------------------------------------------------------------------
01002> *#*************************************************************************|
01003> *#
01004> *# ROUTE CATCHMENT 202 THROUGH ORIFICE PLATE
01005> *# ================================================
01006> *#
01007> *#*************************************************************************|
01008> *#
01009> *
01010> ---------------------
01011> | ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
01012> |  IN>03:(202   )   |
01013> | OUT<04:(SWM   )   |    =========  OUTLFOW STORAGE TABLE  =========
01014> ---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
01015>                            (cms)    (ha.m.)   |    (cms)    (ha.m.)
01016>                             .000  .0000E+00   |     .012  .3280E-01
01017>                             .002  .0000E+00   |     .103  .4690E-01
01018>                             .006  .1900E-02   |     .114  .6320E-01
01019>                             .009  .1050E-01   |     .123  .8170E-01
01020>                             .010  .2070E-01   |     .132  .1026E+00
01021>
01022>      ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
01023>      --------------------       (ha)     (cms)     (hrs)       (mm)
01024>      INFLOW >03: (202   )       1.83      .627     1.000     60.429
01025>      OUTFLOW<04: (SWM   )       1.83      .114     1.400     60.431
01026>     OVERFLOW<05: (OFL-SE)        .00      .000      .000       .000
01027>
01028>                     TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
01029>                     CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
01030>                     PERCENTAGE OF TIME OVERFLOWING    (%)=      .00
01031>
01032>
01033>                     PEAK   FLOW   REDUCTION [Qout/Qin](%)=   18.131
01034>                     TIME SHIFT OF PEAK FLOW         (min)=    24.00
01035>                     MAXIMUM  STORAGE   USED       (ha.m.)=.6333E-01
01036>
01037> ---------------------------------------------------------------------------
01038> 050:0007-----------------------------------------------------------------------
01039> ------------------------
01040> | ADD HYD (TOTAL     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
```

```
01041> ------------------------                    (ha)      (cms)    (hrs)    (mm)    (cms)
01042>                       ID1 02:201              .47      .146     1.00   56.14     .000
01043>                      +ID2 04:SWM             1.83      .114     1.40   60.43     .000
01044>                      +ID3 05:OFL-SE           .00      .000      .00     .00     .000
01045>                       ============================================================
01046>                       SUM 06:TOTAL           2.30      .237     1.00   59.55     .000
01047>
01048>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01049>
01050> ------------------------------------------------------------------------------
01051> 050:0008---------------------------------------------------------------------
01052> * RUN REMAINING DESIGN STORMS (MOUNT HOPE 5 TO 100-YR)
01053> *
01054> ------------------------------------------------------------------------------
01055> 050:0002---------------------------------------------------------------------
01056> *
01057> ------------------------------------------------------------------------------
01058> 050:0002---------------------------------------------------------------------
01059> *
01060> ------------------------------------------------------------------------------
01061> 050:0002---------------------------------------------------------------------
01062> *
01063> ------------------------------------------------------------------------------
01064> 050:0002---------------------------------------------------------------------
01065> *
01066>   ** END OF RUN :  99
01067>
01068> ******************************************************************************
01069>
01070>
01071>
01072>
01073>
01074> --------------------
01075> | START            |  Project  dir.: T:\projects\14008\SWMREP~1\01_AUG~1\SWMHYMO
01076> --------------------  Rainfall dir.: T:\projects\14008\SWMREP~1\01_AUG~1\SWMHYMO
01077>     TZERO =   .00 hrs on        0
01078>     METOUT=   2 (output = METRIC)
01079>     NRUN  = 100
01080>     NSTORM=   1
01081>            #  1=MTHP3100.stm
01082> ------------------------------------------------------------------------------
01083> 100:0002---------------------------------------------------------------------
01084> *#*************************************************************************|
01085> *#  Project Name: LIVING WORD CHRISTIAN FELLOWSHIP
01086> *#                HAMILTON, ONTARIO
01087> *#  JOB NUMBER  : 14008
01088> *#       Date   : AUGUST 2014
01089> *#    Revised   :
01090> *#    Company   : S. LLEWELLYN AND ASSOCIATES LTD.
01091> *#       File   : 14008_1.DAT
01092> *#*************************************************************************|
01093> *
01094> ------------------------------------------------------------------------------
01095> 100:0002---------------------------------------------------------------------
01096> --------------------
01097> | READ STORM       |    Filename: 100-YR 3hr Mount Hope Chicago Storm
01098> | Ptotal=  86.09 mm|    Comments: 100-YR 3hr Mount Hope Chicago Storm
01099> --------------------
01100>               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
01101>                hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
01102>                .17   7.538 |   1.00 181.813 |   1.83  14.754 |   2.67   7.242
01103>                .33   9.603 |   1.17  72.007 |   2.00  12.204 |   2.83   6.584
01104>                .50  13.290 |   1.33  37.943 |   2.17  10.407 |   3.00   6.040
01105>                .67  21.597 |   1.50  25.134 |   2.33   9.076 |
```

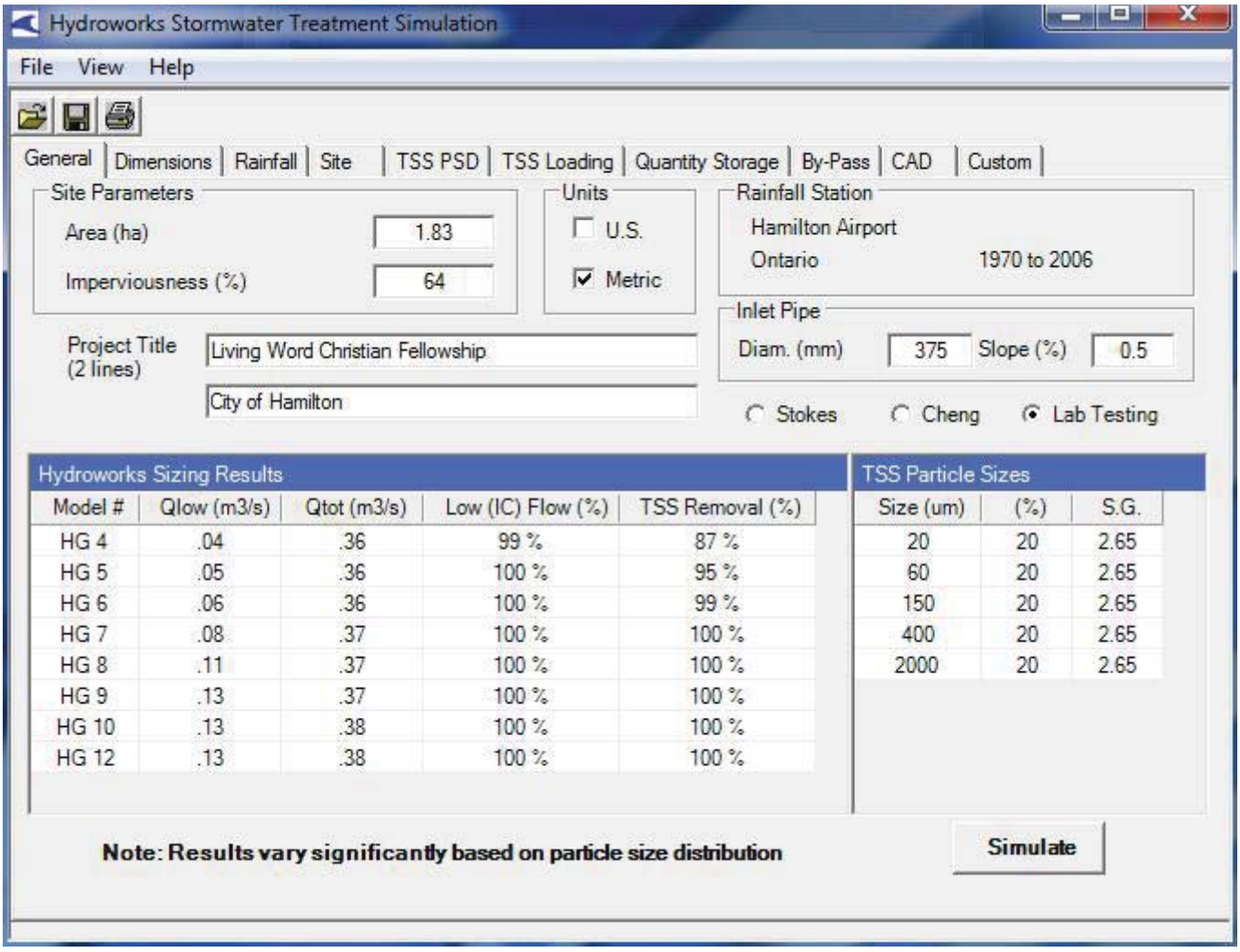
```
01106>                .83  54.599 |   1.67  18.629 |   2.50   8.053 |
01107>
01108> ----------------------------------------------------------------------------
01109> 100:0003-------------------------------------------------------------------
01110> *
01111> *#############################################################################|
01112> *#
01113> *#        PRE-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
01114> *#        ==============================================
01115> *#
01116> *#############################################################################|
01117> *# CATCHMENT 101
01118> *
01119> ----------------------
01120> | CALIB NASHYD       |   Area    (ha)=    2.30   Curve Number   (CN)=76.00
01121> | 01:101    DT= 1.00 |   Ia      (mm)=   6.350   # of Linear Res.(N)= 3.00
01122> ----------------------   U.H. Tp(hrs)=    .100
01123>
01124>      Unit Hyd Qpeak  (cms)=     .878
01125>
01126>      PEAK FLOW       (cms)=     .411 (i)
01127>      TIME TO PEAK    (hrs)=    1.067
01128>      RUNOFF VOLUME    (mm)=   39.749
01129>      TOTAL RAINFALL   (mm)=   86.085
01130>      RUNOFF COEFFICIENT   =     .462
01131>
01132>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01133>
01134> ----------------------------------------------------------------------------
01135> 100:0004-------------------------------------------------------------------
01136> *#############################################################################|
01137> *#
01138> *#        POST-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
01139> *#        ===============================================
01140> *#
01141> *#############################################################################|
01142> *# CATCHMENT 201
01143> *
01144> ----------------------
01145> | CALIB STANDHYD     |   Area    (ha)=     .47
01146> | 02:201    DT= 1.00 |   Total Imp(%)=   54.00   Dir. Conn.(%)=   54.00
01147> ----------------------
01148>                              IMPERVIOUS    PERVIOUS (i)
01149>      Surface Area     (ha)=        .25          .22
01150>      Dep. Storage     (mm)=       1.00         6.35
01151>      Average Slope     (%)=       2.00         5.00
01152>      Length            (m)=      50.00        20.00
01153>      Mannings n           =       .015         .250
01154>
01155>      Max.eff.Inten.(mm/hr)=     181.81        91.97
01156>                over (min)        1.00         5.00
01157>      Storage Coeff.  (min)=       1.17 (ii)    4.83 (ii)
01158>      Unit Hyd. Tpeak (min)=       1.00         5.00
01159>      Unit Hyd. peak  (cms)=        .97          .23
01160>                                                          *TOTALS*
01161>      PEAK FLOW       (cms)=        .13          .04          .166 (iii)
01162>      TIME TO PEAK    (hrs)=       1.00         1.03         1.000
01163>      RUNOFF VOLUME    (mm)=      85.08        39.75        64.231
01164>      TOTAL RAINFALL   (mm)=      86.09        86.09        86.085
01165>      RUNOFF COEFFICIENT   =        .99          .46          .746
01166>
01167>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01168>            CN* =  76.0    Ia = Dep. Storage  (Above)
01169>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01170>            THAN THE STORAGE COEFFICIENT.
```

```
01171>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01172>
01173> ---------------------------------------------------------------------------
01174> 100:0005-----------------------------------------------------------------------
01175> *#*************************************************************************|
01176> *# CATCHMENT 202
01177> *
01178> ----------------------
01179> | CALIB STANDHYD     |   Area    (ha)=    1.83
01180> | 03:202    DT= 1.00 |   Total Imp(%)=   64.00   Dir. Conn.(%)=   64.00
01181> ----------------------
01182>                              IMPERVIOUS    PERVIOUS (i)
01183>      Surface Area     (ha)=       1.17          .66
01184>      Dep. Storage     (mm)=       1.00         6.35
01185>      Average Slope     (%)=       2.00         5.00
01186>      Length            (m)=      50.00        20.00
01187>      Mannings n             =       .015         .250
01188>
01189>      Max.eff.Inten.(mm/hr)=     181.81        91.97
01190>                 over (min)        1.00         5.00
01191>      Storage Coeff.  (min)=       1.17 (ii)    4.83 (ii)
01192>      Unit Hyd. Tpeak (min)=       1.00         5.00
01193>      Unit Hyd. peak  (cms)=        .97          .23
01194>                                                          *TOTALS*
01195>      PEAK FLOW       (cms)=        .59          .13          .707 (iii)
01196>      TIME TO PEAK    (hrs)=       1.00         1.03         1.000
01197>      RUNOFF VOLUME    (mm)=      85.08        39.75        68.764
01198>      TOTAL RAINFALL   (mm)=      86.09        86.09        86.085
01199>      RUNOFF COEFFICIENT   =        .99          .46          .799
01200>
01201>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01202>            CN* =  76.0    Ia = Dep. Storage  (Above)
01203>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01204>            THAN THE STORAGE COEFFICIENT.
01205>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01206>
01207> ---------------------------------------------------------------------------
01208> 100:0006-----------------------------------------------------------------------
01209> *#*************************************************************************|
01210> *#
01211> *# ROUTE CATCHMENT 202 THROUGH ORIFICE PLATE
01212> *# ========================================================
01213> *#
01214> *#*************************************************************************|
01215> *#
01216> *
01217> ----------------------
01218> | ROUTE RESERVOIR    |    Requested routing time step =  1.0 min.
01219> |  IN>03:(202   )    |
01220> | OUT<04:(SWM   )    |    =========  OUTLFOW STORAGE TABLE  =========
01221> ----------------------    OUTFLOW    STORAGE    |  OUTFLOW    STORAGE
01222>                             (cms)    (ha.m.)    |    (cms)    (ha.m.)
01223>                              .000  .0000E+00     |     .012  .3280E-01
01224>                              .002  .0000E+00     |     .103  .4690E-01
01225>                              .006  .1900E-02     |     .114  .6320E-01
01226>                              .009  .1050E-01     |     .123  .8170E-01
01227>                              .010  .2070E-01     |     .132  .1026E+00
01228>
01229>      ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
01230>      --------------------       (ha)     (cms)     (hrs)       (mm)
01231>      INFLOW >03: (202   )       1.83      .707     1.000     68.764
01232>      OUTFLOW<04: (SWM   )       1.83      .119     1.467     68.766
01233>     OVERFLOW<05: (OFL-SE)        .00      .000      .000       .000
01234>
01235>                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
```

```
01236>                    CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
01237>                    PERCENTAGE OF TIME OVERFLOWING    (%)=      .00
01238>
01239>
01240>                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=   16.838
01241>                    TIME SHIFT OF PEAK FLOW         (min)=    28.00
01242>                    MAXIMUM  STORAGE   USED       (ha.m.)=.7347E-01
01243>
01244> ------------------------------------------------------------------------------
01245> 100:0007----------------------------------------------------------------------
01246> ------------------------
01247> | ADD HYD (TOTAL     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
01248> ------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
01249>                       ID1 02:201            .47     .166    1.00  64.23    .000
01250>                      +ID2 04:SWM           1.83     .119    1.47  68.77    .000
01251>                      +ID3 05:OFL-SE         .00     .000     .00    .00    .000
01252>                       ============================================================
01253>                       SUM 06:TOTAL         2.30     .271    1.00  67.84    .000
01254>
01255>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01256>
01257> ------------------------------------------------------------------------------
01258> 100:0008----------------------------------------------------------------------
01259> * RUN REMAINING DESIGN STORMS (MOUNT HOPE 5 TO 100-YR)
01260> *
01261> ------------------------------------------------------------------------------
01262> 100:0002----------------------------------------------------------------------
01263> *
01264> ------------------------------------------------------------------------------
01265> 100:0002----------------------------------------------------------------------
01266> *
01267> ------------------------------------------------------------------------------
01268> 100:0002----------------------------------------------------------------------
01269> *
01270> ------------------------------------------------------------------------------
01271> 100:0002----------------------------------------------------------------------
01272> *
01273> ------------------------------------------------------------------------------
01274> 100:0002----------------------------------------------------------------------
01275> *
01276>       FINISH
01277> ------------------------------------------------------------------------------
01278> ******************************************************************************
01279>      WARNINGS / ERRORS / NOTES
01280>      -------------------------
01281>    Simulation ended on 2014-08-07     at 13:34:48
01282> ==============================================================================
01283>
01284>
```

APPENDIX C

HYDROGUARD INFORMATION


Hydroworks Stormwater Treatment Simulation
File View Help
General Dimensions Rainfall Site TSS PSD TSS Loading Quantity Storage By-Pass CAD Custom
Site Parameters
Area (ha) 1.83
Imperviousness (%) 64
Units
U.S.
Metric
Rainfall Station
Hamilton Airport
Ontario 1970 to 2006
Inlet Pipe
Diam. (mm) 375 Slope (%) 0.5
Project Title (2 lines)
Living Word Christian Fellowship
City of Hamilton
Stokes Cheng Lab Testing
Hydroworks Sizing Results
Model # Qlow (m3/s) Qtot (m3/s) Low (IC) Flow (%) TSS Removal (%)
HG 4 .04 .36 99 % 87 %
HG 5 .05 .36 100 % 95 %
HG 6 .06 .36 100 % 99 %
HG 7 .08 .37 100 % 100 %
HG 8 .11 .37 100 % 100 %
HG 9 .13 .37 100 % 100 %
HG 10 .13 .38 100 % 100 %
HG 12 .13 .38 100 % 100 %
TSS Particle Sizes
Size (um) (%) S.G.
20 20 2.65
60 20 2.65
150 20 2.65
400 20 2.65
2000 20 2.65
Note: Results vary significantly based on particle size distribution
Simulate

Hydroworks® Hydroguard

Maintenance Manual

Version 1.3

Introduction

The Hydroguard is a state of the art hydrodynamic separator. Hydrodynamic separators remove solids, debris and lighter than water (oil, trash, floating debris) pollutants from stormwater. Hydrodynamic separators and other water quality measures are mandated by regulatory agencies (Town/City, State, Federal Government) to protect storm water quality from pollution generated by urban development (traffic, people) as part of new development permitting requirements.

As storm water treatment structures fill up with pollutants they become less and less effective in removing new pollution. Therefore it is important that storm water treatment structures be maintained on a regular basis to ensure that they are operating at optimum performance. The Hydroguard is no different in this regard and this manual has been assembled to provide the owner/operator with the necessary information to inspect and coordinate maintenance of their Hydroguard.

Hydroworks® HG Operation

The Hydroworks HG separator is unique since it treats both high and low flows in one device, but maintains separate flow paths for low and high flows. Accordingly, high flows do not scour out the fines that are settled in the low flow path since they are treated in a separate area of the device as shown in Figure 1.

The HG separator consists of three chambers:

1. an inner chamber that treats low or normal flows
2. a middle chamber that treats high flows
3. an outlet chamber where water is discharged to the downstream storm system

Under normal or low flows, water enters the middle chamber and is conveyed into the inner chamber by momentum. Since the inner chamber is offset to one side of the structure the water strikes the wall of the inner chamber at a tangent creating a vortex within the inner chamber. The vortex motion forces solids and floatables to the middle of the inner chamber. The water spirals down the inner chamber to the outlet of the inner chamber which is located below the inlet of the inner chamber and adjacent to the wall of the structure but above the floor of the structure. Floatables are trapped since the outlet of the inner chamber is submerged. The design maximizes the retention of settled solids since solids are forced to the center of the inner chamber by the vortex motion of water while the outlet of the inner chamber draws water from the wall of the inner chamber.

The water leaving the inner chamber continues into the middle chamber, again at a tangent to the wall of the structure. The water is then conveyed through an outlet baffle wall (high and low baffle). This enhances the collection of any floatables or solids not removed by the inner chamber. Water flowing through the baffles then enters the outlet chamber and is discharged into the downstream storm drain.

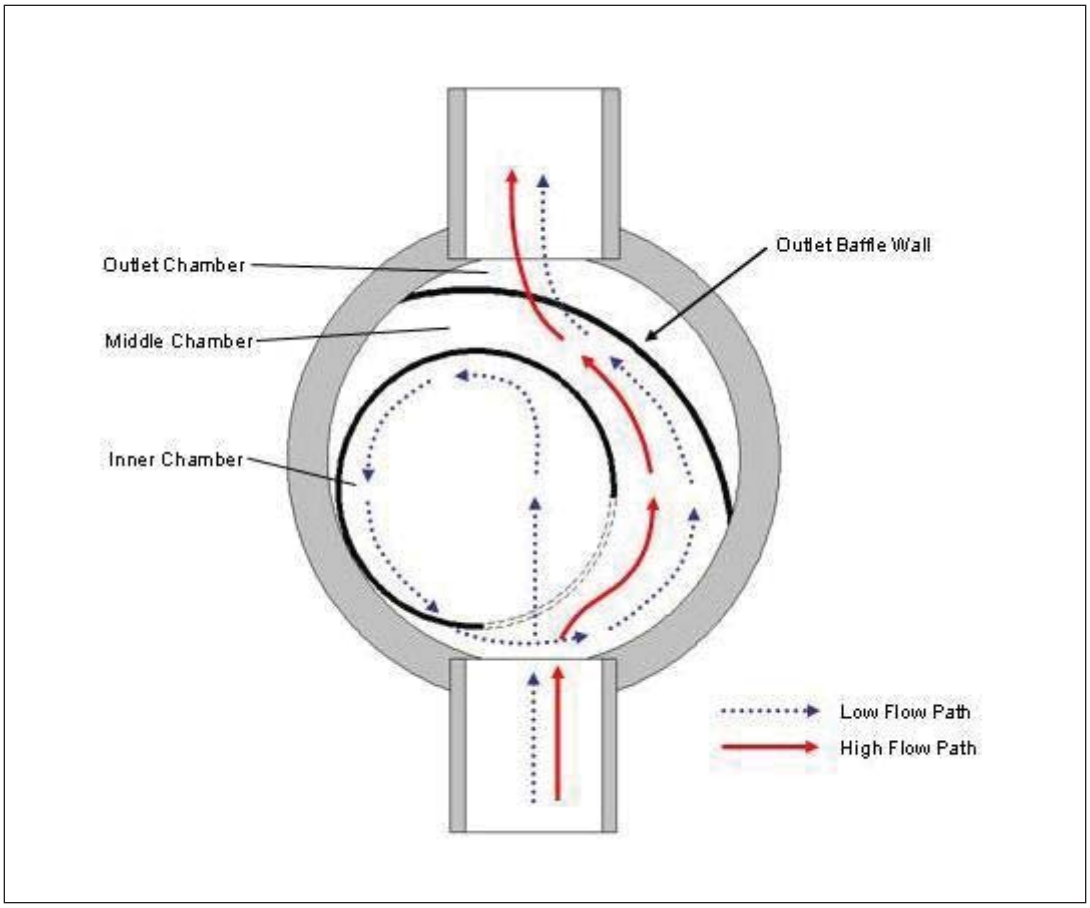


Figure 1. Hydroworks HG Operation – Plan View

During high flows, the flow rate entering the inner chamber is restricted by the size of the inlet opening to the inner chamber. This restriction of flow rate into the inner chamber prevents scour and re-suspension of solids from the inner chamber during periods of high flow. This is important since fines, which are typically considered highly polluted, are conveyed during low/normal flows.

The excess flow is conveyed directly into the middle chamber where it receives treatment for floatables and solids via the baffle system. This treatment of the higher flow rates is important since trash and heavier solids are typically conveyed during periods of higher flow rates. The Hydroworks HG separator is revolutionary since it incorporates low and high flow treatment in one device while maintaining separate low and high flow paths to prevent the scour and re-suspension of fines.

Figure 2 is a profile view of the HG separator showing the flow patterns for low and high flows.

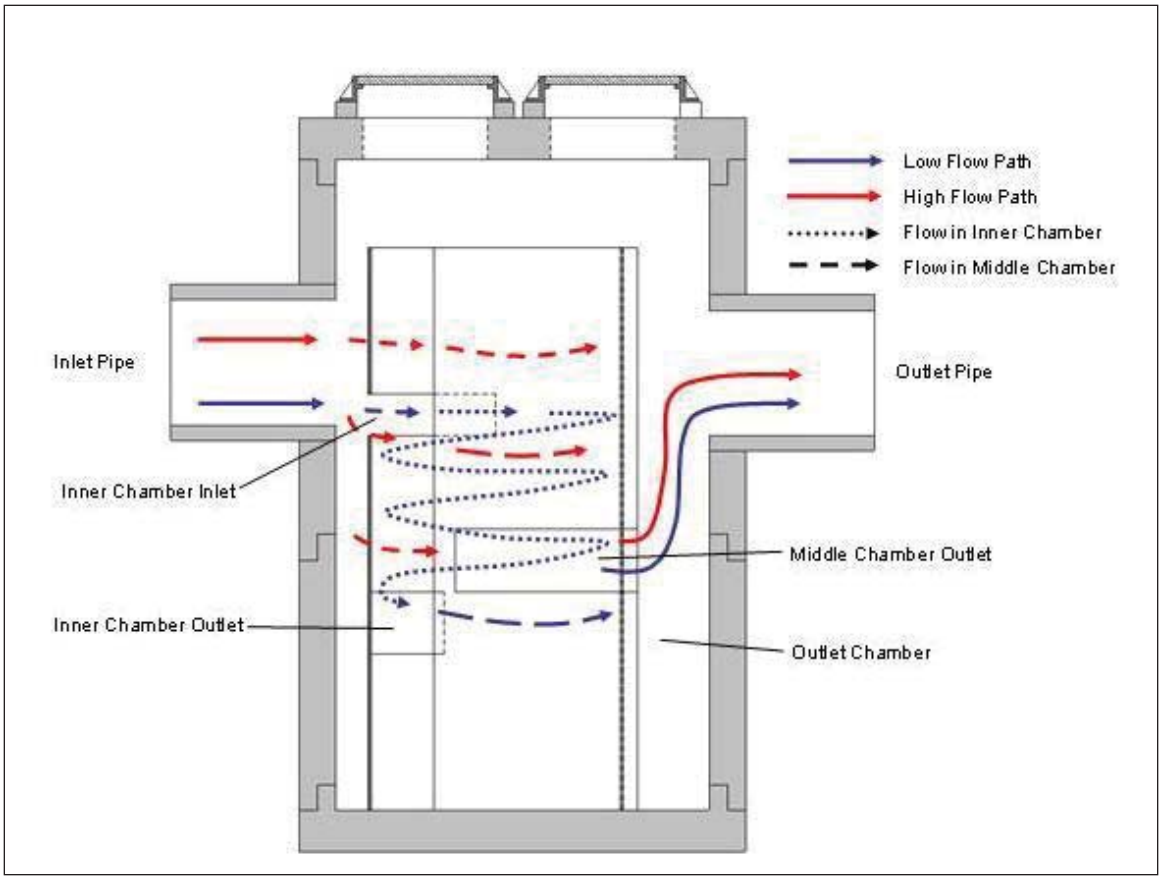
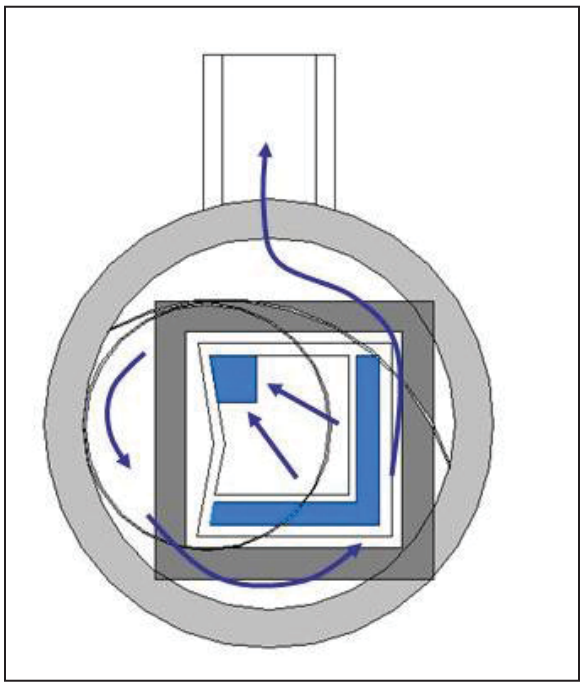


Figure 2. Hydroworks HG Operation – Profile View

The HG 4i is an inlet version of the HG 4 separator. There is a catch-basin grate on top of the HG 4i. Water flows directly into the inner chamber of the HG 4i through the catch-basin grate on top of the structure. The grate is oversized to allow maintenance of the entire structure. A funnel that sits underneath the grate on the top cap of the concrete itself directs the water into the inner chamber during normal flows and the middle chamber during high flows. Figures 3 and 4 show the flow paths for the HG 4i separator.

The inlet funnel is sloped towards the corner inlet and hence the wall of the inner chamber. Water moves in a circular direction in the inner chamber since water enters tangentially along the wall of the inner chamber due to the sloping funnel.

Water continues moving in a circular motion (vortex) through the rest of the structure (through the middle chamber and baffle wall) until it is discharged from the separator.



During periods of peak flow the water will back up from the corner inlet and overflow into two side overflow troughs which discharge directly into the middle chamber. These overflow troughs are covered from the surface such that water cannot directly fall through them (i.e. water must back up to enter the overflow troughs).

Accordingly this funnel provides the same separate flow paths for low and high flow as the other Hydroguard separators.

The whole funnel is removed for inspection and cleaning providing.

Figure 3. Hydroworks Hydroguard HG 4i Normal Flow Path

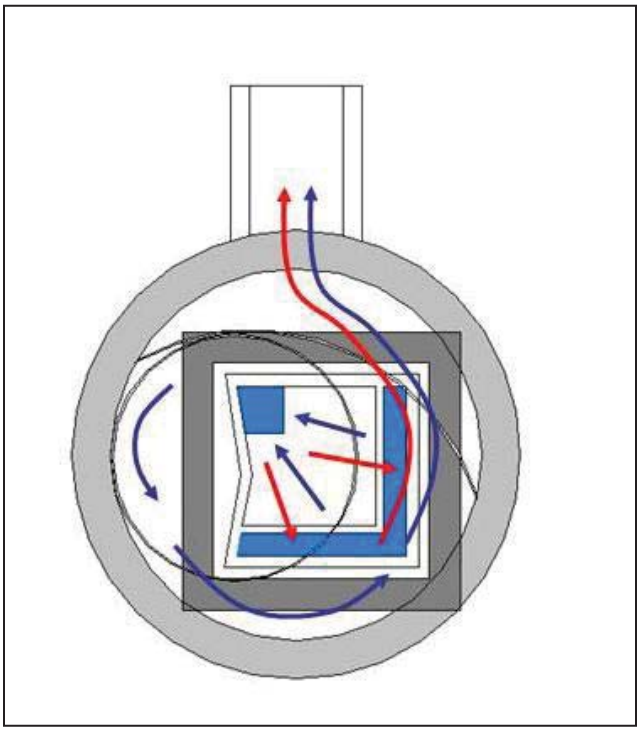


Figure 4. Hydroworks Hydroguard HG 4i Peak Flow Path

Inspection

Procedure

Although all parts of the Hydroguard should be inspected, inspection and maintenance should focus on the inner and middle chambers since this is where the pollutants (floatable and sinking) will accumulate.

Floatables

A visual inspection can be conducted for floatables by removing the covers and looking down into the separator. Multiple covers are provided on Hydroworks HG units to access all areas of the separator (The HG 4 may have a single larger 32” (800mm) cover due to the lack of space for multiple 24” (600mm) covers).

TSS/Sediment

Inspection for TSS build-up can be conducted using a Sludge Judge®, Core Pro®, AccuSludge® or equivalent sampling device that allows the measurement of the depth of TSS/sediment in the unit. These devices typically have a ball valve at the bottom of the tube that allows water and TSS to flow into the tube when lowering the tube into the unit. Once the unit touches the bottom of the device, it is quickly pulled upward such that the water and TSS in the tube forces the ball valve closed allowing the user to see a full core of water/TSS in the unit. The unit should be inspected for TSS through each of the access covers. Several readings (2 or 3) should be made at each access cover to ensure that an accurate TSS depth measurement is recorded.

Frequency

Construction Period

The HG separator should be inspected every two weeks and after every large storm (over 0.5” (12.5 mm) of rain) during the construction period.

Post-Construction Period

The Hydroworks HG separator should be inspected once per year for normal stabilized sites (grassed or paved areas). If the unit is subject to oil spills or runoff from unstabilized (storage piles, exposed soils) areas the HG separator should be inspected more frequently (4 times per year). An initial annual inspection will indicate the required future frequency of maintenance if the unit was maintained after the construction period.

Reporting

Reports should be prepared as part of each inspection and include the following information:

1. Date of inspection
2. GPS coordinates of Hydroworks unit
3. Time since last rainfall
4. Date of last inspection
5. Installation deficiencies (missing parts, incorrect installation of parts)
6. Structural deficiencies (concrete cracks, broken parts)
7. Operational deficiencies (leaks, blockages)
8. Presence of oil sheen or depth of oil layer
9. Estimate of depth/volume of floatables (trash, leaves) captured
10. Sediment depth measured
11. Recommendations for any repairs and/or maintenance for the unit
12. Estimation of time before maintenance is required if not required at time of inspection

A sample inspection checklist is provided at the end of this manual.

Maintenance

Procedure

The Hydroworks HG unit is typically maintained using a vactor truck or clam shell bucket. There are numerous companies that can maintain the HG separator. Envirocalm, LLC, an affiliate company of Hydroworks offers inspection and maintenance services and can inspect and maintain the HG separator. (www.envirocalm.com).

Disposal of the contents of the separator depend on local requirements. Maintenance of a Hydroworks HG unit will typically take 1 to 2 hours.

Frequency

Construction Period

A HG separator can fill with construction sediment quickly during the construction period. The construction sediment will have a much coarser particle size distribution than the suspended solids during the post-development period. Accordingly, scour is not so much of a concern during the construction period compared to the separator filling up with solids. The Hydroguard must be maintained during the construction period when the depth of TSS/sediment reaches 27” (675 mm). This represents 75% of the maximum sediment storage capacity. It must also be maintained during the construction period if there is an appreciable depth of oil in the unit (more than a sheen) or if floatables other than oil cover over 50% of the open water surface on the inlet side of the outlet baffle wall.

The HG separator should be maintained at the end of the construction period, prior to utilization for the post-construction period.

Post-Construction Period

The Hydroguard was independently tested by Alden Research Laboratory in 2008. A HG6 was tested for scour with initial sediment loads of 4.6 ft^3 and 9.3 ft^3. The results from these tests were almost identical. Therefore, the 9.3 ft^3 sediment load was used as 50% of the maximum sediment depth for maintenance in the calculation of the maintenance interval for the HG6 separator based on the NJDEP maintenance interval equation.

Maintenance Interval (months) = 3.565 x (Sediment Storage) / (MTFR x TSS Removal)

Maintenance Interval (HG6) = 3.565 x 9.3 / (1.67x 0.55) = 36 months

All values (flow, sediment storage) can be scaled by the surface area making the sediment depths and maintenance intervals equal for all separators.

The separator was loaded with the sediment in the inner chamber and middle chamber with the majority of sediment (80%) located in the inner chamber. The inner chamber for area represents approximately 44% of the separator surface area. The inner chamber is 4 ft (1200 mm) in diameter in the HG6. Therefore the 50% sediment depth for the HG6 in the inner chamber would be:

9.3 ft^3 x 0.80 / (3.14 x 4 ft^2) x 12 in/ft = 7.1 inches (175 mm)

Accordingly the 100% sediment volume would represent 14.2” (350 mm) of sediment depth in the inner chamber.

The HG separator must be maintained if there is an appreciable depth of oil in the unit (more than a sheen) or if floatables other than oil cover over 50% of the open water surface on the inlet side of the outlet baffle wall. It should also be maintained once the accumulated TSS/sediment depths are greater than 14” (350 mm) in the inner chamber. For typical stabilized post-construction sites (parking lots, streets) it is anticipated that maintenance will be required annually or once every two years. More frequent or less frequent maintenance will be required depending on individual site conditions (traffic use, stabilization, storage piles, etc.). The long term maintenance frequency can be established based on the maintenance requirements during the first several years of operation if site conditions do not change.

HYDROGUARD INSPECTION SHEET

Date _____
Date of Last Inspection _____

Site _____
City _____
State _____
Owner _____

GPS Coordinates _____

Date of last rainfall _____

Site Characteristics	**Yes**	**No**
Soil erosion evident	☐	☐
Exposed material storage on site	☐	☐
Large exposure to leaf litter (lots of trees)	☐	☐
High traffic (vehicle) area	☐	☐

Hydroguard	**Yes**	**No**
Incorrect access orientation	☐ ***	☐
Obstructions in the inlet or outlet	☐ *	☐
Missing internal components	☐ **	☐
Improperly installed internal components	☐ **	☐
Improperly installed inlet or outlet pipes	☐ ***	☐
Internal component damage (cracked, broken, loose pieces)	☐ **	☐
Floating debris in the separator (oil, leaves, trash)	☐	☐
Large debris visible in the separator	☐ *	☐
Concrete cracks/deficiencies	☐ ***	☐
Exposed rebar	☐ **	☐
Water seepage (water level not at outlet pipe invert)	☐ ***	☐

Water level depth below outlet pipe invert _____"

Routine Measurements

Floating debris depth	**< 0.5" (13mm)**	☐	**>0.5" 13mm)**	☐*
Floating debris coverage	**< 25% of surface area**	☐	**> 25% surface area**	☐ *
Sludge depth	**< 14" (350mm)**	☐	**> 14" (350mm)**	☐ *****

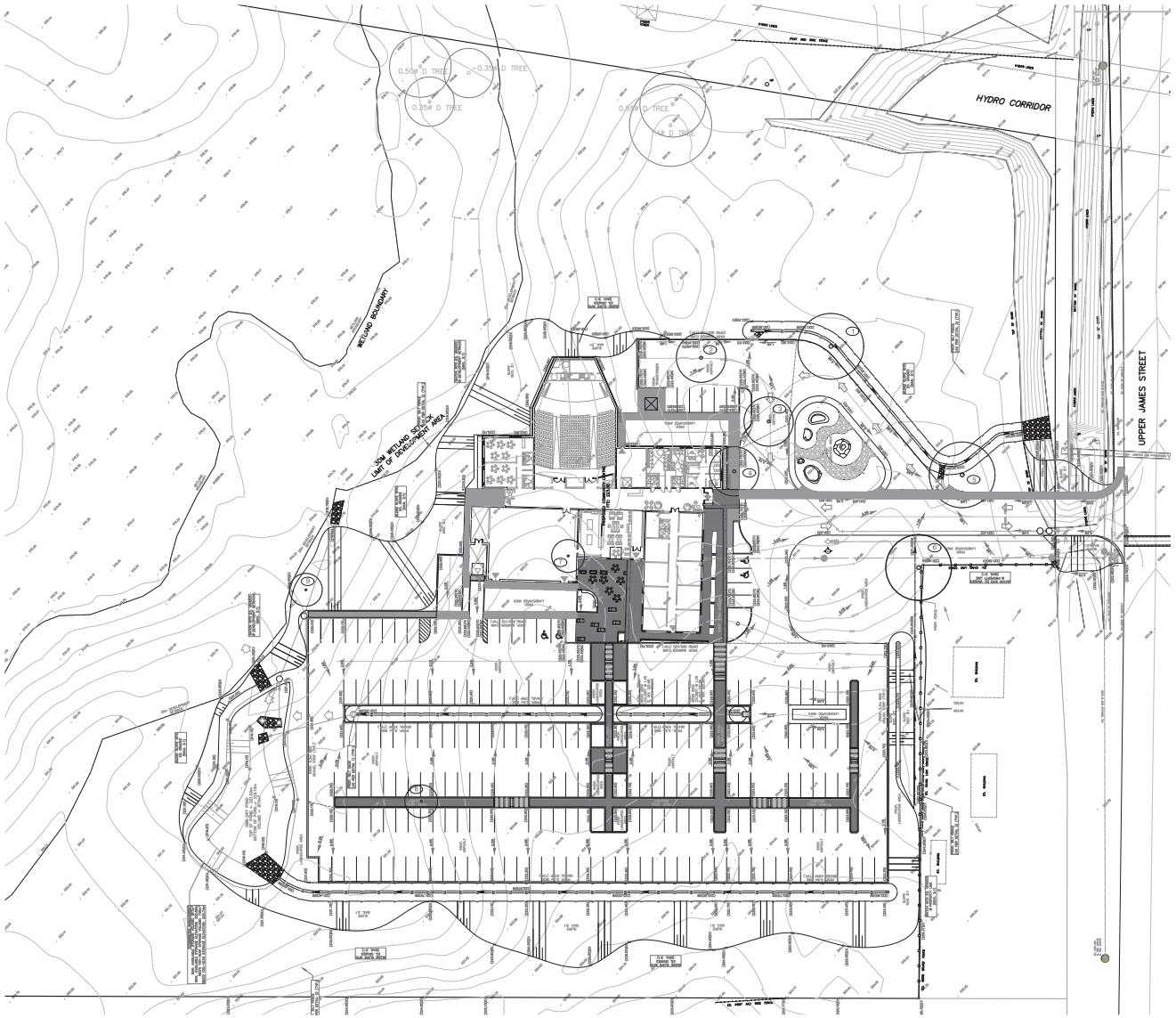
Other Comments: _____
_____
_____

* Maintenance required
** Repairs required
*** Further investigation is required

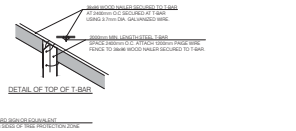
Please call Hydroworks at 888-290-7900 or email us at support@hydroworks.com if you have any questions regarding the Inspection Checklist. Please fax a copy of the completed checklist to Hydroworks at 888-783-7271 for our records.

Appendix H

Vegetation Management Plan



Trunk Diameter (DBH)*	Minimum Protection Distances Required*
< 10 cm	1.8 m
11-40 cm	2.4 m
41-50 cm	3.0 m
51-60 cm	3.6 m
61-70 cm	4.2 m
71-80 cm	4.8 m
81-90 cm	5.4 m
91-100 + cm	6.0 m



DETAIL OF TOP of T-BAR

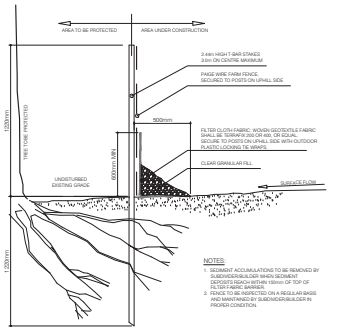
DETAIL OF SIGN

SECTION

TREE PRESERVATION NOTES:

1. ALL EXISTING TREES TO REMAIN ON SITE, OR ON ADJACENT PROPERTIES, SHALL BE TAGGED AND FULLY PROTECTED WITH FENCING BEYOND THEIR DRIPLINE TO THE SATISFACTION OF THE CITY. TREE PROTECTION ZONES MAY BE EXPANDED AS REQUIRED BASED ON THE SPECIES OF THE TREE. THOSE MARKERS ARE CREATED TO PROTECT THE ROOTS, TRUNKS AND BRANCHES OF TREES FROM DAMAGE. TREE PROTECTION ZONES SHALL BE ENCLOSED WITH 1200mm HIGH PAGE WIRE FENCING WITH METAL POST ENCLOSURES. LONG TERM DEVELOPMENT CONSTRUCTION REQUIRES SPECIAL PAGE WIRE FENCING OR PLYWOOD TO A MINIMUM HEIGHT OF 1.8m
2. FENCES SHALL BE LOCATED AT A MINIMUM OF 0.5 TIMES THE CROWN RADIUS OF THE TREE FROM THE DRIPLINE, 360 DEGREES AROUND THE PERIMETER OF INDIVIDUAL OR CLUSTERED TREES.
3. AREAS WITHIN THE TREE PROTECTION ZONE SHALL NOT BE USED FOR THE STORAGE OF BUILDING MATERIALS, STRUCTURES OR EQUIPMENT. THIS TREE PROTECTION ZONE SHALL BE COMPLETED PRIOR TO THE COMMENCEMENT OF SITE CLEARANCE, DEMOLITION, OR ANY TYPE OF CONSTRUCTION.
4. SURPLUS SOIL, EQUIPMENT, VEHICLES, TOOLS, DEBRIS OR MATERIALS SHALL NOT BE PLACED OVER THE ROOT SYSTEMS OF THE TREES WITHIN THE TREE PROTECTION ZONE. NO CONTAMINANTS SHALL BE DUMPED OR FLUSHED WHERE THEY MAY REACH ROOTS OF TREES EVER.
5. TREE ROOTS TYPICALLY SPREAD WELL BEYOND THE DRIPLINE OF TREES, UP TO 3.5 TIMES THE DRIPLINE RADIUS, AND ARE LOCATED PREDOMINANTLY IN THE TOP 30CM OF SOIL. AS THIS AREA IS NOT PROTECTED, ACTIVITY SHOULD BE KEPT TO A MINIMUM TO PREVENT ROOT DAMAGE AND SOIL COMPACTION. WHERE ROOT SYSTEMS OF TREES ARE EXPOSED OR DAMAGED BY CONSTRUCTION WORK, THE CITY MUST BE ADVISED FIRST BEFORE THE ROOTS ARE TRIMMED NEATLY AND THE AREA BACK-FILLED WITH TOPSOIL.
6. EQUIPMENT SHALL NOT COMPACT SOIL OVER THE ROOT ZONE OF EXISTING TREES. TO AVOID DAMAGE TO TREES THAT AREA TO BE PROTECTED, ACCESS ROUTES MUST BE ESTABLISHED AWAY FROM PROTECTED AREAS. ALL ACCESS ROUTES REGARDLESS OF HOW TEMPORARY, MUST BE IDENTIFIED AND APPROVED BY THE CITY.
7. WRITTEN PERMISSION MUST BE OBTAINED FROM THE CITY PRIOR TO COMMENCING WORK SUCH AS TUNNELING, TORPEDOING, DIGGING OR TRENCHING WITHIN THE DRIPLINE OF ANY TREE TO MINIMIZE ROOT INJURY AND AVOID SOIL COMPACTION.
8. WHEREVER POSSIBLE AVOID CUTTING SURFACE ROOTS. DURING EXCAVATION IF ROOT CUTS ARE NECESSARY, IT SHOULD BE DONE QUICKLY, MAKING FLUSH CUTS WHILE SUPERVISED BY AN INSPECTING CITY FORESTRY REPRESENTATIVE. THE ROOTS SHALL BE BACKFILLED AND WATERED BEFORE THEY HAVE A CHANCE TO DRY OUT. WHERE ROOTS REQUIRE REMOVAL, THERE MAY BE A SUBSEQUENT DECLINE WITHIN THE TREE CANOPY. BRANCHES SHOULD ONLY BE PRUNED IF DISEASE OCCURS.
9. WHERE LIMBS OR PORTIONS OF TREES ARE DAMAGED OR MUST BE REMOVED FROM CITY OWNED TREES TO ACCOMMODATE CONSTRUCTION WORK, CITY FORESTRY PERSONNEL, IN ACCORDANCE WITH ACCEPTED ARBORICULTURE PRACTICES, WILL REMOVE THE, HEADLESS SHALL BE TAKEN TO PREVENT ANY FURTHER DAMAGE.
10. UNLESS AUTHORIZED, ALL INDIVIDUALS SHALL AVOID DISTURBING ORIGINAL GRADES AROUND TREES IN AREAS OF THE TREE PROTECTION ZONE. IN ADDITION, ROAD GRADES SHOULD MATCH TOPOGRAPHY AT THE CURB LINES TO MINIMIZE TREE RETENTION IN BOULEVARD AND FRONT YARDS. IF GRADES AROUND PROTECTED TREES ARE LIKELY TO CHANGE, THE DEVELOPER AND THEIR AGENTS SHALL BE REQUIRED TO TAKE SUCH PRECAUTIONS AS DRY WELLING, RETAINING WALLS AND ROOT FEEDING TO THE SATISFACTION OF THE CITY.
11. NO CABLES, ROPES SHALL BE WRAPPED AROUND OR INSTALLED IN OR ON ANY TREE THAT IS TO REMAIN AFTER CONSTRUCTION. NOR SHALL IT HAVE SIGNS OR FENCES NAILED TO IT, OR SURVEY MARKINGS OR PAINT APPLIED TO IT.
12. ALL VEGETATION WITHIN THE TREE PROTECTION ZONE, INCLUDING TREES, SHRUBS, GRASSES ARE TO BE WATERED, AND MAINTAINED TO AN ACCEPTABLE LEVEL AS REQUIRED.
13. THE CITY SHALL BE NOTIFIED TO INSPECT ALL TREE PROTECTION ZONES. THESE MEASURES SHALL REMAIN IN EFFECT UNTIL THE COMPLETION OF THE WORK, AT WHICH TIME AUTHORIZATION FROM THE CITY MUST BE OBTAINED BEFORE REMOVAL.
14. THE CITY MUST BE NOTIFIED IMMEDIATELY WHEN ANY MUNICIPALLY OWNED TREE IS INJURED OR DESTROYED DURING CONSTRUCTION OR DEVELOPMENT.

1 / L-1 TREE PRESERVATION FENCING
N.T.S



2 / L-1 EROSION CONTROL AND SEDIMENTATION FENCING
N.T.S

EXISTING TREE IDENTIFICATION TABLE

TREE NO.	BOTANICAL NAME	COMMON NAME	DBH (cm)	CONDITION (3)	TREE VALUE & CONSTRAINTS (4)	IMPACTS OF DEVELOPMENT	RECOMMENDATION (5)
1	POPULUS TREMELOIDES	TREMBLING ASPEN	20	E		CONFLICTS WITH CONSTRUCTION/GRADING	REMOVE
2	POPULUS TREMELOIDES	TREMBLING ASPEN	35	G		CONFLICTS WITH CONSTRUCTION/GRADING	REMOVE
3	SALIX SPP.	WILLOW SPP.	6X10cm	G		CONFLICTS WITH CONSTRUCTION/GRADING	REMOVE
4	SALIX SPP.	WILLOW SPP.	3x10cm, 20x20cm	G		CONFLICTS WITH CONSTRUCTION/GRADING	REMOVE
5	ROBINIA PSEUDOACACIA	BLACK LOCUST	40	G		CONFLICTS WITH CONSTRUCTION/GRADING	REMOVE
6	POPULUS TREMELOIDES	TREMBLING ASPEN	20	E		NONE	PRESERVE
7	JUGLANS NIGRA	BLACK WALNUT	20	E		CONFLICTS WITH CONSTRUCTION	REMOVE
8	JUGLANS NIGRA	BLACK WALNUT	60	E		CONFLICTS WITH CONSTRUCTION	REMOVE
9	ULMUS AMERICANA	WHITE ELM	20	P	EVIDENCE OF INSECT DAMAGE	CONFLICTS WITH GRADING	REMOVE

(1) Trees recommended for saving in SHADED BOXES
(2) (E)-Excellent, (G)-Good, (F)-Fair, (P)-Poor, (V)-Very Poor, (D)-Dead
(3) Comments based on tree value and existing physical constraints
(4) Recommendations: Preserve, Remove, Transplant

KEY MAP - N.T.S.

LEGEND

- EX. DECIDUOUS TREE TO REMAIN
- EX. CONIFEROUS TREE TO REMAIN
- EX. DECIDUOUS TREE TO BE REMOVED
- EX. CONIFEROUS TREE TO BE REMOVED
- TEMPORARY TREE PROTECTION FENCING D1, D2 ON L1

NOT FOR CONSTRUCTION

SCALE/NORTH ARROW

DESIGNED BY:	J.M.	CHECKED BY:	J.M.
DRAWN BY:	J.M.	DATE:	AUG/JST/2014

#	DATE	BY	DESCRIPTION
1	2015-01-05	JM	FIRST LANDSCAPE SUBMISSION

REVISIONS

APPROVALS

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200 East Wing-360 James Street North
Hamilton ON L8L 1H5 Canada
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ibigroup.com

HAMILTON
ONTARIO, CANADA

LIVING WORD CHRISTIAN FELLOWSHIP
2060 UPPER JAMES STREET

VEGETATION MANAGEMENT PLAN

FILE NUMBER:	SHEET NUMBER:
1226/19505L	L-1

FILE J:\pre-info\all\19505\109 - Living Word Christian Fellowship - Landmark\Landscape\02dc dwg LAYOUT:L1-VEGETATION MANAGEMENT
LAST SAVED BY:Jennifer.moore, Tuesday, January 20, 2015 3:58:27 PM PLOTTED BY:Jennifer.Moore Tuesday, January 20, 2015 4:16:38 PM