November 2016

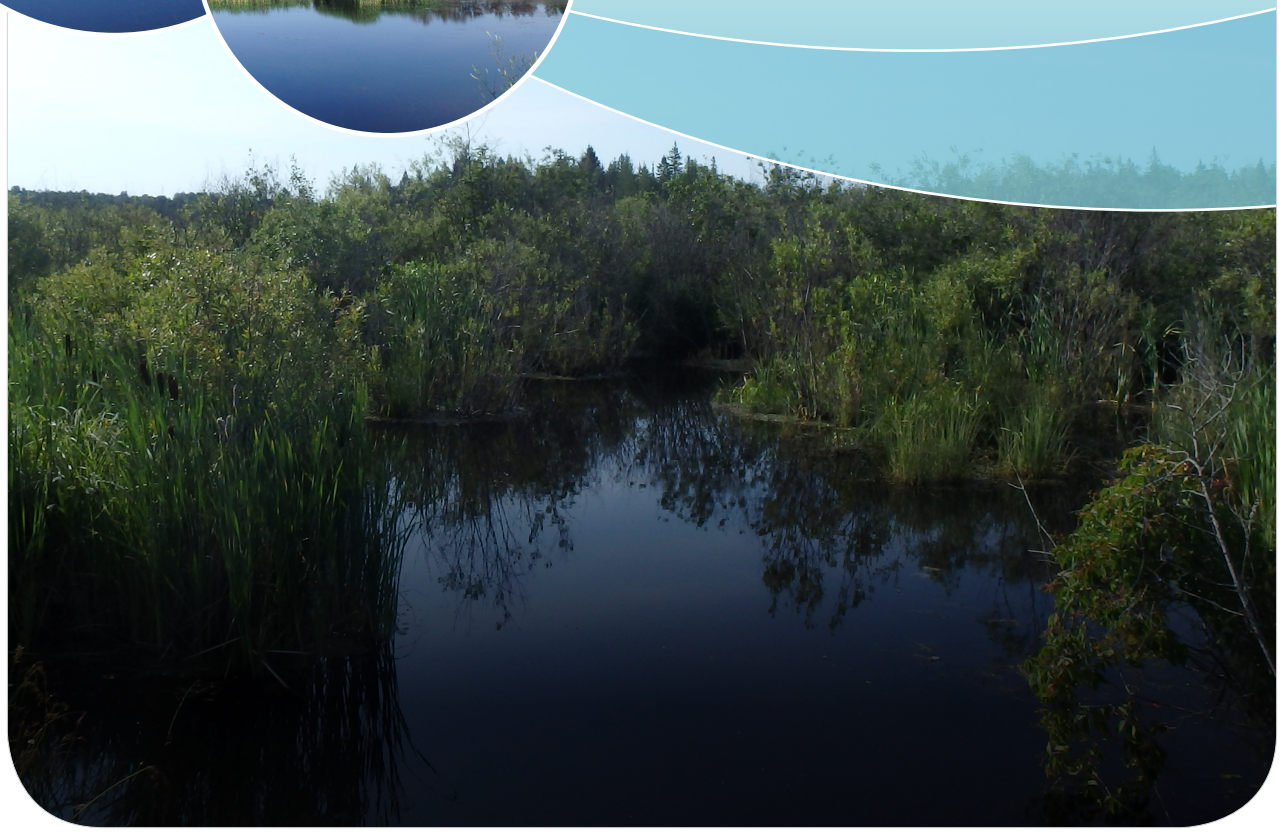
DILLON CONSULTING

CITY OF OTTAWA

GOULBOURN WETLAND COMPLEX

Re-delineation of Wetland Summary Report

16-4195



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November 8, 2016

City of Ottawa
Planning Department
110 Laurier Avenue West, 4th Floor
Ottawa, ON
K1P 1K1

Attention: Nick Stow - Senior Planner, Natural Systems

Re-delineation of the Goulbourn Wetland Complex

Dear Dr. Stow

Dillon Consulting Limited ("Dillon") was retained by the City of Ottawa to undertake a boundary re-delineation for the provincially significant wetland (PSW) known as the Goulbourn Wetland Complex, which is located within the City designated Flewellyn Special Study Area. Existing mapping provided by the Ministry of Natural Resources and Forestry indicates that the Goulbourn Wetland Complex is comprised of a complex of 44 individual units covering 680.46 hectares (ha) of area. Based on Dillon's revaluation the wetland boundaries, it is proposed that the Goulbourn Wetland Complex be expanded to incorporate an additional 463.63 ha resulting in a new wetland area of 1093.91 ha.

Sincerely,

DILLON CONSULTING LIMITED

Alexander Zeller, M.Sc.
Project Manager

Jonathan Harris
Wetland Evaluator

Encl.

Our file: 16-4195

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References

1.0 Introduction

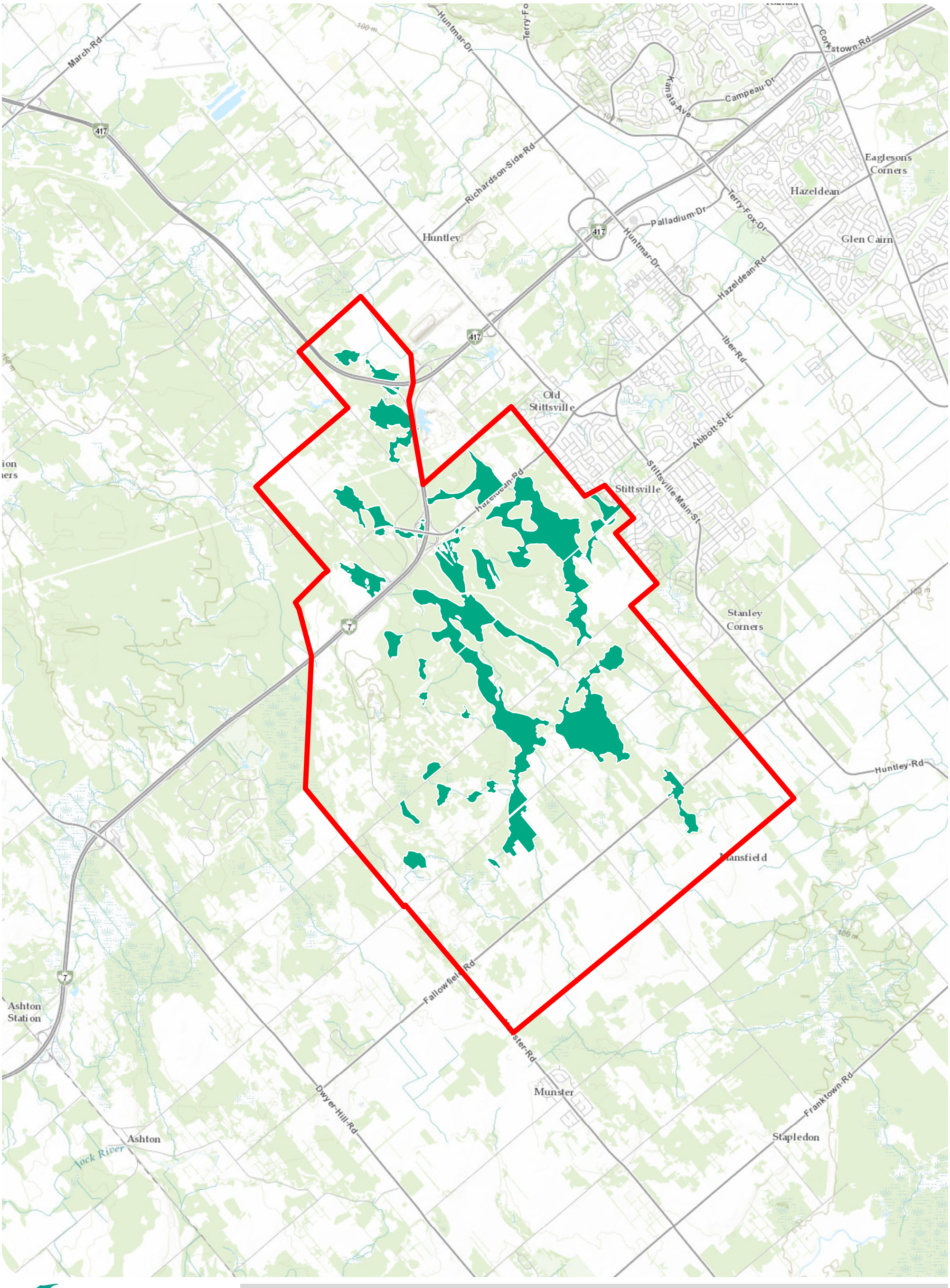
Dillon Consulting Limited ("Dillon") was retained by the City of Ottawa (the "City") to undertake a boundary re-delineation of the provincially significant wetland (PSW) known as the Goulbourn Wetland Complex. This wetland complex is located within the City designated Flewellyn Special Study Area. The re-delineation of Goulbourn Wetland Complex boundaries is required under the City's Official Plan Policy 3.2.5 in which the City is to complete the following within the Flewellyn Special Study Area:

- A cumulative effects study on historical changes to the drainage in the area;
- A Mineral Resources Study; and,
- A re-delineation of the Goulbourn Wetland Complex in 2016, using the Ontario Wetland Evaluation System (OWES).

The City has completed the Mineral Resources Study and the Cumulative Effects Study for the Flewellyn Special Study Area. This summary report outlines the results of the boundary re-delineation of the Goulbourn Wetland complex undertaken by Dillon in 2016.

1.1 Study Area

The Goulbourn Wetland Complex is within the former Goulbourn Township with the area of study roughly bound by Munster Road/Jinkinson Road/Spruce Ridge Road to the west, Mansfield Road to the south, Blacks Side Road/West Ridge Drive to the east and Rothbourne Road/Richardson Side Road to the north (see **Figure 1**).



Study Area

Goulbourn Wetland Complex

GOULBOURN PSW COMPLEX
RE-DELINEATION

FIGURE 1

STUDY AREA

DILLON CONSULTING

MAP DRAWING INFORMATION:
DATA PROVIDED BY MNRF (2016)
AND CITY OF OTTAWA (2016)

MAP CREATED BY: JWH
MAP CHECKED BY: AZ
MAP PROJECTION: NAD 1983 UTM Zone 18N

1:60,000

0 0.5 1 2 km

N W E S

PROJECT: 16-4195 STATUS: DRAFT DATE: 11/8/2016

FILE LOCATION: G:\CAD\2017\17XXXX_GoulburnWetland\MXDs\Working\Documentation of Process\Figure 1 - Study Area.mxd

1.2 Project Background

In response to development pressure and applications, the City contracted Jacques Whitford Limited (now part of Stantec Consulting Limited) in 2004 to conduct a re-delineation of the Goulbourn Wetland Complex. The wetland re-delineation was submitted to the City and the Ministry of Natural Resources (now the Ministry of Natural Resources and Forestry (MNRF)) in January 2005. In February 2005, the Ministry of Natural Resources accepted the conclusions of the wetland evaluation and confirmed the expansion of the wetland complex to include an additional 14 wetland units, made up of 20 sub-units (see **Table A1** in ***Appendix A*** for unit identifier).

The City notified the landowners affected by the new boundaries of the Goulbourn Wetland Complex and the City's intention to designate the additional wetland units as "significant wetland" in the City of Ottawa Official Plan (2003) in April of 2005. Feedback from landowners to this notification resulted in a number of discussions, meetings and work plans over the subsequent four year period. During this time, the additional wetland units remained undesignated in Ottawa's Official Plan, although the Ministry of Natural Resources continued to identify them as provincially significant.

In 2009, the City passed Official Plan Amendment No. 76, which involved a comprehensive review of the City's Official Plan. Following discussions with the Ontario Ministry of Municipal Affairs and Housing, landowners from the former Goulbourn Township area, local quarry operators, the Rideau Valley Conservation Authority and other stakeholders, the City created Official Plan Policy 3.2.5 – Flewellyn Special Study Area. This policy was approved by Ontario Municipal Board on April 26, 2012.

The Flewellyn Special Study Area established a process for determining the appropriate land use designations for the additional wetland units. It froze any new development within the Special Study Area, until such time as the Special Study Area overlay is removed. It also specified that the City would carry out a cumulative effects study on historical changes to the drainage in the area, a Mineral Resources Study, and the re-delineation of the Goulbourn Wetland Complex, using OWES. The information from these studies is to be used by City staff to recommend the most appropriate land use designations to City Council.

1.3 Study Objective

In 2016 Dillon was retained by the City of Ottawa to undertake a formal re-delineation of the Goulbourn Wetland Complex. The objective of this re-delineation was to update the boundaries of existing mapped Provincially Significant Wetland units within the Goulbourn Wetland Complex.

This was done using a scoped variant of the Ontario Wetland Evaluation System (MNR 2014) consisting of a Geographic Information System (GIS) based desktop assessment with an on-site verification component. This scoped protocol was suitable to re-delineate existing wetland units but did not include the scoring component typically required to conduct a comprehensive wetland evaluation.

2.0 Methods

The approach to re-delineate the boundaries of the Goulbourn PSW Complex consisting primarily of a GIS based desktop assessment with on-site field verification where access was permitted. The re-delineation work was undertaken by two Dillon biologists certified by the MNRF to undertake evaluations using the OWES for Southern Ontario. The certified evaluators included an intermediate biologist in collaboration with a senior biologist. The curriculum vitae for the two evaluators are available for reference in ***Appendix B***.

2.1 Desktop Assessment

The GIS based desktop re-delineation involved aerial imagery interpretation of the existing wetland boundaries as mapped by the MNRF. Revisions to boundaries included either a reduction, and/or expansion, of wetland area based on the underlying imagery.

Patterns that emerge on air photos are an accepted method for delineating operational units for ecosystem management and planning across Ontario (OMNR, 2001). Used in this way, air photos can be helpful in describing and inventorying large geographic areas. Interpretation of aerial imagery covering the Goulbourn Wetland Complex within the Study Area was done according to the methods for air photo interpretation outlined in the *Ecological Land Classification for Southern Ontario: Training Manual* (OMNR, 2001).

The data and imagery used for this desktop assessment included the following:

- A 2016 file geo-database provided by Land Information Ontario containing unevaluated and evaluated wetlands mapped in Ontario.
- Ortho-rectified 2016 imagery of the Study Area in both true-colour composite and false-colour composite (colour infrared) provided by the City.
- Light Detection and Ranging (LiDAR) data in the form of contours (0.25 m increments) and raster dataset showing the contrast in elevations provided by the City.
- Historical imagery available through Google Earth Pro (2004-2016).
- Imagery available through the Google Maps web application Street View.

Using the data and imagery listed above, the desktop re-delineation of the Goulbourn Wetland Complex boundaries was broken down into the following tasks:

1. **Subtract Inconsistencies from Wetland Units**
2. **Expansion of Contiguous Wetland Units**
3. **Desktop Assessment Results**

The following sections outlines the methods used to complete each of these tasks.

2.1.1 Subtract Inconsistencies from Wetland Units

As a first step in the desktop assessment, Goulbourn Wetland Complex units currently mapped by the MNRF were compared with digital imagery. The non-wetland areas were subtracted from the mapping where portions of the PSW is no longer considered wetland, based on the OWES for Southern Ontario (MNR, 2014). Portions of wetland units were no longer be considered wetland if the underlying imagery indicated an anthropogenic land use or upland vegetation community.

2.1.1.1 Anthropogenic Subtraction

Non-wetland areas were subtracted from the PSW unit in areas where wetland boundaries were observed to overlap with anthropogenic features. If the mapped PSW unit entirely overlaps a non-natural feature, the entire unit was removed. Examples of anthropogenic features include roads, annual row crop fields, aggregate extraction, and residential dwellings/properties.

2.1.1.2 Upland Vegetation Subtraction

A review and interpretation of digital imagery, where colour infrared imagery was the primary source, was undertaken to determine the presence of upland vegetation communities within mapped wetland units. Since infrared light is readily absorbed by water, infrared imagery is commonly used in the interpretation of vegetation. This means that, when displayed as a colour infrared image, upland vegetation communities appear brighter in colour (e.g. whites, bright reds) than topographically lower (and wetter) vegetation communities.

By identifying these brighter areas in the colour infrared imagery upland vegetation communities could be identified in the mapping and digitally subtracted from the respective PSW unit. If the mapped unit was interpreted as entirely upland, the unit boundary would then revised to follow wetland areas or the unit could be removed.

2.1.2 Expansion of Contiguous Wetland Units

The next step involved delineation of wetlands not previously identified as part of the Goulbourn Wetland Complex but are contiguous with the existing PSW units.

This delineation involved review and interpretation of digital imagery, with the colour infrared imagery being the primary source for revising PSW unit boundaries. Wetland vegetation in colour infrared imagery appears darker (e.g. blacks, dark blue, or deep red), generally an indication of standing water or saturated soils due the infrared light being absorbed by the water present. In these cases the PSW unit boundary was expanded. These were generally obvious continuations of the existing mapped PSW units, where the colour infrared imagery was much darker in colour than the surrounding upland area.

The City also provided a supplemental GIS dataset containing an initial review of the Goulbourn Wetland Complex boundaries. This dataset was reviewed during Dillon's desktop assessment, primarily to help focus on areas not previously delineated as part of PSW units.

2.1.3 Desktop Assessment Results

After the delineation of wetland boundaries, a GIS analysis was conducted to summarize the results from the desktop re-delineation and to provide focus for on-site field verification of the Goulbourn Wetland Complex boundaries. This analysis included:

- Calculation of area for the existing MNRF delineated PSW units
- Calculation of the expanded wetland areas for affected PSW units
- Calculation of the subtracted wetland areas for affected PSW units
- Calculation of the total area for the revised PSW units

The results from this analysis were used to consult with the City and MNRF and provide a comparison of the total wetland area pre and post re-delineation.

2.2 On-site Field Verification

The primary on-site field verification of the desktop assessment used a scoped protocol which combined methods outlined in the *Ontario Wetland Evaluation System – Southern Manual, 3rd Edition, Version 3.3* (MNR, 2014) and the *Ecological Land Classification (ELC) System for Southern Ontario* (Lee *et al.,* 1998) to characterize vegetation communities and wetland boundaries. This scoped protocol was required due to the extent of the wetland units and the limited site access within the Study Area.

The primary on-site field verification included thirteen units of which only three were directly accessed. The remaining ten were assessed from adjacent lands where the evaluator had a vantage point.

2.2.1 Areas with Site Access

For the majority of the Study Area, access to wetland areas was limited to public right-of-ways and a few private properties (see **Figure 2**). The focus for the verification in these areas was on validating ambiguous wetland boundaries identified during the desktop assessment through aerial interpretation. For example, dense stands of coniferous trees (e.g. Eastern White Cedar) tend to block the underlying ground cover as viewed in aerial imagery. The verification of PSW unit revisions, as outlined in the OWES for Southern Ontario manual (MNR, 2014), was based on the presence of wetland indicator vegetation and whether the density of wetland species exceeded 50%.

2.2.2 Areas without Site Access

Where access was not permitted, verification of wetland boundaries could only occur from adjacent lands. This consisted of viewing revised wetland units from public right-of-ways and private properties, where access was permitted. Due to the limitations of access, verification was generally based on the dominant tree/shrub species for assumed swamp communities and emergent species for marsh communities. Where a revised PSW unit was not accessible from adjacent lands, the basis for revisions remained from the desktop assessment though refinements to boundaries were possible based on verification of other units and comparison of the results with the colour infrared imagery.

2.2.3 Technical Review

To mitigate the inherent subjectivity associated with natural heritage inventories, a second complete round of field verification was completed by a senior field biologist to validate the primary on-site findings. This, double-blind, approach to the technical review facilitated the comparison of two independent sets of field observations to determine areas of potential discrepancy as a means of Quality Assurance/Quality Control.

The secondary on-site field verification included the same number of units verified (13) as during the initial on-site field verification.

2.2.4 Rationalization of Findings

Where discrepancies were noted from the two rounds of on-site field visits, the areas were further reviewed using field mark-ups, field notes, photos, and GIS mapping by the two evaluators and the boundaries were rationalized as required. The revised PSW unit GIS data was updated to reflect the observations made based on this rationalization of the two independent surveys.

2.3 GIS Data

All GIS mapping, digitizing, and analysis for this project was done using ArcGIS 10.3. The mapping was compiled into a geo-database for delivery to the MNRF for review and incorporation into the provincial wetland database. A summary of the shapefiles contained within the geo-database including attributes are provided in ***Appendix C***.

The primary field verification utilized mobile GPS enabled tablets running ESRI's Collector mobile application. This tool enabled the efficient and accurate review of the data while in the field.

Using the latest wetland data from the Ministry of Natural Resources and Forestry, existing wetland boundaries were compared with 2016 imagery. The original 44 units of the Goulbourn Wetland Complex are shown on this figure.

Public right-of-ways and private property where access was permitted are also indicated (yellow outline).

Study Area

Goulbourn Wetland Complex (MNRF 2016)

GOULBOURN PSW COMPLEX
RE-DELINEATION

FIGURE 2

GOULBOURN WETLAND COMPLEX

DILLON CONSULTING

MAP DRAWING INFORMATION:
DATA PROVIDED BY MNRF (2016)
AND CITY OF OTTAWA (2016)

MAP CREATED BY: JWH
MAP CHECKED BY: AZ
MAP PROJECTION: NAD 1983 UTM Zone 18N

1:33,000

0 0.5 1 2 km

PROJECT: 16-4195 STATUS: DRAFT DATE: 11/8/2016

FILE LOCATION: G:\CAD\2017\17XXXX_GoulburnWetland\MXDs\Working\Documentation of Process\Figure 2 - Goulbourn PSW.mxd

3.0 Results

A review of the 2016 wetland mapping indicates that the Goulbourn Wetland Complex is comprised of 44 individual wetland units (see **Figure 2**) covering 680 hectares (ha) of area (see **Table A1** in ***Appendix A***). Some of the larger units are comprised of several vegetation communities, as indicated in **Table A1** that were merged together for the purposes of this re-delineation.

3.1 Desktop Assessment

The results from the desktop assessment were based on the 44 individual units and are summarized in the following sections. The wetland units were assigned a numerical identifier (1 to 44) to help track the revisions to each unit (see **Table A1** in ***Appendix A***).

3.1.1 Subtract Inconsistencies from Wetland Units

Upon review and interpretation of aerial imagery, areas of anthropogenic land uses and areas of upland vegetation were subtracted from the mapped PSW units as part of the GIS based desktop assessment (see **Figure 3**). This included 38 ha of the PSW unit area being removed from the Goulbourn Wetland Complex (see **Table A1** in ***Appendix A***). The areas removed from the wetland units were considered to be one of the following upland vegetation communities and/or anthropogenic land use:

<u>Upland</u>

- FOC: Coniferous Forest
- FOD: Deciduous Forest
- FOM: Mixed Forest
- MEM: Mixed Meadow – primarily areas of drained wetland

<u>Anthropogenic</u>

- OAGM1: Annual Row Crop – primarily areas of drained wetland
- OAGM2: Hayfield
- CVI_1: Transportation – hard surface and road right-of-ways
- CVR_3: Single Family Residential
- CVR_4: Rural Residential

Subtraction of anthropogenic and upland vegetation communities from PSW units resulted in several larger wetland units being divided into smaller units. As those divided units are still considered PSW, 11 new PSW units were delineated. These new wetland units applied the same numerical identifier as the parent unit but with an alphabetical sub-identifier (e.g. 44a, 44b).

Colour infrared imagery was used to revise boundaries of PSW units based on the underlying colour. The darker colours generally indicate the presence of standing water or moist soils whereas lighter colouring indicates upland.

Goulbourn Wetland Complex (MNRF 2016)

Desktop Assessment - Removed Portions

Study Area

Ottawa

GOULBOURN PSW COMPLEX
RE-DELINEATION

FIGURE 3

SUBTRACTION FROM UNITS

DILLON CONSULTING

MAP DRAWING INFORMATION:
DATA PROVIDED BY MNRF (2016)
AND CITY OF OTTAWA (2016)

MAP CREATED BY: JWH
MAP CHECKED BY: AZ
MAP PROJECTION: NAD 1983 UTM Zone 18N

1:33,000

0 0.5 1 2 km

PROJECT: 16-4195 STATUS: DRAFT DATE: 11/8/2016

FILE LOCATION: G:\CAD\2017\17XXXX_GoulburnWetland\MXDs\Working\Documentation of Process\Figure 3 - Subtraction from Units.mxd

3.1.2 Expansion of Contiguous Wetland Units

Upon review and interpretation of aerial imagery, potential areas of swamp and marsh were added to the mapped PSW units as part of the GIS based desktop assessment (see **Figure 4**). This included 622 ha of the PSW unit area being added to the Goulbourn Wetland Complex (see **Table A1** in ***Appendix A***). The areas added to the wetland units were considered to have the following dominant vegetation forms based on the review and interpretation of aerial imagery:

- h = deciduous trees
- c = coniferous trees
- ts = tall shrubs
- ne = narrow-leaved emergent
- re = robust emergent

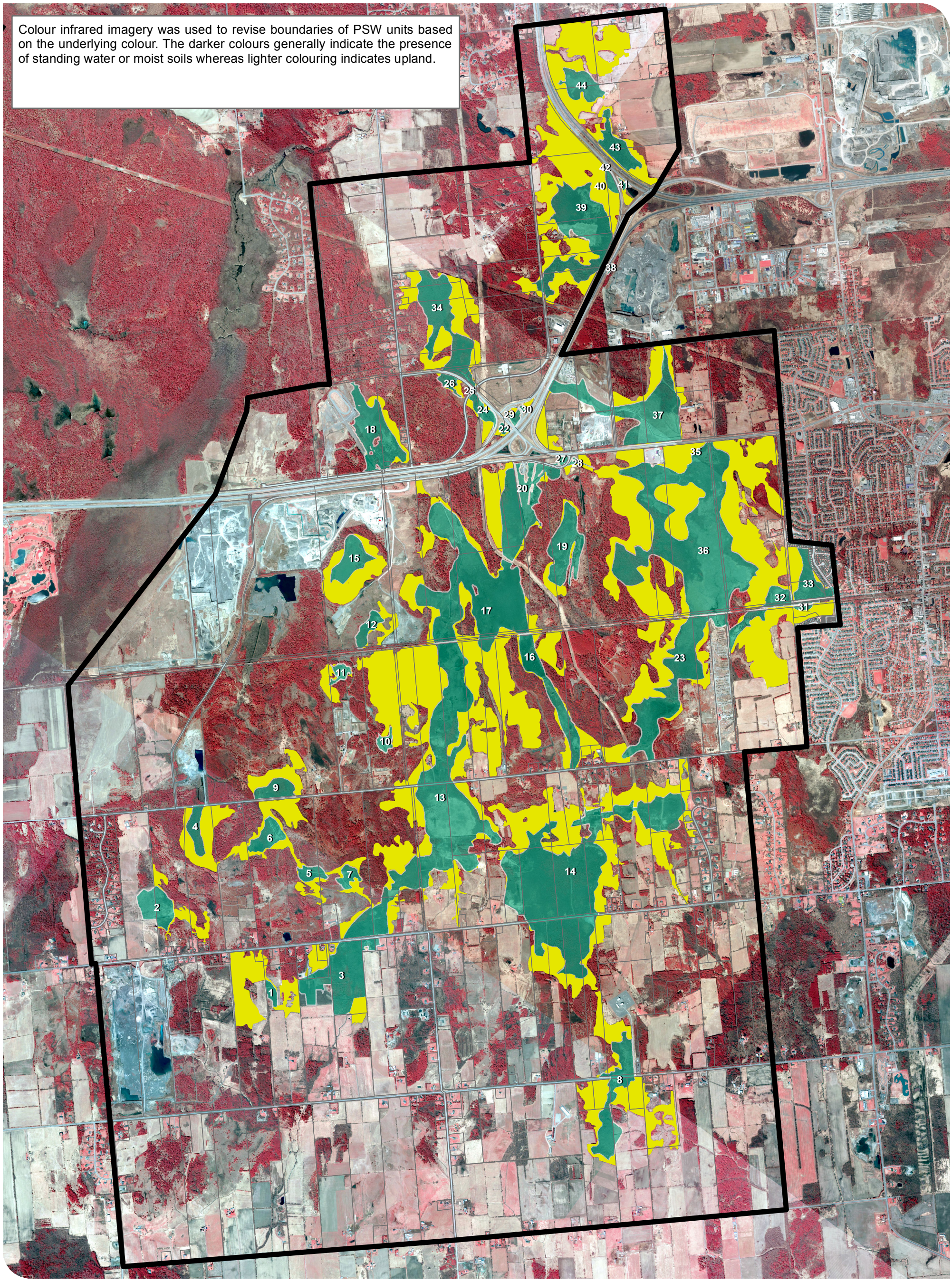
Where areas of added wetland resulted in a connection of two or more PSW units to form a contiguous unit, the wetland units were combined. The numerical identifier used to identify the combined wetland unit was the lowest number (i.e. #5, #6, #7 combined therefore the unit is now just #5).

3.1.3 Desktop Assessment Results

After revisions to the PSW units were conducted, a GIS analysis was undertaken for the now 42 individual PSW units to determine to the new total wetland size.

The total contiguous Goulbourn Wetland Complex based on the desktop assessment equals 1265 ha (see Figure 5).

Colour infrared imagery was used to revise boundaries of PSW units based on the underlying colour. The darker colours generally indicate the presence of standing water or moist soils whereas lighter colouring indicates upland.



Study Area

Desktop Assessment - Expanded Portions

Goulbourn Wetland Complex (MNRF 2016)

GOULBOURN PSW COMPLEX
RE-DELINEATION

FIGURE 4

EXPANSION OF UNITS

DILLON CONSULTING

MAP DRAWING INFORMATION:
DATA PROVIDED BY MNRF (2016)
AND CITY OF OTTAWA (2016)

MAP CREATED BY: JWH
MAP CHECKED BY: AZ
MAP PROJECTION: NAD 1983 UTM Zone 18N

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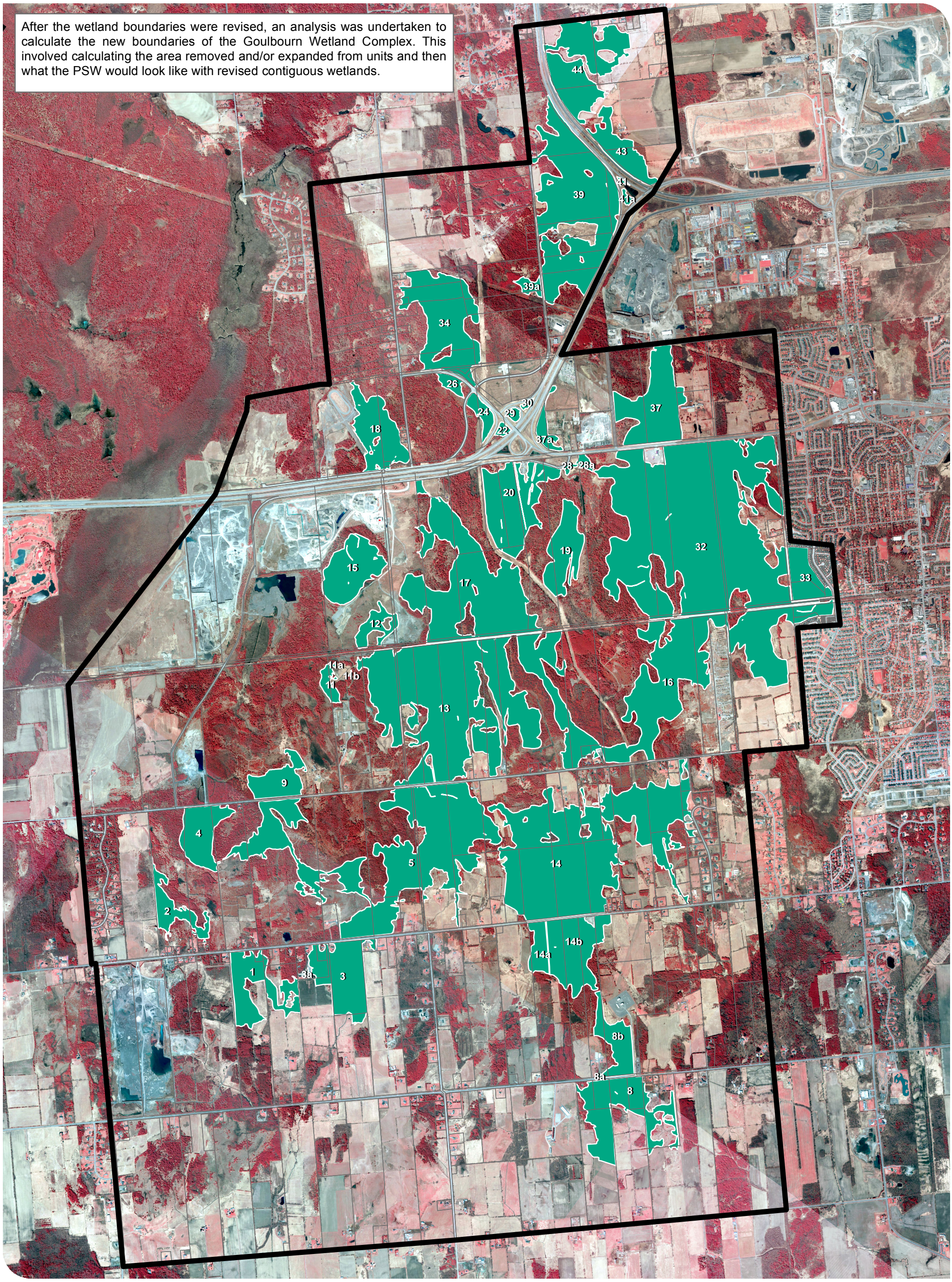
0 0.5 1 2 km

PROJECT: 16-4195 STATUS: DRAFT DATE: 11/8/2016

FILE LOCATION: G:\CAD\2017\17XXXX_GoulburnWetland\MXDs\Working\Documentation of Process\Figure 4 - Expansion of Units.mxd

After the wetland boundaries were revised, an analysis was undertaken to calculate the new boundaries of the Goulbourn Wetland Complex. This involved calculating the area removed and/or expanded from units and then what the PSW would look like with revised contiguous wetlands.



Study Area Desktop Assessment Wetland Re-Evaluation Results

GOULBOURN PSW COMPLEX
RE-DELINEATION

FIGURE 5

DESKTOP ASSESSMENT RESULTS

DILLON CONSULTING

MAP DRAWING INFORMATION:
DATA PROVIDED BY MNRF (2016)
AND CITY OF OTTAWA (2016)

MAP CREATED BY: JWH
MAP CHECKED BY: AZ
MAP PROJECTION: NAD 1983 UTM Zone 18N

1:33,000

0 0.5 1 2 km

PROJECT: 16-4195 STATUS: DRAFT DATE: 11/8/2016

FILE LOCATION: G:\CAD\2017\17XXXX_GoulburnWetland\MXDs\Working\Documentation of Process\Figure 5 - Desktop Assessment Results.mxd

3.2 On-site Field Verification

On-site field verification was undertaken to confirm the findings from the desktop re-delineation of the wetland complex. The primary on-site field investigation was carried out by Mr. Jonathan Harris (see ***Appendix B*** for CV) on July 21 and August 17/18, 2016.

The boundaries of several PSW units were refined to reflect the observations made during on-site verification. The results of the on-site verification and refinement were based on the 42 units established following the desktop re-delineation process. The wetland units were assigned the same numerical identifier (1 to 44) as during the desktop assessment to help track the revisions to each unit (see **Table A1** in ***Appendix B***). These results are summarized in the following sections.

3.2.1 Subtraction from Wetland Units

The primary on-site verification resulted in the subtraction of some additional anthropogenic land uses and areas of upland vegetation. These additional areas were subtracted from the mapped PSW units as part of the GIS based refinements to the PSW unit mapping (see **Figure 6**). These additional subtractions equalled 15 ha, which were mostly upland vegetation communities. This resulted in a total of 53 ha of the PSW unit area being removed from the Goulbourn Wetland Complex (see **Table A1** in ***Appendix B***).

Subtraction of anthropogenic and upland vegetation communities from PSW units resulted in several larger wetland units being divided into smaller units. As those divided wetland units were still considered PSW, the result was nine new PSW units of which eight were included in the desktop assessment results.

Subtraction of wetland area also resulted in two wetland units with an area less than 0.10 ha. These two units were not carried forward as they did not meet the minimum size threshold for individual wetland units. These new units were applied the same numerical identifier as the parent unit but with an alphabetical sub-identifier (e.g. 44a, 44b).

Following the desktop assessment of the wetland complex boundaries, on-site verification occurred where access was permitted. This included two seperate and independent visits by an intermediate wetland evaluator and senior wetland evaluator. The results from each independent visit were compared and the overall results combined to refine the wetland boundaries, where required.

Study Area

Area Removed/Subtracted From PSW Unit

Goulbourn Wetland Complex (MNRF 2016)

GOULBOURN PSW COMPLEX
RE-DELINEATION

FIGURE 6

ON-SITE VERIFICATION SUBTRACTION

DILLON CONSULTING

MAP DRAWING INFORMATION:
DATA PROVIDED BY MNRF (2016)
AND CITY OF OTTAWA (2016)

MAP CREATED BY: JWH
MAP CHECKED BY: AZ
MAP PROJECTION: NAD 1983 UTM Zone 18N

1:33,000

0 0.5 1 2 km

PROJECT: 16-4195 STATUS: DRAFT DATE: 11/8/2016

FILE LOCATION: G:\CAD\2017\17XXXX_GoulburnWetland\MXDs\Working\Documentation of Process\Figure 6 - Verification Subtraction.mxd

3.2.2 Expansion of Contiguous Wetland Units

The primary on-site verification of the desktop assessment resulted in less wetland area being added to the PSW units. This was generally based on the confirmation of ambiguous areas assessed from desktop to be upland instead of wetland. Areas of swamp and marsh were added to the mapped PSW units as part of verification and refinement of unit boundaries (see **Figure 7**). This included 464 ha of the PSW unit area being added to the Goulbourn Wetland Complex (see **Table A1** in ***Appendix A***).

Where areas of added wetland resulted in a connection of two or more PSW units to form a contiguous unit, the units were combined. The numerical identifier used to identify the combined unit was the lowest number (i.e. #5, #6, #7 combined, therefore the unit is now #5).

3.2.3 Technical Review and Rationalization of Results

Following the primary on-site field verification, a second independent evaluation was conducted by Mr. Tom Young (CV found in ***Appendix B***) to confirm and validate the findings primary delineation. Results from this secondary on-site field verification indicated similar results to the initial on-site field verification. Based on this second independent evaluation, further refinement to expanded wetland boundaries occurred from discussions between the two evaluators.

After refinements to the PSW units were conducted, a GIS analysis was undertaken for the now 41 individual PSW units. The total contiguous Goulbourn Wetland Complex based on the verification and refinement equals 1094 ha (see Figure 8).

3.3 GIS Data File

The final wetland re-delineation Data file has been saved to an ESRI *File GeoDatabase*. This data file includes the data that is presented on **Figures 2-8**. Complete meta-data associated with this file can be found in ***Appendix C***.

Following the desktop assessment of the wetland complex boundaries, on-site verification occurred where access was permitted. This included two seperate and independent visits by an intermediate wetland evaluator and senior wetland evaluator. The results from each independent visit were compared and the overall results combined to refine the wetland boundaries, where required.

Study Area
Expanded Portions
MNRF 2016 Goulbourn PSW

GOULBOURN PSW COMPLEX
RE-DELINEATION

FIGURE 7

ON-SITE VERIFICATION EXPANSION OF UNITS

DILLON CONSULTING

MAP DRAWING INFORMATION:
DATA PROVIDED BY MNRF (2016)
AND CITY OF OTTAWA (2016)

MAP CREATED BY: JWH
MAP CHECKED BY: AZ
MAP PROJECTION: NAD 1983 UTM Zone 18N

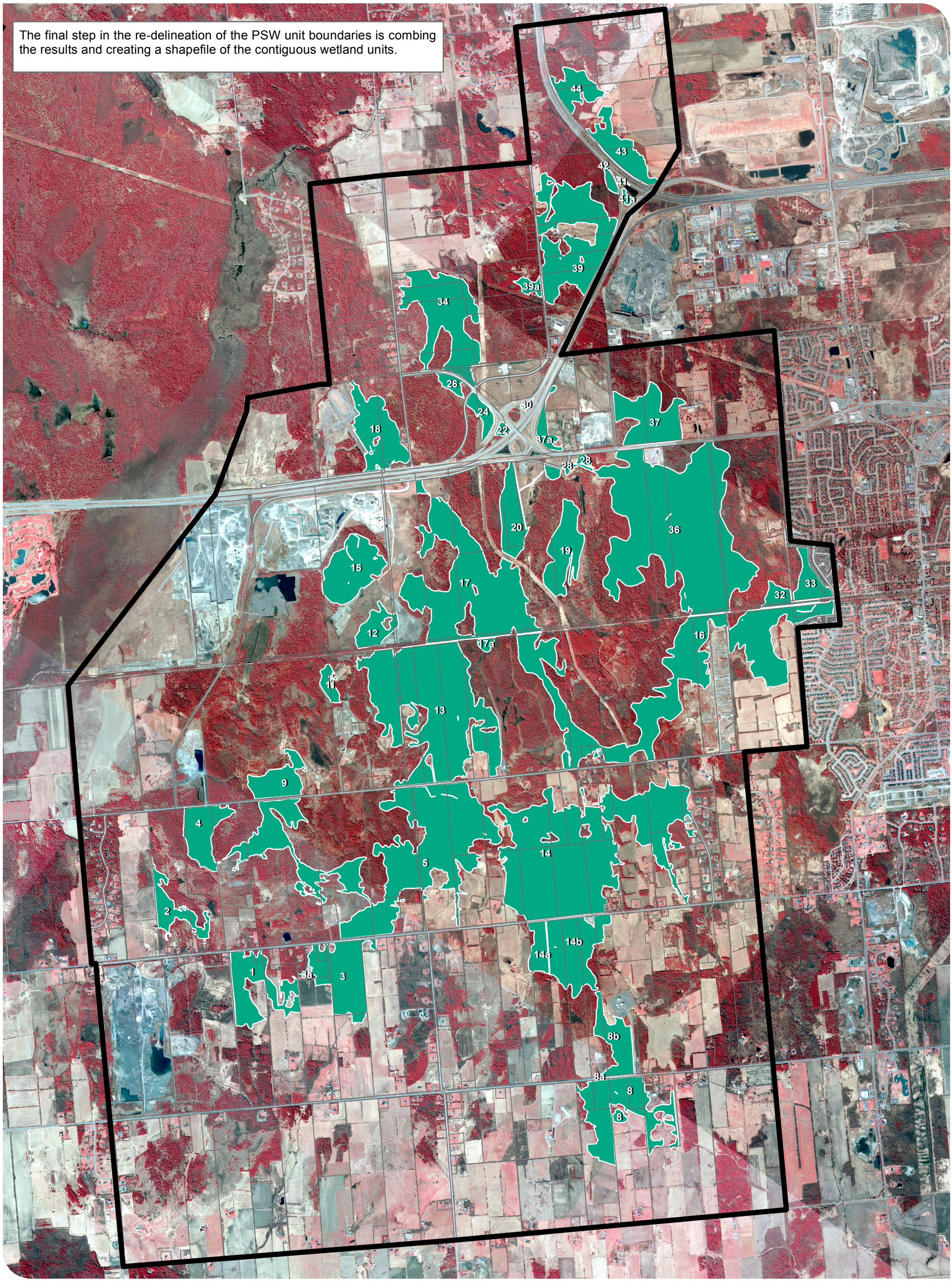
1:33,000

0 0.5 1 2 km

PROJECT: 16-4195 STATUS: DRAFT DATE: 11/8/2016

FILE LOCATION: G:\CAD\2017\17XXXX_GoulburnWetland\MXDs\Working\Documentation of Process\Figure 7 - Verification Expansion.mxd

The final step in the re-delineation of the PSW unit boundaries is combing the results and creating a shapefile of the contiguous wetland units.



Study Area Final Dillon Wetland Delineation

GOULBOURN PSW COMPLEX
RE-DELINEATION

FIGURE 8

**VERIFICATION &
REFINEMENT RESULTS**

DILLON CONSULTING

MAP DRAWING INFORMATION:
DATA PROVIDED BY MNRF (2016)
AND CITY OF OTTAWA (2016)

MAP CREATED BY: JWH
MAP CHECKED BY: AZ
MAP PROJECTION: NAD 1983 UTM Zone 18N

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0 0.5 1 2 km

PROJECT: 16-4195 STATUS: DRAFT DATE: 11/10/2016

FILE LOCATION: G:\CAD\2017\17XXXX_GoulburnWetland\MXDs\Working\Documentation of Process\Figure 8 - Verification Results.mxd

4.0 Conclusion

The project met the objective of re-delineating the boundaries of the Goulbourn Wetland PSW by conducting a GIS based desktop assessment but also verifying the desktop assumptions through on-site surveys. A summary of the re-delineation results is provided below in **Table 1** while the full results are provided in **Table A1** in ***Appendix A***. Select photos of wetland units are provided in ***Appendix D***.

Table 1: Summary of Goulbourn Wetland Complex Re-delineation Results

	Original Delineation	Desktop Assessment Results	On-site Verification and Refinement Results
Number of Units	44	42	41
Area removed (ha)	---	37.71	53.18
Area expanded (ha)	---	621.91	463.63
Total Size (ha)	680.46	1264.66	1093.91

Appendix A

Results Table

Wetland Re-delineation Results

Wetland Unit ID	No. of Vegetation Communities within wetland unit (MNRF 2016)	Original Unit Area (ha)	Verification Type	Result of Desktop Assessment					Result of On-site Verification and Refinement							Summary		
				Area of Wetland Unit Removed From Original Unit (ha)	Rationale for Removal	Area of Wetland Unit Expanded to Original Unit or Divided Unit (ha)	Rationale for Expansion Based on False-colour Imagery	New Wetland Unit Area (ha)	Refined Area of Wetland Unit Removed From Original Unit (ha)	Rationale for Removal	Refined Area of Wetland Unit Expanded to Original Unit or Divided Unit (ha)	Rationale for Expansion Based on Field Verification/ Refinement to Aerial Interpretation	Dominant Vegetation Forms	Wetland Indicator Species Observed	New Wetland Unit Area (ha)	PSW Unit Removed	PSW Unit Revised	Difference Between Original Area and New Area (ha)
1*	1	1.76	Aerial Interpretation Only	0.00	---	20.04	Darker areas indicate potential swamp	21.8	---	---	---	---	h, c, ts	---	---	---	Y	20.04
2*	1	9.19	Aerial Interpretation Only	4.24	Anthropogenic (agricultural)	6.03	Darker areas indicate potential marsh and swamp	10.98	---	---	---	---	ne, ts, h, c	---	---	---	Y	1.79
3*	1	25.86	Aerial Interpretation Only	4.71	Anthropogenic (agricultural)	2.15	Darker areas indicate potential swamp	28.01	---	---	---	---	h, c	---	---	---	Y	2.15
4*	1	4.97	Aerial Interpretation / Field Verified	0.21	Anthropogenic (Road, disturbed)	12.51	Darker areas indicate potential swamp	17.48	0.21	Anthropogenic (Road, disturbed)	11.02	Darker areas confirmed to be cedar swamp with a small patch of ash swamp	c, d	Eastern White Cedar Balsam Fir American Larch Green Ash Trembling Aspen Black Ash Common Boneset Spotted Joe Pye-weed Blue Vervain Glossy Buckthorn	15.77	---	Y	10.80
5*	1	3.13	Aerial Interpretation / Field Verified	0.75	Upland (WOD/MEM)	101.70	Darker areas indicate	113.96	---	---	48.07	Mostly through aerial interpretation.	h, c, ts, ne	Willow species Red-osier Dogwood Green Ash Reed Canary Grass	114.12	---	Y	101.86
6*	1	6.09		0.00	---	Combination of former			0.0006	Upland (WOD/MEM)	Combination of former							

Wetland Unit ID	No. of Vegetation Communities within wetland unit (MNRF 2016)	Original Unit Area (ha)	Verification Type	Result of Desktop Assessment					Result of On-site Verification and Refinement							Summary		
				Area of Wetland Unit Removed From Original Unit (ha)	Rationale for Removal	Area of Wetland Unit Expanded to Original Unit or Divided Unit (ha)	Rationale for Expansion Based on False-colour Imagery	New Wetland Unit Area (ha)	Refined Area of Wetland Unit Removed From Original Unit (ha)	Rationale for Removal	Refined Area of Wetland Unit Expanded to Original Unit or Divided Unit (ha)	Rationale for Expansion Based on Field Verification/ Refinement to Aerial Interpretation	Dominant Vegetation Forms	Wetland Indicator Species Observed	New Wetland Unit Area (ha)	PSW Unit Removed	PSW Unit Revised	Difference Between Original Area and New Area (ha)
7*	1	3.04		0.23	Upland (WOD/MEM)	units 5, 6, 7 and part of 13 with added areas of wetland	potential swamp and marsh.		---	---	units 5, 6, 7 and part of 13 with added areas of wetland.	Small area in the west field verified. Darker areas indicate swamp, and marsh. Only confirmed for a small portion.						
8*	1	17.28	Aerial Interpretation Only	1.67	Anthropogenic (Road, disturbed) Upland (FOC, MEM) Divided into three units (8, 8a, 8b) Unit 8 is now 9.54 ha	15.74	Darker areas indicate potential swamp	33.02		---	24.67	Expanded area revised based on other ground truthing results	h, c	---	34.21	---	Y	16.93
9*	1	5.26	Aerial Interpretation Only	0.00	---	7.80	Darker areas indicate potential swamp	13.06	---	---	---	---	c	---	---	---	Y	7.80
10*	1	1.93	Aerial Interpretation Only	1.87	Upland (MEM)	--- Remaining portion merged with Unit 13	---	---	---	---	---	---	---	---	---	---	---	---

Wetland Unit ID	No. of Vegetation Communities within wetland unit (MNRF 2016)	Original Unit Area (ha)	Verification Type	Result of Desktop Assessment					Result of On-site Verification and Refinement							Summary		
				Area of Wetland Unit Removed From Original Unit (ha)	Rationale for Removal	Area of Wetland Unit Expanded to Original Unit or Divided Unit (ha)	Rationale for Expansion Based on False-colour Imagery	New Wetland Unit Area (ha)	Refined Area of Wetland Unit Removed From Original Unit (ha)	Rationale for Removal	Refined Area of Wetland Unit Expanded to Original Unit or Divided Unit (ha)	Rationale for Expansion Based on Field Verification/ Refinement to Aerial Interpretation	Dominant Vegetation Forms	Wetland Indicator Species Observed	New Wetland Unit Area (ha)	PSW Unit Removed	PSW Unit Revised	Difference Between Original Area and New Area (ha)
11*	1	2.21	Aerial Interpretation Only	2.07	Upland (MEM) Divided into three units	1.32	Darker areas indicate potential swamp	3.53	2.13	Upland (MEM) Divided into three units though two were <0.10 ha and not carried forward as separate units.	3.45	Expanded area revised based on other ground truthing results	c, ts	---	3.53	---	Y	1.46
12*	1	3.92	Aerial Interpretation Only	0.00	---	3.22	Darker areas indicate potential open water marsh and swamp	7.14	---	---	4.73	Expanded area revised based on other ground truthing results	ts	---	8.65	---	Y	4.73

Wetland Unit ID	No. of Vegetation Communities within wetland unit (MNRF 2016)	Original Unit Area (ha)	Verification Type	Result of Desktop Assessment					Result of On-site Verification and Refinement							Summary		
				Area of Wetland Unit Removed From Original Unit (ha)	Rationale for Removal	Area of Wetland Unit Expanded to Original Unit or Divided Unit (ha)	Rationale for Expansion Based on False-colour Imagery	New Wetland Unit Area (ha)	Refined Area of Wetland Unit Removed From Original Unit (ha)	Rationale for Removal	Refined Area of Wetland Unit Expanded to Original Unit or Divided Unit (ha)	Rationale for Expansion Based on Field Verification/ Refinement to Aerial Interpretation	Dominant Vegetation Forms	Wetland Indicator Species Observed	New Wetland Unit Area (ha)	PSW Unit Removed	PSW Unit Revised	Difference Between Original Area and New Area (ha)
13*	26	87.61	Aerial Interpretation Only	1.31	Anthropogenic (Road, disturbed) Upland (FOC, MEM) Divided into two by TransCanada Trail. South portion merged with Unit 5. North portion is remains Unit 13 (31.58 ha) and merged with a portion of Unit 17 (1.46 ha)	98.59	Darker areas indicate potential swamp	131.63		Still divided into two by TransCanada Trail. South portion merged with Unit 5. North portion is remains Unit 13 (31.58 ha) though no longer merged the portion of Unit 17	68.67	Expanded area revised based on other ground truthing results	c	---	100.25	---	Y	12.64
14*	1	98.50	Aerial Interpretation Only	3.11	Anthropogenic (Road, disturbed) Upland (FOC, MEM) Divided into three units (14, 14a, 14b) Unit 14 is now 75.36 ha	56.77	Darker areas indicate potential swamp	132.13	---	---	53.08	Expanded area revised based on other ground truthing results	c, h	---	128.42	---	Y	29.92

Wetland Unit ID	No. of Vegetation Communities within wetland unit (MNRF 2016)	Original Unit Area (ha)	Verification Type	Result of Desktop Assessment					Result of On-site Verification and Refinement							Summary		
				Area of Wetland Unit Removed From Original Unit (ha)	Rationale for Removal	Area of Wetland Unit Expanded to Original Unit or Divided Unit (ha)	Rationale for Expansion Based on False-colour Imagery	New Wetland Unit Area (ha)	Refined Area of Wetland Unit Removed From Original Unit (ha)	Rationale for Removal	Refined Area of Wetland Unit Expanded to Original Unit or Divided Unit (ha)	Rationale for Expansion Based on Field Verification/ Refinement to Aerial Interpretation	Dominant Vegetation Forms	Wetland Indicator Species Observed	New Wetland Unit Area (ha)	PSW Unit Removed	PSW Unit Revised	Difference Between Original Area and New Area (ha)
15	7	9.00	Aerial Interpretation Only	0.16	Upland (WOD/MEM)	14.27	Darker areas indicate potential swamp	23.12	---	---	14.68	Expanded area revised based on other ground truthing results	c	---	23.52	---	Y	14.52
16	5	14.28	Aerial Interpretation Only Expanded area connects Unit 16 with units 23 and 31. The size of the combined units is 52.37 ha	0.39	Upland (WOD/MEM)	61.36	Darker areas indicate potential swamp	113.74	---	---	43.32	Expanded area revised based on other ground truthing results	c, h	---	95.31	---	Y	81.03
17	21	61.32	Aerial Interpretation / Field Verified	0.13	Anthropogenic (Trail) Divided into two units. Smaller unit was merged with Unit 13 Unit 17 is now 59.72 ha	18.20	Darker areas indicate potential swamp	77.93	0.24	Anthropogenic (Trail) Divided into two units (17 and 17a) Unit 17 is now 59.61 ha	17.84	Only confirmed a small portion visible from the TransCanada Trail	c, ts	Eastern White Cedar	77.45	---	Y	16.13

Wetland Unit ID	No. of Vegetation Communities within wetland unit (MNRF 2016)	Original Unit Area (ha)	Verification Type	Result of Desktop Assessment					Result of On-site Verification and Refinement							Summary		
				Area of Wetland Unit Removed From Original Unit (ha)	Rationale for Removal	Area of Wetland Unit Expanded to Original Unit or Divided Unit (ha)	Rationale for Expansion Based on False-colour Imagery	New Wetland Unit Area (ha)	Refined Area of Wetland Unit Removed From Original Unit (ha)	Rationale for Removal	Refined Area of Wetland Unit Expanded to Original Unit or Divided Unit (ha)	Rationale for Expansion Based on Field Verification/ Refinement to Aerial Interpretation	Dominant Vegetation Forms	Wetland Indicator Species Observed	New Wetland Unit Area (ha)	PSW Unit Removed	PSW Unit Revised	Difference Between Original Area and New Area (ha)
18	18	19.52	Aerial Interpretation Only	0.05	Anthropogenic (Disturbed)	3.62	Darker areas indicate potential swamp	23.10	---	---	---	---	ts, c	---	---	---	Y	3.58
19	4	15.70	Aerial Interpretation Only	0.00	---	3.37	Darker areas indicate potential swamp	19.07	---	---	---	---	h	---	---	---	Y	3.37
20	13	24.53	Aerial Interpretation / Field Verified	0.35	Upland (MEM)	10.98	Darker areas indicate potential swamp	35.51	8.97	Upland (MEM)	0.61	Darker areas confirmed to be swamp	h	Eastern White Cedar	16.18	---	Y	-8.35
21	1	0.15	Aerial Interpretation Only	0.15	Upland (MEM)	---	---	---	---	---	---	---	---	---	---	Y	---	---
22	1	0.80	Field Verified (adjacent lands)	0.00	---	0.35	Darker areas indicate potential swamp	1.15	---	---	---	---	h	---	1.15	---	Y	0.5
23	5	37.28	Aerial Interpretation Only	0.00	---	Combined with unit 16 and 31	---	---	---	---	---	---	---	---	---	---	Y	---
24	4	3.16	Aerial Interpretation / Field Verified (Adjacent Lands	0.31	Upland (MEM)	1.54	Darker areas indicate potential swamp	4.70	---	---	---	Darker areas confirmed to be Only confirmed for a small portion from roadside.	h, c	Trembling Aspen Eastern White Cedar	4.70	---	Y	1.54

Wetland Unit ID	No. of Vegetation Communities within wetland unit (MNRF 2016)	Original Unit Area (ha)	Verification Type	Result of Desktop Assessment					Result of On-site Verification and Refinement							Summary		
				Area of Wetland Unit Removed From Original Unit (ha)	Rationale for Removal	Area of Wetland Unit Expanded to Original Unit or Divided Unit (ha)	Rationale for Expansion Based on False-colour Imagery	New Wetland Unit Area (ha)	Refined Area of Wetland Unit Removed From Original Unit (ha)	Rationale for Removal	Refined Area of Wetland Unit Expanded to Original Unit or Divided Unit (ha)	Rationale for Expansion Based on Field Verification/ Refinement to Aerial Interpretation	Dominant Vegetation Forms	Wetland Indicator Species Observed	New Wetland Unit Area (ha)	PSW Unit Removed	PSW Unit Revised	Difference Between Original Area and New Area (ha)
25	1	0.07	Aerial Interpretation / Field Verified (Adjacent Lands	0.07	Upland (MEM)	---	---	---	---	---	---	Confirmed to upland from roadside	---	---	---	Y	---	---
26	1	2.21	Aerial Interpretation Only	0.10	Upland (MEM)	0.78	Darker areas indicate potential swamp	2.89	---	---	---	---	---	---	2.89	---	Y	0.78
27	2	0.63	Aerial Interpretation / Field Verified (Adjacent Lands	0.63	Upland (MEM)	---	---	---	---	---	---	Confirmed to upland from roadside	---	---	---	Y	---	---
28	2	0.79	Aerial Interpretation / Field Verified (Adjacent Lands)	0.39	Upland (MEM) Divided into two units (28, 28a) Unit 28 is now 0.08 ha	0.87	Darker areas indicate potential swamp	0.95	0.40	Upland (MEM) Not divided into two units.	1.64	Only confirmed areas from roadside is upland	h	---	2.04	---	Y	1.25
29	1	1.04	Aerial Interpretation / Field Verified (Adjacent Lands	0.28	Upland (MEM)	0.28	Darker areas indicate potential swamp	1.04	1.04	Upland (MEM)	---	Confirmed to upland from roadside	---	---	---	Y	---	---

Wetland Unit ID	No. of Vegetation Communities within wetland unit (MNRF 2016)	Original Unit Area (ha)	Verification Type	Result of Desktop Assessment					Result of On-site Verification and Refinement							Summary		
				Area of Wetland Unit Removed From Original Unit (ha)	Rationale for Removal	Area of Wetland Unit Expanded to Original Unit or Divided Unit (ha)	Rationale for Expansion Based on False-colour Imagery	New Wetland Unit Area (ha)	Refined Area of Wetland Unit Removed From Original Unit (ha)	Rationale for Removal	Refined Area of Wetland Unit Expanded to Original Unit or Divided Unit (ha)	Rationale for Expansion Based on Field Verification/ Refinement to Aerial Interpretation	Dominant Vegetation Forms	Wetland Indicator Species Observed	New Wetland Unit Area (ha)	PSW Unit Removed	PSW Unit Revised	Difference Between Original Area and New Area (ha)
30	1	0.35	Aerial Interpretation / Field Verified (Adjacent Lands	0.17	Upland (MEM)	0.14	Darker areas indicate potential swamp	0.49	---	---	0.32	Darker areas confirmed to be Only confirmed for a small portion from roadside.	c	Trembling Aspen	0.49	---	Y	0.14
31	1	0.81	Aerial Interpretation Only	0.00	---	--- Combined with unit 16 and 23	---	---	---	---	---	---	---	---	---	---	---	---
32	2	4.63	Aerial Interpretation Only Expanded area connects Unit 16 with units 35 and 36. The size of the combined units is 100.14 ha	0.02	Upland (MEM)	105.25	Darker areas indicate potential swamp	205.39	---	---	0.22 Unit no longer connected with Unit 35 or 36	Expanded area revised based on other ground truthing results	h	---	4.83	---	Y	0.20
33	2	8.43	Aerial Interpretation Only	0.62	Anthropogenic (Road, houses)	4.32	Darker areas indicate potential swamp	12.13	---	---	0.32	Expanded area revised based on other ground truthing results	c	---	8.13	---	Y	-0.30

Wetland Unit ID	No. of Vegetation Communities within wetland unit (MNRF 2016)	Original Unit Area (ha)	Verification Type	Result of Desktop Assessment					Result of On-site Verification and Refinement							Summary		
				Area of Wetland Unit Removed From Original Unit (ha)	Rationale for Removal	Area of Wetland Unit Expanded to Original Unit or Divided Unit (ha)	Rationale for Expansion Based on False-colour Imagery	New Wetland Unit Area (ha)	Refined Area of Wetland Unit Removed From Original Unit (ha)	Rationale for Removal	Refined Area of Wetland Unit Expanded to Original Unit or Divided Unit (ha)	Rationale for Expansion Based on Field Verification/ Refinement to Aerial Interpretation	Dominant Vegetation Forms	Wetland Indicator Species Observed	New Wetland Unit Area (ha)	PSW Unit Removed	PSW Unit Revised	Difference Between Original Area and New Area (ha)
34	4	23.96	Aerial Interpretation Only	0.14	Anthropogenic (Road, disturbed)	20.87	Darker areas indicate potential swamp	44.70	---	---	16.69	Expanded area revised based on other ground truthing results	---	---	40.51	---	Y	16.55
35	1	0.000039	Aerial Interpretation Only Combined with unit 32	0.00	---	---	---	---	0.14 Two units merged together	---	41.75	Expanded area revised based on other ground truthing results	h, ts, c	---	137.12	---	Y	41.61
36	8	95.51																
37	1	32.33	Aerial Interpretation Only	7.20	Anthropogenic (Road, disturbed) Divided into two units (37, 37a) Unit 37 is now 24.87 ha	9.02	Darker areas indicate swamp and marsh	33.9	12.54 Divided into two units (37, 37a) Unit 37 is now 19.53 ha	---	3.33	Expanded area revised based on other ground truthing results	c, h, re	---	22.85	---	Y	-9.48
38	1	0.27	Aerial Interpretation / Field Verified (Adjacent Lands	0.00	---	---	---	0.27	0.27	Upland (MEM)	---	---	---	---	---	Y	---	---

Wetland Unit ID	No. of Vegetation Communities within wetland unit (MNRF 2016)	Original Unit Area (ha)	Verification Type	Result of Desktop Assessment					Result of On-site Verification and Refinement							Summary		
				Area of Wetland Unit Removed From Original Unit (ha)	Rationale for Removal	Area of Wetland Unit Expanded to Original Unit or Divided Unit (ha)	Rationale for Expansion Based on False-colour Imagery	New Wetland Unit Area (ha)	Refined Area of Wetland Unit Removed From Original Unit (ha)	Rationale for Removal	Refined Area of Wetland Unit Expanded to Original Unit or Divided Unit (ha)	Rationale for Expansion Based on Field Verification/ Refinement to Aerial Interpretation	Dominant Vegetation Forms	Wetland Indicator Species Observed	New Wetland Unit Area (ha)	PSW Unit Removed	PSW Unit Revised	Difference Between Original Area and New Area (ha)
39	17	34.04	Aerial Interpretation Only Expanded area connects Unit 39 with units 40 and 42. The size of the combined units is 36.12 ha	5.35 Divided into two units (39, 39a) Unit 39 now 30.32 ha	Anthropogenic (Road, disturbed)	49.17	Darker areas indicate potential swamp	79.49	--- Smaller expanded area so unit no longer merged with Unit 40 or 42 Still divided into two units (39, 39a) Unit 39 now 28.24 ha	---	19.33	Expanded area revised based on other ground truthing results	c	---	47.57	---	Y	13.53
40	1	0.16	Aerial Interpretation Only Combined with unit 39 and 42	0.00	---	---	---	---	0.16 No longer merged with Unit 39	Upland (FOC)	---	Expanded area revised based on other ground truthing results	---	---	---	---	---	---

Wetland Unit ID	No. of Vegetation Communities within wetland unit (MNRF 2016)	Original Unit Area (ha)	Verification Type	Result of Desktop Assessment					Result of On-site Verification and Refinement							Summary		
				Area of Wetland Unit Removed From Original Unit (ha)	Rationale for Removal	Area of Wetland Unit Expanded to Original Unit or Divided Unit (ha)	Rationale for Expansion Based on False-colour Imagery	New Wetland Unit Area (ha)	Refined Area of Wetland Unit Removed From Original Unit (ha)	Rationale for Removal	Refined Area of Wetland Unit Expanded to Original Unit or Divided Unit (ha)	Rationale for Expansion Based on Field Verification/ Refinement to Aerial Interpretation	Dominant Vegetation Forms	Wetland Indicator Species Observed	New Wetland Unit Area (ha)	PSW Unit Removed	PSW Unit Revised	Difference Between Original Area and New Area (ha)
41	1	0.57	Aerial Interpretation / Field Verified (Adjacent Lands	0.28 Divided into two units	Anthropogenic (SWM Pond)	---	---	0.31	---	---	0.04	Observed from road	ne	Trembling Aspen	0.31	---	Y	-0.26
42	1	1.92	Aerial Interpretation Only Combined with unit 39 and 42	0.07	Anthropogenic (Road)	---	---	---	--- No longer merged with Unit 39 and 40	---	---	---	---	---	1.85	---	Y	-0.07
43	1	8.16	Aerial Interpretation Only	0.07	Upland (FOC)	6.40	Darker areas indicate potential swamp	15.56	---	---	6.46	Expanded area revised based on other ground truthing results	h, c	---	16.93	---	Y	8.77
44	2	8.06	Aerial Interpretation Only	0.62	Upland (WOD/MEM)	30.00	Darker areas indicate potential swamp	38.06	---	---	2.98	Expanded area revised based on other ground truthing results	h, c	---	10.43	---	Y	2.37
New PSW Units Derived from Original Units After Subtractions																		
3a	Subtractions divided unit 3							0.16	Subtractions divided unit 3						0.16	---	---	---
8a	Subtractions divided unit 8							0.13	Subtractions divided unit 8						0.13	---	---	---
8b	Subtractions divided unit 8							13.31	Subtractions divided unit 8						13.67	---	---	---
14a	Subtractions divided unit 14							7.02	Subtractions divided unit 14						7.02	---	---	---
14b	Subtractions divided unit 14							27.83	Subtractions divided unit 14						27.83	---	---	---

Wetland Unit ID	No. of Vegetation Communities within wetland unit (MNRF 2016)	Original Unit Area (ha)	Verification Type	Result of Desktop Assessment					Result of On-site Verification and Refinement							Summary		
				Area of Wetland Unit Removed From Original Unit (ha)	Rationale for Removal	Area of Wetland Unit Expanded to Original Unit or Divided Unit (ha)	Rationale for Expansion Based on False-colour Imagery	New Wetland Unit Area (ha)	Refined Area of Wetland Unit Removed From Original Unit (ha)	Rationale for Removal	Refined Area of Wetland Unit Expanded to Original Unit or Divided Unit (ha)	Rationale for Expansion Based on Field Verification/ Refinement to Aerial Interpretation	Dominant Vegetation Forms	Wetland Indicator Species Observed	New Wetland Unit Area (ha)	PSW Unit Removed	PSW Unit Revised	Difference Between Original Area and New Area (ha)
11a	Subtractions divided unit 11							0.08	Subtractions divided unit 11 – size <0.10 ha, not carried forward						---	---	---	---
11b	Subtractions divided unit 11							0.08	Subtractions divided unit 11 – size <0.10 ha, not carried forward						---	---	---	---
28a	Subtractions divided unit 28							1.09	Not divided during verification						---	---	---	---
37a	Subtractions divided unit 37							4.41	Subtractions divided unit 37						4.41	---	---	---
39a	Subtractions divided unit 39							2.59	Subtractions divided unit 39						2.59	---	---	---
41a	Subtractions divided unit 55							0.77	Subtractions divided unit 55						0.77	---	---	---
17a	---							---	Subtractions divided unit 17						1.47	---	---	---

* Unit added by Jacques Whitford Limited in 2005

Appendix B

Wetland Evaluator CV's

Tom P. Young, B.Sc. (Agr.), P.Ag., ISA Certified Arborist

ASSOCIATE
tyoung@dillon.ca

PERSONAL PROFILE

Tom is a terrestrial biologist, agrologist, arborist and botanist with experience in highway, railway, pipeline, sewage and energy infrastructure and residential development across the province of Ontario. His project experience includes field assessment of trees, soils, forests and wetlands; conducting floral and faunal inventories; determining the potential of agricultural lands; peer reviews; and providing expert testimony at various tribunals. Tom also has considerable experience in recommending rehabilitation strategies to mitigate construction impacts.

RELEVANT EXPERIENCE

PROJECT MANAGEMENT

Project Manager, Environmental Impact Statement, Bluegrove Investments Inc., Richmond Hill, Ontario
Coordinated field work including a tree inventory of a 5.61 ha property on Elgin Mills Road East. The project included plant and birds inventories, identification of tree species including caliper and health rating and reporting of results. *2016 (ongoing).*

Project Manager, Environmental Impact Statements, DG Group Inc., Richmond Hill, Ontario
Coordinated field work and prepared four EISs for four separate properties totalling an area of 60 ha. The project included inventories of plants, birds and amphibians; identification of tree species including caliper and health rating; and reporting of results. *2016 (ongoing).*

Project Manager, Environmental Impact Statement, TSI-CGE International Canada Inc., Stayner, Ontario
Prepared an EIS for a proposed seniors' subdivision development in the town. The project included field inventories and liaison with the local conservation authority and the Township of Clearview. *2015 (completed).*

Project Manager and Expert Witness, Twiss Road Part 2, TSI International Group Inc., Milton, Ontario
Completed baseline natural environment studies for the potential residential development. An opportunities and constraints report was prepared indicating the limits of the natural features, the buffer setbacks and remaining table lands that may be developed as estate residential lots.

EDUCATION

B.Sc. (Agr.), Entomology-Apiculture, University of Guelph, 1988

Associate Dipl. in Agriculture, Ornamental Horticulture, University of Guelph, 1980

REGISTRATIONS/LICENCES

Ontario Institute of Agrologists, Central Branch (Professional Agrologist)

CERTIFICATIONS

International Society of Arboriculture (Certified Arborist, ON-1181A)

Arboriculture Canada Training & Education Ltd. ArborCanada.com (Qualified Arboriculture Technician – Tree Appraiser)

DILLON CONSULTING

Specific works included field work and technical input to legal counsel for the 40 ha property that included provincially significant wetlands; significant woodlands and other features within OPA 38 in the town; compiled a report and attended an Ontario Municipal Board hearing to answer questions regarding agriculture and ecology on site. *2015 (completed).*

Project Manager, Environmental Impact Statement, TSI International Group Inc., Stayner, Ontario
Prepared an EIS for a proposed subdivision development in the town. The project included field inventories and liaison with the local conservation authority. *2015 (completed).*

Project Manager, Environmental Impact Statement, Devon Lane Construction Ltd., Richmond Hill, Ontario
Coordinated field work and prepared an EIS for a 20 ha property on Bayview Avenue. The project included conducting inventories of plants, birds and amphibians; restoration plantings of disturbed wetland areas; and monitoring of a small, isolated wetland over three years. *2015 (completed).*

Project Manager, Environmental Impact Statement, Earlglen Investments Ltd., Richmond Hill, Ontario
Coordinated field work and prepared an EIS for a 37.7 ha property on 19th Avenue. The project included inventories of plants, birds and amphibians; identification of tree species including caliper and health rating; and reporting of results. *2015 (completed).*

Project Manager, Environmental Impact Statement, Sandmill Developments Inc., Richmond Hill, Ontario
Coordinated field work including a tree inventory on a 19.3 ha property on Leslie Street. Inventories included plant and birds (including boboloink) and identification of tree species, caliper and health rating and reporting of results. *2013 (completed).*

Project Manager, Environmental Impact Statement, Private Developer, Richmond Hill, Ontario
Coordinated field work and prepared an EIS for a 40 ha property on 19th Avenue. The project included inventories of plants, birds and amphibians; identification of tree species including caliper and health rating; and reporting of results. *2013 (completed).*

Project Manager, Hepburn Farm Development Peer Review, City of St. Thomas, Ontario
Completed a peer review of an environmental impact study that has been prepared for the property. The review included the environmental impact statement and environmental management plan. The project included an assessment of butternut trees using Ontario Ministry of Natural Resources protocols and provided advice to city planning staff regarding trail development. *2012 (completed).*

Project Manager, Parish Farm Development Peer Review, City of St. Thomas, Ontario
Completed a peer review of the environmental impact study for the residential development. The review included the environmental impact statement, environmental management plan and supplemental herpetofaunal and tree studies. *2012 (completed).*

Arborist, Street Tree Inventories, City of Hamilton, Ontario
Coordinated tree inventories for fourteen infrastructure projects throughout the city. Inventories included identification of species, caliper and health rating and reporting of results. *2012 (completed).*

Biologist, River's Edge Plan Peer Review, Town of Wasaga Beach, Ontario
Provided a peer review of a consultant's report for a 7.5 ha residential development in east Wasaga Beach. The project included inspection of habitat for Eastern Hog-nosed Snake and other species at risk. *2012 (completed).*

Project Manager and Expert Witness, Wetland Investigations, Zephyr Peat Land Harvesting Inc., Uxbridge, Ontario
Conducted field work and provided technical input to legal counsel regarding Ontario Ministry of Natural Resources Provincially Significant Wetlands wetland mapping. This work was for the preparation of extraction permits for the harvesting of peat soils and creation of fish ponds. Attended an Ontario Labour Tribunal as an expert witness and answered questions regarding harvesting activities at a commercial peat operation. *2011 (completed).*

Project Manager/Biologist, Environmental Impact Statement, Calloway Reit (Acquisitions) Inc, London, Ontario
Prepared an EIS for a commercial/retail complex adjacent to an environmentally sensitive area (Meadowlily Woods). The project included inventories of flora and fauna, including reptiles and amphibians, and meeting with London staff and EPAC groups. *2011 (completed).*

Project Manager, West Wasaga Resort Peer Review, Town of Wasaga Beach, Ontario
Complete a peer review of the in West Wasaga Beach. The project included a field check for species at risk, including Eastern Hog-nosed Snake, and prairie indicators; and review of findings and recommendations for revisions according to relevant sections of the town's official plan. *2010 (completed).*

Biologist, Harvey Woodlot Assessment Peer Review, Town of Wasaga Beach, Ontario
Conducted a peer review of two separate consultant reports to determine limits of Category 1 and Category 2 lands within the Sunnidale Trails Secondary Plan area. The project included field work to determine if significant habitat for Eastern Hog-nosed Snake was present. *2010 (completed).*

Project Manager/Agrologist, Spring Creek Compost Facility, Town of Lincoln, Ontario
Conducted a peer review of a consultant's report for a proposed compost facility. The project included a review of opinion regarding agricultural activity within the proposed site and a 1 km study area. *2009 (completed).*

Project Manager, Watson Property Agricultural Survey, Private Developer, Manotick, Ontario
Prepared an agricultural assessment report for a 60 acre property. The project included soil excavation through test pits, review of secondary source literature and collection of data. *2008 (completed).*

Agrologist, Environmental Assessment, IO Investments Ltd., Brampton, Ontario
Conducted a detailed analysis of a 75 acre farm field. The review included historical photo analysis, soil investigations, farmer interview and determination of agricultural capability. *2008 (completed).*

Project Manager, Shopping Centre, Smart Centres Ltd., Georgetown, Ontario
Conducted field studies to confirm the extent of watercourses within a proposed site of a commercial development. *2008 (completed).*

Biologist, Subdivision Wetland Opinion, Beechnut Development Corporation, Oshawa, Ontario
Confirmed Ontario Ministry of Natural Resources Provincially Significant Wetlands wetland boundaries and determined suitable location of residential development within a forest in east Oshawa. *2008 (completed).*

Project Manager, Murphy Road Impact Assessment, Orillia Centres Ltd., Orillia, Ontario
Prepared an impact assessment report for road improvements for a commercial development on Highway 12. *2008 (completed).*

Biologist, Cape Dundas Subdivision, Private Developer, Bruce Peninsula, Ontario
Coordinated biological surveys including plant wildlife and birds for a cottage development on the Bruce Peninsula. The surveys included examining the site for its suitability for Massassauga rattlesnakes. *2007 (completed).*

Biologist, Kingsway Forest: Durham Homes, Kingsway Meadows Limited, Oshawa, Ontario
Prepared an environmental analysis that examined existing Ministry of Natural Resources, Provincially Significant Wetlands wetland evaluation. Work also included three-season inventories for flora and fauna, including reptiles and amphibians, for an area within the proposed Rossland Road expansion in the city. *2007 (completed).*

Project Manager/Biologist, Trinity Neighbourhood Woodlot, City of Hamilton, Ontario
Coordinated three-season biological surveys of plants, herpetofauna and birds within a woodlot in eastern Hamilton. *2007 (completed).*

Agrologist, Agricultural Analysis, Private Developer, London, Ontario
Conducted an agricultural analysis of a 35 acre site. The project included analysis of soils and agricultural capability, review of wetland mapping and preparation of report for legal counsel. *2006 (completed).*

Expert Witness, Masonville Meadows, Sifton Properties Limited, London, Ontario
Attended at an Ontario Municipal Board hearing as an expert witness and answered questions in relation to buffer widths and frog habitat potential of an adjacent locally significant wetland near London. *2006 (completed).*

Project Manager/Arborist, Tree Appraisal, Private Developer, Woodbridge, Ontario
Conducted a tree evaluation report for a property that had been expropriated for the widening of Islington Avenue. Using formulas that had been developed by the International Society of Arboriculture (ISA), a report was provided to legal counsel who was successful in obtaining sufficient compensation for tree loss. *2006 (completed).*

Peer Reviewer, Huron Shores Estates, Municipality of Lambton Shores, Ontario
Conducted a peer review of an environmental impact study that had been conducted for a 30-unit condominium project on Lake Huron near Kettlepoint. Specific works included inspection of site for species at risk. *2006 (completed).*

Arborist, Vellore Woods Tree Inspection, TACC Construction, Boxgrove, Ontario
Conducted a tree survey of a 50 acre area. Specific works included determination of species, age, size and health, etc., and discussions with agencies to determine preservation potential. *2006 (completed).*

Biologist, Rehabilitation Plan, Maplewood Homes Ltd., Vaughan, Ontario
Suggested a rehabilitation plan for planting of disturbed areas within a proposed development in the city. The project included selecting native species that would complement adjacent natural areas. *2005 (completed).*

Arborist, Arborist's Report, Private Developer, Richmond Hill, Ontario
Prepared an arborist's report and tree preservation plan on a 10 acre development property. *2005 (completed).*

Project Manager, Land Use Study, Private Farmer, Beamsville, Ontario
Examined past history of an apple orchard and how land use had changed over the past 50+ years. *2005 (completed).*

Project Manager, Vellore Woods Tree Inspection, TACC Construction Ltd., Woodbridge, Ontario
Designed an edge management plan using native species for a locally significant area of natural and scientific interest that had been impacted by development. The project included marking of hazardous trees and coordination of tree crews to remove them. *2004 (completed).*

Arborist, Environmental Study, Greenland Consultants Ltd., Queensville, Ontario
Conducted a preliminary investigation of a 20 acre woodlot. The project included a description of the composition, species and health of the trees, as well as its ecological significance to the area. *2004 (completed).*

Arborist, Arborist Report, Private Developer, Toronto, Ontario
Inspected and evaluated a hazardous tree, and submitted an arborist's report for its removal to the city. *2004 (completed).*

Biologist, Environmental Assessment, Park Bridge Communities Inc., Wasaga Beach, Ontario
Prepared an environmental analysis and an environmental impact study that dealt with the impacts of a retirement-style community on an adjacent significant wetland and possible habitat for Eastern Hog-nosed Snake (species at risk). The project included wetland delineation through soil and vegetation analysis, report preparation and coordination with agency groups. *2003 (completed).*

Biologist, Environmental Impact Study, Hallstone Group, Innisfil, Ontario
Conducted an environmental impact study for a 1.32 ha infill development in the community of Belle Ewart near Lake Simcoe. Liaised with the conservation authority for terms of reference, field work and preparation of the report. *2003 (completed).*

Biologist, Environmental Analysis, PMG Planning Ltd., Richmond Hill, Ontario
Conducted an environmental analysis on a 50 acre property located in the Town and that occurs on the Oak Ridges Moraine. Prepared a report that described existing conditions, development potential and appropriate buffer width based on the Oak Ridges Moraine Conservation Plan. *2003 (completed).*

Project Manager, Landform Analysis, Private Developer, Vaughan, Ontario
Completed a landform analysis for a 14 acre property on the Oak Ridges Moraine. The analysis included classification of soils and determination of past land use activity through comparison of topsoil depth across property, review of historic air photos and property records. *2002 (completed).*

Project Manager/Agrologist, Agricultural Justification Study and Oak Ridges Moraine Conformance Study, Weston Consulting Inc., Vaughan, Ontario
Prepared two reports for an existing garden centre operation in the city. Both documents addressed policies found in OPA 600 and/or the Oak Ridges Moraine Conservation Plan. The project further included preparing minor variance reports for five separate properties based on requirements of the Oak Ridges Moraine Conservation Plan. *2002 (completed).*

Agrologist, Land Evaluation Studies, Private Farmer, Manotick, Ontario
Conducted detailed field studies for four adjoining 100 acre farms. The project included soil analysis, farmer interviews and review of existing Land Evaluation for Agriculture scores. The findings were summarized in two reports that were presented to council. *2002 (completed).*

Biologist, Environmental Impact Study, Toronto Zoo, City of Toronto, Ontario
Conducted an environmental impact study for a proposed structure at the Toronto Zoo. This structure forms part of the Zoomobile circulation project and crosses a steep ravine and environmentally sensitive area. *2001 (completed).*

Biologist, Ballantrae Natural Area Management Study, Map Realty Limited, Pickering, Ontario
Conducted and prepared an environmental analysis report and an environmental impact study for a proposed gated senior's community. The site in question was adjacent to a significant wetland and included a number of features including abandoned gravel pits, a marsh and swamp and active agricultural lands. For the environmental impact statement, a three-month amphibian monitoring study was conducted. *2000 (completed).*

Expert Witness, Environmental Study, Map Realty Limited, Pickering, Ontario
Appeared at an Ontario Municipal Board hearing as an expert witness to answer questions related to appropriate buffer width around significant wetlands, suitability of habitat to support herpetofauna species and tree health related matters. *2000 (completed).*

Expert Witness, Agricultural Potential, Fernlea Flowers, Ottawa, Ontario
Appeared at an Ontario Municipal Board hearing as an expert witness and answered questions in relation to the agricultural potential for lands located near the Ottawa area. *2000 (completed).*

Arborist, Arborist Report, Adanac Realty Ltd., Etobicoke, Ontario
Conducted an arborist report for an infill development in the city. The site contained some Carolinian species and recommendations were made for their preservation. *1999 (completed).*

Agrologist, Land Inspection and Approvals, Upper City Corporation, Richmond Hill, Ontario
Inspected and obtained approvals from York County for the removal of selected hedgerows so that agricultural expansion could occur. *1999 (completed).*

Biologist, Re-evaluation of Wetland Complex, Reinders and Associates, Town of Wasaga Beach, Ontario
Conducted a re-evaluation of the Wasaga Beach wetland complex. Conducted field work, recalculated wetland score and presented results to Ministry of Natural Resources, town officials and landowners. *1998 (completed).*

ENVIRONMENTAL SCIENCE

International Investigations

Biologist, Northern Corridor Buffer Zone Area Specific Master Plan, Royal Commission of Jubail and Yanbu, Saudi Arabia

Completed an area specific master plan for the area. The project included an environmental study, land use and urban design plan, transportation and traffic impact studies, implementation strategy, scope book and basis of urban design, and design and investment/development plans. Specific works included field work, data collection and identification of desert plants, birds and wildlife in a 20 km^2 artificial wetland (fresh/brackish). *2015 (completed).*

Horticulturist, Jubail Industrial City Master Plan Update, Royal Commission of Jubail and Yanbu, Saudi Arabia

Completed the updates to the master plan for Jubail Industrial City (JIC). JIC is a large industrial complex comprising petrochemical plants, fertilizer plants, steel works, an industrial port and a number of support industries. Updates to the plan included transportation systems (roads, port), environmental impacts and management, physical plan, telecommunications, power generation and distribution, water and wastewater, urban plan, land use, and recreation. Specific works included literature review to find suitable tropical shrubs and trees that would be suitable for landscape situations including streetscapes, park areas and boulevards. *2011 (completed).*

Arboriculture (Tree) Investigations

Arborist, Development Options for Disposition of Surplus Properties, Town of Halton Hills, Ontario

Completed development recommendations for three key sites in Georgetown. Prepared a highest and best use study, several concept plans, a preferred concept recommendation and urban design guidelines. Specific works included detailed studies including tree plots to determine extent of woodlots and woodlands within proposed alignment for the continuation of Halton Hills Drive, providing a mitigation plan to describe impacts to surrounding forest community, and completing butternut health assessments. *2015 (ongoing).*

Arborist, GTA Pipeline Right-of-Way Tree Management, Enbridge Gas New Brunswick Inc., Toronto, Ontario

Conducted a survey of trees growing within and adjacent to a proposed 1.2 m diameter gas pipeline. Prepared tree removal permits for trees that required removal. Specific works included conducting tree inspections for permit and non-permit tress during construction, and was on-call for contractor issues. *2015 (ongoing).*

Arborist, Old South Combined Sewer Overflow, City of London, Ontario

Completed an environmental assessment for a new storm outfall and natural channel to the Thames River to facilitate sewer separation in the area. Specific works included assessment of trees including species identification, condition and potential removals, preparation of an overall benefit proposal for a species at risk relocation (*e.g.*, Kentucky Coffee tree) and environmental analysis report of vegetation within the right-of-way. *2011 (completed).*

Arborist, Watermain and Sewer Improvements at MacKay and Cliftonvale, City of London, Ontario
Completed construction administration services for the placement of sidewalks, curb, storm sewer, sanitary sewer, watermain and site reinstatement on MacKay Avenue and Cliftonvale Avenue. Specific works included a tree assessment. *2009 (completed).*

Arborist, Balfour Sanitary Subtrunk Replacement, City of London, Ontario
Completed the rehabilitation of a 450 mm sanitary subtrunk sewer along a busy collector and bus route, and environmentally sensitive area at Kiwanis Park and Pottersburg Creek. A cured-in-place pipe (CIPP) solution was recommended along with a complex sewer by-pass plan to enable safe transportation through the construction area. The project included a hydraulic analysis of the lined sewer to verify service quality to the upstream sewershed. *2009 (completed).*

Arborist, Water Pipe Right-of-Way Mitigation Assessment, Exeter-Hensell Pipeline, City of London, Ontario
Conducted a site investigation to review the condition of butternut specimen within the right-of-way of a water pipeline. The review included coordination with contractor to mitigate damage from construction impacts. *2005 (completed).*

Arborist, Root Depth Literature Review, Heavenly Rest Cemeteries Inc., Windsor, Ontario
Conducted a literature review of the root depth of different species of trees including species at risk and their tolerance to transplanting in response to the expansion of a cemetery into an environmentally sensitive area. *2000 (completed).*

Arborist, Tree Assessment, Private Developer, Cambridge, Ontario
Prepared an arborist's report and tree preservation/site grading plan on a 5 acre property. *1999 (completed).*

Arborist, Tree Preservation Plan, Metrus Developments, Kewsick, Ontario
Prepared a tree preservation plan of 84 hedgerows and four woodlots on a 1,000 acre development. Information collected included species, size, condition and preservation status. *1996 (completed).*

Arborist, Environmental Inspection Report, City of Ottawa, Ontario
Prepared an environmental inspection report of trees that had been planted alongside Hunt Club Road. Report included a health assessment of all trees and recommendations to improve their health. *1995 (completed).*

Arborist, Impact Assessment, Municipal Telephone System, Blanshard, Ontario
Evaluated damage claims and the overall health of trees that had been impacted by telephone cabling operations between Stratford and Sebringville. *1995 (completed).*

Arborist/Environmental Inspector, River Road Golf Course, London Public Utilities Commission, Ontario
Completed the construction of an 18-hole golf course. The project included ensuring mitigation measures were in place and being followed, and the preservation of specimen trees, species at risk or other natural features where possible. *1994 (completed).*

Wetland Investigations

Biologist, Wetland Environmental Study, Canadian Pacific, North Bay, Ontario
Conducted field studies within a provincially significant wetland (Parks Creek). Investigations included determining the effects that a new rail connection would have on the hydrological, biological, ecological and special features functions of the wetland. Net mitigation measures addressed the construction and long-term operational effects on the wetland. *2006 (completed).*

Biologist, Fish Habitat Compensation Plan, County of Essex, Ontario
Designed a wetland as part of a fish habitat compensation plan for the relocation of a degraded bridge in Cedar Creek. The design included the planting of native species that are locally significant and complemented species found in the Cedar Creek significant wetland located 0.5 km upstream. *2005 (completed).*

Biologist, Environmental Impact Study, L.V. Maughan Co. Ltd., Parry Sound, Ontario
Conducted field studies, including detailed plant surveys, of vegetation growing within the Partridge Bay Wetland. The project work involved determining the best location of an access road for a new cottage development. An environmental impact study also addressed the effects that the access road would have on the wetland community. *2005 (completed).*

Biologist, Dreamworks Property Environmental Impact Statement, Senator Homes, Brampton, Ontario
Completed an EIS for a proposed development adjacent to a significant wetland (Heart Lake wetland). The project included confirmation and staking of boundaries with Toronto Region Conservation Area and City officials. Suggestion of approximate buffer widths were based on past, existing and future land uses and historical air photo review. *2004 (completed).*

Biologist, Degraded Urban Pond Assessment, Town of Unionville, Ontario
Evaluated and assessed wetland communities around the degraded urban pond, Toogood Pond. The project included the recommendation of plant species to revegetate wetland areas that had low plant diversity. *2002 (completed).*

Expert Witness, Property Severance, Private Developer, Essex County, Ontario
Testified as an expert witness before an Ontario Municipal Board hearing for the severance of a property adjacent to Big Creek Marsh. Specific works included nswering questions relating to wetlands, agriculture, buffers and general ecology. *2001 (completed).*

Biologist, Boundary Evaluation, Private Client, Cookstown, Ontario
Conducted field work and examined specific areas of a significant wetland, Cookstown Hollows, to determine if earlier evaluation boundaries matched those within the field. *2000 (completed).*

Biologist, Westland Environmental Impact Study, Private Developer, Cambridge, Ontario
Conducted field studies and recorded natural features of lands of a provincially significant wetland. The project included an environmental impact study that addressed the effects that a planned single-family dwelling would have on the wetland. *2000 (completed).*

Biologist, Wetland Area Design, Private Developer, Bowmanville, Ontario
Conducted field studies and assisted in the design of an 11 acre wetland. The project included analysis of adjacent wetlands that are slated for aggregate extraction and incorporation of the best features of the existing wetland into the new wetland. *2000 (completed).*

Biologist, Wetland Environmental Impact Study, South Winds Development Co. Inc., Coldstream, Ontario
Conducted field studies and recorded natural features of lands located within the adjacent lands of a provincially significant wetland. The possible effects of a proposed residential development and related stormwater concerns were presented in an environmental impact study in accordance with the Provincial Wetlands Policy. *2000 (completed).*

Biologist, Wetland Environmental Study, Shugg Engineering Ltd., Cambridge, Ontario
Conducted field studies, reviewed secondary source material and suggested a mitigation strategy for a residential development adjacent to Devil's Creek wetlands. Technical details for a proposed stormwater pond that would use an existing kettle lake for stormwater management were also presented. *1999 (completed).*

Biologist, Biological Investigation, National Capital Commission, Shirleys Bay, Ontario
Conducted biological investigations of fish, vegetation, sediment and benthic sampling in Shirleys Bay, a provincially significant wetland, to determine the impacts of sewage discharge from the Watts Creek Sewage Treatment Plant within the wetland. The project included determining appropriate mitigation to rehabilitate the wetland and improving its fish and benthic community which had low diversity. *1998 (completed).*

Biologist, Environmental Study and Mitigation Plan, Horseshoe Resort Corporation, Barrie, Ontario
Conducted field studies including wetland evaluations of plant communities that were in the vicinity of a proposed development in Horseshoe Valley. Studies included the comparison of forest, wetland and stream corridors to the proposed development limits. Phase 2 included the design of an environmental mitigation plan that would minimize impacts of adjacent forest and stream communities. *1996 (completed).*

Biologist, Fish Habitat Review, MillPar Developments, Mississauga, Ontario
Conducted field visits to the east branch of the Humber River and its tributaries to determine a suitable location for fish habitat compensation. Options included bank-side revegetation, installation of vortex weirs or riverine wetland creation. *1995 (completed).*

Biologist, Wetland Environmental Study, Sifton Properties, London, Ontario
Conducted field studies (wetland mapping, plant composition) within a locally significant wetland. Investigations included evaluating the contribution of each wetland type to the local ecosystem and determining a suitable buffer width for an adjacent development. *1994 (completed).*

Site Investigations and Assessment

Biologist, Natural Environment Study, South Windsor Development Co. Ltd., Windsor, Ontario
Conducted extensive field studies on a 12.2 ha site that includes a Candidate Natural Heritage Site (#24) in the city. This work included an assessment of the existing natural features, their sensitivity to change, and opportunities for restoration or preservation should development occur. *2016 (ongoing).*

Biologist, Environmental Evaluation Report, Private Residential Developer, Windsor, Ontario
Compiled an environmental evaluation report for a 4.0 ha development property. Field visits were conducted in the winter and summer and species at risk and their habitat were identified through these visits. *2016 (ongoing).*

Biologist, Gormley Industrial Park, Gateway North Inc., York Region, Ontario
Conducted biological investigations for a proposed 2.7 ha industrial park near Highway 404/ Stouffville Road. *2015 (ongoing).*

Project Manager, Environmental Study, Rosati Construction, LaSalle, Ontario
Conducted numerous field visits to an 8 acre site which included a portion of Candidate Natural Heritage Site (TC4). This work included field work in all four seasons, meetings with agencies and report preparation, and assessment of seven development scenarios. *2012 (completed).*

Biologist, Commercial Vehicle Inspection Facilities (CVIFs), Putnam, Ministry of Transportation, Ontario
Prepared the preliminary design of the conversion of the Putnam north and south truck inspection stations to CVIFs. Specific works included agricultural and biological investigations on active agricultural lands to determine if the site would be suitable for a farm equipment auction facility. *2010 (completed).*

Biologist, Migrating Bird Survey, City of Windsor, Ontario
Coordinated a field program to survey migrating bird populations within a small woodlot. Specific works included interpretation of avifaunal data over a two-month period. *2006 (completed).*

Biologist, Vegetation Analysis, Box Grove Hills Development Inc., Markham, Ontario
Completed analysis of vegetation within a stream corridor in a proposed development. *2005 (completed).*

Biologist, Mitigation for Revegetated Dredging Material, Public Works and Government Services Canada, Seaway Island, Ontario
Recommended a mitigation strategy for revegetated dredging material that had been extracted from waters around Seaway Island in the St. Clair River. Treatment of seedbed and recommendations for suitable seed mix formed part of this strategy. *2005 (completed).*

Biologist, Spivak Golf Course, The Oaks Golf and Country Club, Komoka, Ontario
Completed a natural features assessment report for an 18-hole golf course. The project included a savanna prairie grass report. Specific works included coordinating field work, acting as environmental inspector during constriction, and developing a monitoring program for benthic and savanna grass community. *2004 (completed).*

Biologist, Environmental Impact Statement, Par Finance, LaSalle, Ontario
Conducted an environmental impact statement for a low density development project in LaSalle, including field work, report preparation and responding to agency comments, and preparing for Ontario Municipal Board hearings. *2004 (completed).*

Biologist, Benthic Sampling and Monitoring, County of Northumberland, Ontario
Conducted field studies including benthic sampling and monitoring at four locations at a new landfill near Cobourg. *2004 (completed).*

Biologist, Environmental Impact Study, Private Developer, Parry Sound, Ontario
Prepared an environmental impact study report that addressed the environmental implications and loss of functions that a secondary road and adjacent development would have on an adjacent provincially significant wetland. *2003 (completed).*

Biologist, Rehabilitation of Highway Right-of-Way, Public Works and Government Services Canada, Collingwood, Ontario
Recommended a mitigation strategy to rehabilitate a highway right-of-way. Fertilizer recommendations based on soil tests and a suitable seed mixture formed part of the plan. *2002 (completed).*

Biologist, Fish Habitat Study, Confidential Client, Ontario
Compared the riparian features of two intermittent streams and assessed their potential value for fish habitat. Field studies included the identification and delineation of various plant communities, determination of soil type and identification of aquatic habitat. *2002 (completed).*

Biologist, Natural Environment Audit, Department of National Defence, Ontario
Identified natural features (environmentally significant areas, streams, woodlots), or areas of natural and scientific interest (streams, deer congregation sites) that were adjacent to or on 24 Canadian Forces bases in the Golden Horseshoe area as part of an environmental audit of Canadian Forces bases across Canada. *2002 (completed).*

Biologist, Environmental Monitoring Program, Granite Golf Inc., Stouffville, Ontario
Coordinated a terrestrial biology program including inventories for plants, wildlife and birds for a new 18-hole golf course. Specific works working with the design team and other disciplines to produce a championship facility while preserving and maintaining natural features in the area. *2001 (completed).*

Biologist, Light Transit Biological Program, Region of Ottawa-Carleton, Ontario
Coordinated the biological program (terrestrial and aquatic) for the Ottawa pilot light transit study. This alignment uses an existing track that would extend from Hunt Club Road to the Ottawa River. Determined biological impacts and report preparation. *1999 (completed).*

Biologist, Environmental Study, The Hearn Group Inc., Essex County, Ontario
Conducted field studies for a proposed 18-hole golf course, including spring and late summer floral, mammal and herpetofauna studies and report preparation. Met with Essex Region Conservation Authority, Ontario Ministry of Natural Resources, wetland evaluation technical team and attended public meetings. *1999 (completed).*

Biologist, Literature Review, Wildlife Study, New Brunswick Department of Transportation
Conducted a literature review on wildlife and road crossing methods with particular reference to underpasses. This is part of a two-year study to determine what crossing methods are most efficient in New Brunswick. *1997 (completed).*

Biologist, Environmental Impact Statement, Georgetown Estates Corporation, Ontario
Conducted an environmental impact study on a property between Georgetown and Norval which included an environmentally significant area and two significant wetlands. Specific works included characterization of vegetation communities, assessment of potential impacts from the construction of a residential community and recommendation of mitigation measures to reduce net impacts. *1996 (completed).*

Biologist, Biological Study, City of Sault Ste. Marie, Ontario
Conducted a biological study at a snow dump site. Field studies included the assessment of vegetation, sampling of soils for salt content and designing a monitoring plan that would evaluate the long-term impacts of snow dumping on the site and surrounding area. *1996 (completed).*

Expert Witness, Residential Development, Georgetown Estates Corporation, Norval, Ontario
Appeared at the Ontario Municipal Board hearing and answered questions in relation to biological issues regarding a property. *1996 (completed).*

Biologist, Species at Risk Study, Transport Canada, Ottawa, Ontario
Conducted a field program during the breeding season of the Loggerhead Shrike (Lanius ludovicianus) to confirm if these species were breeding in lands surrounding the MacDonald Cartier International Airport. Studies included long-term observations of suspected sites. *1995 (completed).*

Biologist, Species at Risk Study, Transport Canada, Ottawa, Ontario
Conducted a field program to delineate preferred habitat for a species at risk (Loggerhead Shrike (Lanius ludovicianus)) habitat on lands surrounding the MacDonald Cartier International Airport. The program also included a literature search for recent shrike information, as well as an early spring survey of plants, animals and birds in the area. *1994 (completed).*

Arborist, Impact Assessment, Roman Catholic Cemeteries Board, Windsor, Ontario
Provided expert opinion on matters of provincial policy relating to expansion of a mausoleum and its impact on species at risk trees. *1993 (completed).*

Biologist, Highway 24 Planning Study, Cambridge to Guelph, Ministry of Transportation, Ontario
Conducted a detailed survey of a forest flora within the preferred technical alignment of Highway 24. The survey included the mapping of Dentaria spp (toothwort), which is the preferred food plant for a species at risk (West Virginia white butterfly), as well as wildlife activity within the forest. Specific works included extensive literature search of wildlife accident-related material including mitigative strategies to reduce wildlife fatalities. *1993 (completed).*

Biologist, Environmental Study, Thunder Bay, Ministry of Transportation, Ontario
Completed an environmental study report on vegetation and other natural features on the proposed Terry Fox monument site. *1993 (completed).*

Biologist, Vegetation Mapping Study, Huntsville, Ministry of Transportation, Ontario
Conducted a detailed mapping study of vegetation growing within the floodplain and along adjacent uplands of a cold water fishery (Jessops Creek) for the preparation of the re-alignment of the stream for the proposed twinning of Highway 11. *1992 (completed).*

Agrologist, Alternatives to Pesticides Study, City of North York, Ontario
Studied alternatives to pesticides in the parks, playing areas and boulevards. *1991 (completed).*

Agrologist, Integrated Pest Management Program, Confidential Client, Ontario
Designed an integrated pest management program to reduce pesticide use on a 64 acre corporate property in Toronto. *1991 (completed).*

Agrologist, Rehabilitation Plan – Abandoned Gravel Pit, Cosburn, Patterson and Wardman, Woodbridge, Ontario
Assessed an abandoned gravel pit and designed a rehabilitation plan suitable for conservation area use. *1991 (completed).*

Advisor, Horticulture and Entomology, Ministry of Agriculture and Food, Toronto, Ontario
Answered horticulture and entomology enquiries from the general public from across Ontario. Interpreted home soil fertilizer recommendations, suggested ways to improve soil through composting methods and other amendments, and developed and maintained a horticultural database. Specific works included acting as Chair of the Horticulture Working Group with responsibility for writing, editing and publishing horticultural related factsheets; and member of the Technical Advisory Committee with responsibility for rewriting the factsheet for the Ontario Home Lawn and Garden Soil Testing Program. *1990 (completed).*

Arborist, Tree Maintenance, Municipality of Metropolitan Toronto, Ontario
Maintained trees and shrubs including planting, pruning and topping. Removed dead and dangerous trees on public and private lands throughout Metropolitan Toronto. *1989 (completed).*

Horticulturist, Pest Diagnostic and Advisory Clinic, University of Guelph, Ontario
Analyzed, identified and controlled (both chemical and non-chemical) diseases, insects and weeds; reported recommendations in verbal and written form; tested plants for triazine resistance; curated photographic slide, weed seed and plant specimen collections. *1988 (completed).*

Agriculture

Agrologist, Agriculture Analysis, Urbandale Corporation, Ottawa, Ontario
Conducted agricultural analysis of three properties totaling 900 acres in the Ottawa area to determine the long-term potential. Work included review of existing land evaluation and area review scores, historical air photos, secondary source literature, infield soil analysis and preparation of an agricultural assessment report for each property. *2009 (completed).*

Agrologist, North York Region Generating Station Environmental Assessment, Pristine Power Ltd., Georgina, Ontario
Undertook an environmental assessment and secured permits for a proposed 300 MW natural gas-fired generating station. The project included a due diligence Phase I Environmental Site Assessment on adjacent properties, purchased prior to construction to facilitate permitting. *2009 (completed).*

Environmental Coordinator, Mill Creek – South Block Area Subwatershed Study, City of St. Thomas, Ontario
Prepared a subwatershed plan to meet the requirements of the Provincial Policy Statement. The plan included environmental monitoring and sampling activities; mapping of natural heritage and hazard features water balance computations, soil loss estimates, and HEC-RAS modelling; specific targets and constraints; comprehensive environmental impact assessment to identify and evaluate responses to proposed land use changes; six interrelated management strategies; and an implementation strategy. *2008 (completed).*

Agrologist, Agricultural Assessment, Regional Municipality of Ottawa-Carleton, Ontario
Conducted field studies, farm interviews and agricultural assessment for the Trail Road landfill expansion project. The report also included a description of impacts to farms along the haul route and recommendation of mitigation measures in the off-site areas. *2001 (completed).*

Agrologist, Site Assessment for Landfill, Region of Sudbury, Ontario
Evaluated seven sites from an agricultural perspective for a preferred landfill site in the Region. Detailed field studies were conducted on three of these sites which included sampling of soils, air photo interpretation and on-site consultation with agencies. *1999 (completed).*

Agrologist, Highway 17 Environmental Assessment Study, Haley Station to Meath Hill, Ministry of Transportation, Ontario
Identified and assessed agricultural land for alternatives on both sides of Highway 17 and Muskrat Lake. The project included detailed farmer interviews, field reconnaissance, discussions with agricultural representatives, and soil capability and air photo interpretation. Agricultural information was presented at numerous public meetings, open houses and Ontario Federation of Agriculture meetings from resource and economic points of view. *1998 (completed).*

Agrologist, Farming and Farmland Assessment, London, St. Thomas and Lake Erie, Ontario Clean Water Agency
Conducted numerous site visits to farms and farmland situated along the main water supply pipeline. Assessment included inspection of farmland to determine if there was a decline in crop health from past construction, and determine best mitigation methods to reduce farmland damage (e.g., soil compaction, drainage) from proposed construction. *1996 (completed).*

Agrologist, Best Management Practices Study, Townships of Southwold and Yarmouth, Ontario
Identified and assessed the quality of farmland that was within the Lynhurst subwatershed. Studies included interviewing farmers to determine what best management practices are being used and identifying areas that could be further improved through best management practices. *1993 (completed).*

Agrologist, Landfill Impact Study, BFI Canada Inc., Blenheim, Ontario
Conducted field visits to assess farmland in the vicinity of an existing landfill. Studies included the identification of viable farmland, impact of haul routes and degree of farm abandonment. The study included interviews of farmers within 1 km of the landfill and along the proposed haul route. *1993 (completed).*

Agrologist, Agricultural Assessment, BFI Canada Inc., Southwestern Ontario
Conducted an agricultural analysis using secondary sources (soil mapping, air photo) of 12 possible areas that were suitable for a landfill facility. *1993 (completed).*

Agrologist, Landfill Site Investigation, Counties of Leeds and Grenville, Ontario
Conducted detailed investigations of a preferred landfill site in the area. Studies included interviews with farmers around the site and along the haul route. The assessment included the application of numerous factors and indicators. *1992 (completed).*

Agrologist, Landfill Site Investigation, Domtar Fine Papers Inc., Cornwall, Ontario
Conducted field visits to dairy and beef farms within the vicinity of a proposed pulp and paper landfill site. Farm interviews focused on the negative effects (noise, dust, litter) the operation would have on adjacent farms. *1992 (completed).*

Agrologist, Agricultural Assessment, Hawkesbury Regional Board of Waste Management, Ontario
Evaluated 18 sites from an agricultural perspective for the preferred site in the area. Studies included examination of soil, Canada Land Inventory (CLI) and air photo mapping and delineation of agricultural and non-agricultural land. *1992 (completed).*

Agrologist, Farmland Assessment- Residential Development, Warden Estates, Newmarket, Ontario
Identified and assessed farmland adjacent to a proposed estate residential development. The assessment included the calculation of minimum separation distance and impacts to farm traffic movement. *1992 (completed).*

Agrologist, Agricultural Assessment, The Diconstanzo Corp., Bethesda, Ontario
Conducted farm field studies on an 80 acre property. The assessment included the ability of existing lands to support agriculture in an urban environment, and included examination of soil capability, soil mapping and past cropping history. *1992 (completed).*

Agrologist, Highway 11/17, Farming Assessment for Highway Upgrade, Ministry of Transportation Ontario
Conducted farm interviews of dairy, beef, greenhouse and specialty crop farms along a 35 km stretch of Highway 11/17 from Welch Creek to the Black Sturgeon River as part of a multi-discipline assessment to determine the best alternative for the upgrading of the Trans-Canada Highway. *1992 (completed).*

Agrologist, Landfill Site Investigation, County of Lambton and City of Sarnia, Ontario
Conducted field visits and farmer interviews on and around four potential landfill sites in an intensive farming area in Lambton County. Agricultural features including soil capability, drainage improvements, infrastructure and degree of specialization of all sites were compared from an agricultural perspective and the preferred site for a landfill facility was selected. *1991 (completed).*

Apiarist, Department of Entomology, University of Guelph, Ontario
Completed fall management of 150+ bee colonies, honey extraction, wax rendering, disease and pest control. Demonstrated education programs and tour groups at the Townsend Apiculture Research Laboratory. *1987 (completed).*

Researcher, Bee Colony Study, University of Guelph, Ontario
Examined honey bees for the presence of tracheal mites and conducted a literature search for relevant information. Collected and analyzed nectar from canola and alfalfa varieties. Provided a statistical analysis of the findings at the Townsend Apiculture Research Laboratory. *1987 (completed).*

TRANSPORTATION ENVIRONMENTAL ASSESSMENTS

Biologist, Impact Assessment, Cambridge, Ministry of Transportation, Ontario
Responsible for documenting and assessing impacts on wildlife and vegetation resources including significant wetlands from the expansion of Highway 401 from four to six lanes within the Cambridge area. *2005 (completed).*

Biologist, Reconstruction of Highway 401, Chatham, Ministry of Transportation Ontario
Provided contract administration services and detailed design for the reconstruction of Highway 401. The project included biological investigations within the right-of-way for a 34.5 km section of the roadway in the Chatham area including detailed descriptions of watercourses. *2005 (completed).*

Biologist, Biological Investigation, Strathroy to Sarnia, Ministry of Transportation, Ontario
Provided contract administration services and detailed design for the reconstruction of Highway 402. The project included biological investigations within and adjacent to the right-of-way in six sections totaling 60 km. The investigations included determining appropriate places to stockpile soil, identifying candidate endangered species and suggesting mitigation measures to stabilize steep or unstable slopes. *2004 (completed).*

Biologist, Environmental Report, Whitebread Line, Whitebread, Ministry of Transportation, Ontario
Provided an environmental report of terrestrial conditions surrounding a bridge in need of repair near the Community. This report included information on vegetation, wildlife potential (including birds) near the vicinity of the bridge. *2003 (completed).*

Biologist, Environmental Study, Oakville, Ministry of Transportation, Ontario
Prepared the biological component of six separate environmental study reports for four parking lots and two inspection stations for the western extension of Highway 407 between Trafalgar Road and Dundas Street. *2002 (completed).*

Biologist, Master Transportation Master Plan, Region of Niagara, Ontario
Reviewed secondary sources for the location and status of streams, forests, environmentally significant areas, areas of natural significance and prime agricultural land. Alternatives were evaluated with regard to their impact on adjacent natural and agricultural resources. *2002 (completed).*

Biologist, Review and Update of Terrestrial and Agriculture Information, Newmarket, Ministry of Transportation, Ontario
Conducted a review of information that had been conducted for the Highway 9 widening between Weston Road and Bathurst Street. The analysis included field trips to update the terrestrial and agricultural information that had been previously collected and a review of the environmental study document. *2002 (completed).*

Biologist, Field Investigation, London, Ministry of Transportation, Ontario
Conducted field investigations within the vicinity of a proposed intersection at Highway 402 and Wonderland Road South. Studies included assessing the impacts on Dingman Creek and surrounding woodlots. *2002 (completed).*

Biologist, Flood Plain Mitigation Plans, City of London, Ontario
Conducted field work and developed mitigation plans to restore the Thames River flood plain bank vegetation within right-of-way of the Oxford Street Extension. *2001 (completed).*

Biologist, Terry Fox Drive Expansion, Regional Municipality of Ottawa-Carleton, Ontario
Conducted numerous field studies within the proposed alignment of the Terry Fox Drive expansion in Kanata. Studies included herpetofaunal monitoring, fish electroshocking, seine netting and vegetation community mapping. This project is ongoing and will be an examination

of the possible impacts that the chosen alignment will have on the agricultural and natural features of the area. *2001 (completed).*

Biologist, Highway 4, Field Investigation and Impact Assessment, Arva and Birr, Ministry of Transportation, Ontario
Conducted field investigation and determined impacts on specimen trees growing within and adjacent to the Highway 4 right-of-way between Arva and Birr. *2000 (completed).*

Biologist, Field Investigation and Impact Assessment, City of Ottawa, Ontario
Conducted field investigations and determined impacts on specimen trees and watercourses within the right-of-way of Woodroffe Avenue. This work was required for the widening of this secondary road. *2000 (completed).*

Biologist, Airport Access Review, Greater Toronto Airports Authority, Ontario
As part of the future improvements to Pearson International Airport, the extension of Courtneypark Drive access into the western portion of the airport was examined. The terrestrial biology component included examining the impacts that building a structure across Etobicoke Creek valleylands would have on wildlife passage and remnant forests. *1998 (completed).*

Biologist, Trafalgar Road Upgrade, Class Environmental Assessment, Region of Halton, Ontario
Conducted biological field investigations for the upgrading of Trafalgar Road between the communities of Silvercreek (near Highway 7) and Ballinafad (RR 42). This Class EA included the assessment of four roadway alternatives. *1998 (completed).*

Biologist, Highway 48 Improvements, Ministry of Transportation, Ontario
Conducted biological investigations within and adjacent to the right-of-way on Highway 48 between Aurora Road and Mount Albert Road. This work was conducted in preparation for resurfacing and the addition of a truck climbing lane. *1998 (completed).*

Biologist, Airport Biological Studies, Toronto Harbour Commission, Ontario
Conducted biological studies in the area of the Toronto City Centre Airport to determine the preferred location of a fixed link between the Toronto mainland and the Toronto City Centre Airport. The analysis included assessing the advantages and disadvantages of a deep and shallow tunnel as well as a moveable structure. *1997 (completed).*

Biologist, Impact Assessment, Mississauga, Ministry of Transportation, Ontario
Conducted field studies on the existing Queen Elizabeth Way and Mississauga Road intersection and surrounding area to assess the impacts of five alternatives on the vegetation and wildlife communities in the vicinity of this facility. *1996 (completed).*

Arborist, Environmental Study, City of London, Ontario
Identified and evaluated trees within the site boundaries of a proposed widening of Adelaide Street. Studies also examined the impact of expansion on adjacent environmentally sensitive areas, Stoney Creek and wildlife habitat. *1996 (completed).*

Biologist, Highway 401, Field Investigation, Ministry of Transportation, Ontario
Conducted detailed field studies of environmental features located within the vicinity of six interchanges along Highway 401 in eastern Ontario to map environmental constraints for future interchange improvements. *1996 (completed).*

Biologist, Truck Route and Main Street Improvements Study, County of Wellington, Ontario
Completed a truck route by-pass study in the village of Erin. The study was conducted under the Class Environmental Assessment for Municipal Road Projects and included assessing the need for a by-pass and, if necessary, alternative routes around the village and the required improvements to Main Street through the village. Specific works included field investigations and assessed the impacts of four different routes. *1995 (completed).*

Biologist, Field Investigation, City of London, Ontario
Identified and assessed vegetation and other natural features for a proposed widening for Wonderland Road. *1995 (completed).*

Biologist, Field Investigation, Placer Dome Mines, Timmins, Ontario
Conducted field studies and assessed natural features to find the best route for a proposed relocation of secondary road near a gold mine. *1995 (completed).*

Biologist, Environmental Study, City of Cambridge, Ontario
Identified and evaluated trees growing within the site limits of the proposed widening of Parkhill Bridge. *1994 (completed).*

Biologist, Highway 11, Natural Environment Assessment, Burks Falls to Powassan, Ministry of Transportation, Ontario
Identified and assessed streams, woodlots and other sensitive areas along Highway 11 from Burks Falls to Powassan. The study included the comparison of natural features that would be impacted by either twinning or bypasses along the route. *1993 (completed).*

Biologist, Field and Inventory Study, Wallaceburg, Ministry of Transportation, Ontario
Conducted field studies and inventories of vegetation growing within the study limits of a proposed bridge reconstruction on Highway 40. *1992 (completed).*

Biologist, Fish Habitat Data Interpretation, Glenora and Adolphustown, Ministry of Transportation, Ontario
Interpreted and plotted scientific data that had been collected during an underwater survey of the lake bottom between Glenora and Adolphustown ferry docks in preparation for the improvement of both dock facilities while still maintaining fish habitat. *1992 (completed).*

Biologist, Field Investigation, Timmins, Ministry of Transportation, Ontario
Conducted field studies and assessed forests and wetland within a proposed highway corridor that would connect Highways 629 and 655 near Timmins. *1992 (completed).*

Arborist, Eglinton West Rapid Transit Environmental Assessment, Toronto Transit Commission, Ontario
Prepared a full EA for a rapid transit line on Eglinton Avenue from Spadina subway to the Toronto-Mississauga boundary. The study defined the problem, reviewed options, alternative corridors and developed an evluation of technology-alignment combinations. The study recommended a rapid transit line using subway technology, and an additional connection to the Mississauga Transitway east to Martin Grove Road. Specific works included identifying and evaluating trees and other natural features. *1993 (completed).*

Arborist, Environmental Study, York Region, Ontario
Identified and evaluated noteworthy trees within the site boundaries of a proposed widening of Woodbine Avenue from John Street to Highway 7. *1992 (completed).*

Arborist, Environmental Study, Rutherford Road/Highway 400, Ministry of Transportation, Ontario
Identified and evaluated trees growing within site limits of a proposed interchange at Rutherford Road/Highway 400. *1992 (completed).*

Biologist, Environmental Study, Region of Hamilton-Wentworth, Ontario
Conducted herpetofauna, fish and vegetation studies within the boundaries of a proposed intersection near Cootes Paradise. *1991 (completed).*

ENERGY, WASTE, SEWAGE AND WATER ENVIRONMENTAL ASSESSMENT

Agrologist, Soil Investigations, SkyPower Limited, Ontario
Conducted agricultural soil analysis for five large solar power properties located within Simcoe, York, and Victoria Counties. Investigations included excavation of soil pits to determine texture, structure, moisture regime and classification ratings. *2012 (completed).*

Arborist, Tree Inventory, Erie Street/Oak Street Interchange Sewer and Watermain, Municipality of Leamington, Ontario
Completed the final design for road and drainage works at the Erie and Oak streets' intersection. The design included a widening of the intersection with dedicated left turn lanes. In addition to the roadway construction, the project included a new Heinz parkette landscaping feature and parking lot/walking trail area reconfiguration. Upgrades to signalized intersections and new pedestrian signals were also included. *2011 (completed).*

Agrologist/Biologist, Agricultural and Biological Investigations, GTA Reinforcement Pipeline Environmental Assessment, Enbridge Gas, Toronto, Ontario
Provided environmental and socio-economic constraints and opportunities input for the installation of a reinforced natural gas supply line throughout the GTA. The project included several potential routes followed by additional work to ascertain the feasibility of installation with a marine environment and in northern areas of the GTA. Also provided environmental and due diligence support for the proposed pipeline route and potential alternatives. *2011 (completed).*

Biologist, Grand Bend Sewage Treatment Plant Upgrade, Municipality of Lambton Shores, Ontario
Completed the environmental assessment, predesign and detailed design for the upgrades to the STP, with a design capacity of 4800 m^3/d. The existing lagoon system was upgrades to tertiary level treatment utilizing screening, grit removal, activated sludge and tertiary filtration and UV disinfection. Sustainable design components included heat recovery form effluent, solar wall, solar voltaic roof mounted units and green roof. The existing sludge lagoons were converted into wetland complexes. *2008 (completed).*

Agrologist, Environmental Assessment, Leader Wind Corporation, Kincardine, Ontario
As part of the ongoing environmental assessment, preliminary and detailed agricultural field investigations were conducted for approximately 120 wind turbine sites, as well as staging and concrete batching sites in the area. Activities included checking secondary sources for soil and tile drainage information and providing a mitigation strategy to reduce impacts to prime agricultural areas. *2005 (completed).*

Biologist, Leachate Pipeline Field Assessment, Region of Ottawa-Carleton, Ontario
Conducted field studies and assessed four alternative routes for a leachate pipeline in the Ottawa region. The assessment included the impacts of construction and long-term operation on forests, wetlands, and streams within the right-of-way. *2003 (completed).*

Arborist, Landscape Plan, Canadian Waste Services Inc., Etobicoke, Ontario
Recommended low maintenance plantings and assisted in the design of a landscape plan for a reconstruction of a waste transfer station in the city. *2003 (completed).*

Biologist, Environmental Impact Study, Region of Waterloo, Ontario
Conducted a scoped environmental impact study with regard to the impacts of a proposed inground water reservoir on an adjacent ESPA in the Kitchener-Waterloo area. *2001 (completed).*

Biologist, Natural Environment Assessment, Region of Hamilton-Wentworth, Ontario
Conducted preliminary studies in Freelton to document and assess the significance of the natural features in the area as part of the ongoing master servicing plan for the community to determine sewer and water needs for future development. *2001 (completed).*

Biologist, Ash Disposal Site Determination, Cochrane Power Corporation, Cochrane, Ontario
Completed detailed comparison of 13 sites located within 10 km of Cochrane to determine a preferred site for waste ash disposal. This analysis was conducted using air photo interpretation followed by helicopter inspection The waste ash was a product of a large, wood waste burning facility that produced electricity for the area. Investigations also included the potential to use the ash as a liming agent on adjacent agricultural lands. *2000 (completed).*

Arborist, Tree Survey, Region of Ottawa, Ontario
As part of the Woodroffe Avenue forecemain a tree survey was conducted to determine what impacts would occur to street trees along the alignment. This survey included determination of species, and condition and sensitivity to root disturbance. *2000 (completed).*

Peer Reviewer, Biological Investigations, City of St. Thomas, Ontario
Conducted biological investigations within a woodlot and an existing agricultural drain in preparation of a route selection of a municipal drain. *2000 (completed).*

Biologist, Biological Field Studies, City of London, Ontario
Conducted biological field studies adjacent to the Pottersburg pollution control plant in London, Ontario. These studies were part of the upgrading process of this plant, and included the classification of vegetation communities and assessing the impacts that the construction of a new outfall would have on the terrestrial and aquatic communities. *1999 (completed).*

Agrologist, Agriculture Field Studies, Progressive Waste Solutions, Ontario
Conducted field studies at two sites in southwestern Ontario to compare farming activity including cropping and infrastructure type, degree of farm abandonment and extent of land improvement as part of a comprehensive study to determine the siting location of a new landfill facility. *1996 (completed).*

Biologist, Field Study, Fred Schaeffer & Associates, Richmond Hill, Ontario
Conducted field studies at a proposed forcemain crossing of a tributary of the Rouge River in OPA 121. Specific works included mapping of vegetation units and assessment of the stream in the crossing area. *1994 (completed).*

Biologist, Field Study, Minto Communities, Richmond Hill, Ontario
Conducted field studies and suggested a rehabilitation enhancement plan for a sanitary sewer crossing of the Rouge River in OPA 121/135. The enhancement plan called for the use of root wads, in-stream habitat structures and native plantings. *1994 (completed).*

Biologist, Biological Studies for Forcemain Alignment, City of London, Ontario
Conducted preliminary biological studies to a proposed forcemain alignment in Lambeth. The project included preparation of an environmental impact study to document net impacts on an adjacent environmentally sensitive area. *1994 (completed).*

Biologist, Sewage Facility Improvement Study, Township of Bosanquet, Ontario
Reviewed secondary source material, contacted various environmental agencies and identified significant natural features in the North Bosanquet sewage Class Environmental Assessment study area to address sewage needs in the future. *1994 (completed).*

Biologist, Environmental Study for Proposal Sewage Treatment Plant, Village of Ilderton, Ontario
Conducted field studies and assessed trees and vegetation within and adjacent to the proposed site of the Ilderton STP. *1994 (completed).*

Biologist, Natural Environment Assessment, Domtar Fine Papers Inc., Cornwall, Ontario
Conducted spring and fall vegetation inventories and assessed and evaluated woodlots for a proposed pulp and paper landfill site. Local naturalists were also interviewed. *1993 (completed).*

Biologist, Sewage Facility Improvement Study, Village of Port Stanley, Ontario
Reviewed secondary source material, contacted various environmental agencies and established appropriate indicators for eight alternatives for the improvement of sewage facilities. *1993 (completed).*

Biologist, Sewage Facility Improvement Study City of Sarnia, Ontario
Reviewed secondary source material and established appropriate indicators for seven alternatives for the improvement of a sewage lagoon system in Brights Grove within an environmentally sensitive area. *1993 (completed).*

Biologist, Natural Environment Assessment, County of Lambton/City of Sarnia, Ontario
Conducted vegetation studies, identified and assessed watercourses and woodlots potential on two adjoining properties and then compared natural features of both as part of the work involved in finding suitable locations for the Lambton County waste management master plan. *1992 (completed).*

Biologist, Natural Environment Study, Lambton Shores, Ontario Ministry of the Environment
Completed an environmental study (including vegetation survey) of natural features within a 1,500 acre parcel of land near the existing Grand Bend sewage lagoon as part of the environmental assessment study to determine the best area for the expansion/upgrading of the facility. *1992 (completed).*

Biologist, Proposed Landfill Site Assessment, City of Toronto, Ontario
Assessed proposed landfill sites for the solid waste environmental assessment plan program. *1991 (completed).*

Biologist, Natural Environment Assessment, Chatham, Ontario Clean Water Agency
Identified environmentally sensitive areas, fish spawning areas, provincially significant wetlands and other wetlands in three townships near Chatham. The project included determining the best route for a water pipeline to serve the townships and communities of the area. *1991 (completed).*

Biologist, Flood Plain Capacity Study, City of Cambridge, Ontario
Conducted field studies including vegetation surveys and recommended mitigation measures in the Mill Creek floodplain in response to proposed improvements to the floodplain capacity. *1991 (completed).*

Biologist, Field Study and Contaminated Site Remediation, City of Toronto, Ontario
Conducted field studies including documentation of existing conditions and recommendations for the rehabilitation of a sedimentation pond north of Grenadier Pond in High Park. Analysis included the remediation of contaminated soils and recommendation of suitable plant species. *1991 (completed).*

Biologist, Natural Environment Study, London, Ontario Ministry of the Environment
Identified wetlands, areas of natural and scientific interest, environmentally sensitive areas, woodlots and other natural areas in a water supply pipeline corridor extending from Lakes Huron and Erie to the London area. *1991 (completed).*

Biologist, Vegetation Assessment for Stormwater Management Plan, Cosburn, Patterson and Wardman, Toronto, Ontario
Assessed vegetation and identified sensitive areas for a proposed stormwater management plan north of the city. *1991 (completed).*

Biologist, Class Environmental Assessment, Mississippi Valley Conservation Authority, Constance Bay, Ontario
Conducted field studies and participated in a class environmental assessment of various flood control options at Constance Bay on the Ottawa River. *1990 (completed).*

Biologist, Environmental Study, City of London, Ontario
Completed an environmental study report on natural features within and adjacent to the Vauxhall pollution control plant in response to proposed expansion of this facility. *1990 (completed).*

PLANNING

Biologist, New Official Plan, Municipality of Lambton Shores, Ontario
Prepared a new official plan (OP) for the municipality to protect significant resources from future development. The new OP includes approaches for cultural heritage preservation; provision of infrastructure and public service facilities; sustainable community planning and development; environmental stewardship; urban design principles and guidelines. *2009 (completed).*

Project Manager, Master Environment Servicing Plan, North Leslie Residential Landowners Group Inc., Richmond Hill, Ontario
Conducted numerous field studies in the North Leslie planning area. The studies were part of a master environmental servicing plan to identify constraints and opportunities for development.

Assessed streams, wetlands, forests and agricultural lands using Ecological Land Classification. *2009 (completed).*

Biologist, Environmental Constraint Report, Fieldgate Developments Ltd., City of Vaughan, Ontario
Completed an environmental constraint report of a 20 ha (50 acre) property within the Oak Ridges Moraine to document the development potential based on constraints on the property. *2006 (completed).*

Biologist, Environmental Analysis, Private Developer, Gosfield South, Ontario
Completed an environmental analysis report on a 51 ha property in the Township near Kingsville. The issues paper identified the potential impacts and opportunities that developing the area had on an adjacent provincially significant wetland and regionally significant environmentally significant area. *2006 (completed).*

Biologist, Land Development Boundaries, Private Developer, Vaughan, Ontario
Determined and staked the top-of-bank of valley lands and special natural features within a large portion of Block 12 to the amount of developable land available for land owners. *2003 (completed).*

Biologist, Natural Environment Assessment, Jay-M Holdings Ltd., Uxbridge, Ontario
Identified areas of natural and scientific interest, environmentally sensitive areas, streams, wetlands, within and adjacent to seven potential development sites. *2003 (completed).*

Biologist, Environmental Study, Al Boucher Ltd., Parry Sound, Ontario
Evaluated and assessed three environmental protection areas and others situated on a lake in Foley. *2002 (completed).*

Biologist, Master Environmental Servicing Plan, Block 11 Landowners, City of Vaughan, Ontario
Conducted numerous field studies in Block 11 in Vaughan. These studies were part of a Master Environmental Servicing Plan that would identify constraints and opportunities for development. Field studies included the assessment of streams, wetlands, forests and agricultural lands. *2000 (completed).*

Biologist, Environmental Constraint Report, Fieldgate Developments Ltd., Vaughan, Ontario
Completed an environmental constraint report of a 37.5 ha (92.7 acre) property within the Oak Ridges Moraine. This report documented the development potential of the property based on existing features in the area. *1999 (completed).*

Biologist, Master Environmental Servicing Plan, Fred Schaeffer & Associates, Vaughan, Ontario
Conducted numerous field studies to Block 18 as part of a master environmental servicing plan to identify constraints and opportunities for development. Field studies included the assessment of streams, wetlands, forests and agricultural lands. *1997 (completed).*

Biologist, Master Environmental Servicing Plan, North Elgin Mills Group Limited, Richmond Hill, Ontario
As part of the master environmental servicing plan of OPA 100, numerous field visits were conducted to assess the natural features of the area. The report written for this study documented constraints and opportunities that would have to be addressed. *1997 (completed).*

Biologist, Master Environmental Servicing Plan, Malon, Given and Parsons, Woodbridge, Ontario
Conducted field studies as part of a master servicing pla for the Woodbridge expansion area lands (OPA 400). The project included identification and assessment of natural features and recommendation of setbacks for their protection. Tree preservation plans were also completed. *1996 (completed).*

Biologist, Master Environmental Servicing Plan, Fred Schaeffers and Associates, Maple, Ontario
Conducted field studies as part of a master servicing plan for a 430 acre parcel of land (OPA 32). Studies included assessment of woodlands, old fields and watercourses and the inventory of these communities. The project also included a detailed tree inventory of a portion of a regionally significant areas of natural and scientific interest. *1995 (completed).*

Biologist, Environmental Study, Metrus Management Land Development, Aurora, Ontario
Identified and assessed trees and rehabilitation of streams on lands designated for a residential community. *1995 (completed).*

Biologist, Proposed Development Green Plan, Ecos Garratech, Keswick, Ontario
Conducted numerous field visits to a 1,000 acre property. Information was collected on natural features included forestry, wildlife potential and watercourses. A literature review on suitable buffer widths for wildlife corridors was also conducted as part of the green plan for the proposed development. *1994 (completed).*

Biologist, Master Environmental Servicing Plan, Tridel Corporation, Maple, Ontario
Conducted field studies on OPA 332 (160 acres). The project included the delineation of noteworthy forests, wetlands and land forms in the preparation of a master servicing plan for the property. Using an ecosystem approach, ecolines were established that maximized environmental protection but allowed significant development potential to take place. *1994 (completed).*

Biologist, Natural Environment Assessment, Wycliffe Elgin West Limited, Richmond Hill, Ontario
Conducted numerous field visits on OPA 118 (200 acres). Field work included the identification of sensitive areas including noteworthy forests and hazard areas, the establishment of top of bank in consultation with the Conservation Authority and Ministry of Natural Resources personnel, and the delineation of ecolines that give maximum protection to these areas that are environmentally sensitive. *1993 (completed).*

Biologist, Natural Environment Assessment, Town of Richmond Hill/Bayview Heath Group, Ontario
Conducted numerous field visits to a 1,000 acre property (OPA 121, 113 and 114). Information on natural features including wildlife, forests, wetlands and streams was collected. Through an ecosystem approach, environmental constraint areas and appropriate mitigation strategies were established, as well as suitable environmental setbacks and buffers for proposed developments on the site. *1993 (completed).*

Biologist, Field Studies for Development Plans, Kings Point Condominiums, Niagara-on-the-Lake, Ontario
Reviewed secondary source material, conducted field studies and suggested appropriate mitigation strategies for a planned condominium/marina project on the Niagara River. *1992 (completed).*

Biologist, Site Assessment for Residential Development, Paracon Group, Brampton, Ontario
Conducted field studies on a large property where details on natural features were recorded. Mitigation strategies were suggested for the planned high density residential development, and a detailed rehabilitation plan for an unnamed creek (a tributary of Etobicoke Creek) and stormwater pond were also presented. *1992 (completed).*

Biologist, Field Study for Collins Creek Watershed Study, Cataraqui Region Conservation Authority, Kingston, Ontario
Conducted field studies and reviewed secondary source information in order to determine locations of areas of natural and scientific interest, environmentally sensitive areas, noteworthy forests and wetlands, as part of the Collins Creek watershed study to address future development concerns and environmental issues. *1992 (completed).*

Biologist, Terrestrial Biology Study, City of Windsor, Ontario
Provided terrestrial biology input, including field work, analysis of three major alternatives, meeting with agency groups and reporting results. *1991 (completed).*

Biologist, Environmental Study, Calora Investments, Ajax, Ontario
Conducted field studies and assessed a small woodlot growing on the site of a proposed residential development. *1991 (completed).*

Biologist, Environmental Study, Runnymede Development Corporation, Ajax, Ontario
Inventoried and assessed vegetation and sensitive areas for a proposed industrial park. *1991 (completed).*

Biologist, Natural Environment Assessment, Cole Sherman and Associates, Ajax, Ontario
Conducted field studies to assess woodlots, streams and other natural features on the site of a proposed residential development. *1990 (completed).*

Biologist, Vegetation Study, City of Brantford, Ontario
Conducted vegetation inventories in a wetland northwest of the city. *1990 (completed).*

EMPLOYMENT HISTORY

DILLON CONSULTING LIMITED

1990 - Present Terrestrial Biologist, Agrologist, Botanist, Arborist, Project Manager, Expert Witness, Peer Reviewer, Associate

MINISTRY OF AGRICULTURE AND FOOD

1989 - 1990 Horticulture Consultant

MUNICIPALITY OF METROPOLITAN TORONTO

1988 - 1989 Arborist

UNIVERSITY OF GUELPH

1987 - 1988 Diagnostician and Consultant, Pest Diagnostic and Advisory Clinic

UNIVERSITY OF GUELPH

1983-1986 Apiarist, Research Technician, Department of Environmental Biology

CLARESHOLM FARMS

1982 Agricultural Assistant

1978 - 1980 Agricultural Assistant (summers)

PROFESSIONAL DEVELOPMENT

Ground Penetrating Radar Short Course, Sensors & Softwares Inc., 2015, Mississauga, Ontario

Advanced Tree Appraisal Course, sponsored by Arboriculture Canada Training and Education, Sept 30 to Oct 3, 2014, Cambridge, Ontario

International Society of Arboriculture Emerald Ash Borer Workshop, September 2013

Advanced Tree Appraisal Workshop sponsored by the International Society of Arboriculture/ University of Toronto. August 18/19, 2010

Butternut Health Assessment Course sponsored by the Ontario Ministry of Natural Resources/ Kemptville College. August 26, 2010 (updated August 16, 2013), Certificate # 308

Ecological Land Classification (ELC) training course, June 2001

Ontario Fish Identification Workshop, May 1999

Invited speaker to a one-day golf course conference in Woodstock, Ontario. Topic of the speech was "Ecologically Sound Golf Course Development", November 1996 (Middlesex Stewardship Committee)

Presented a poster entitled, "River Road Golf Course" at Partners in Environmental Management Conference, March 1996

Environmental Impact Study Training Session, July 1995

Southern and Northern Wetlands Evaluation Course, June 1994, updated in 2010 by OWES

Field Botanist of Ontario Sedge Workshop, April 1992

Field Botanist of Ontario Fern Workshop, March 1991

PUBLICATIONS

Young, T.P. 1993. “Indoor Growing: Barking Up the Right Tree”. Canadian Gardening, 4(4):19.

Young, T.P. 1993. “Indoor Growing: Raising Plants to New Heights”. Canadian Gardening, 4(3):21.

Young, T.P. 1993. “Indoor Growing: An Office Oasis”. Canadian Gardening, 4(1):19.

Young, T.P. 1992. “Indoor Growing: Home Alone”. Canadian Gardening, 3(5):21.

Young, T.P. 1992. “Indoor Growing: Turning Over a New Leaf”. Canadian Gardening, 3(3):19.

Young, T.P. 1992. “Indoor Growing: Off-the-wall Plants”. Canadian Gardening, 3(2):17.

Jonathan W.A. Harris

BIOLOGIST/WETLAND EVALUATOR/ARBORIST

jharris2@dillon.ca

PERSONAL PROFILE

Jonathan is a field biologist and certified wetland evaluator with experience in natural environment management projects and as a skilled field biologist brings a broad level of understanding various environmental disciplines to every project. His area of expertise primarily in terrestrial ecosystem field studies with a focus on ecological land classification, wildlife surveys, wetland evaluation, species at risk surveys, invasive plant species control, and arborist studies. Jonathan is a certified evaluator in Ontario for Ecological Land Classification and the Ontario Wetland Evaluation System. Jonathan is also a certified Arborist.

EDUCATION

Ontario Advanced Diploma, Fish and Wildlife Technology, Sir Sandford Fleming College, 2009

Ontario Diploma, Fish and Wildlife Technician, Sir Sandford Fleming College, 2008

AFFILIATIONS/ASSOCIATIONS

Ontario Invasive Plant Council (Member)
Ontario Nature (Member)
Field Botanists of Ontario (Member)
Toronto Field Naturalists (Member)
Ontario Field Ornithologists (Member)

RELEVANT EXPERIENCE

WETLAND DELINEATION/EVALUATION

Biologist/Wetland Evaluator, Goulbourn Wetland Complex, City of Ottawa, Ontario
Completed a re-evaluation of a large provincially designated wetland complex located in Ottawa. *2016 (on-going).*

Biologist/Wetland Evaluator, South Cameron Development Site, City of Winsor, Ontario
Completed a re-evaluation of an 82 hectare provincially designated wetland complex located in Windsor. *2015 (completed).*

Biologist/Wetland Evaluator, Roseland Development Site, City of Winsor, Ontario
Completed an evaluation of an 82 hectare provincially designated wetland complex located in Windsor. *2015 (completed).*

Biologist/Wetland Evaluator, Harper Road Landfill, City of Peterborough, Ontario
Completed the assessment and development of a long-term mitigation plan for the former landfill. Environmental issues addressed included off-site migration of polychlorinated biphenyls in surface water and sediments, off-site chlorinated solvent groundwater plume, waste of unknown composition and quality, undefined landfill area and sensitive land use within the area. *2014 (completed).*

Biologist/Wetland Evaluator, Dufferin Wind Farm, Dufferin Wind Power Inc., Melancthon, Ontario
Completed a natural heritage risk assessment study for a proposed wind energy development. The study assessed the development risks and probable effects to wildlife species and habitat.

DILLON CONSULTING

Field studies involved ecological land classification, wetland delineation/evaluation, and amphibian/marsh breeding bird surveys. *2012 (completed).*

Biologist, Maple Lakes Estates, Metrus Properties Limited, Georgina, Ontario
Completed an environmental impact study of the natural heritage features within and surrounding the site as part of an application for residential development. The project included an edge management plan. *2011 (completed)*.

ECOLOGICAL LAND CLASSIFICATION

Biologist, Beeton Management Plan, Walton Developments and Management, Beeton, Ontario
Prepared environmental overview and land management plans (EOLMPs) for three master plan areas including ~40 properties. The EOLMPs compiled preliminary inventories and an understanding of the natural heritage features on each property such as woodlands, valleys, wetlands, watercourses, etc., as well as to identify the potential areas of opportunity and constraints to development in the future. *2014 (completed).*

Biologist, Gore Road Bridge Replacement, City of London, Ontario
Completed the Municipal Class Environmental Assessment, preliminary design and detailed design for the replacement of the bridge. This included changes to municipal utilities and the extension of the Kiwanis Park Pathway under the bridge. *2014 (completed).*

Biologist, Gateway Employment Zone, Walton Development and Management, New Tecumseth, Ontario
Completed a report which documents natural features through background review of secondary sources and field studies to determine potential constraints to development that may exist as a result of the natural environment. Also identify stewardship and enhancement opportunities on three properties. *2013 (completed).*

Biologist, 1756 St. John's Sideroad Environmental Impact Study, Team Greensborough JV Inc., Aurora, Ontario
Completed an Environmental Impact Study of the natural heritage features within and surrounding a site in Aurora, Ontario as part of an application for employment and residential development. *2013 (completed).*

Biologist, Southwest Georgetown Peer Review, Southwest Georgetown Landowners Group, Halton Hills, Ontario
Assessed previously completed natural environmental works on the property. The project has included natural environmental work and field studies, and expert witness at the Ontario Municipal Board for the appeal of the regional official plan update. *2013 (completed).*

Biologist, Watermain Twinning, Lambton Area Water Supply System, Ontario
Completed the twinning of a transmission main and designed grid reinforcement of the existing trunk main in the southern part of Sarnia, to ensure water supply security to all LAWSS users. The project comprised of two 900 mm watermains and one 600 mm watermain for a distance of more than 20 km. *2013 (completed).*

Biologist, East Marsh Dyke Rehabilitation, Essex Region Conservation Authority, Leamington, Ontario
Designed the upgrade and expansion of an earthen dyke and channelization under the Drainage Act. The project included the use of armour stone revetment system to preserve and

protect agricultural and residential lands from high lake levels. Extensive terrestrial and aquatic assessments were also conducted including correspondence with regulatory bodies (MNR, DFO, etc.). *2012 (completed).*

Biologist, Pelee Drive Sanitary Sewage System, Municipality of Leamington, Ontario
Conducted the Class EA and provided public consultation, planning and engineering services. The primary objective included the resolution of potential impacts to the environment and the community of aging, failed or substandard septic treatment systems. *2012 (completed).*

Biologist, Red Hill Business Park, City of Hamilton, Ontario
Prepared functional and detailed design of road, sanitary sewers and watermains for Nebo Road, Twenty Road and Glover Road, as well as an intersection improvement at Rymal/Glover. Provided technical support during construction, coordinated utilities and relocation work, subconsultants, geotechnical and approval applications to Ministry of the Environment and Hamilton Conservation Authority. *2012 (completed).*

Biologist, Cherry Beach Shoreline Protection Environmental Assessment, City of Hamilton, Ontario
Completed the shoreline protection infrastructure conceptual design and municipal class EA. Signs of high erosion rates were observed at the site and included a very steep bank with no vegetation established on the bank. One of the proposed options for reducing the erosion included a groyne on the west side of the beach's shoreline. *2012 (completed).*

Biologist, Laurier Parkway, Detailed Design, Town of LaSalle, Ontario
Completed the detailed design and construction of 6 km of a two-lane arterial road, extending from Malden Road to Howard Avenue. The project included dedicated auxiliary lanes at major intersections, a roundabout at Mike Raymond Drive, a 2.5 m wide asphalt trail, storm drainage via roadside swales and storm sewers, watermains, streetlighting and signalized intersections. *2011 (completed).*

WILDLIFE SURVEYS

Biologist, McGregor Environmental Impact Study, Bazil Developments Inc., Newmarket, Ontario
Completed an Environmental Impact Study of the natural heritage features within and surrounding a site in Newmarket as part of an application for residential development. Also, as part of this project we are involved with Showcasing Water Innovation to illustrate how greener and more sustainable communities may be fast-tracked through approvals process. *2013 (completed).*

Biologist, Dartnall Road Extension, City of Hamilton, Ontario
Provided project management and engineering design to widen the existing two-lane Dartnall Road to four to five lanes and also extend the road beyond Red Hill business park. Street lighting and watermain design were included in the design. This multi-phased project included the realignment of the Hannon Creek to facilitate the extension of the road. Contract administration and construction field services were provided for the construction phase of the creek realignment. *2012 (completed)*

Biologist, Mountain Park Bridge Environmental Assessment, City of Hamilton, Ontario
Prepared the Schedule B Class Environmental Assessment to replace Mountain Park Avenue. The bridge was classified as having moderate heritage potential. *2012 (completed).*

Biologist, Sault Ste. Marie Annual Program, City of Sault Ste. Marie, Ontario
Undertook the Sault Ste. Marie Municipal Landfill Work Programs for several years, providing assistance with groundwater, surface water and leachate monitoring programs. The phases included sampling coordination and lab analysis, biological testing, environmental monitoring, committee resource and 2008 NPRI & O. Reg. 127 Report for Landfill. *2011 (completed)*

Biologist, Bush Street and Mississauga Road Class Environmental Assessment, Regional Municipality of Peel, Ontario
Completed the Class EA for Bush Street and Mississauga Road improvements near Belfountain. The project included natural heritage, water resources and archaeology components. *2010 (completed).*

Biologist, Environmental Impact Study, 1739626 Ontario Limited, London, Ontario
Completed an EIS as part of a development application adjacent to fish habitat, significant woodland and significant wetland. *2008 (completed).*

EMPLOYMENT HISTORY

DILLON CONSULTING LIMITED
2011 - Present Field Biologist

UNIVERSITY OF CHICAGO
2010 Songbird Research Assistant

DUCKS UNLIMITED CANADA
2009 Muskrat/Wetland Research Technician

NORTHERN TILAPIA INC.
2008 - 2009 Fisheries Technician

FLEMING COLLEGE ATLANTIC SALMON HATCHERY
2007 - 2008 Hatchery Assistant

PROFESSIONAL DEVELOPMENT

International Society of Arboriculture, Certified Arborist – March 2016
MNR Data Sensitivity Training, December 2013
Ecological Land Classification Training, September 2011
Ontario Wetland Evaluation System Certification, June 2012
WHMIS 2015, 2016
Standard First Aid, CPR and AED training 2016
Wilderness First Aid, 2012
Radio and Ultrasonic Telemetry, 2008
Pleasure Craft Operator Card, 2004

Appendix C

GIS Metadata

Type: File Geodatabase
Projection: NAD 1983 UTM Zone 18N
Creator: Dillon Consulting Limited
Date: November 2016
Purpose: Re-delineation of Goulbourn Wetland Complex

File Name	File Description	Attribute	Description
On-site Field Verification			
Dillon_GoulbournPSW_FINAL_24OCT2016_dissolve	Includes the final re-delineation of the Goulbourn Wetland Complex units which are merged together where	Unit_ID	Numerical identifier for each individual unit of PSW
Dillon_GoulbournPSW_FINAL_24OCT2016	Includes the final re-delineation of the Goulbourn Wetland Complex units. Includes multiple polygons for several units where portions were only aerial interpreted and portions were field verified	Survey	Confirmed or unconfirmed, based on site access
		PartOfPSW	In PSW or not (all are yes)
		Area_ha	Area in hectares for the unit
		Delin_Source	Primary source for revisions • Aerial interpretation • Field verified
		Unit_ID	Numerical identifier for each individual unit of PSW
Dillon_GoulbournPSW_FINAL_expanded24OCT2016	Includes polygons of expanded wetland area, identified by the associated parent unit	Survey	Confirmed or unconfirmed, based on site access
		PartOfPSW	In PSW or not (all are yes)
		Area_ha	Area in hectares for the unit
		Delin_Source	Primary source for revisions • Aerial interpretation • Field verified
		Unit_ID	Numerical identifier for each

File Name	File Description	Attribute	Description
			individual unit of PSW
		ELC	Vegetation community type
		Dom_form	dominant vegetation forms
		Species_Obs	wetland species observed
Dillon_GoulbournPSW_FINAL_removed24OCT2016	Includes polygons of removed wetland area, identified by the associated parent unit	Unit_ID	Numerical identifier that the removed area is associated with
		Area_ha	Area in hectares of the removed portion
		Rationale	Reason for why area was removed • Anthropogenic Upland
		Source	Primary source for revisions • Aerial interpretation • Field verified

Appendix D

Site Photographs

Former Unit 27 – assessed as anthropogenic and upland

Former Unit 11 – best vantage point from TransCanada Trail

Unit 4 – young ash swamp

References

City of Ottawa. [Document] 2003. Official Plan

Lee, H.T., W.D. Bakowsky, J. Riley, J. Bowles, M. Puddister, P. Uhlig and S. McMurray. [Document] 1998. Ecological Land 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.

Ontario Ministry of Natural Resources. [Document] 2001. Ecological Land Classification for Southern Ontario: Training Manual.

Ontario Ministry of Natural Resources. [Document] 2014. Southern Manual for the Ontario Wetland Evaluation System. 3rd Edition, Version 3.3, Queen's Printer for Ontario.